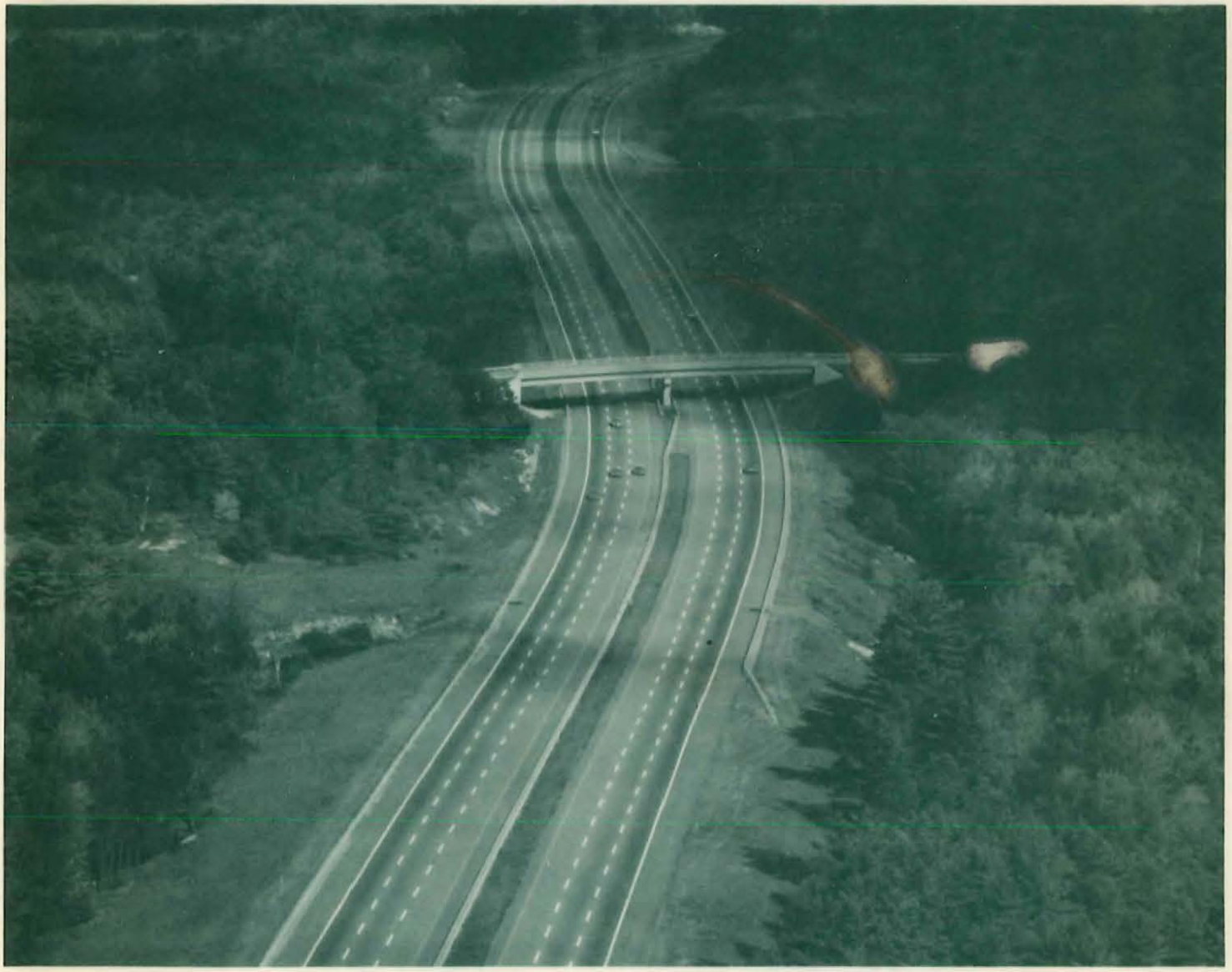
MAINE TURNPIKE AUTHORITY

Portland, Maine



CAPITAL IMPROVEMENT STUDY

HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS ENGINEERS PLANNERS
HNTB

Wilbur Smith and Associates

HOWARD NEEDLES TAMMEN & BERGENDOFF

September 25, 1986

Maine Turnpike Authority
430 Riverside Street
Portland, Maine 04103

Gentlemen:

We are pleased to submit this special report relating to the existing conditions on the Turnpike; the projected increase in traffic and revenue to 1995; the necessary improvements (new interchanges, access roads and turnpike widening) required to serve this increased traffic; and several alternatives for financing the above improvements.

Those sections of the report dealing with traffic, revenue and finacial feasibility were prepared by Wilbur Smith and Associates, special consultants to HNTB.

We wish to express our appreciation to the several representatives of L. F. Rothschild, Unterberg, Towbin, Inc., Maine National Bank, the Maine Department of Transportation and the Turnpike Authority staff who have provided valuable advise and reference material.

Very truly yours,

HOWARD NEEDLES TAMMEN & BERGENDOFF

Francis X. Hall
Partner

FXH/bjc

Architects Engineers Planners **Suite 4200-Prudential Center • P.O. Box 9106, Boston, Massachusetts 02199, 617 267-6710**

Partners James F. Finn PE, Paul L. Heineman PE, Gerard F. Fox PE, Browning Crow PE, Charles T. Hennigan PE, Edgar B. Johnson PE, Daniel J. Watkins PE, Daniel J. Spigai PE, John L. Cotton PE, Francis X. Hall PE, Robert S. Coma PE, Donald A. Dupies PE, William Love AIA, Robert D. Miller PE, James L. Tuttle, Jr. PE, Hugh E. Schall PE, Cary C. Goodman AIA, Gordon H. Slaney, Jr. PE

Associates Daniel J. Appel PE, Robert W. Richards PE, Don R. Ort PE, Frederick H. Sterbenz PE, Robert B. Kollmar PE, Kendall T. Lincoln CPA, Jack P. Shedd PE, Roberts W. Smithem PE, Jack C. Thompson PE, Richard D. Beckman PE, Harry D. Bertossa PE, Ralph E. Robison PE, Cecil P. Counts PE, Stephen G. Goddard PE, Harvey K. Hammond, Jr. PE, Stanley I. Mast PE, Robert W. Anzia PE, Walter Sharko PE, James O. Russell PE, Ross L. Jensen AIA, Frank T. Lamm PE, Alexander F. Silady PE, John W. Wight PE, Thomas K. Dyer PE, Ronald W. Aarons AIA, H. Jerome Butler PE, Blaise M. Carriere PE, Michael P. Ingardia PE, Bernard L. Prince PE, Stephen B. Quinn PE, Saul A. Jacobs PE, James A. Smith, Ronald F. Turner AIA, C. Frank Harscher, III, Ewing H. Miller, FAIA, Douglas C. Myhre PE

Offices Alexandria, VA, Atlanta, GA, Austin, TX, Baton Rouge, LA, Boston, MA, Casper, WY, Charleston, SC, Charleston, WV, Chicago, IL, Cleveland, OH, Dallas, TX, Denver, CO, Fairfield, NJ, Houston, TX, Indianapolis, IN, Kansas City, MO, Lexington, KY, Lexington, MA, Los Angeles, CA, Miami, FL, Milwaukee, WI, Minneapolis, MN, Newark, DE, New York, NY, Orlando, FL, Overland Park, KS, Philadelphia, PA, Phoenix, AZ, Raleigh, NC, Seattle, WA, Tampa, FL, Tulsa, OK, Penang, Malaysia,

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

In November of 1984 the Maine Turnpike Authority authorized the firms of Howard Needles Tammen & Bergendoff and Wilbur Smith and Associates to proceed with a capital improvement study. The purpose of this study was to inventory the existing Turnpike conditions regarding its existing facilities and appurtenances, traffic conditions and finances and forecast any needed improvements or major capital outlays that may be required within the next ten (10) year period. The study was to begin in January of 1985 and, for traffic data collection purposes, extend over a period of approximately one (1) year.

As the study developed, it became apparent that the greatest point of consideration and concern should be traffic flow and the improvements required to maintain adequate flow. Chapters II and III of the study report discuss the existing traffic and revenue trends and the estimated future traffic demands, respectively. Within this information, we find that traffic has increased significantly over the past ten (10) years, averaging 7 percent per year. This portion of the report also provides a tool by which to measure traffic flow as well as documenting the current traffic flow conditions and volumes. In addition, it forecasts conditions and volumes for various improvement scenarios.

The tool used to indicate traffic flows is a Level of Service (LOS) value which may be related directly to traffic volume. These levels range from LOS A, or free flow, to LOS F or stop and go/forced flow. A complete description of these levels may be found on pages 38 and 39 of the text. Table III-3 and III-4, respectively, provide the traffic volumes, existing and forecast, as well as the comparable levels of service. The improvements indicated on these tables refer to the MDOT interchange/access road program only. As indicated on Table III-4, the Turnpike is currently operating at its best in the northern section (LOS A-B) and approaching a deteriorating condition (LOS C-D) in the southern section. These conditions would not change dramatically if the MDOT program were implemented at this time. Under the projected traffic demand, however, a severe deter-

ioration of traffic flow conditions will occur from Interchange 1 to 6A. The LOS in this region for the year 1994 is generally forecast at LOS F or a stop and go/forced flow condition. This may be equated to the recurring backups which have been witnessed between York and Wells, during peak traffic periods in 1985 and 1986.

Four (4) improvement scenarios are described in Chapters II and III of the study report. Program 1 may be referred to as the No Build scenario. It advocates a status quo condition. That is, the Turnpike would continue to implement the MDOT program on a pay-as-you-go basis with no other improvements. Under this program, fare increases would be required to maintain the Turnpike's financial stability and traffic flow on the Turnpike would continue to deteriorate. Program 2, the partial build, advocates the rapid completion of the MDOT program by introducing a fare increase in 1988. As in the case of Program 1, Program 2 also allows traffic flow to deteriorate by providing no improvements to the Turnpike itself. It could also accelerate this condition by providing additional traffic links to the presently congested U.S. Route 1. Program 3, Full Build, provides for the MDOT program and widening the Turnpike from mile 12 to mile 42 or exit 6A. Under this program a bond issue of $112 million dollars would be required. As indicated in Chapter V, several toll increases could be required to repay this bond issue and maintain the financial integrity of the Turnpike. Program 4 is similar to Program 3 except for the amount of bond issue.

Chapters IV and V contain all of the pertinent data relative to construction costs and financial requirements. Table IV-1 presents the 1985 estimated construction costs of the MDOT program. Tables IV-3, IV-4, IV-5, IV-6 and IV-7 present the estimated costs for the Turnpike widening and the total cost of Program 3. More specifically, Table IV-7 presents a summary of the costs for Program 3 for both the 1985 prices and the projected 1989 dollars. Tables V-3, V-6, V-7 and V-8 are financial feasibility Pro Forma for the four improvement scenarios.

The costs for Program 1, No Build, are simply the costs of implementing the MDOT projects on a pay-as-you-go basis in conjunction with the Turnpike's

operating costs. Table V-3 provides a financial feasibility Pro Forma for Program 1 under the current toll schedule. This table assumes that the only MDOT projects to be constructed at this time are the Auburn and Lewiston proposals. As indicated in Table V-3, the Turnpike is able to fund both Auburn and Lewiston and continue to provide surplus funds to the MDOT improvement fund until 1992. In 1992, the Turnpike would begin to operate at a deficit and would require a toll increase to maintain financial stability. Two (2) potential conditions arise from the implementation of Program 1. First, this program does not provide a solution to the growing traffic congestion condition. This could have a resultant effect on revenues in the sense that growth will be limited. Second, the MDOT program, which has been estimated to have a 1985 value of $42,100,000, would most certainly increase due to inflation and thereby require higher contributions by the Turnpike. This would increase the financial burden envisioned in Table V-3.

Program 2 costs are similar to Program 1 in that they consist of the costs of implementing the MDOT projects in conjunction with the Turnpike's operating costs. The difference in this program is that Program 2 assumes that all of the MDOT projects will be constructed on an accelerated schedule. This schedule would cause the improvement program to be in-place and operational by 1991. Table V-5 of the report, the financial feasibility Pro Forma for Program 2 under the current toll schedule, indicates that, in attempting to meet this Program's schedule, a $3.8 million deficit occurs in 1989. This condition worsens as the program is completed indicating that a toll fare increase is required. Table V-6, financial feasibility Pro Forma for Program 2 with a revised toll schedule, indicates the successful completion of the Program by implementing a 15 percent fare increase in 1988. This increase would also provide for the Turnpike's financial stability until approximately 2003, when a deficit would begin to appear. Further, this program as in the case of Program 1 does nothing to alleviate the growing traffic congestion problem in the southern section. Rather, the implementation of the three (3) MDOT projects that occur in the southern section could serve to further accelerate this condition.

Costs associated with Program 3, Full Build, include construction costs for

an accelerated Program 2, widening of the Turnpike from mile 12 to mile 42, operation costs of the Turnpike and the costs associated with having a revenue bond issue to fund the construction operation. Additionally, the relocation of the York toll plaza would be included. A summary of the construction costs for this program may be seen on Table IV-7. The costs in 1985 dollars include: $27,565,000 for the Turnpike share of the MDOT projects; $63,071,000 for the Turnpike widening and side road relocation; and $3,480,000 for the York toll plaza relocation. This totals $94,116,000 in 1985 dollars for the construction of Program 3. Since an estimated balance of $15,400,000 will exist in the improvement fund at the time of construction, the net cost is estimated at $78,716,000 in 1985 dollars. Escalating this to 1989 dollars we find that the total cost would be $105,500,000. A Pro Forma for this program was conducted asssuming a $112,000,000 bond issue and a 25 year term. Table V-7, illustrates this Pro Forma and indicates that three (3) toll increases of 20 percent in 1987, 20 percent in 1994 and 25 percent in 2000 would probably be required to meet all of the Turnpike obligations including maintaining the $4.7 million payment to MDOT. The benefit of this program is that it completes the MDOT projects, and solves the increasing traffic congestion problem in the southern section while still maintaining the Turnpike's financial stability.

Costs associated with Program 4, Full Build, include construction costs for access road/interchanges phased over the years 1986 to 1995, widening the Turnpike from mile 12 to mile 42 between 1988 and 1991 and relocation of the York Toll Plaza. The total construction cost in 1985 dollars is similar to Program 3 - $96,381,000. Escalating this cost into 1988 thru 1994 dollars results in a total construction cost of $128,478,000. A Pro-forma for this program was conducted assuming a $76,000,000 bond issue for a 25 year term in conjunction with a pay-as-you-go concept using net surplus income. Table V-8 illustrates this Pro Forma and indicates a 20 percent toll increase in 1987 and 1992. An additional fare increase would probably be required in the year 2000 in the magnitude of 25 percent. All Turnpike obligations are provided for, including the annual $4.7 million payment to MDOT. The benefits of this program is that it solves the increasing traffic congestion in the southern section of the Turnpike; it completes

the access road/interchange projects in an orderly fashion; it requires a lessor bond issue then Program 3; and it still maintains the Turnpike's financial stability.

RECOMMENDATION

We would recommend that the Authority initiate the several procedures required to proceed with the implementation of Program 4.

CHAPTER I

INTRODUCTION

Initially, the Maine Turnpike, constructed as a 45-mile, four-lane, divided highway between Kittery and Portland, was financed by a $20.6 million bond issue and was opened to traffic on December 13, 1947. Shortly afterward, planning for a 66-mile extension from Portland to Augusta including a four-mile spur to U.S. Route 1 in Falmouth was begun. On December 13, 1955 this new extension was opened to traffic.

Today, the Maine Turnpike extends from the York Toll Plaza on the south to the Augusta Toll Plaza on the north. There are also 14 internal interchanges. Two of these interchanges provide only partial service. The Scarborough Interchange (6A) serves traffic to and from the south only, while the Scarborough Downs Interchange (6) is only operated seasonally in conjunction with the Scarborough Downs Race Track.

The Maine Turnpike, between the York Toll Plaza (1) and the Falmouth - Route 1 Interchange (9), has been incorporated into the Interstate Highway System as Interstate Route 95 (I-95). The I-95 designation is also carried on the section between the Gardiner Interchange (14) and the northern terminal point at the Augusta Toll Plaza (15).

In November of 1981, a Toll Schedule Analysis and Commuter Plan Study report was prepared and submitted to the Maine Turnpike Authority. The main thrust of this work program was to respond to the legislation enacted by the Maine Legislature relative to future operation of the Turnpike after retirement of the then outstanding bond debt.

During the course of expanding the highway system in Maine, tripartite agreements were entered into, between FHWA, Maine DOT and the Maine Turnpike Authority, for use of federal money on connections between the Turnpike and the Interstate Highway System. These monies totaled approximately $8.6 million.

Subsequently, the Maine DOT and Turnpike Authority sought and received congressional approval to repay the initial federal contributions and to remain as an operating toll road after debt retirement. In 1982, the Maine Legislature enacted Legislative Document (L.D.) No. 2064 (Chapter 595, Public Laws of the State of Maine, 1982) pursuant to the future operation of the Maine Turnpike.

On June 15, 1982, the Authority issued $7.5 million in Turnpike Revenue Bonds. The proceeds received by the Authority from the sale of the 1982 Bonds, excluding accrued interest, was to be used together with other funds of the Authority to pay the federal government certain amounts owed by Maine pursuant to the Federal-Aid Highway Act. On July 1, 1982, the Authority redeemed all principal amounts of its initial bond issues leaving only the 1982 Bonds outstanding.

The Turnpike employs a closed ticket method of toll collection structured on six separate toll classes (as listed below) determined by vehicle type and number of axles. A motorist is issued a ticket, signifying the vehicle classification at the point of entry. The ticket is surrendered at the exiting interchange and a predetermined toll charge is assessed based on the vehicle class and the pair of interchanges used.

- Class 1 - Two-axle, four tire vehicles - includes passenger cars, pick-up trucks, vans and motorcycles.
- Class 2 - Two-axle, six tire vehicles - includes buses and motorhomes.
- Class 3 - Three-axle vehicles and combinations.
- Class 4 - Four-axle vehicles and combinations.
- Class 5 - Five-or-more axle vehicles and combinations.
- Class 7 - Class One vehicles towing trailer.

The toll schedule on the Turnpike was last changed on May 1, 1982, when passenger car and commercial vehicle toll rates were increased by 25 and 35 percent, respectively. In addition, the Authority adopted a commuter discount plan for all eligible Class One motorists. As mandated in the 1982 legislation, commuter fees were structured on a 50 percent discount of the cash toll in effect on June 1, 1981. The commuter plan adopted by the Authority involves four quarterly prepayments for selected interchange to interchange movements. The quarterly fee due was determined on an assumed commuter trip frequency of 126 trips per quarter.

Also mandated under this legislation was the establishment of a fund, the purpose of which would be to construct and/or improve new or existing interchanges and access roads. The intent of this facet of the legislation was to utilize excess funds generated by the Turnpike to spur potential industrial growth through access improvement. Under this program, the Maine Department of Transportation identified nine (9) potential locations to be studied and evaluated. Of these, the proposed industrial access road at Auburn is currently under construction, a new interchange and access road is now in the preliminary engineering stage at Scarborough as is the proposed relocation of the Lewiston interchange and its proposed access road and the proposed industrial access road at Biddeford is currently in the final design stage.

Since 1980, patronage of the Turnpike has increased dramatically. Traffic backups, an occurrence that was once limited to the exceptional vacation weekend or holiday, have now become a common place condition on the southern section of the Turnpike. With the realization of the previously mentioned interchange/access road program and its inducement of growth to the communities in which they are located, it can only be assumed that this condition will worsen.

Purpose of Study

A review of toll transactions records on the Turnpike since 1980 indicates a substantial increase in usage despite the national recession experienced and the May 1982 toll schedule increase. Passenger car transactions grew by 4.5 percent in 1981, 3.6 percent in 1982, 4.8 percent in 1983, 9.7 percent in 1984 and 8.4 percent in 1985. Comparable growth was recorded in commercial vehicle transactions. These transactions rose by 3.5 percent in 1981, 3.2 percent in 1982, 7.2 percent in 1983, 9.8 percent in 1984 and 6.4 percent in 1985. The excellent growth being experienced certainly contributes to the state economy in terms of: toll revenues to the Authority, in services rendered by the many businesses located in the travel corridor and in increased motor fuel sales and allied taxation to the state. However, such strong growth also demands that continued sound and thorough planning programs be followed to assure that growth can be sustained through the

foreseeable future with a facility fully capable of meeting the demands created.

The purpose of this study was to develop a ten-year forecast of traffic demand stratified by mainline density and interchange ramp usage for both passenger cars and commercial vehicles. Based on the current and projected demands, and recognizing seasonal and hourly peaks in Turnpike use, a determination of capital improvements necessary to maintain a continued high level of patron services was made.

Improvement scenarios were established to remedy existing excessive traffic delays and/or provide a program that would prevent the same from taking place in the near future, as well as attempting to provide some relief to the overburdened Route 1 corridor in the southern section. To be included among these scenarios were: the improvement of Turnpike access facilities, the addition to such facilities and the potential of widening the Turnpike where needed.

After reviewing the estimated cost of the required improvements, an analysis was made of the current operating toll schedule to determine its capacity to generate sufficient toll revenue to meet the capital costs of the improvements, in addition to the other financial obligations of the Authority.

Currently, the Authority is progressing on a pay-as-you-go program for interchange and access road construction through annual deposits to the Interchange Fund. It was necessary that the study analysis evaluate the financial viability of this program versus the issuance of revenue bonds to fund and more promptly implement the improvement program.

Scope of Report

This report will present the data researched in a manner that will be readily comprehendable such that a clear understanding of the conclusion published may be easily attained. This report will present the conclusions in a manner that depicts conditions that may be expected to occur for the

anticipated circumstances. That is to say, it will identify improvement needs based upon current and projected traffic demands.

As a means to understanding how these conclusions were reached, the following is a brief outline of the procedures and major work tasks that were undertaken.

Task 1 - Assemble Traffic Data/Inventory Turnpike Facilities

Traffic data was assembled by vehicle class and by interchange utilizing toll transaction data for "on" Turnpike conditions. MDOT records were obtained and used to generate "off" Turnpike daily and seasonal traffic information. The MDOT information research was limited to roadway networks that provided direct access to and from the Turnpike. All commutation movements on the Turnpike were identified by interchange pair and an evaluation of these movements versus the 1981 commutation projections was made. A review of the current interchanges, considering their ramp configurations, restrictions limiting expansion, proposed modification and expected dates of implementation along with available information pertaining to state and local highway improvement programs, was made. The inventory of mainline and Turnpike access point traffic capacities, operational characteristics and traffic demands was updated to facilitate a determination of present volume/capacity ratios and the ability of these individual sections to accommodate future growth.

Task 2 - Review Available Travel Pattern Data

Next, a review of available travel pattern data was conducted. In August, 1981, as part of the Toll Fare Schedule Analysis and Commuter Fare Toll System Study, a turnpike patron travel survey was conducted at all entering interchanges on the Turnpike. Although the Turnpike has experienced strong traffic growth since the 1981 travel data survey, which could well have changed travel patterns and trip characteristics, it was thought unnecessary to rerun the earlier survey.

Therefore, for planning purposes the 1981 data was employed. This survey

should be verified if the Authority decides to proceed with revenue bond sale. Recognizing that the Commuter Discount Plan was not in place at the time of the 1981 survey, a subjective analysis was made to compare the Class One interchange movements prior to and after the commuter toll plan implementation.

Finally, an analysis was conducted that assumes greater Turnpike usage in this corridor through improving existing routings to and from existing interchanges and/or the addition of new interchanges. It should be recognized that the analysis did not include use of current travel patterns and trip characteristic data for this section of U.S. Route 1.

Task 3 - Evaluate Economic Impact of Turnpike Operation

It is generally recognized that vehicular traffic growth is dependent upon the strength of the economy in the travel corridor it serves; conversely, economic growth depends upon the quality of the transportation network available. The economy of the state of Maine is heavily orientated toward tourism, agriculture and the harvesting of seafood. Among the thousands of vacationers entering the state annually, the vast majority use automobiles or other vehicle types as their principal mode of transportation. The Maine Turnpike is known to be a primary routing for much of this traffic.

An economic growth analysis was performed for the study corridor. Data was collected from all pertinent sources relative to historical trends and future year projections of several economic indices. These included, but were not limited to, population, employment, retail sales, personal income and residential, commercial and industrial construction.

Based on this analysis of future economic growth plus historical toll transaction experience on the Turnpike, a schedule of projected vehicle growth was developed for the term of the study period.

Task 4 - Define Future Year Traffic Demand

The series of computer highway networks prepared for the toll fare schedule

analysis in 1981 were updated and expanded to represent the current, 1984, highway network. The network, for both passenger cars and commercial vehicles, reflect current operating conditions ascertained from the route reconnaissance studies conducted in the travel corridor, current trip cost data and toll fares now assessed on the Turnpike.

Based on the economic growth analysis and historical traffic trends, a traffic growth schedule was determined which, when applied to the 1984 base per year trip table, would establish the future year (1995) trip table. Assignments using the 1995 trip table were then made to the 1984 network to determine the impact on the highway system from the estimated 1995 traffic demand, assuming no improvements were made to the highway system. In this way, a determination could be made as to where traffic capacity deficiencies will occur and to what degree impacts on traffic growth may be expected if improvements are not implemented.

After identifying potential problem areas i.e., mainline, interchange ramps, toll plazas, etc., the base year 1984 network was updated to indicate all proposed and required improvements to establish a future year, 1995 network. The 1995 trip table was then loaded and assigned to assess the impact of the proposed improvements on Turnpike traffic demands.

The traffic assignments to the base and future year networks assumed retention of the present toll schedule. Annual estimates of toll income were developed for the forecast period. Deducting the current financial obligations of the Authority, a level of annual toll revenue income available to fund the required improvement programs was established. Where sufficient funds were not available under this scenario, a level of toll rate increases, representative of the minimum required, was identified.

Task 5 - Review Highway Capacity

The traffic data collected for this study was reviewed and utilized to determine whether some portions of the Turnpike and its interchanges have reached or surpassed or will surpass their capacity during the study period. This review set the basic criteria for the minimum needed roadway

improvements by establishing areas of existing poor levels of service (LOS) as well as anticipated problem areas and the remedial action required to rectify those conditions.

Task 6 - Development of Improvement Scenarios

Using the traffic movement projections, required improvements were developed that would provide a proper LOS through the study year for the mainline and the interchanges. A vital part of this task was the analysis of required improvements generated by the inclusion of additional interchanges and access roads that may serve to promote development and/or alleviate traffic congestion on Route 1 by providing better, more direct routing to the Turnpike. This portion of the analysis weighed the benefit to Route 1 versus the required improvements to the Turnpike.

Task 7 - Cost Determination

After establishing the required improvements as discussed in Task 6, anticipated construction costs were developed. Construction cost estimates were prepared on the basis of existing information and order of magnitude quantity estimates.

In addition to construction costs, operation and maintenance costs were developed for the existing condition and the improvement scenarios.

Task 8 - Define Possible Financing Programs

The Maine Turnpike is maintained and operated solely from toll revenues and receives no subsidies from general taxation. In addition to normal operating-maintenance expenses, the Authority is obligated to provide $4.7 million annually to the Maine DOT. The current bond debt amortization schedule assumes $1.0 million in bonds will be retired annually on July 1, through 1989. On January 1, 1990, the remaining outstanding debt of $500,000 would be retired.

The current policy of the Authority to implement required highway improve-

ments is on a "pay as you go" basis through annual deposits made to the Interchange Fund. Under this process, the extent of an adopted improvement program can be somewhat restricted based upon the funds available within a given fiscal year.

After identifying and establishing the proposed 10-year improvement program, an analysis was developed considering two potential financing schemes. The first assumed immediate financing of the total program through a new revenue bond issue while the second used a combination of a smaller revenue bond issue and a "pay as you go" concept.

CHAPTER II

TRAFFIC AND REVENUE TRENDS

A recent history of the traffic and revenue performance on the Maine Turnpike was reviewed. Examination of the historical data provided useful insight into existing traffic and revenue patterns and trends and aided in preparing estimates of future traffic demands on the Turnpike.

Annual Traffic Trends by Vehicle Toll Class

Annual traffic trends since 1975 are presented by vehicle toll class in Table II-1. Approximately 12.6 million vehicles exited from the Turnpike in 1975. Exiting traffic increased to 24.9 million vehicles in 1985, representing an average annual growth of 7.0 percent. Beginning in 1975, strong growth was experienced until a gasoline shortage in 1979 caused a 1.7 percent reduction in traffic. Following this period, annual growth began to increase steadily through 1985, when traffic increased by 9.1 percent over the previous year.

Class 1 vehicles are shown to comprise the majority of Turnpike Traffic. Since the implementation of the commuter discount plan in May, 1982, commuter traffic has grown to about 2.3 million vehicles exiting the Turnpike in 1985. At the same time that the discount plan was implemented, a revised toll schedule went into effect. Heavy commercial vehicles which had previously been classified as one vehicle class were separated into four and five-axle truck toll classes. Growth has been steady for most vehicle classes, particularly since 1982. Class 2 vehicles have shown the largest percent change over this period, with an average annual increase of 7.5 percent.

Annual Traffic Trends by Interchange

Trends in average daily traffic entering and exiting the Turnpike by interchange are shown in Table II-2. Throughout the period from 1975 to

TABLE II-1

ANNUAL EXITING TRAFFIC TRENDS BY VEHICLE TOLL CLASS

YEAR	VEHICLE TOLL CLASS One	Two	Three	Four	Five	Seven	Sixteen	TOTAL	PERCENT CHANGE OVER PREVIOUS YEAR
	(thousands)								
1975	11,116	290	121	--	862(1)	--	228	--	12,617	--
1976	12,258	330	161	--	956	--	237	--	13,942	10.5
1977	13,526	377	157	--	1,050	--	245	--	15,355	10.1
1978	14,474	421	182	--	1,156	--	244	--	16,477	7.3
1979	14,203	423	166	--	1,203	--	196	--	16,191	(1.7)
1980	14,535	411	165	--	1,197	--	211	--	16,519	2.0
1981	15,343	431	176	--	1,222	--	218	--	17,390	5.3
1982(2)	15,753	454	177	222	409	648	218	883	18,764	7.9
1983	16,775	500	173	330	--	1,073	239	1,546	20,636	10.0
1984	18,419	551	198	331	--	1,197	243	1,905	22,844	10.7
1985	19,972	595	203	325	--	1,301	255	2,265	24,916	9.1
AVERAGE ANNUAL PERCENT CHANGE									
1975-1985	6.0	7.5	5.3	--	6.6(1)	--	1.1	--	7.0	
1982-1985	8.2	9.4	4.7	--	8.3(1)	--	5.4	--	9.9	

SOURCE: Maine Turnpike Authority
(1) Represents Classes Four and Five combined.
(2) Revised toll schedule and commuter discount plan implemented on May 1, 1982.

TABLE II-2

ANNUAL ENTERING AND EXITING TRAFFIC TRENDS

Total Vehicles

INTER-CHANGE	1975	PERCENT CHANGE	1976	PERCENT CHANGE	1977(1)	PERCENT CHANGE	1978	PERCENT CHANGE	1979 Average Daily Traffic	PERCENT CHANGE	1980	PERCENT CHANGE	1981	PERCENT CHANGE	1982(1)	PERCENT CHANGE	1983	PERCENT CHANGE	1984	PERCENT CHANGE	1985	AVERAGE ANNUAL PERCENT CHANGE 1975-1985
1	16,200	6.7	17,290	4.6	18,090	5.0	18,986	(6.2)	17,807	3.0	18,334	6.1	19,460	7.8	20,978	6.4	22,326	5.4	23,533	7.8	25,379	4.6
2	2,549	11.2	2,834	14.6	3,248	8.8	3,533	(3.8)	3,398	9.7	3,728	7.2	3,997	11.6	4,460	6.0	4,727	13.0	5,341	11.0	5,929	8.8
3	1,567	13.5	1,778	20.4	2,140	8.2	2,315	10.3	2,554	(0.9)	2,530	6.1	2,684	11.6	2,995	5.9	3,173	12.3	3,563	8.7	3,872	9.5
4	2,967	14.1	3,384	14.3	3,868	10.8	4,287	5.0	4,503	3.8	4,674	7.3	5,016	13.2	5,678	6.6	6,051	12.3	6,798	10.4	7,507	9.7
5	2,797	13.8	3,183	18.4	3,770	9.5	4,127	4.2	4,302	6.3	4,572	5.2	4,809	13.8	5,473	20.7	6,606	22.6	8,097	17.9	9,534	13.1
6	SEASONAL INTERCHANGE - LIMITED HOURS OF OPERATION																					
6A	3,732	24.5	4,645	21.9	5,662	17.2	6,638	2.1	6,780	7.2	7,265	8.3	7,871	11.1	8,743	7.9	9,430	10.8	10,445	3.8	10,837	11.3
7	6,557	12.6	7,381	11.5	8,227	2.9	8,463	0.3	8,488	(0.6)	8,436	3.1	8,698	12.8	9,808	8.9	10,685	16.1	12,401	11.5	13,829	7.8
8	6,944	10.0	7,635	5.7	8,072	0.9	8,144	(3.1)	7,891	(1.9)	7,744	5.3	8,158	10.6	9,023	5.6	9,530	10.9	10,568	9.2	11,542	5.2
9	4,338	(1.0)	4,294	6.1	4,558	1.0	4,604	(6.5)	4,307	(0.8)	4,273	4.9	4,482	8.1	4,846	6.3	5,150	9.9	5,662	17.8	6,668	4.4
10	1,769	1.8	1,801	8.5	1,954	5.0	2,051	2.2	2,097	(2.3)	2,049	4.0	2,130	14.3	2,434	9.2	2,657	17.5	3,123	14.8	3,584	7.3
11	2,494	11.9	2,790	11.7	3,117	1.7	3,171	(3.8)	3,051	(0.7)	3,029	4.3	3,158	10.1	3,477	9.1	3,792	12.1	4,252	10.1	4,681	6.5
12	3,752	12.5	4,221	4.4	4,405	6.7	4,701	0.7	4,735	(1.0)	4,686	5.3	4,936	10.3	5,446	6.3	5,787	8.0	6,252	4.8	6,549	5.7
13	2,930	8.2	3,170	7.1	3,396	12.2	3,810	(10.7)	3,403	(1.9)	3,337	5.5	3,519	11.2	3,914	3.7	4,058	7.4	4,359	7.7	4,696	4.8
14	2,102	23.3	2,591	45.0	3,756	36.5	5,127	3.0	5,283	1.2	5,347	6.0	5,668	13.4	6,427	6.3	6,833	8.3	7,400	9.2	8,083	14.4(2)
15	8,200	9.1	8,947	7.7	9,635	7.4	10,347	(3.9)	9,942	0.3	9,974	4.5	10,424	7.9	11,252	6.7	12,008	6.5	12,794	6.4	13,612	5.2
TOTAL	68,898	10.2	75,944	10.5	83,898	7.6	90,304	(2.0)	88,541	1.6	89,978	5.6	95,010	10.5	104,954	7.5	112,813	10.4	124,588	9.4	136,302	7.1

(1) Revised toll schedule and commuter discount plan implemented on May 1, 1982.
(2) I-95 from Gardner to Falmouth opened on June 15, 1977.

1985, the largest traffic volumes have continually been realized at Interchange 1. Interchange 15 in Augusta, the northern terminus of the Turnpike had an average daily traffic volume of about 13,600 vehicles in 1985. Interchange 7, 8 and 6A have experienced the heaviest traffic usage over the past ten years, with approximate 1985 average daily traffic volumes of 13,800, 11,500 and 10,800 vehicles, respectively. All three interchanges serve the Portland area.

Traffic using Interchange 14 has increased at an average annual rate of 14.4 percent since 1975, the highest among any interchange. This is largely due to the fact that Interchange 14 is a junction point between the Turnpike and the competing segment of I-95 which opened in June, 1977. The average daily volume of about 2,600 vehicles in 1976 increased to almost 3,800 vehicles in 1977 after the opening of I-95. Interchange 5 has also experienced rapid growth. This interchange, which provides access to the Saco area, served an average 2,800 vehicles per day in 1975 and approximately 9,500 vehicles per day in 1985, representing an average annual growth of 13.1 percent. This increase can be attributed to the opening of I-195 which connects Interchange 5 with the Old Orchard Beach area. Traffic at Interchange 6A, another junction point with I-295, has increased an average of 11.3 percent per year, or from 3,700 vehicles per day in 1975 to over 10,800 vehicles per day in 1985. Interchange 9 which leads to I-95 and to U.S. Route 1 in Falmouth, has seen the least amount of traffic growth during this period, with an average annual increase of only about 4 percent.

Monthly Traffic Variations

Table II-3 presents 1985 monthly traffic variations by vehicle class. All vehicles are classified into three major categories: passenger cars-cash includes vehicle classes 1 and 7; commercial vehicles consist of vehicle Classes 2, 3, 4 and 5; and commuters are Class 16 vehicles. The primary tourist months of July and August are reflected in the variations of cash-paying passenger cars. Variations are based on average daily traffic volumes. August was the peak travel month, with an average daily traffic volume of 50 percent above that in the average month. Turnpike usage in

TABLE II-3

MONTHLY TRAFFIC VARIATIONS

1985

MONTH	PASSENGER CARS-CASH	COMMERCIAL VEHICLES (index)	COMMUTERS	TOTAL
January	68	88	100	73
February	76	86	98	78
March	79	91	102	82
April	87	98	98	89
May	97	105	100	99
June	108	103	98	107
July	140	106	90	132
August	150	113	95	142
September	108	103	100	107
October	104	111	104	104
November	93	99	106	95
December	90	97	109	92
AVERAGE MONTH	100	100	100	100

SOURCE: Maine Turnpike Authority.

July was 40 percent above average. Traffic in January was 32 percent below average, making it the lowest travel month for cash-paying passenger cars.

Monthly variations for commercial vehicles and commuters show less fluctuation than those for passenger cars. The peak travel month for commercial vehicles was August, followed by October and July. February was the low travel month, with commercial traffic 14 percent below average. Commuter traffic varied less month by month than any other vehicle class. In 1985, December was the peak month for commuters, while July was the lowest travel month. Monthly variations in total Turnpike traffic followed the same pattern as those of passenger cars paying cash, although deviations from the average were slightly less.

Distribution of Annual Toll Transactions and Revenues by Vehicle Class

A total of over 24.9 million transactions took place on the Maine Turnpike in 1985. As shown in Table II-4, Class 1 vehicles accounted for 80.2 percent of these, or 20.0 million transactions. Revenue from these transactions, along with an additional 255,000 transactions from Class 7 vehicles, totalled approximately $16.2 million, which was 68.4 percent of the total annual revenue.

Commercial vehicles accounted for 9.7 percent of the total transactions in 1985, and the majority of these were five-axle vehicles. Toll revenue from commercial vehicles amounted to approximately $7.0 million for the year, or 29.4 percent of the total annual revenue.

Over 2.2 million commuter transactions took place during the year, which comprised 9.1 percent of the total toll transactions. Commuter revenue totalled almost $527,000, or 2.2 percent of the total $23.7 million in toll revenue earned in 1985. After subtracting volume discounts and adjustments amounting to approximately $312,000, a net toll revenue of almost $23.4 million was realized for the year.

TABLE II-4

DISTRIBUTION OF ANNUAL TOLL TRANSACTIONS AND TOLL REVENUES BY VEHICLE TOLL CLASS

1985

VEHICLE TOLL CLASS	ANNUAL TOLL TRANSACTIONS	PERCENT OF TOTAL	ANNUAL TOLL REVENUE	PERCENT OF TOTAL
One	19,971,941	80.2	$15,797,214	66.7
Seven	254,664	1.0	414,764	1.7
Subtotal	20,226,605	81.2	$16,211,978	68.4
Two	595,148	2.4	$ 834,041	3.5
Three	202,575	0.8	428,785	1.8
Four	324,669	1.3	899,328	3.8
Five	1,300,536	5.2	4,799,481	20.3
Subtotal	2,422,928	9.7	$ 6,961,635	29.4
Sixteen	2,266,407	9.1	$ 526,906	2.2
TOTAL	24,915,940	100.0	$23,700,519	100.0
	LESS VOLUME DISCOUNTS AND ADJUSTMENTS		$ 312,139	
	NET TOLL REVENUE		$23,388,380	

SOURCE: Maine Turnpike Authority.

Trends in Annual Total Income

Annual toll revenues earned over the past ten years are shown in Table II-5. Gross toll revenue consists of cash payments from all vehicle toll classes plus commuter plan payments minus small adjustments. Commercial user discounts under the volume discount plan are then subtracted from gross toll revenue for the year. Gross revenue increased from $12.4 million in 1975 to $23.8 million in 1985. This amounted to an average annual growth of 6.7 percent.

Adjusted gross toll revenues have increased from $12.2 million in 1975 to almost $23.4 million in 1985. Except for a temporary setback in 1979 due primarily to the energy crisis, net revenues have experienced a slow but steady growth through 1981. At the end of 1982, after eight months of operation under the new toll schedule, net toll revenues had increased by 24.3 percent over the previous year.

Along with income derived from toll revenue, the Maine Turnpike receives income from various other sources. These include service stations and restaurants operating under lease from the Turnpike Authority, interest earned on investments, and other miscellaneous sources. Income from concessions has dropped rather severly from $1,009,000 in 1975 to $568,000 in 1985, an average annual decrease of 5.9 percent. However, income from both miscellaneous sources and interest on investments has shown a steady annual increase, the former at an average rate of 9.7 percent and the latter at 7.7 percent. The total annual income from all sources has increased from almost $14.0 million in 1975 to $25.6 million in 1985, representing an average annual growth of 6.2 percent.

Trends in Anuual Net Income

Although the total income earned by the Turnpike has continued to increase over the past ten years, the net income realized after expenses has fluctuated annually and, for the most part, decreased. As shown in Table II-6, this is largely due to increasing maintenance and operating expenses. Expenses of almost $4.0 million in 1975 increased to $11.2 million in 1985,

TABLE II-5

TRENDS IN ANNUAL TOTAL INCOME

YEAR	GROSS TOLL REVENUE	VOLUME DISCOUNT	ADJUSTED GROSS TOLL REVENUE	CONCESSION INCOME	MISCELLANEOUS INCOME	INTEREST INCOME	TOTAL INCOME	PERCENT CHANGE OVER PREVIOUS YEAR
	(thousands)							
1975	$12,448	$209	$12,239	$1,009	$113	$ 630	$13,991	--
1976	13,339	232	13,107	981	89	437	14,614	4.5
1977	13,730	243	13,487	923	123	360	14,893	1.9
1978	14,034	248	13,786	928	117	348	15,179	1.9
1979	13,457	260	13,197	762	128	434	14,521	(4.3)
1980	13,665	248	13,407	685	285	578	14,955	3.0
1981	14,284	243	14,041	633	432	873	15,979	6.8
1982(1)	17,989	302	17,450	692	575	620	19,337	21.0
1983	20,584	348	20,235	707	279	662	21,884	13.2
1984	22,154	403	21,751	498	305	1,342	23,896	9.2
1985	23,791	403	23,388	568	284	1,325	25,565	7.0
Average Annual Percent Change								
1975-1985	6.7	6.8	6.7	(5.9)	9.7	7.7	6.2	

(1) Revised toll schedule and commuter discount plan implemented on May 1, 1982.
SOURCE: Maine Turnpike Authority.

TABLE II-6

TRENDS IN ANNUAL NET INCOME

YEAR	TOTAL INCOME	MAINTENANCE AND OPERATING EXPENSES	RESERVE MAINTENANCE FUND EXPENDITURES	NET INCOME BEFORE INTEREST	PERCENT CHANGE OVER PREVIOUS YEAR
	(thousands)				
1975	$13,991	$3,988	$1,964	$8,093	--
1976	14,614	4,415	4,254	5,945	(26.0)
1977	14,893	5,180	3,752	5,961	0.3
1978	15,179	6,001	4,124	5,054	(15.2)
1979	14,521	6,895	3,380	4,246	(16.0)
1980	14,955	7,397	2,503	5,055	19.1
1981	15,979	8,234	2,558	5,187	2.6
1982(1)	19,337	8,396	1,194(2)	9,747	87.9
1983	21,884	8,564	977(3)	12,343	26.6
1984	23,896	9,600	4,798(3)	9,498	(23.0)
1985	25,565	11,238	5,069(3)	9,258	(2.5)
AVERAGE ANNUAL PERCENT CHANGE:					
1975-1985	6.2	10.9	10.0	1.4	

(1) Revised toll schedule and commuter discount plan implemented on May 1, 1982.
(2) Excludes $8,711,000 payback to the Federal Government and expenses of the 1982 Bond Issue.
(3) Excludes $4,700,000 represents payment to the Maine DOT.
SOURCE: Maine Turnpike Authority.

an average growth of 10.9 percent each year. Reserve maintenance fund expenditures have been fluctuating each year as the need for new Turnpike improvements arise. These expenditures do not include a total of $8,711,000 required in 1982 for payment to the Federal Government and expenses for the 1982 Bond Issue. In addition, expenditures from 1983 to date do not include annual payments of $4,700,000 to the Maine DOT. Net income before interest of $8.0 million in 1975 increased to $9.3 million by 1985. This represents an average annual increase of 1.4 percent over the 11 year period.

Commuter Toll Plan Impact

A subjective analysis was conducted to compare Class 1 interchange movements prior to and after the commuter toll plan implementation. As reported in the Toll Revenue Update, August, 1983, performed by Wilbur Smith and Associates for the Authority, cash-paying passenger cars decreased by 0.5 percent for the 12-month period immediately following implementation of the revised toll schedule on May 1, 1982. This reduction can be attributed to two factors:

1. The 25 percent increase in cash toll schedule; and
2. The diversion of cash-paying passenger car motorists to the commuter plan.

Total passenger cars, both cash and commuter increased by 8.4 percent in the 12 months following the new toll schedule implementation.

Both cash and commuter passenger car traffic on the Turnpike have increased substantially in the last two years. Cash-paying passenger cars increased by 6.3 percent in 1983 and by 9.9 percent in 1984. During those same two years commuter traffic increased by over 17 and 23 percent, respectively. This trend indicates that while the commuter plan is becoming increasingly attractive to motorists, the level of cash-paying passenger car traffic has not diminished, but in fact, has increased quite significantly. Simply put, it would appear that the commuter plan has attracted a significant number of passenger car motorists that had not previously used the Maine Turnpike for their work trip.

The 1984 commuter traffic as a percentage of the total passenger car traffic is presented in Table II-7. The interchange with the most commuter traffic was South Portland (7) with 1,437 average daily directional trips, almost 13 percent of the total Turnpike commuter traffic. Saco (5) and Biddeford (4) had average directional daily commuter trips of 1,160 and 1,073, respectively in 1984. Biddeford has the highest percentage of commuter traffic relative to total passenger cars at 17.0 percent. Approximately 9.3 percent of the Turnpike passenger car trips fell under the commuter plan.

The top 1984 commuter traffic movements by interchange are shown below:

BETWEEN INTERCHANGES	1984 AVERAGE DAILY DIRECTIONAL TRIPS
Saco (5) and Scarborough (6A)	389
Gardiner (14) and Augusta (15)	377
South Portland (7) and Portland-Westbrook (8)	322
Saco (5) and South Portland (7)	305
Biddefdord (4) and Scarborough (6A)	272
Auburn (12) and Lewiston (13)	261
York (1) and Wells-Sanford (2)	244
Biddeford (4) and South Portland (7)	228
Portland-Westbrook (8) and Falmouth U.S. Rt.1 (9)	203

The interchange pair with the highest average daily commuter traffic was between Saco (5) and Scarborough (6A) with almost 389 trips, followed closely by Gardiner (14) and Augusta (15) with 377 trips.

TABLE II-7

COMMUTER TRAFFIC BY INTERCHANGE

1985

INTERCHANGE	COMMUTERS	TOTAL[1] PASSENGER CARS (Average Daily Traffic)	COMMUTERS AS A PERCENTAGE OF TOTAL PASSENGER CARS
1	778	20,309	3.8
2	612	4,963	12.3
3	552	3,414	16.2
4	1,073	6,317	17.0
5	1,160	7,631	15.2
6A	931	9,562	9.7
7	1,437	11,164	12.9
8	997	9,680	10.3
9	285	5,353	5.3
10	401	2,915	13.8
11	350	3,899	9.0
12	540	5,475	9.9
13	490	3,966	12.4
14	400	6,642	6.0
15	450	10,916	4.1
TOTAL	10,456	112,206	9.3

NOTE: Includes both entering and exiting traffic.
(1) Classes 1, 7 and 16.

CHAPTER III

ESTIMATED TRAFFIC IMPACTS AND FUTURE DEMANDS

An analysis was conducted to estimate the impact that nine access road/interchange improvements proposed by the Department of Transportation would have on Turnpike traffic. Following this analysis, an investigation was made of the area served by the Maine Turnpike to determine its present economic condition and evaluate recent growth trends and available socioeconomic projections. Based on the socioeconomic projections and recent traffic trends, annual Turnpike traffic growth schedules were developed through 1995. After estimating future year Turnpike traffic, an analysis was performed to identify where Turnpike capacity improvements may be needed.

Access Improvement Impacts

An analysis was conducted to estimate the impact that the nine proposed access road/interchange improvements would have on Turnpike traffic. The proposed improvements are as follows:

1. Lewiston, State Route 196 - Interchange modification and access road.
2. Auburn, U.S. Route 202 - Access Road.
3. Gray, U.S. Route 202 - Access Road.
4. Portland, Route 302 (Forest Avenue) - New interchange.
5. Westbrook Arterial Extension - Relocation of existing interchange.
6. Portland, State Routes 9 and 22 (Congress Street - Johnson Road) - New Interchange.
7. Scarborough Downs, U.S. Route 1 (Payne Road) - Full time interchange and access road.
8. Biddeford Connector, U.S. Route 1 and State Route 111 - Access Road.
9. Ogunquit-Wells, U.S. Route 1 - New interchange and access road.

A complete reconnaissance was made of each of the improvement locations. This included extensive travel time-distance studies of area routes and investigation to determine the likely economic impacts that each improvement would have.

Methodology - The traffic impacts of a new access road or interchange were divided into three components:

1. Existing Turnpike traffic that would divert to the new interchange or access road.
2. Traffic which, prior to the implementation of the improvement, did not use the Turnpike; however, would now use the Turnpike because of the improvement.
3. Traffic which would be induced due to the economic development of the area which the improvement serves.

Lewiston - The Lewiston access improvement would provide access to the intersection of Cottage and Goddard Roads located south of the interchange.

The Lewiston improvement is not expected to have a major effect on existing traffic since traffic volumes in the area are low and the existing roads can accommodate the demand. The improvement would, however, assist in the development of a 200 acre parcel to be known as the South Lewiston Industrial Park. This industrial park at full capacity, is expected to draw 2,000 employees by 1995.

Auburn - This improvement consists of an access road to connect U.S. Route 202 south of the Auburn interchange, with Lewiston Junction Road in the Auburn-Lewiston Municipal Airport area.

The access road improvement will not better serve existing traffic but will promote the economic development of the Auburn-Lewiston Municipal Airport Airpark Industrial Park with potential new employment of approximately 800. The access road would provide more direct routing from a $100 million dollar Ethanol plant proposed near the Airpark.

Gray - The Gray improvement would provide direct access from just west of

the Gray Interchange on U.S. Route 202, to State Route 26 north of the Turnpike. It would serve as an alternative to travelling through the village of Gray.

This proposed improvement was estimated to have the least impact on Turnpike traffic of all the Maine DOT proposals. The proposed access road would provide only minimal time and distance savings over the existing route. Minimal future traffic increases at the Gray Interchange would be realized due to economic development in the access road corridor.

Portland-Forest Avenue - This improvement consists of a new Turnpike interchange to be located at Forest Avenue (U.S. Route 302) in Portland north of Interchange 8 (Portland-Westbrook).

The proposed Forest Avenue Interchange would divert a significant portion of existing Turnpike traffic, especially from Interchanges 8 and 10. An interchange at Forest Avenue would also attract many new trips to the Turnpike, since U.S. Route 302 provides direct access from the Turnpike to recreation areas at Sebago Lake and Bridgton. Economic development potential in the area is considered moderate and can cause an increase in traffic volumes at the Forest Avenue Interchange.

Portland-Westbrook Arterial Extension - The Westbrook Arterial improvement would be a relocation of Interchange 8, currently at State Route 25, southerly to provide a direct connection to the Westbrook Arterial.
Since the interchange would be relocated only a short distance from its existing location, minimal impacts on Turnpike traffic are anticipated. No significant committed economic development is proposed in the influence area surrounding the proposed interchange.

Portland-Congress Street - This would be a new interchange located between Interchange 7 (South Portland) and Interchange 8 (Portland-Westbrook).

A new interchange at Congress Street would provide almost direct service to the Portland International Jetport. It would also provide better Turnpike access to the developed areas east and west of the Turnpike along State

Route 22 (Congress Street). An estimated 5,500 vehicles per day, at base year 1984 levels, would be expected to use the new interchange. However, 3,600 of these vehicles would be diverted from existing Turnpike interchanges.

Scarborough-Downs - It has been proposed that Interchange 6 (Scarborough Downs) be relocated and converted into a year-round interchange. Also, an access road connecting the interchange to U.S. Route 1 would be constructed.

A full time Interchange 6 would serve an estimated 3,000 vehicles per day at 1984 levels, over and above what it currently serves as a seasonal interchange. However, access points north on the Turnpike corridor would not be significantly improved since the Scarborough Connector, which feeds into the Turnpike approach road into Interchange 7 (South Portland), connects to U.S. Route 1 in Scarborough just two to three miles north of the proposed access road connection. To the south, West Scarborough, Blue Point and Pine Point are currently well served by Interchange 5 (Saco).

There are two industrial parks located near the proposed improvement area. One is approximately 260 acres while the other is approximately 416 acres. The proposed improvement would facilitate direct access to the Turnpike from the industrial sites. Each industrial park is expected to be fully utilitzed by 1995 creating an estimated 700 jobs.

Biddeford Connector - This improvement consists of a new access road to connect Interchange 4 (Biddeford) with U.S. Route 1 almost directly across from Biddeford Airport. It would serve as a bypass for motorists travelling from south of Biddeford to areas north of Saco, currently using congested U.S. Route 1. An estimated 1,500 vehicles per day would be attracted to Interchage 4 away from U.S. Route 1, as a result of the new access road.

Two industrial parks along U.S. Route 1 would be better served by the proposed improvement. It is estimated that the proposed access road would promote full utilization at the industrial areas within ten years.

Ogunquit-Wells - This would be a new interchange between the entrance of the Maine Turnpike at Interchange 1 (York) and Interchange 2 (Wells), although oriented closer to the latter. An access road would be constructed, connecting the new interchange with U.S. Route 1, directly across from Furbish Road.

This improvement would attract an estimated 2,700 vehicles per day. About half of these would be new Turnpike trips. Motorists currently traveling from the Ogunquit and Moody Beach area on U.S. Route 1 would be particularly attracted to the new interchange.

Summary

Economic development in terms of new business enterprises, additional employment and growth in the local community's tax base would be spurred by each of the above referenced Maine Turnpike Interchange improvements. In addition to serving the induced traffic at each interchange from the expansion of economic development, normal traffic, or that traffic which will occur despite new development, will be served more effectively. The normal traffic will be particularly assisted by interchange improvements in southern Maine during the summer months by providing a viable alternative to the already over crowded U.S. Route 1.

Corridor Growth Analysis

Traffic growth on the Maine Turnpike is tied to the economic health of the area around it. Population trends and projections, employment, retail sales, average household effective buying income, economic development, and motor fuel availability and price are elements which indicate the stability of the State's current economy and its potential.

Population Trends and Projections - Population in the Turnpike corridor has been increasing and is expected to continue growing through 1992 as shown in Table III-1. Population in the state grew 1.2 percent annually between 1970 and 1980 while population growth in the five-county study ranged from

TABLE III-1

POPULATION

TRENDS AND PROJECTIONS

AREA	1970	AVERAGE ANNUAL PERCENT CHANGE	1980	AVERAGE ANNUAL PERCENT CHANGE	1985	AVERAGE ANNUAL PERCENT CHANGE	1990	AVERAGE ANNUAL PERCENT CHANGE	1992
	(thousands)								
Androscoggin	91,279	0.9	99,657	0.1	100,400	0.2	101,500	0.6	102,750
Cumberland	192,528	1.1	215,789	0.7	223,500	0.6	230,450	0.9	234,550
Kennebec	95,306	1.4	109,889	0.6	113,250	0.6	116,500	0.9	118,650
Sagadahoc	23,452	2.1	28,795	0.7	29,850	0.4	30,400	0.5	30,700
York	111,576	2.3	139,666	1.9	153,450	1.5	165,400	1.7	171,200
Study Area	514,141	1.5	593,796	0.9	620,450	0.8	644,250	1.0	657,850
Maine	993,722	1.2	1,125,030	0.6	1,161,350	0.6	1,194,650	0.9	1,216,200

SOURCE: 1980 Census of Population and Housing, U.S. Department of Commerce, Bureau of the Census
Total Population by Counties and Minor Civil Divisions 1983-1992 Projections, Maine Department of Human Services, Bureau of Health Planning and Development, Division of Data and Research, June, 1984.

an average 0.9 percent annually in Androscoggin County to 2.3 percent per year in York County.

The forecast developed by the Maine Department of Human Services extends from 1980 to 1992. York County is expected to sustain the most optimistic growth, increasing 1.7 percent annually for the 12 year period. Cumberland County is expected to experience a 0.7 percent annual increase during this period. The slowest growing area in terms of population is Androscoggin County with average annual percentage growth of 0.3 percent. Population in the State is expected to increase 0.7 percent annually between 1980 and 1992.

Employment Considerations - In an annual report published by the Maine State Development office, new and expanding industries are reported in addition to those companies' products, capital investment, number of employment and location. During 1984, Cumberland County registered the greatest number of new and expanded industry locations of any county in Maine. Eight new firms and 29 expansions of existing firms were recorded in this county in 1984 for a total of 978 additional jobs. Androscoggin County experienced Maine's second largest increase of employees due to new or expanded businesses. York County, the third highest in the state, recorded 430 new employment positions in 1984 from new or expanding industries. Portland and Lewiston each reported 575 new jobs. Throughout the state 493 of the 3,247 new positions were in the leather industry, while 613 were in the machinery industry.

Effective Buying Income and Retail Sales - Average household Effective Buying Income (EBI) is an indicator of an area's economic health because it measures a household's income which is available for spending. Retail sales, also an indicator of an area's economic well being, measures dollars spent in the retail markets. This is an especially important indicator in Maine given the large number of people who vacation in the state during the summer and winter months.

Accounting for the effects of inflation, constant dollar average household effective buying income (EBI) and retail sales were reviewed over a 10 year

period for the five county study area of Androscoggin, Cumberland, Kennebec, Sagadahoc and York. Average household EBI in the study area decreased at an average annual rate of 0.6 percent between 1974 and 1979 and increased at an average annual rate of 0.8 percent between 1979 and 1984. Retail sales in the state grew at a faster rate than average household EBI between 1974 and 1984. Average annually, retail sales grew 2.0 percent and 2.6 percent in the periods 1974 to 1979 and 1979 to 1984, respectively. One reason for the disparity in growth between two indicators is the effect that out-of-state vacationers have on retail sales.

Energy Consideration - Motor fuel supplies are expected to be abundant in the United States and Maine. The Organization of Petroleum Exporting Countries (OPEC) remains in a deadlock over price determination and productions quotas. The United States also continues to import more of its crude oil from non-OPEC members, limiting the nation's dependence on OPEC oil.

The price of unleaded-regular motor fuel in Maine has fluctuated from a low $1.15 in March, 1983 to a high of $1.31 in July and August, 1983, during the period of January, 1983, to October, 1985. Unleaded-regular motor fuel prices in 1985 were at a low of $1.20 in January and a high of $1.29 in August. Higher motor fuel prices are typical during the summer months as seasonal motorists vacation in the state.

Overall, Maine's economy is expected to exhibit moderate and stable growth in the future. The expansion of its industry will assist in sustaining the state's economic base.

Estimated 1994 Turnpike Traffic Profile

Annual traffic growth schedules were developed through 1994 for each Turnpike interchange by market segment. The basis of these growth schedules were the traffic trend and corridor socioeconomic analysis. A computer process, applying the interchange growth factors, and taking into

account the present toll rate schedules, facilitated in developing annual Turnpike traffic and revenue.

Table III-2 presents the estimated 1994 Turnpike interchange traffic profile, both without and with proposed access road/interchange improvements. These comparative profiles are also presented in graphic form on schematic diagrams in Figure III-1. Approximately 2,200 vehicles would be expected to enter the Turnpike at Interchange 1A (Ogunquit-Wells) in 1994, while entering vehicles at Interchange 2 (Wells) would decrease from 4,550 to 3,350 vehicles per day. Making Interchange 6 (Scarborough Downs) a full time interchange would increase entering traffic from 150 per day (annualized average) to about 3,600 per day. Vehicles entering at the proposed new interchanges at Congress Street and Forest Avenue would be about 5,300 and 4,350 vehicles per day respectively. The composition of traffic estimated on these interchanges would represent volumes diverted from existing adjacent interchanges and traffic that would be induced or generated as a result of the new access opportunities.

The estimated 1994 average daily traffic profile by mainline section is also shown in Figure III-1. Without the proposed access improvements, the highest mainline density would be expected between Interchanges 5 and 6A at about 46,000 vehicles per day in both directions. The highest mainline density assuming that the access improvements are in place would be between Interchanges 5 and 6A, 49,100 vehicles. The mainline sections with the greatest impact on traffic due to the proposed access improvements would be between Interchanges 8 and 8A, an increase of 5,300 vehicles per day. Note that the mainline section between Interchanges 3 and 4 would be the only section expected to decrease in traffic, a small decline of only about 200 vehicles per day.

Future Turnpike Needs

The estimated 1994 Turnpike traffic demands were analyzed to determine where Turnpike widening would be needed with and without the proposed nine new access improvements.

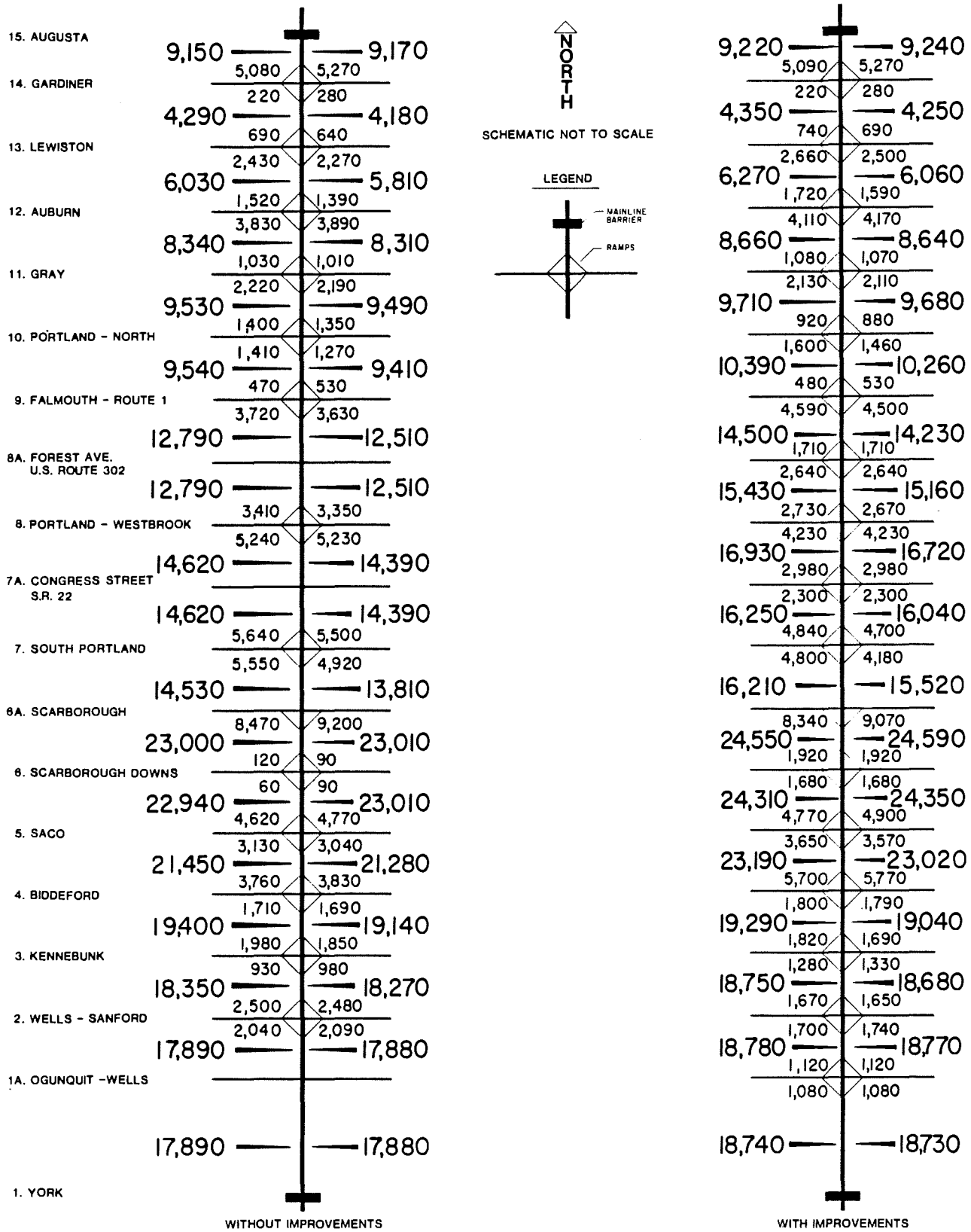
TABLE III-2

ESTIMATED 1994 AVERAGE DAILY TRAFFIC PROFILE

BY INTERCHANGE

INTER-CHANGE	WITHOUT IMPROVEMENTS						WITH IMPROVEMENTS					
	North		South		Both Directions		North		South		Both Directions	
	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit
1	17,900	-	-	17,900	17,900	17,900	18,700	-	-	18,750	18,700	18,750
1A	-	-	-	-	-	-	1,100	1,100	1,100	1,100	2,200	2,200
2	2,500	2,100	2,050	2,500	4,550	4,600	1,650	1,750	1,700	1,650	3,350	3,400
3	1,850	1,000	950	2,000	2,800	3,000	1,700	1,350	1,300	1,800	3,000	3,150
4	3,850	1,700	1,700	3,750	5,550	5,450	5,750	1,800	1,800	5,700	7,550	7,500
5	4,750	3,050	3,150	4,600	7,900	7,650	4,900	3,550	3,650	4,750	8,550	8,300
6	100	100	50	100	150	200	1,900	1,700	1,700	1,900	3,600	3,600
6A	-	9,200	8,450	-	8,450	9,200	-	9,050	8,350	-	8,350	9,050
7	5,500	4,900	5,550	5,650	11,050	10,550	4,700	4,200	4,800	4,850	9,500	9,050
7A	-	-	-	-	-	-	3,000	2,300	2,300	3,000	5,300	5,300
8	3,350	5,250	5,250	3,400	8,600	8,650	2,650	4,250	4,250	2,750	6,900	7,000
8A	-	-	-	-	-	-	1,700	2,650	2,650	1,700	4,350	4,350
9	550	3,650	3,700	450	4,250	4,100	550	4,500	4,600	500	5,150	5,000
10	1,350	1,250	1,400	1,400	2,750	2,650	900	1,450	1,600	900	2,500	2,350
11	1,000	2,200	2,200	1,050	3,200	3,250	1,100	2,100	2,150	1,100	3,250	3,200
12	1,400	3,900	3,850	1,500	5,250	5,400	1,600	4,150	4,100	1,700	5,700	5,850
13	600	2,250	2,450	700	3,050	2,950	700	2,500	2,650	750	3,350	3,250
14	5,250	300	200	5,100	5,450	5,400	5,250	300	200	5,100	5,450	5,400
15	-	9,150	9,150	-	9,150	9,150	-	9,250	9,200	-	9,200	9,250

(1) Assumes nine proposed MDOT access road/interchange improvements are in-place. New interchanges are as follows: 1A - Ogunquit-Wells, 6 - Scarborough Downs (full-time), 7A - Congress Street, and 8A - Forest Avenue.



ESTIMATED 1994
AVERAGE DAILY TRAFFIC PROFILE

MAINE TURNPIKE

Wilbur Smith and Associates

FIGURE III-1

Estimated 1984 and 1994 summer weekend mainline peak hour volumes are presented in Table III-3. These volumes were developed based on plaza traffic counts taken during the month of August, 1985. It is important to note that the 1984 peak hour volumes shown do not represent the year's worst hour condition, but represent a typical peak hour experienced on a July or August weekend. It is estimated that the volumes shown generally represent the thirtieth highest hour of the year, the criteria to which most highways are designed, although continuous hourly count data for a full year was not available.

The mainline sections between Interchange 1 (York) and 6A (Scarborough) were estimated to have the highest peak hour volumes on the Turnpike, ranging from 2,800 to 3,000 vehicles in the southbound lanes, and 2,600 to 2,700 in the northbound lanes. The traffic counts showed that peak hour traffic volumes were higher in the southbound direction than the northbound direction. The reason for this is that tourists and vacationers depart the State of Maine on Sunday afternoons, within a relatively concentrated time period, but enter throughout a greater time spread during hours on Friday evening and on Saturday mornings.

The access improvements would have had a significant impact on peak hour traffic volumes had they been in place in 1984. The mainline section between new Interchange 8 and new Interchange 8A would increase by 300 vehicles per hour. This represents the greatest increase in hourly traffic.

In 1994, Turnpike mainline peak hour directional volumes are expected to increase to around the 4,000 mark between Interchanges 1 (York) and 6A (Scarborough). Again, the southbound direction would be expected to have the highest peak hour volumes, 4,200 vehicles per hour between Interchanges 1 (York) and 2 (Wells) assuming no access improvements are constructed, and 4,300 vehicles per hour assuming that they are constructed.

These mainline hourly traffic demands were compared to the capacity of the mainline sections to identify where Turnpike widening would be needed. Volume/capacity ratios were developed for each mainline section to serve in

TABLE III-3

SUMMER WEEKEND MAINLINE PEAK-HOUR DEMAND

BETWEEN INTERCHANGES	1984				1994			
	WITHOUT IMPROVEMENTS		WITH IMPROVEMENTS		WITHOUT IMPROVEMENTS		WITH IMPROVEMENTS	
	Northbound	Southbound	Northbound	Southbound	Northbound	Southbound	Northbound	Southbound
1-1A	2,700	3,000	2,800	3,100	3,800	4,200	3,900	4,300
1A-2	2,700	3,000	2,800	3,100	3,800	4,200	3,900	4,300
2-3	2,700	2,900	2,800	3,000	3,800	4,100	3,900	4,200
3-4	2,700	2,900	2,700	3,000	3,800	4,100	3,800	4,200
4-5	2,700	2,900	2,900	3,000	3,800	4,100	4,000	4,200
5-6	2,600	2,800	2,800	2,900	3,700	4,000	3,800	4,100
6-6A	2,600	2,800	2,800	2,900	3,700	4,000	3,800	4,100
6A-7	1,800	1,800	2,000	2,000	2,400	2,500	2,600	2,700
7-7A	1,700	1,600	1,900	1,800	2,300	2,300	2,500	2,500
7A-8	1,700	1,600	1,900	1,800	2,300	2,200	2,500	2,400
8-8A	1,500	1,400	1,800	1,700	2,000	1,900	2,300	2,200
8A-9	1,500	1,400	1,700	1,600	2,000	1,900	2,200	2,100
9-10	1,000	1,000	1,100	1,100	1,400	1,400	1,500	1,500
10-11	1,000	1,000	1,000	1,000	1,400	1,400	1,400	1,400
11-12	900	900	900	900	1,200	1,200	1,200	1,200
12-13	800	800	800	800	1,000	1,000	1,000	1,000
13-14	700	700	700	700	900	900	900	900
14-15	1,100	1,100	1,100	1,100	1,400	1,400	1,400	1,400

NOTE: Traffic volumes are based on August, 1985, weekend hourly traffic counts.

determining the section's service level. The analysis of each Turnpike section resulted in the designation of the roadway section with the appropriate Level of Service [1]. The description of the various service levels are as follows:

- Level of Service A - Level A describes primarily free flow operations. Average travel speeds near 60 mph generally prevail on 70-mph freeway elements. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream. This affords the motorist a high level of physical and psycological comfort. The effects of minor incidents or breakdowns are easily absorbed at this level. Although they may cause a deterioration in LOS in the vicinity of the incident, standing queues will not form, and traffic quickly returns to LOS A on passing the disruption.

- Level of Service B - Level B also represents reasonably free-flow conditions, speeds of over 57 mph are maintained on 70-mph freeway elements. The ability to maneuver within the traffic stream is only slightly restricted, and the general level of physical and psychological comfort provided to drivers is still high. The effects of minor incidents and breakdowns are still easily absorbed, though local deterioration in service would be more severe than for LOS A.

- Level of Service C - Level C provides for stable operations, but flows approach the range in which small increases in flow will cause substantial deterioration in service. Average travel speeds are still over 54 mph. Freedom to maneuver within the traffic stream is noticeably restricted at LOS C, and lane changes require additional care and vigilance by the driver. Minor incidents may still be absorbed, but the local deterioration in service will be substantial. Queues may be expected to form behind any significant blockage. The driver now experiences a noticeable increase in tension due to the additional vigilance required for safe operation.

- Level of Service D - Level D borders on unstable flow. In this range, small increases in flow cause substantial deterioration in service. Average travel speeds of 46 mph or more can still be maintained on 70 mph freeway elements. Freedom to maneuver within the traffic stream is severly limited, and the driver experiences drastically reduced physical and psychological comfort levels. Even minor incidents can be expected to create substantial queuing, because the traffic stream has little space to absorb disruptions.

- Level of Service E - The boundary between LOS D and LOS E describes operation at capacity. Operations in this level are extremely unstable, because there are virtually no usable gaps in the traffic stream. Any disruption to the traffic stream, such as

(1) Highway Capacity Manual, 1985 Transportation Research Board, National Research Council.

a vehicle entering from a ramp, or a vehicle changing lanes, causes following vehicles to give way to admit the vehicle. This condition establishes a disruption wave which propagates through the upstream traffic flow. At capacity, the traffic stream has no ability to dissipate even the most minor disruptions. Any incident can be expected to produce a serious breakdown with extensive queuing. The range of flows encompassed by LOS E is relatively small compared to other levels, but reflects a substantial deterioration in service. Maneuverability within the traffic stream is extremely limited, and the level of physical and psychological comfort afforded to the driver is extremely poor. Average travel speeds at capacity are approximately 30 mph.

- Level of Service F - Level F describes forced or breakdown flow. Such conditions generally exist within queues forming behind breakdown points. Such breakdowns occur for a number of reasons:

  1. Traffic incidents cause temporary reduction in the capacity of a short segment, such that the number of vehicles arriving at the point is greater than the number of vehicles that can traverse it.

  2. Recurring points of congestion exist, such as merge or weaving areas and lane drops where the number of vehicles arriving is greater than the number of vehicles traversing the point.

  3. In forcasting situations, any location presents a problem when the projected peak hour (or other) flow rate exceeds the estimated capacity of the location.

It is noted that in all cases, breakdown occurs when the ratio of actual arrival flow rate to actual capacity or the forecasted flow rate to estimated capacity exceeds 1.00. Operations at such a point will generally be at or near capacity, and downstream operations may be better as vehicles pass the bottleneck (assuming that there are no additional downstream problems). The LOS F operations observed within a queue are the result of a breakdown or bottleneck at a downstream point. The designation "LOS F" is used, therefore, to identify the point of the breakdown or bottleneck, as well as the operations within the queue which forms behind it.

As shown in Table III-4 1984 service levels were at 'D' on many Turnpike sections south of Interchange 6A (Scarborough), mostly in the southbound direction. This is not to imply that there were not some hours in 1984 where service levels decreased to 'E' or 'F' as described above.

In 1994, service levels are expected to worsen significantly to levels 'E'

TABLE III-4

ESTIMATED SUMMER WEEKEND MAINLINE PEAK-HOUR SERVICE LEVELS

BETWEEN INTERCHANGES	1984				1994			
	WITHOUT IMPROVEMENTS		WITH IMPROVEMENTS (1)		WITHOUT IMPROVEMENTS		WITH IMPROVEMENTS (1)	
	Northbound	Southbound	Northbound	Southbound	Northbound	Southbound	Northbound	Southbound
1-1A	C	D	C	D	E	F	F	F
1A-2	C	D	C	D	E	F	F	F
2-3	C	D	C	D	E	F	F	F
3-4	C	D	C	D	E	F	F	F
4-5	C	D	D	D	E	F	F	F
5-6	C	C	C	D	E	F	E	F
6-6A	C	C	C	D	E	F	E	F
6A-7	B	B	C	C	C	C	C	C
7-7A	B	B	B	B	C	C	C	C
7A-8	B	B	B	B	C	C	C	C
8-8A	B	B	B	B	C	B	C	C
8A-9	B	B	B	B	C	B	C	C
9-10	A	A	A	A	B	B	B	B
10-11	A	A	A	A	B	B	B	B
11-12	A	A	A	A	A	A	A	A
12-13	A	A	A	A	A	A	A	A
13-14	A	A	A	A	A	A	A	A
14-15	A	A	A	A	B	B	B	B

NOTE: Traffic volumes are based on August, 1985, weekend hourly traffic counts.
(1) Includes access road/interchange improvements only.

and 'F' south of Interchange 6A. However, north of Interchange 6A all Turnpike sections are expected to operate under a Level of Service 'C' or better. Accordingly, widening of the Turnpike south of Interchange 6A from four to six lanes is needed to meet currently forecast peak demands of 1994. With the widening programs, all sections of the Turnpike would operate under a Level of Service 'C' or better.

CHAPTER IV

CAPITAL IMPROVEMENT PROGRAM

Traffic Needs

As demonstrated in the previous chapter, the traffic conditions vary from interchange to interchange on the Maine Turnpike. As one might expect, the highest usage of the turnpike access is in and around the more populated areas and the cities which contain most of the businesses and industry. Table III-4 illustrates the existing summer weekend peak hour demand volumes (approx. 30th highest hour) for the Turnpike on an interchange to interchange basis. This table also illustrates the change in traffic with improvements for the base year 1984 with and without improvements for the design year of 1994. It should be restated that the improvements referred to in this table are the proposed interchange/access road projects as depicted by Maine Department of Transportation in their November 1983 report. In conjunction with Table III-4 which presents the peak hour demand volumes, Table III-5 illustrates the Level of Service (LOS) at which the roadway operates at the present, how it would operate if it were subjected to the additional traffic generated by the MDOT program and how it would operate in the design year under the improvement/no improvement scenario.

As discussed in Chapter III, LOS is a convenient term for describing the traffic flow on a highway segment and thereby reflects that segment's capacity to accommodate additional traffic. For example, a four lane freeway can accommodate approximately 1,300 vehicles per lane per hour at a LOS C. As can be seen on Table III-4, northbound traffic between interchanges 1 and 5 is currently 2,700 vehicles and 2,600 vehicles between interchanges 5 and 6A at the present time. If the MDOT improvements were implemented these values would increase by approximately 100 vehicles. The design year (1994) traffic volume for this same area is expected to grow to between 3,700-3,800 vehicles for the turnpike northbound and 4,000-4,200 for the turnpike southbound under the base condition. If the MDOT program is

implemented, an increase of approximately 100 additional vehicles may be expected. These values indicate, as shown in Table III-5, that the northbound turnpike currently operates at a LOS C and would continue to do so for the next few years under the present conditions or with the MDOT program. By the design year, however, this same segment will be operating at LOS E, meaning reduced speeds and unstable flow under the current conditions and a borderline F if the MDOT program were implemented. The values for the southbound turnpike indicate that a LOS D currently exists between interchanges 1 and 5 and that the MDOT program would extend this condition through interchange 6A. In the design year (1994) the southbound turnpike would operate at LOS F under any of the conditions presented thus far.

As a correlation of traffic flow and LOS, the example of the indicated LOS D for the turnpike southbound and the traffic slowdowns which have recently become prominent between York (interchange 1) and Biddeford (interchange 4) may be considered synonymous. The severe traffic backups occasionally taking place between York and Wells (interchange 2) are the approximate equivalent of LOS E-F. An added consideration of the traffic flow (LOS) conditions being experienced between interchanges 1 and 6 is the increasing difficulty to perform routine maintenance and repair operations such as roadway paving and bridge deck replacements.

To summarize, the northbound turnpike between interchange 1 and 6A currently operates in an average free flowing (LOS C) condition. By the design year this will deteriorate to a slow speed unstable condition (LOS E) or a forced flow bottleneck condition (LOS F) depending on whether or not the MDOT program were implemented. The southbound turnpike currently experiences lower speed stable flow (LOS D) conditions between interchange 1 and 6A. By the design year this condition will worsen to a forced flow bottleneck (LOS F) condition regardless of the MDOT program implementation. The turnpike operation north of interchange 6A currently operates freely at a LOS B in either direction and will continue to operate freely at no worse than an average flow condition (LOS C) through the design year.

Alternate Improvement Scenarios

Based upon the information presented and the desire to implement the MDOT program, alternate improvement scenarios have been developed with the need to maintain good traffic operations being the prime consideration. The need for legislative action and financing are the subject of a subsequent section of this report. While any number of improvement schemes or programs could be developed as a result of combining and/or intermixing the stated improvement scenarios, it was felt that identifying the four (4) presented below best expressed the inherent attitude of what would best serve the turnpike needs. The improvement programs include:

Program 1 - Under this program the turnpike would continue to operate under a status quo, in essence a "No Build" alternative.

Program 2 - Under this program the MDOT interchange/access road program would be fully developed and/or supplemented with alternative or additional locations that would significantly reduce congestion on U.S. Route 1 by utilizing the turnpike as a bypass route.

Program 3 - This program would incorporate Program 2 into an improvement program that would adjust or avoid unacceptable traffic conditions on the turnpike.

Program 4 - This program would be similar to Program 3 except for the method of financing.

Program 1

For the purpose of this report, Program 1 may be considered the No Build alternative. It would advocate a status quo condition for the turnpike operation. That is to say, under the program the two (2) MDOT projects currently on line, the Auburn access road and the Lewiston interchange/access road, would be completed and the remainding MDOT projects would be dependant upon the availability of funds and the feasibility of the project. As may be easily recognized, this program would not alleviate or

avoid the present or growing congestion problems on the southern section of the turnpike. This program could, in fact, serve to accelerate the traffic congestion in this section of the turnpike if the MDOT projects in this area were implemented. In this context, it should be noted that following the Auburn and Lewiston projects, the priority list indicates that the Biddeford and Scarborough Downs projects would be the next to be designed and constructed. Further, no consideration of additional or alternative projects in the southern section should be granted as they could only serve to further impair the traffic flow. As a result, the traffic congestion on the turnpike will continue to grow and with it the difficulties of maintenance.

Program 2

This program would advocate the full development of the MDOT projects for interchanges and access roads and include the potential for alternative or additional locations that would significantly reduce traffic congestion on U.S. Route 1 by increasing access to the turnpike and thereby utilize it as a bypass route. The locations of these improvements are shown on Figure IV-1. To this end, during this portion of the study, additional and alternate locations for access links to U.S. Route 1 in the southern corridor were reviewed and evaluated. The findings indicate that with the implementation of MDOT Scarborough Downs, Biddeford and Ogunquit-Wells projects, no additional links to U.S. Route 1 would serve to further alleviate congestion on U.S. Route 1. It was determined, however, that in the case of the MDOT proposed Ogunquit-Wells interchange that would intercept U.S. Route 1 opposite the Furbish Road, the interchange would better serve the Town of Ogunquit if it were located in the immediate vicinity of the North Berwick Road. This would provide a direct link into the center of Ogunquit and also serve to maintain the six (6) miles between interchanges that generally exists along the turnpike. As in the case of Program 1, Program 2 would in no way help to alleviate the rising congestion problem of the turnpike's southern section. It would, in fact, serve to accelerate this problem by increasing the number of links to the even more congested U.S. Route 1.

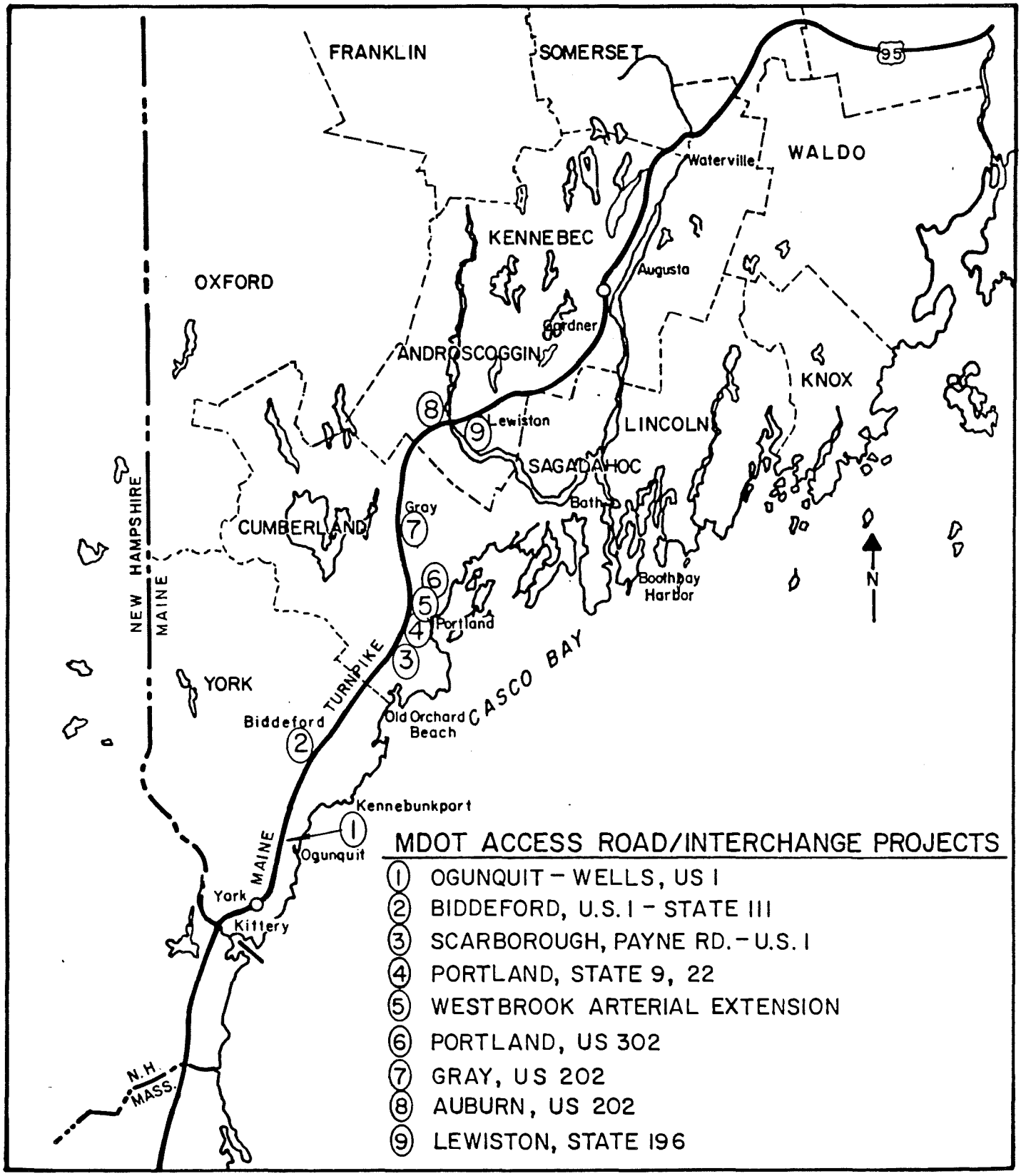


FIGURE IV - 1

MDOT ACCESS ROAD/INTERCHANGE PROGRAM

The primary benefit of this program is that it promotes the immediate evaluation, design and construction of the selected MDOT and/or alternate access road/interchange projects, thereby fulfilling the legislative intent to help spur industrial growth. In order to accomplish this, it would be necessary to implement a fare increase to provide the money that would be required to accomplish this type of an undertaking. This program assumes that all of the approved facilities would be in place and operational by January 1, 1991.

Program 3

This improvement program would consist of evaluating and constructing the selected MDOT access road interchange projects and/or alternatives, as discussed under Program 2, and also a turnpike widening project. The widening project would be proposed for the southern section of the turnpike which currently experiences traffic slow downs and backups. As shown on Figure IV-2, this work would extend from a southern most point at approximately milepost 12 to the northern most point at milepost 42 or interchange 6A. This would serve to extend the existing six (6) lane section that currently exists between mile 6 (York Toll) and mile 12, through to the Portland area. The implementation of this program would increase the traffic capacity of the turnpike southern section such that it would operate at a LOS C or free flow condition throuth 1995. It would also provide for the qualifying MDOT projects simultaneously and thereby meet the desire to promote industrial growth along the turnpike corridor. Also included in this program would be the replacement of the York Toll Plaza. This is necessitated by the potential need to widen this Plaza under the future demands as well as its current repair need due to settlement. The York Toll Plaza's current location prohibits its expansion and creates a costly repair condition.

This program would also enable the turnpike to better facilitate the anticipated traffic resulting from this growth, as well as any additional traffic that might be diverted from U.S. Route 1.

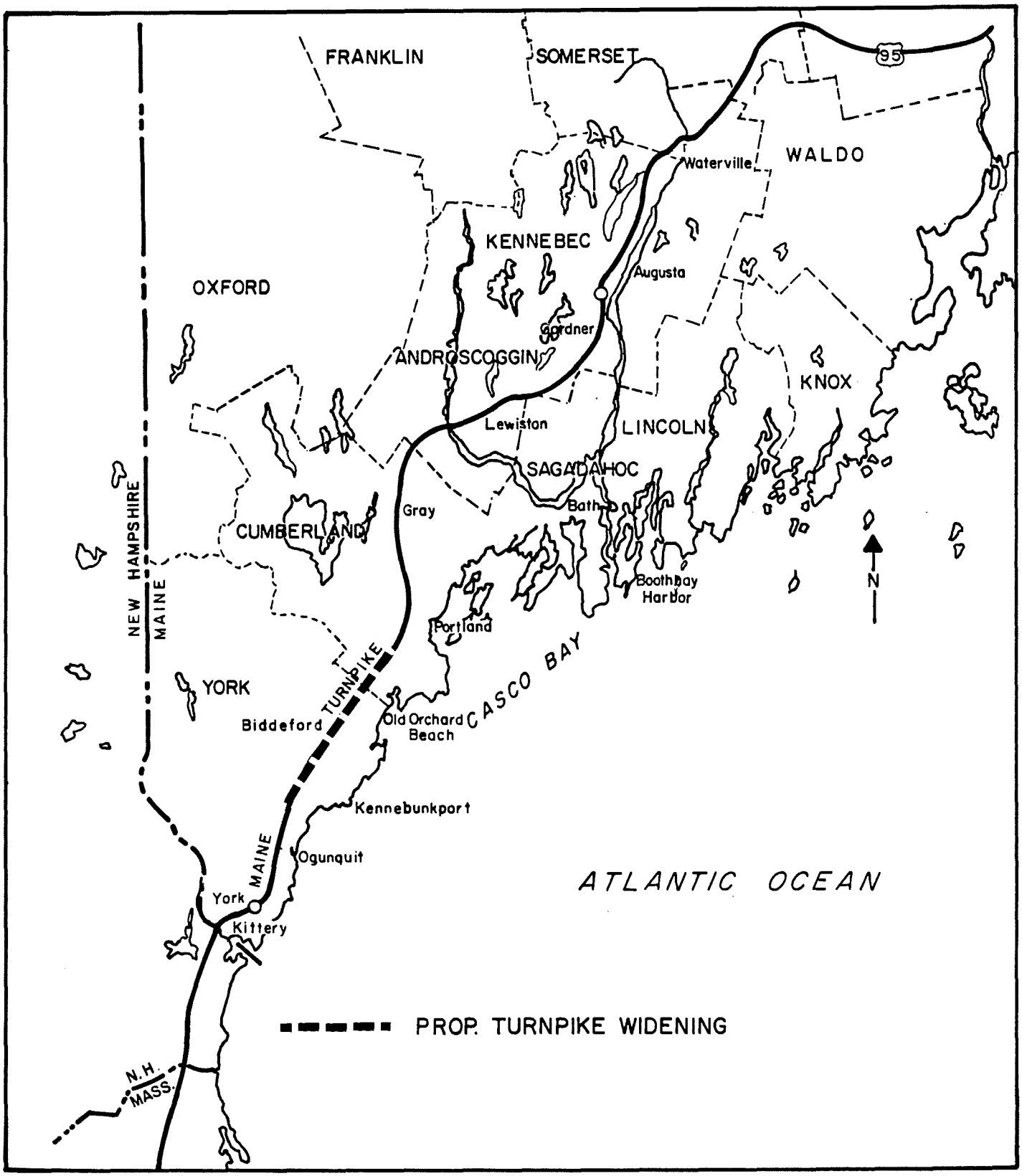


FIGURE IV - 2

PROPOSED TURNPIKE WIDENING

Program 4

This improvement program would be identical to Program 3 with the following exceptions:

1. A smaller bond issue in conjuction with a pay-as-you-go concept would be used for financing this program.
2. Turnpike widening would be accomplished between 1988 and 1991.
3. The proposed MDOT access road/interchange improvement projects are assumed to be completed on the following dates:

   Auburn - November 1987
   Lewiston - November 1988
   Biddeford - July 1988
   Scarborough Downs - July 1989
   Congress St. - November 1990
   Portland-Westbrook - November 1993
   Forest Ave. - November 1994
   Gray - November 1995
   Ogunquit-Wells - November 1995

Improvement Program Costs

In discussing project or program costs it is necessary to understand that the total cost is made up of several elements. The common attitude is to consider the construction cost of the facility as being the total cost. While this certainly constitutes the single major cost of any project, several other cost considerations should be accounted for. Among these are Right of Way costs and Operation and Maintenance (O&M) costs.

As the name indicates, Right of Way costs are those costs incurred in obtaining the land required to situate the project. This cost may be significant in heavily populated or developed areas and somewhat insignificant in the more rural, open or forested areas. These costs are incurred immediately and considered to be a one time expense.

Operating and Maintenance costs refer to the long term costs associated

with repaving, sanding and salting, plowing and generally repairing the facility.

Program 1 & 2

These programs, while different in time span, share a potentially common end in that they could both lead to the installation of the MDOT interchange/access road projects. Table IV-1 presents these projects and indicates the 1983 estimated cost as well as the 1985 estimated cost. The values presented in this table indicate all costs to be incurred except that of Operation and Maintenance. Under these programs, O&M costs would vary depending on the type of project, interchange or access road, and agreements with the community and state. Regardless of this fact, the change created by these projects in relation to the overall O&M costs of the turnpike would be minimal. It must also be realized that the estimated costs shown are in 1985 dollars and that these values would change significantly as the project's were completed over the long period of time that may be contemplated for Program 1. In Program 2, this change would not be as severe since the entire program would be completed by 1991.

Program 3

As may be expected this program, with the inclusion of all of the Program 2 work, the York Toll Plaza reconstruction and the turnpike widening, would by far have the greatest financial impact. Due to the extent of work contained in this Program it was deemed necessary to make an order of magnitude quantity estimate so that reasonably accurate cost estimates could be prepared. The unit prices used to establish the estimates are presented in Table IV-2. As shown in Figure IV-3 and IV-4, the widening portion of this project continues in the spirit of the 1970 study in that, while the end product would provide a six (6) lane facility, the earth work, drainage and bridges would reflect the base to facilitate an eventual eight (8) lane section. As part of the overall widening estimate, the need to widen and/or lengthen existing bridge structures must be taken into account.

TABLE IV-1

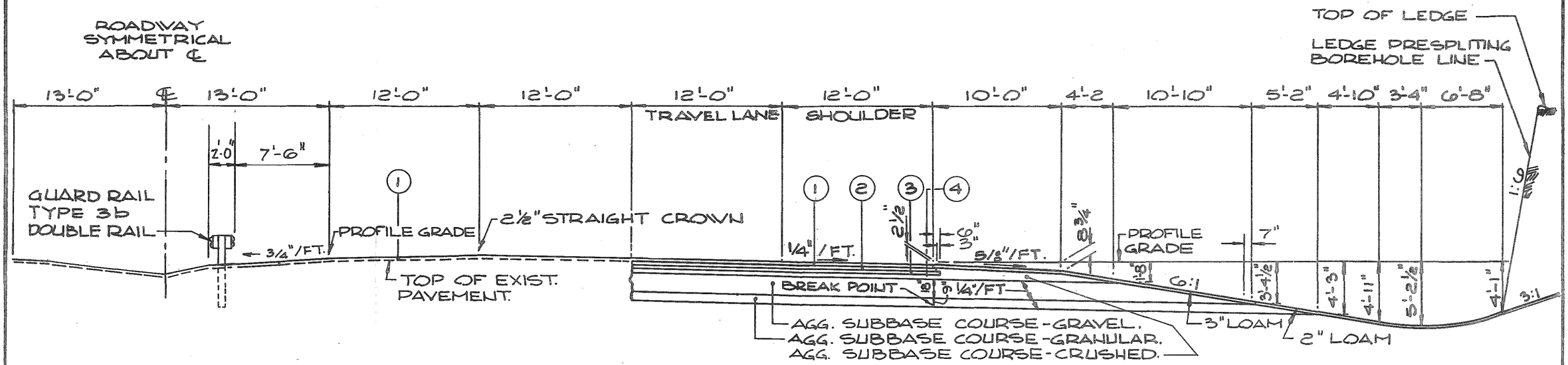
MAINE TURNPIKE 10 YEAR STUDY-ACCESS ROAD/INTERCHANGE SUMMARY

LOCATION	FACIL.TYPE	EST. 1983 COST	EST. 1985 COST
AUBURN	ACCESS	$4,800,000	$4,000,000
LEWISTON	ACCESS/INT.	$3,800,000	$5,000,000
PORTLAND (CONGRESS ST.)	INTER.	$5,800,000	$6,400,000
SCARBOROUGH	INT./ACCESS	$4,900,000	$5,500,000
BIDDEFORD	ACCESS	$4,200,000	$4,000,000
PORTLAND (FOREST AVE)	INTER.	$5,000,000	$5,500,000
WESTBROOK	INTER.	$5,300,000	$5,000,000
GRAY	ACCESS	$1,400,000	$1,600,000
OGUNQUIT-WELLS	INT./ACCESS	$4,600,000	$5,100,000
	TOTAL	$39,800,000	$42,100,000

ESTIMATED MTA SHARE OF COST IS 65.5+/-% OR $27,565,000

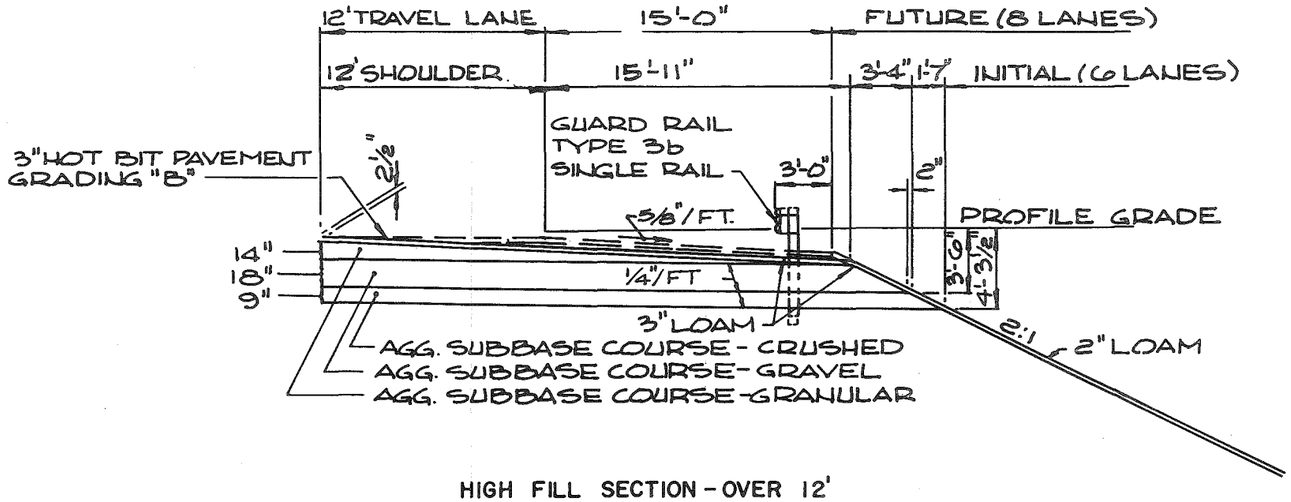
TABLE IV-2

Item	Unit	1983 Interstate Projects Wt.Avg.	Exp.Low	Exp.Hi.	1983 Urban Project Wt.Avg.	Exp.Low	Exp.Hi.	1983 Use	1985 Use
Clearing	Acre	541.00	500.00	623.00	945.00	862.00	1000.00	800.00	1000.00
Common Excavation	CY	2.02	1.24	2.68	4.09	2.50	8.00	4.00	5.00
Rock Excavation	CY	4.27	4.01	8.59				16.00	20.00
Common Borrow	CY	1.92	1.50	5.00	4.41	2.79	6.65	5.00	5.00
Plant Mix Bit.(B)	T				27.99	24.39	45.00	27.00	27.00
Agg. Base Crse.Crush	CY							10.00	12.00
Agg.Subbase Crse.Gravel	CY	5.72	5.72	5.72	6.16	5.06	9.92	6.00	7.00
Agg.Subbase Crse.Gran								5.00	6.00
Hot.Bit.Pave.Gr.B	T	25.97	25.97	25.97	28.13	24.39	36.50	27.00	27.00
Hto.Bit.Pave.Gr.C	T	27.00	27.00	27.00	28.84	25.90	45.00	28.00	28.00
12" RCP Class III	LF	16.14	16.14	16.14	19.43	13.93	39.22	17.00	17.00
18" RCP Class III	LF	19.01			19.64	19.00	20.27	19.00	20.00
24" RCP Class III	LF	24.59			31.26	22.00	40.00	26.00	26.00
30" RCP Class III	LF	30.44			36.00			34.00	34.00
36" RCP Class III	LF	36.00			39.34	38.58	54.54	40.00	42.00
42" RCP Class III	LF	47.00						48.00	54.00
48" RCP Class III	LF	61.20			80.00			60.00	68.00
54" RCP Class III	LF							68.00	80.00
60" RCP Class III	LF							80.00	100.00
72" RCP Class III	LF	135.42						120.00	120.00
78" RCP Class III	LF							140.00	140.00
6" Underdrain "B"	LF	9.30	9.29	10.20	9.48	8.50	12.44	9.50	10.00
Guard Rail (3b) S.F.	LF	8.39	7.98	8.90	8.04	8.04	8.04	8.50	8.50
Guard Rail (3b) D.F.									
Terminal Ends-S.F.	EA	21.42			20.28	18.23	22.14	22.00	22.00
Twisted End-3b	EA							225.00	225.00
Loam	CY	4.44	4.05	7.00	10.09	8.00	18.69	8.00	8.00
Sodding	SY	2.64	2.18	4.97	2.81	2.00	4.71	3.00	3.00
Erosion Cont. Mesh (H.D.)	SY	.92	.68	1.50	.83	.67	.87	1.00	1.00
Seeding,Method 2	UN	9.08	8.90	10.35	10.14	8.90	15.00	12.00	12.00
Hay Mulch	UN	6.50	6.17	7.00	6.65	5.00	13.77	8.00	8.00



NORTHBOUND ROADWAY - CUT SECTION

N.T.S.



HIGH FILL SECTION - OVER 12'

(1) 3 "HOT BIT. PAVEMENT GRADING "C"
2¼" HOT BIT. PAVEMENT GRADING "B"

(2) 4" PLANT MIX BIT. BASE COURSE GRADING "B"

(3) 3" BIT. SLAB BASE

(4) 4" AGG. BASE COURSE-CRUSHED

HOWARD, NEEDLES, TAMMEN & BERGENDOFF.
ARCHITECTS ENGINEERS PLANNERS
BOSTON

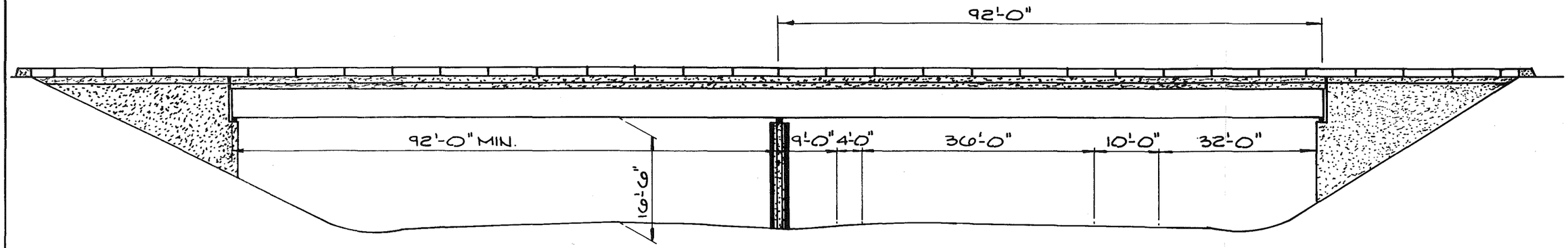
MAINE TURNPIKE AUTHORITY

CAPITAL IMPROVEMENT STUDY

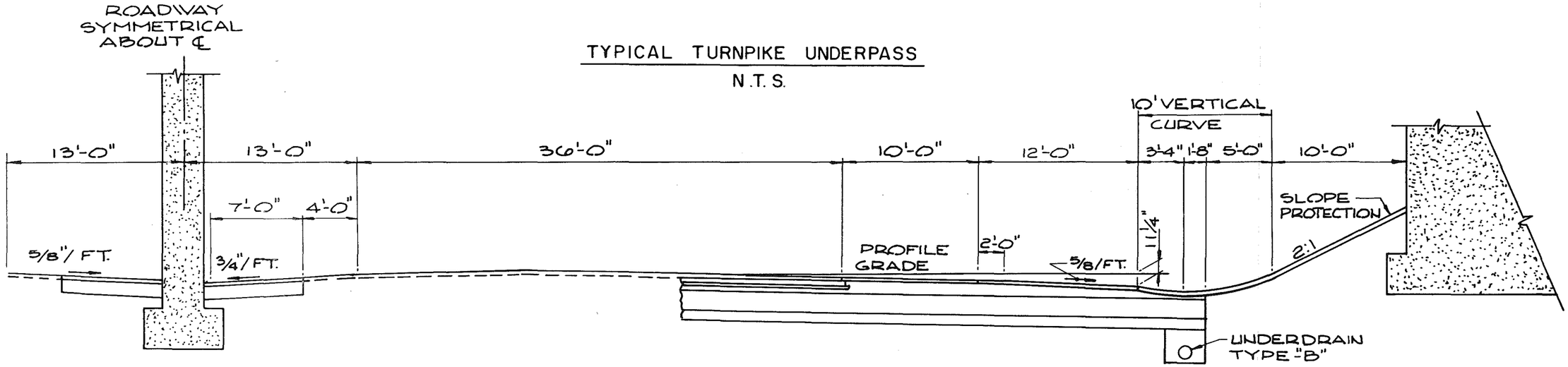
YORK - TO SOUTH PORTLAND

TYPICAL SECTIONS

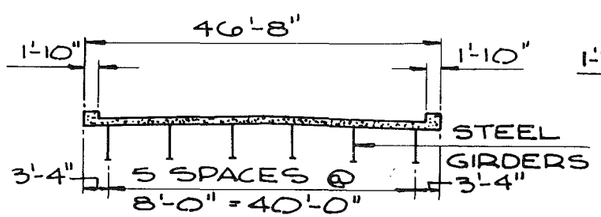
FIGURE IV - 3



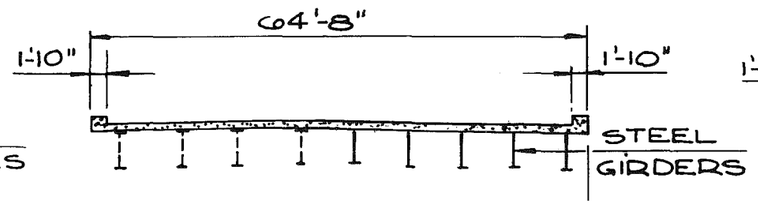
TYPICAL TURNPIKE UNDERPASS
N.T.S.



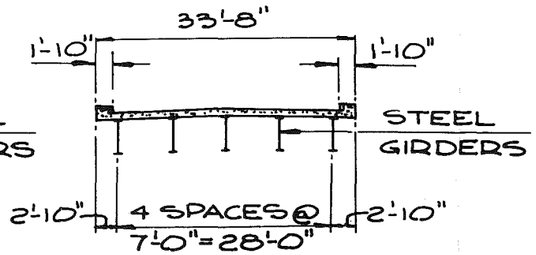
TURNPIKE UNDERPASS DETAILS
N.T.S.



TURNPIKE UNDERPASS
MAJOR ROADWAY
N.T.S



TURNPIKE OVERPASS
TYPICAL WIDENING
N.T.S.



TURNPIKE UNDERPASS
MINOR ROADWAY
N.T.S.

HOWARD, NEEDLES, TAMMEN & BERGENDOFF.
ARCHITECTS ENGINEERS PLANNERS
BOSTON

MAINE TURNPIKE AUTHORITY
CAPITAL IMPROVEMENT STUDY
YORK - TO SOUTH PORTLAND
BRIDGE DETAILS
FIGURE IV - 4

Figure IV-5 illustrates the proposed limits of the widening on a map of the turnpike. This figure also indicates the limits of the five (5) construction contracts. Tables IV-3, IV-4, and IV-5 list the bridges that would require modification by construction contract and type (overpass vs. underpass) and the cost for these structures by construction contract. Table IV-6 shows the aggregation of the bridge structure costs with the cost to perform the roadway widening including right of way costs by construction contract. It should be noted that all of these estimates are represented in 1985 dollars and would therefore need to be increased to reflect the construction year. Since, for the purposes of the study, it was assumed that this work would take place simultaneously and be bid by 1989, an inflation factor of 134 percent or 7.5 percent annually may be applied.

In conclusion, the total cost of Program 3 consists of the sum of Tables IV-1 and IV-6 less the existing balance in the interchange/access road account or approximately $78,716,000. Projecting this value into 1989 dollars, the total cost of Program 3 may be estimated at approximately $105,500,000. The aggregation of the costs and inflation factors is presented in Table IV-7.

As in Program 2 it is anticipated that there would be only a minimal increase in O&M costs associated with this Program.

Program 4

The total cost of Program 4 is estimated to be approximately $96,381,000 expressed in 1985 dollars. Projecting this into 1988 to 1994 dollars (inflation factor of 7.5 percent annually) would result in a total cost of Program 4 of approximately $128,478,000. The project costs and proposed construction schedule are presented in Table IV-8.

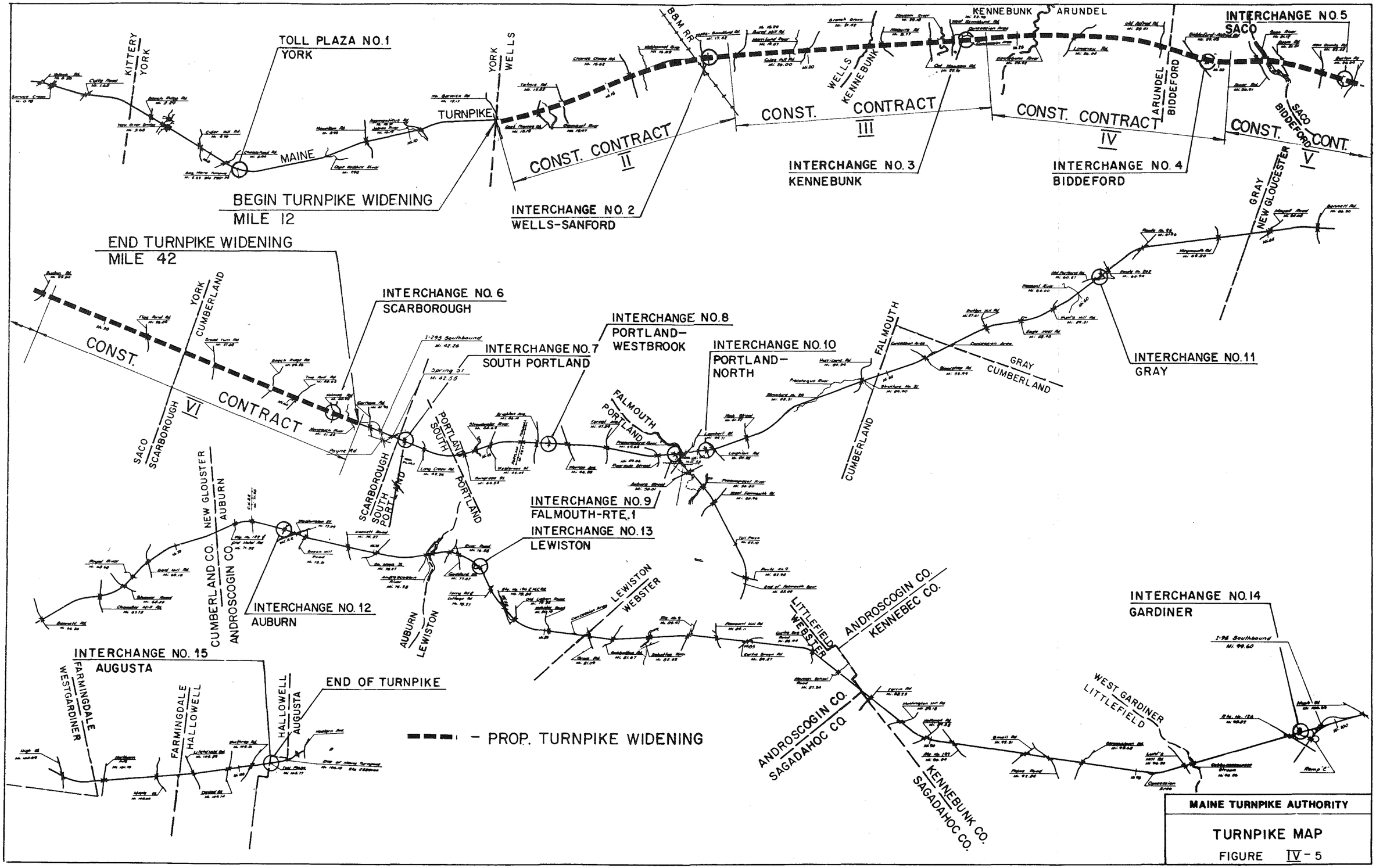

TOLL PLAZA NO.1
YORK
KITTERY
YORK
MAINE
TURNPIKE
YORK
WELLS
BEGIN TURNPIKE WIDENING
MILE 12
CONST. CONTRACT II
INTERCHANGE NO. 2
WELLS-SANFORD
B&M RR
WELLS
KENNEBUNK
KENNEBUNK
ARUNDEL
CONST. CONTRACT III
INTERCHANGE NO. 3
KENNEBUNK
ARUNDEL
BIDDEFORD
CONST. CONTRACT IV
INTERCHANGE NO. 4
BIDDEFORD
INTERCHANGE NO. 5
SACO
SACO
BIDDEFORD
CONST. CONT. V
GRAY
NEW GLOUCESTER
INTERCHANGE NO. 11
GRAY
END TURNPIKE WIDENING
MILE 42
CONST. CONTRACT VI
YORK
CUMBERLAND
SACO
SCARBOROUGH
INTERCHANGE NO. 6
SCARBOROUGH
I-295 Southbound
Spring 31
INTERCHANGE NO. 7
SOUTH PORTLAND
SCARBOROUGH
SOUTH PORTLAND
PORTLAND
INTERCHANGE NO. 8
PORTLAND-
WESTBROOK
FALMOUTH
PORTLAND
INTERCHANGE NO. 10
PORTLAND-
NORTH
FALMOUTH
CUMBERLAND
GRAY
CUMBERLAND
NEW GLOUCESTER
AUBURN
CUMBERLAND CO.
ANDROSCOGIN CO.
INTERCHANGE NO. 12
AUBURN
AUBURN
LEWISTON
INTERCHANGE NO. 9
FALMOUTH-RTE. 1
INTERCHANGE NO. 13
LEWISTON
LEWISTON
WEBSTER
LITTLEFIELD
WEBSTER
ANDROSCOGIN CO.
KENNEBEC CO.
ANDROSCOGIN CO.
SAGADAHOC CO.
KENNEBUNK CO.
SAGADAHOC CO.
INTERCHANGE NO. 14
GARDINER
I-95 Southbound
WEST GARDINER
LITTLEFIELD
INTERCHANGE NO. 15
AUGUSTA
FARMINGDALE
WESTGARDINER
FARMINGDALE
HALLOWELL
HALLOWELL
AUGUSTA
END OF TURNPIKE
– – – – PROP. TURNPIKE WIDENING
MAINE TURNPIKE AUTHORITY
TURNPIKE MAP
FIGURE IV - 5

TABLE IV-3

BRIDGE UNDERPASS SUMMARY

CONSTRUCTION	DESCRIPTION	SKEW ANGLE	DESIGN DATA				COST
			Span Length	Width	Area	Foundation	
2	North Berwick Rd.	5°	92'-4"	33'-8"	6218	Spread Footing	$ 466,350
	Captain Thomas Rd.	10°	93'-5"	33'-8"	6290	Spread Footing	471,750
	Tatnic Rd.	0°	92'-0"	33'-8"	6195	Spread Footing	464,625
	Charles Chase Rd.	10°	93'-5"	46'-8"	8719	Spread Footing	653,925
3	Burnt Mills Rd.	25°	101'-6"	33'-8"	6835	Spread Footing	512,625
	Coles Hill Rd.	30°	106'-3"	33'-8"	7153	Spread Footing	536,475
	McGuire Rd.	15°	95'-3"	46'-8"	8890	Piles	755,650
	Cat Mousam Rd.	5°	92'-4"	33'-8"	6218	Spread Footing	466,350
	West Kennebunk Rd.	10°	93'-5"	46'-8"	8719	Piles	741,115
4	Limerick Rd.	45°	130'-1"	33'-8"	8761	Piles	744,685
	Old Alfred Rd.	25°	101'-6"	33'-8"	7153	Piles	608,005
	Biddeford-Alfred Rd.	45°	130'-1"	46'-8"	12,143	Piles	1,032,155
	Biddeford Interchange	5°	92'-4"	46'-8"	8619	Piles	732,615
5	River Rd.	10°	93'-5"	33'-8"	6290	Piles	534,650
	Boon Rd.	15°	95'-3"	33'-8"	6413	Piles	545,105
	New County Rd.	5°	92'-4"	46'-8"	8619	Piles	732,615
	Buxton Rd.	0°	92'-0"	46'-8"	8587	Piles	729,895
6	Flag Pond Rd.	30°	106'-3"	33'-8"	7153	Spread Footing	536,475
	Broad Turn Rd.	15°	95'-3"	33'-8"	6413	Piles	545,105
	Beech Ridge Rd.	15°	95'-3"	33'-8"	6413	Piles	545,105
	Two Rod Rd.	20°	97'-11"	33'-8"	6592	Piles	560,320
	Holmes Rd.	30°	106'-3"	33'-8"	7153	Piles	608,005
							$ 13,523,600

TABLE IV-4

BRIDGE OVERPASS SUMMARY

CONTRACT	DESCRIPTION	STRUCTURE TYPE	FOUNDATION	COST
2	Ogunquit River	Concrete Arch	Spread Footing	$ 289,447
	Webhannet River	Culvert	Spread Footing	144,723
	Boston & Maine RR	3-span (Steel Beams)	Ledge	685,024
	Wells-Sanford Rd.	1-span (Steel Beams)	Spread Footing	421,306
	Wells Interchange	1-span (Steel Beams)	Spread Footing	424,522
3	Merriland Rd.	Arch Type Structure	Piles	260,501
	Mousam River	3-span (Steel Beams)	Piles	1,505,124
4	Kennebunk River	1-span (Steel Beams)	Piles	443,819
6	Nonesuch River	Arch Type Structure	Piles	160,804
				$ 4,335,271

TABLE IV-5

COST SUMMARY OF BRIDGE MODIFICATIONS

SUMMARY

Contract	Cost Crossing	Over	Total
2	2,056,650	1,965,022	$ 4,021,672
3	3,012,215	1,765,626	4,777,841
4	3,117,460	443,819	3,561,279
5	2,542,265		2,542,265
6	2,795,010	160,804	2,955,814
Sub-Totals	13,523,600	4,335,271	
Total			$ 17,858,871

TABLE IV-6

SUMMARY OF TURNPIKE WIDENING COSTS

Contract	Sta. to Sta.	Length (Miles)	Cost
II	590+00 to 905+00	5.97	$13,361,000
III	905+00 to 1240+00	6.34	15,621,000
IV	1240+00 to 1555+00	5.97	12,042,000
V	1555+00 to 1730+00	3.31	8,187,000
VI	1730+00 to 2175+00	8.43	13,860,000
TOTAL		30.02	$63,071,000*

*1985 Prices

TABLE IV-7

SUMMARY OF PROGRAM 3 COSTS

Interchange/Access Road Costs	$27,565,000 (Table IV-1)
Turnpike Widening Costs	$63,071,000 (Table IV-6)
York Toll Plaza Relocation	$ 3,480,000
Total Program 3 Costs	$94,116,000*
Less Available Interchange/Access Road Funds	-15,400,000**
Net Cost Program 3	$78,716,000*
Net Cost Program 3 in 1989 Dollars	$105,500,000

* 1985 Prices
** Available to new bond issue 1989

TABLE IV-8

PROGRAM 4

PROJECT COSTS AND CONSTRUCTION SCHEDULE

Contract		1985 Cost	Const. Year	Const. Year X	Const. Year Cost
Mile 12-18 Grading & Paving	IIA	$8,709	1989	1.335	$11,627
Mile 12-18 Structures	IIB	4,652	1988	1.242	5,778
Mile 18-24 Grading & Paving	IIIA	10,103	1989	1.335	13,488
Mile 18-24 Structures	IIIB	5,518	1989	1.335	7,367
Mile 24-30 Grading & Paving	IVA	8,051	1990	1.435	11,553
Mile 24-30 Structures	IVB	3,991	1989	1.335	5,328
Mile 30-34 Grading & Paving	VA	5,004	1989	1.335	6,680
Mile 30-34 Structures	VB	3,183	1989	1.335	4,249
Mile 34-42 Grading & Paving	VIA	10,154	1989	1.335	13,556
Mile 34-42 Structures	VIB	3,706	1989	1.335	4,948
Lewiston			1987		$ 5,800
Auburn			1985		3,800
Gray		400	1994	1.917	767
Forest Ave.		1,300	1993	1.783	2,318
Portland Westbrook		3,800	1992	1.659	6,304
Congress St.		4,900	1989	1.335	6,542
Scarboro			1987		5,000
Biddeford		2,280	1986		2,280
Ogunquit-Wells		2,550	1994	1.917	4,888
York		3,480	1993	1.783	6,205

CHAPTER V

FINANCIAL FEASIBILITY

A financial feasibility analysis was performed to assess the viability of funding and implementing the various Turnpike improvement needs over the forcast period. Funding mechanisms studied included:

- o Funding of limited improvements from current and projected available funds assuming no change in toll rates or supplemental bond sales;
- o Funding from currently available sources plus additional resources made available through future toll increases but without supplemental bond sales; and
- o Funding from currently available sources supplemented by new bonding and concurrent toll increases.

Alternate Turnpike Capital Improvement Programs

For purposes of simplification, the nine proposed access improvements plus major widening were grouped into four possible alternate improvement program scenarios. These included:

Program 1 - Under this scenario, only those access improvements presently committed would be implemented. This includes improvements at Auburn (completion November, 1987) and Lewiston (completion November, 1988).

Program 2 - Includes all nine proposed access road/interchange improvements. Assumed completion dates of the improvements are as follows:

Auburn - November, 1987;
Lewiston - November, 1988;
Biddeford - July, 1988;
Scarborough Downs - July, 1989; and
All others - January, 1991

Program 3 - This program consists of the nine access improvements with assumed completion dates as listed above, plus the widening of the Maine Turnpike from four to six lanes, from Milepost 12 to Interchange 6A

Scarborough. The assumed completion date of the widening is January 1, 1991. All Turnpike mainline sections would operate under a Level of Service 'C' or better under this program.

Program 4 - This program consists of the nine access/interchange improvements with assumed completion dates between 1987 and 1995. The assumed completion date of widening the Maine Turnpike from four to six lanes from Milepost 12 to Interchange 6A, is December 1991.

Estimates of future revenue available to fund the alternate improvement programs were developed from gross toll income minus volume discount allowances, concession income earned through lease agreements with operators of service areas, and interest income earned on investments. Net income was derived by deducting estimated maintenance operating expenses, reserve maintenance fund deposits, Maine DOT contributions and current or proposed bond debt service.

Basic Assumptions

Estimated future revenues available to the Authority to finance a selected capital improvement program were developed using certain basic assumptions. These included:

1. Specific projects of the alternate capital improvement programs, as described in this report, will be implemented on the date(s) indicated. All elements of Program 1 and 2 would be operational by January 1, 1991.

2. Required toll increases associated with the alternate programs would become effective on approximately the dates indicated.

3. Legislative approval would be sought to remove any restrictions on the Authority to finance the Programs through revenue bond financing, where applicable.

4. The Maine Turnpike will continue to be well maintained, efficiently operated and effectively signed to encourage maximum usage.

5. The annual contribution to the Maine DOT will remain constant at $4.7 million.

6. The national economy, recognizing annual recessional periods, will record an average annual positive growth over the forecast period.

7. The present level of motor fuel pricing and availability will prevail during the projection period and no national emergency will arise which would abnormally alter the use of motor vehicles.

Any significant departure from these assumptions could materially affect estimated traffic and revenues for the Maine Turnpike.

Estimated Gross Income

Based on historical traffic growth on the Turnpike, projected economic activity within the primary travel corridor and the impact created by the alternate improvement programs, annual gross toll revenue was projected annually over the next decade, 1985 to 1995 and at five year increments thereafter. As shown in Table V-1, assuming retention of the present toll schedule throughout the forecast period, gross toll income under Program 1 would increase from $23,791,000 in 1985 to $35,048,000 in 1995 and $51,910,000 in 2010. This program assumes only the Lewiston and Auburn projects would be constructed.

Assuming the construction of all access road/interchange projects, Program 2, gross toll income would increase from $23,791,000 to $54,431,000 in the final projection year. Including the mainline widening that would be operational on January 1, 1991, gross toll revenues for Program 3 would increase to $55,383,000 in the 2010 forecast year. The gross toll revenues for Program 4 would be similar to Program 3.

These estimates are preliminary and intended to show the earning trend over a period of years rather than the exact earnings for any particular year. There could, of course, be years in which growth in traffic and revenues might be higher or lower than indicated, depending upon economic conditions and other local factors that might affect project usage at that time. Projected toll revenue earnings are shown annually through 1995 reflecting the analysis of detail available in economic indicators within the short term. Beyond that date, future toll revenues are shown at five year

TABLE V-1

ESTIMATED ANNUAL GROSS REVENUES

Assuming Continuation of Present Toll Schedule

YEAR	PROGRAM NO.1	PROGRAM NO. 2	PROGRAM NO. 3
	(----------thousands----------)		
1985	$23,791	$23,791	$23,791
1986	24,815	24,815	24,815
1987	25,990	25,990	25,990
1988	27,208	27,340	27,340
1989	28,356	28,659	28,659
1990	29,494	29,841	29,841
1991	30,611	32,031	32,250
1992	31,771	33,258	33,549
1993	32,843	34,400	34,787
1994	33,928	35,557	36,067
1995	35,048	36,751	37,393
2000	40,656	42,631	43,376
2005	46,348	48,600	49,449
2010	51,910	54,431	55,383

NOTE: Includes commuter plan payments.

increments based on the most appropriate assessment of growth over the long term of the forecast period.

Total Income

Future estimates were developed of all revenue sources and impacts to determine the amount of total income that would be annually available to apply toward the funding of the selected improvement program.

Volume Discount Plan - The same terms of the present volume discount plan offered to patrons of the Turnpike were maintained throughout the forecast period. Deductions of these estimated discount revenues produced estimated net toll income.

Concession Revenue - Concession revenues are earned through lease agreements entered into with operators of the service areas on the Turnpike. Future estimates reflect these terms in conjunction with anticipated vehicular growth.

Interest Income - Interest income is earned on investments made from the various fund balances. This income source is dictated by the volume of monies available for investment and interest rates prevailing at the time of investment. After consultation with the Authority comptroller it was determined most appropriate to use an estimated $1,000,000 as annual interest income during the forecast period. It is generally agreed that this income source may be exceeded, particularly if toll increases are implemented. However, for purposes of conservatism, interest income of $1,000,000 was maintained throughout the forecast period.

Net Operating Income

Future year expenses were estimated to determine the annual level of net operating income that would be available to the Authority to fund the alternate improvement programs. Annual expenses are projected to be

generated in the following four categories:

- o Maintenance-Operating Expenses;
- o Reserve Maintenance Fund Deposits;
- o Bond Debt Service; and
- o Maine DOT Deposits.

Annual maintenance-operating costs are expenses incurred to maintain the facility in a safe operating condition and to pay for the salaries of personnel required to perform all functions of a toll road. Deposits to the Reserve Maintenance Fund reflect the opinion of the Authority's Consulting Engineer of extraordinary projects that will be needed over the forecast period.

The Maine Turnpike Authority currently has an outstanding bond debt which is scheduled to be retired in 1990. A schedule of principal retirement plus interest has been determined under an annual amortization schedule. If, however, the Authority should decide to issue new bonds, the existing bond debt would have to be retired prior to the sale of a new issue. Estimates of future new bond debt service reflect this condition.

The Maine Turnpike Authority currently contributes $4,700,000 annually to the Maine Department of Transportation. The analyses of possible future programs assumes the retention of this annual obligation. Obviously, if this annual payment was not made, a significant impact would result on each financing scenario.

Improvement Program 1

Improvement Program 1 is basically a "no-build" program except that the Lewiston and Auburn projects are included because they are committed and underway. As shown in Table V-2, annual total income on the Maine Turnpike, assuming retention of the existing toll schedule, would increase from $25,565,000 in 1985 to $37,172,000 in 1995 and to $51,910,000 in 2010.

Annual maintenance and operating expenses are expected to increase at an annual rate beyond that projected for toll income. Total expenses are estimated to increase from $22,572,000 in 1985 to $98,677,000 in 2010. As

TABLE V-2

ESTIMATED ANNUAL NET OPERATING INCOME
Improvement Program No.1 (1)
Existing Toll Schedule

YEAR	GROSS TOLL REVENUE	VOLUME DISCOUNT	NET TOLL REVENUE	CONCESSION REVENUE	INTEREST AND MISCELLANEOUS INCOME	TOTAL INCOME	MAINTENANCE-OPERATING EXPENSE	CURRENT BOND DEBT SERVICE	RESERVE MAINTENANCE DEPOSIT	MAINE DOT FUND	TOTAL EXPENSES	ANNUAL NET OPERATING INCOME
	(thousands)											
1985 (Actual)	$23,791	$403	$23,388	$568	$1,609	$25,565	$11,238	$1,565	$5,069	$4,700	$22,572	$2,993
1986	24,815	445	24,370	1,100	1,000	26,470	13,018	1,470	5,275	4,700	24,463	2,007
1987	25,990	465	25,525	1,105	1,000	27,630	14,190	1,370	4,375	4,700	24,635	2,995
1988	27,208	486	26,722	1,110	1,000	28,832	15,467	1,268	5,225	4,700	26,660	2,172
1989	28,356	507	27,849	1,275	1,000	30,124	16,859	1,162	4,625	4,700	27,346	2,778
1990	29,494	530	28,964	1,489	1,000	31,453	18,376	555	5,825	4,700	29,456	1,997
1991	30,611	551	30,060	1,503	1,000	32,563	20,030	0	4,850	4,700	29,580	2,983
1992	31,771	574	31,197	1,518	1,000	33,715	21,833	0	7,825	4,700	34,358	-643
1993	32,843	596	32,247	1,534	1,000	34,781	23,798	0	5,425	4,700	33,923	858
1994	33,928	620	33,308	1,751	1,000	36,059	25,940	0	6,450	4,700	37,090	-1,031
1995	35,048	645	34,403	1,769	1,000	37,172	28,274	0	5,600	4,700	38,574	-1,402
2000	40,656	748	39,908	1,870	1,000	42,778	41,545	0	11,645	4,700	57,890	-15,112
2005	46,348	853	45,495	1,980	1,000	48,475	58,269	0	13,720	4,700	76,689	-28,214
2010	51,910	955	50,955	2,100	1,000	54,055	77,977	0	16,000	4,700	98,677	-44,622

---

(1) Assumes construction of Lewiston and Auburn access road/interchange projects only.

shown, annual net.operating income would fluctuate during the forecast period, but would be reduced from a surplus of $2,993,000 in 1985 to a deficit of $1,402,000 in 1995 and to a $44,622,000 deficit in 2010. Based on this limited Turnpike improvement program, projected annual net operating income would indicate that toll schedule revisions would be required starting in 1992 to offset annual net operating income deficiencies.

The estimated annual net operating income available to fund the limited project (Lewiston-Auburn) as proposed under Program 1 are shown in Table V-3. The Authority currently has a fund balance of approximately $10,000,000 to finance construction of proposed access roads/interchanges. As indicated, the estimated net operating income, together with the 1985 Improvement Fund balance would provide $12,993,000 for application toward improvement project cost. Deducting $8,500,000 as the Authority's share of the Lewiston-Auburn projects would result in a surplus of $4,493,000 which would be used for additional access road/interchange projects.

Under Improvement Program 1, with its limited improvement projects, the annual balance in the Improvement Fund would continue to increase until 1992. Estimated deficits in net operating income, which surface in 1992, would accelerate in future years without a toll revision to counteract this projected trend. The surplus balance in the Improvement Fund would be expected to be depleted in approximately 1998.

Improvement Program 2

Under this program all projects of the access road/interchange improvements would be constructed with all elements operational by January 1, 1991. Estimated annual net operating income for Program 2, reflecting additional toll income earned as a result of the additional new projects, is shown in Table V-4. Retention of the existing toll schedule would produce a surplus of net operating income of $265,000 in 1995. The additional net operating income generated by the new Program No. 2 improvements does not remove the need to generate additional toll revenues to fund the capital cost of these projects.

TABLE V-3

FINANCIAL FEASIBILITY PRO FORMA

Improvement Program No. 1[1]

Existing Toll Schedule

YEAR	NET OPERATING INCOME	IMPROVEMENT FUND BALANCE	PROJECT COST	NET CUMULATIVE INCOME SURPLUS (DEFICIT)
	(thousands)			
1985	$ 2,993	$10,000	$8,500	$ 4,493
1986	2,007	4,493	--	6,500
1987	2,995	6,500	--	9,495
1988	2,172	9,495	--	11,667
1989	2,778	11,667	--	14,445
1990	1,997	14,445	--	16,442
1991	2,983	16,442	--	19,425
1992	(643)	19,425	--	18,782
1993	(858)	18,782	--	19,640
1994	(1,031)	19,640	--	18,609
1995	(1,402)	18,609	--	17,207
2000	(15,112)	--	--	(27,520)
2005	(28,214)	--	--	(141,264)
2010	(44,622)	--	--	(329,366)

(1) Assumes construction of Lewiston and Auburn Access Road/ Interchange Project only.

TABLE V-4

ESTIMATED ANNUAL NET OPERATING INCOME
Improvement Program No. 2 (1)
Existing Toll Schedule

YEAR	GROSS TOLL REVENUE	VOLUME DISCOUNT	NET TOLL REVENUE	CONCESSION REVENUE	INTEREST AND MISCELLANEOUS INCOME	TOTAL INCOME	MAINTENANCE-OPERATING EXPENSE	CURRENT BOND DEBT SERVICE	RESERVE MAINTENANCE DEPOSIT	MAINE DOT FUND	TOTAL EXPENSES	ANNUAL NET OPERATING INCOME
	(thousands)											
1985 (Actual)	$23,791	$403	$23,388	$568	$1,609	$25,565	$11,238	$1,565	$5,069	$4,700	$22,572	$2,993
1986	24,815	445	24,370	1,100	1,000	26,470	13,018	1,470	5,275	4,700	24,463	2,007
1987	25,990	465	25,525	1,105	1,000	27,630	14,190	1,370	4,375	4,700	24,635	2,995
1988	27,340	491	26,849	1,110	1,000	28,959	15,467	1,268	5,225	4,700	26,660	2,299
1989	28,659	516	28,143	1,275	1,000	30,418	16,859	1,162	4,625	4,700	27,346	3,072
1990	29,841	540	29,301	1,489	1,000	31,790	18,376	555	5,825	4,700	29,456	2,334
1991	32,031	581	31,450	1,503	1,000	33,953	20,030	0	4,850	4,700	29,580	4,373
1992	33,258	605	32,653	1,518	1,000	35,171	21,833	0	7,825	4,700	34,358	813
1993	34,400	629	33,771	1,534	1,000	36,305	23,798	0	5,425	4,700	33,923	2,382
1994	35,557	654	34,903	1,751	1,000	37,654	25,940	0	6,450	4,700	37,090	564
1995	36,751	681	36,070	1,769	1,000	38,839	28,274	0	5,600	4,700	38,574	265
2000	42,631	790	41,841	1,870	1,000	44,711	41,545	0	11,645	4,700	57,890	-13,179
2005	48,600	901	47,699	1,980	1,000	50,679	58,269	0	13,720	4,700	76,689	-26,010
2010	54,431	1,009	53,422	2,100	1,000	56,522	77,977	0	16,000	4,700	98,677	-42,155

---

(1) Assumes construction of all proposed access road/interchange projects.

The analysis of determining the feasibility of the existing toll schedule to fund the Program 2 project costs are shown in Table V-5. As shown, the total Authority share of estimated project cost is estimated to be $36,700,000 with a construction draw-down of $8,500,000 in 1985, $2,800,000 in 1986, $4,100,000 in 1987, $2,250,000 in 1988 and $9,525,000 in 1989 and 1990.

As indicated, the present toll schedule would not generate sufficient revenues to fund the project costs as proposed under Program 2. An estimated deficit of $3,809,000 net cumulative income would be experienced in 1989, increasing to $11 million in 1990. This clearly demonstrates that an adjustment in the operating toll schedule would be required in order to implement Improvement Program 2. Beyond 1995, deficits are projected in net operating income.

An analysis was made to determine the size and date of adoption of a toll increase that would be needed to make the funding of Program No. 2 a viable financial endeavor. Since the primary objective of this report is long term planning for improvements to the Maine Turnpike, no formal toll sensivity analyses were performed as part of this study. A general assessment of revenue potential at higher toll levels was made based on past experience on the Maine Turnpike and elsewhere following recent toll changes. While this approach is considered adequate for long term planning, more formal studies of toll sensitivity should be performed prior to actually implementing a toll change.

As shown in Table V-6, a 15 percent across-the-board toll increase was assumed to be introduced on January 1, 1988. As a result, the net income supplus available to be transferred to the Improvement Fund increased from $2,595,000 in 1987 to $6,470,000 in 1988. Annual deficits during the construction period are eliminated as well as over the first ten years. In 1995 the cumulative net income surplus is shown to be $33,833,000. In approximately 1998, deficits in annual net operating income would be experienced and without the benefit of other toll increases would increase annually throughout the projection period. Surplus balances in the Improvement Fund would be expected to be exhausted in about 2003.

TABLE V-5

FINANCIAL FEASIBILITY PRO FORMA

Improvement Program No. 2[1]

Existing Toll Schedule

YEAR	NET OPERATING INCOME	IMPROVEMENT FUND BALANCE	PROJECT COST	NET CUMULATIVE INCOME SURPLUS (DEFICIT)
	(thousands)			
1985	$ 2,993	$10,000	$8,500	$ 4,493
1986	2,007	4,493	2,800	3,700
1987	2,995	3,700	4,100	2,595
1988	2,299	2,595	2,250	2,644
1989	3,072	2,644	9,525	(3,809)
1990	2,334	--	9,525	(11,000)
1991	4,373	--	--	(6,627)
1992	813	--	--	(5,814)
1993	2,382	--	--	(3,432)
1994	564	--	--	(2,868)
1995	264	--	--	(2,603)
2000	(13,179)	--	--	(38,211)
2005	(26,010)	--	--	(140,492)
2010	(42,155)	--	--	(316,791)

(1) Assumes construction of all proposed access road/interchange projects.

TABLE V-6

FINANCIAL FEASIBILITY PRO FORMA

Improvement Program No. 2[1]

Revised Toll Schedule

YEAR	NET OPERATING INCOME	IMPROVEMENT FUND BALANCE	PROJECT COST	NET CUMULATIVE INCOME SURPLUS (DEFICIT)
	(thousands)			
1985	$ 2,993	$10,000	$8,500	$ 4,493
1986	2,007	4,493	2,800	3,700
1987	2,995	3,700	4,100	2,595
1988[2]	6,125	2,595	2,250	6,470
1989	7,083	6,470	9,525	4,028
1990	6,509	4,028	9,525	1,012
1991	9,218	1,012	--	10,230
1992	5,466	10,230	--	15,696
1993	7,194	15,696	--	22,890
1994	5,538	22,890	--	28,428
1995	5,405	28,428	--	33,833
2000	(7,216)	33,551	--	26,335
2005	(19,213)	--	--	(43,676)
2010	(34,540)	--	--	(183,574)

(1) Assumes construction of all proposed access road/interchange projects.
(2) Assumes implementation of a 15 percent across-the-board toll increase on January 1, 1988.

Improvement Program 3

Program 3 includes all access road/interchanges plus the mainline widening cost from Milepost 12.0 to Milepost 42.0. It was determined that a bond issue would be required to fund the projects in order to achieve a January 1, 1991, opening date. In addition, toll increments at selected dates would be required to finance project costs prior to sale of bonds and subsequent bond debt service. Future debt service estimates and inputs regarding refinancing assumptions were provided by L. F. Rothschild, Untenberg, Towbin. The analysis assumed that bonds could be sold by the end of 1987.

1988 Bonds - The proposed 1988 Bond Issue would be approximately $112,120,000 having a bond term of 25 years. The analysis assumed that adjusted net operating income would have to cover debt service by 1.2 times. As shown in Table V-7, the 1988 Bond Issue would require a three tier toll increase. This would occur as across-the-board increases in the amounts of 20 percent on January 1, 1987, and January 1, 1994. The third toll adjustment representing a 25 percent across-the-board increase would occur on or about January 1, 2000. An interval of approximately seven years would elapse before implementing the scheduled toll increases. Again, revenue impact estimates due to toll increases are based on preliminary assessments and past history.

From 1985 through 1987, project costs would be funded from the current Improvement Fund balance and annual net operating income. In 1988, all remaining project costs plus the retirement of the outstanding bond debt would be funded by the new issue.

As indicated, annual debt service is estimated to be about $8,720,000 during the period of construction increasing to $9,785,000 at opening date of the projects. Implementation of the three toll increases as indicated would generate sufficient revenues to provide the minimmum 1.2 coverage of debt service.

If the terms of the new bond agreement were structured to ensure debt

TABLE V-7

FINANCIAL FEASIBILITY PRO FORMA

Improvement Program No. 3(1)

1988 Bonding

YEAR	NET OPERATING INCOME	IMPROVEMENT FUND BALANCE	ADJUSTED NET OPERATING INCOME	PROJECT COST	DEBT(2) SERVICE	NET CUMULATIVE INCOME SURPLUS (DEFICIT)	RATIO OF ADJUSTED NET OPERATING INCOME TO DEBT SERVICE
	(thousands)						
1985	$ 2,993	$10,000	$12,993	$ 8,500	--	$ 4,493	--
1986	2,007	4,493	6,700	2,800	--	3,700	--
1987(3)	7,691	3,700	11,391	4,100	--	7,291	--
1988	8,508	7,291	15,799	--	$ 8,072	7,727	1.96
1989	9,412	7,727	17,139	--	8,072	9,067	2.12
1990	8,281	9,067	17,348	--	9,785	7,563	1.77
1991	10,419	7,563	17,982	--	9,785	8,197	1.84
1992	7,155	8,197	15,352	--	9,785	5,567	1.57
1993	9,050	5,567	14,617	--	9,785	4,832	1.49
1994(4)	15,280	4,832	20,112	--	9,785	10,327	2.06
1995	15,650	10,327	25,977	--	9,785	16,192	2.65
2000(5)	18,306	20,915	39,221	--	9,785	29,436	4.01
2005	9,749	47,961	57,710	--	9,785	47,925	5.90
2010	(2,068)	26,091	24,023	--	9,785	14,238	2.46

(1) Assumes construction of all proposed access roads/interchange projects and mainline widening.
(2) Debt service and financial assumptions provided by L.F. Rothschild, Unterberg, Towbin.
(3) Assumes implementation of a 20 percent across-the-board toll increase on January 1, 1987.
(4) Assumes implementation of a 20 percent across-the-board toll increase on January 1, 1994.
(5) Assumes implementation of a 25 percent across-the-board toll increase on January 1, 2000.

service has prior call on net revenues to other fund deposits, such as the Maintenance Reserve and Maine DOT funds, the assumed 1.2 coverage would be "implied" by the amount needed to cover these other fund deposits. In this case, net operating income available for supplemental debt service would only have to cover debt service 1.0 times. This approach could reduce the size or delay implementation of other toll increase slightly.

Improvement Program 4

Program 4 includes all access road/interchange improvements plus the mainline widening cost from Milepost 12.0 to Milepost 42.0. This program would be financed using a smaller bond issue than required under Program 3 in conjunction with a Pay As You Go concept utilizing net operating income. Toll increments at selected dates would be required to finance project costs prior to sale of bonds and subsequent bond debt service. This analysis assumes that bonds would be sold by the end of 1988.

1989 Bonds

The proposed 1989 Bond Issue for Program 4 would be approximately $76,000,000 having a bond term of 25 years. The analysis asumed that adjusted net operating income would have to cover debt service by 1.2 times. As shown in Table V-8, the 1989 Bond Issue would require a two tier toll increase in the amounts of 20 percent on January 1, 1987 and January 1, 1992. A third toll adjustment representing a 25 percent increase would be required at approximately the same time as indicated in Program 3.

As indicated, annual debt service is estimated to be about $5,471,000 during the period of construction, increasing to $6,633,000 in 1990.

Conclusions

The analysis to determine a viable financial plan to implement the alternate improvement programs clearly demonstrates specific courses of action that would be required to achieve financial viability. Assuming

TABLE V-8

FINANCIAL FEASIBILITY PRO FORMA

Improvement Program No. 4[1]
1989 Bonding

YEAR	NET OPERATING INCOME	IMPROVEMENT FUND BALANCE	ADJUSTED NET OPERATING INCOME	PROJECT COSTS	DEBT SERVICE	NET CUMULATIVE INCOME SURPLUS (DEFICIT)	RATIO OF NET OPERATING INCOME TO DEBT SERVICE
	(Thousands)						
1985	$ 2,993	$10,000	$12,993	$ 3,800	—	$9,193	
1986	2,007	9,193	11,200	5,800	—	5,400	
1987[2]	7,585	5,400	12,985	2,280	—	10,705	
1988	7,130	10,705	17,835	9,045	—	8,790	
1989	8,137	8,790	88,554[4]	48,803	5,471	34,280	1.49
1990	7,611	34,280	41,891	32,840	6,633	2,418	1.15
1991	10,038	2,418	12,456	5,428	6,633	395	1.51
1992[3]	13,679	395	14,074	4,413	6,633	3,028	2.06
1993	15,742	3,028	18,770	7,857	6,633	4,280	2.37
1994	14,401	4,280	18,681	6,516	6,633	5,532	2.17
1995	14,573	5,532	20,105	1,696	6,633	11,776	2.20

(1) Assumes construction of all proposed access road/interchange projects and mainline widening.

(2) Assumes implementation of a 20 percent toll increase on January 1, 1987.

(3) Assumes implementation of a 20 percent toll increase on January 1, 1992.

(4) Includes $71,627,000 from proceeds of bond issue - January 1, 1989.

adoption of Improvement Program 1, a toll increase in 1992 would be required to offset anticipated annual deficits in net operating income in 1992 and increasing annually thereafter.

Under Program 2, project costs could be funded from the present balance of the Improvement Fund and assuming implementation of one toll increase to the operating toll schedule. This is projected to be in the magnitude of 15 percent across-the-board for all vehicle classes. While this Program would construct all presently proposed access road/interchange projects, it would fail to address mainline capacity problems presently being experienced on certain sections of the Turnpike which will become more intolerable with future traffic growth. Also, it must be recognized that future toll increases will be required under this planning scenario when total operating costs begin to exceed net operating income in the late 1990's.

The adoption of Improvement Program 3 would construct all proposed access road/interchange projects including the widening of the Turnpike mainline from four to six lanes between Mileposts 12 and 42. Program 3 would require the sale of a new bond issue in association with a three-tier toll increase. Under the bonding scenario, toll increases of 20, 20 and 25 percent in 1987, 1994 and 2000, respectively would be required to maintain an approximate 1.2 ratio of adjusted net operating income to anticipated level debt service.

Improvement Program 4 accomplishes the same results as Program 3 except that it uses a Pay As You Go approach in conjunction with a smaller bond issue.

It should be emphasized that the estimates for financing the alternate Capital Improvement Programs were based on a detailed analysis of events that will most likely occur over the next decade. If the Authority should choose Program No. 4 and elect to market a revenue bond issue, a more detailed analysis would be required to provide inputs to the proposed bond sale.

CHAPTER VI

SUMMARY

As indicated in this report, the turnpike has undergone significant change since its inception. Not the least of this changing process has been the tremendous traffic growth along all portions of the turnpike, but particularly noticeable in the southern section. As stated, the now commonly occurring congestion on this portion of the turnpike will continue to grow under the present condition. With the implementation of the MDOT interchange/access road program, particularly that portion that relates to the southern section of the turnpike, this growing condition can only be expected to accelerate.

Within the body of this report the physical needs of the turnpike, as well as a financial forecast to accommodate these needs has been presented.

From the standpoint of physical needs, it appears inevitable that if the turnpike is to continue to be a safe and adequate transportation facility, it will require widening in its southern section. This would provide for proper traffic flow of the volumes anticipated as a result of normal growth process as well as from the industrial growth generated by the interchange/access road program and what traffic may be further induced by this program onto the turnpike from the even more congested U.S. Route 1. Additionally, maintenance would become a simplier and safer undertaking. This point can be best made by recognizing that for the first time in the history of the turnpike, paving is being restricted to low volume time frames in the southern section.

Financially, a review of the revenues versus the administrative operating costs indicates that the operating costs are rising at a much faster rate. This would suggest that both a revenue increase will soon be required in addition to exploring some cost cutting measures. Also presented herewith are the financial requirements to implement such a program as that described under Program 4. Certainly this would be the largest undertaking

by the Authority since the turnpike construction and cannot be taken lightly. It appears however, that if the turnpike is to continue to serve the commuting public in a prudent manner, the present conditions of growing congestion cannot be ignored.