Maine Turnpike Authority

Toll Collection Alternatives Study

HNTB
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TOLL COLLECTION ALTERNATIVES STUDY

Presented to

MAINE TURNPIKE AUTHORITY

Prepared By

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EXECUTIVE SUMMARY

In June of 1992, the Maine Turnpike Authority authorized the firms of Howard Needles Tammen & Bergendoff (HNTB) and Wilbur Smith Associates (WSA) to proceed with a Toll Collection Alternatives Study. The purpose of this study is to analyze system conversion potential and provide information to the Authority relative to long term budget requirements of maintaining or modifying their present method of toll collection.

The Maine Turnpike Authority currently operates two different forms of toll collection. Exit 1 through Exit 11 operate under a ticket toll system while north of Exit 11, the Turnpike uses a closed barrier system.

The ticket toll system is the familiar form of toll collection. Upon entering the Turnpike, the patron receives a toll ticket and when departing, the patron presents the ticket along with the proper toll to the Turnpike employee. The toll charge is directly related to the distance traveled and the vehicle class. With this form of toll collection, a toll plaza is required at every interchange to distribute and collect toll tickets to and from every Turnpike patron.

Unlike the ticket toll system, barrier systems do not use tickets. With the closed barrier system, toll plazas exist on the mainline as well as on ramps and vehicles pay a toll according to class, regardless of point of entry or exit. Therefore, the toll rate per mile is not uniform.

An open barrier system allows toll free travel between low traffic volume interchanges. Interchange toll plazas are not required since tolls are collected on the mainline in high traffic volume areas.

Although the existing ticket toll system is adequate, it may not be the most cost effective method of toll collection. This study assesses the impacts of implementating a barrier form of toll collection on the southern end of the Turnpike and implementating an Electronic Toll Collection (ETC) system on the entire Turnpike.

The barrier type system was chosen as the focus of this study for many reasons. The most important reason being the service and simplicity provided to all Turnpike patrons. Future benefits may also result from the implementation of the barrier type system. For instance, toll collection at some interchanges may be simplified, therefore, reducing the overall maintenance and labor costs. Also, the cost of constructing future access to the Turnpike could be reduced significantly if a toll plaza was not required.

In addition to converting to a barrier type system, the possibilities of implementing an Electronic Toll Collection (ETC) system were also considered. ETC would allow Turnpike patrons the privilege of not stopping at the plaza because the toll would be electronically subtracted from the patrons account. For this to be possible, the patrons participating in the ETC program would prepay or charge on credit their travel on the Turnpike, and would receive a transponder to place in their vehicle.

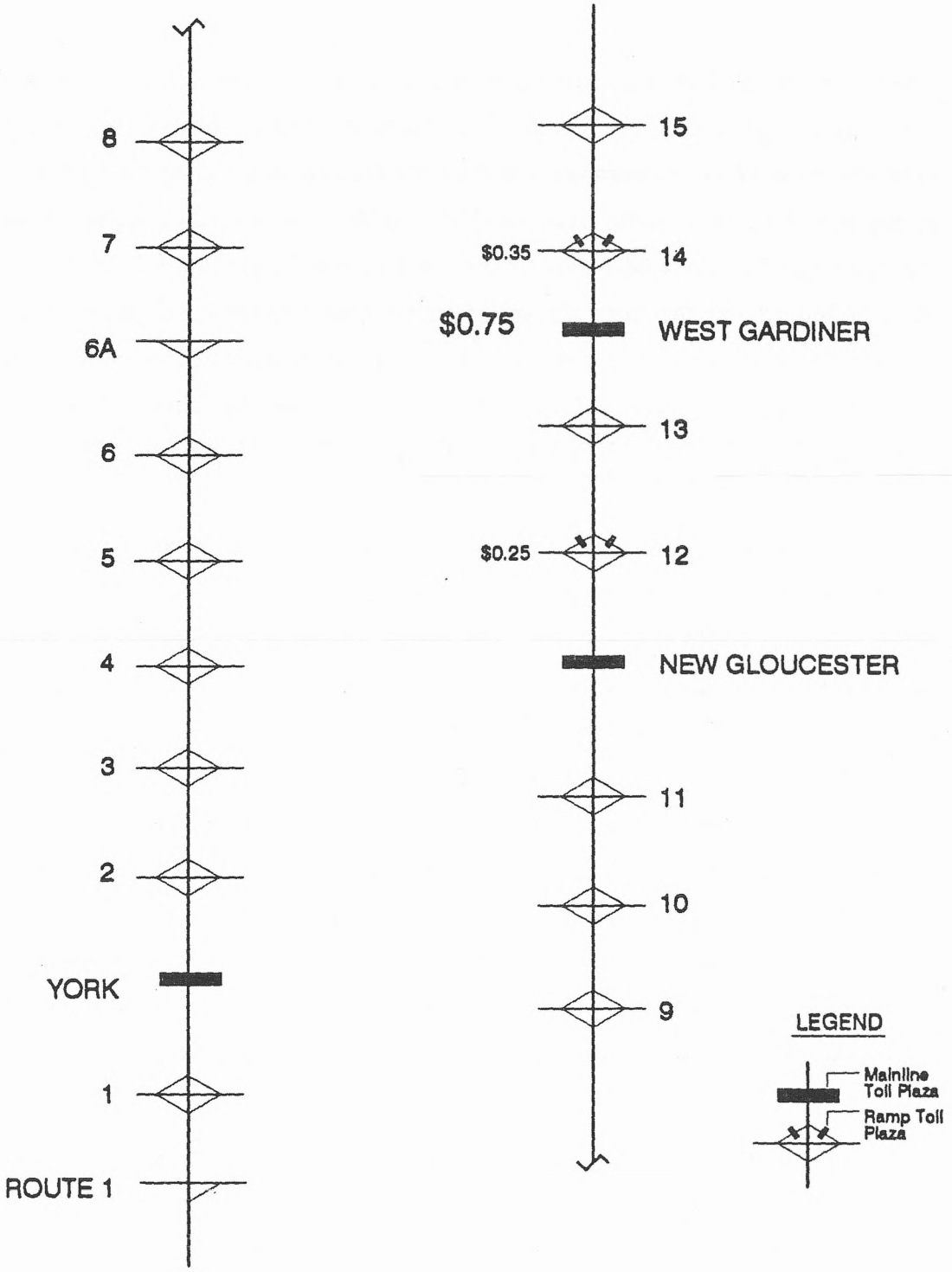
When entering the Turnpike, the vehicle with the transponder would pass through the reading area of the ETC antenna and the account number would be read and validated against a list of authorized ETC accounts. When the patron with the transponder exits the Turnpike, the transponder would again be read and validated. If the transponder was valid, the vehicle would be authorized to proceed, an ETC transaction would be counted on the toll collection recording system and an ETC record would be generated.

Not requiring the Turnpike patrons to stop at a plaza to pay a toll is considered a major advantage of the ETC system. Therefore, the new mainline barrier toll plaza considered for West Scarborough would be constructed with high speed by-pass lanes to separate ETC only traffic from non-ETC traffic. This would be accomplished by constructing a toll plaza adjacent to high speed by-pass lanes. Non-ETC traffic would be required to exit the main stream of traffic pass through a toll plaza and then reenter the traffic flow. The vehicles with transponders would continue through the high speed by-pass lanes. Their tolls would be deducted from their account electronically while the vehicles were moving at traditional highway speeds.

The ETC system will be made simple, convenient and as inexpensive as possible. Patrons involved in the present commuter program would not experience much change other than that added convenience. The Maine Turnpike ETC system will probably be compatible with ETC systems on other toll facilities. This will allow for some form of regional if not national use in the future.

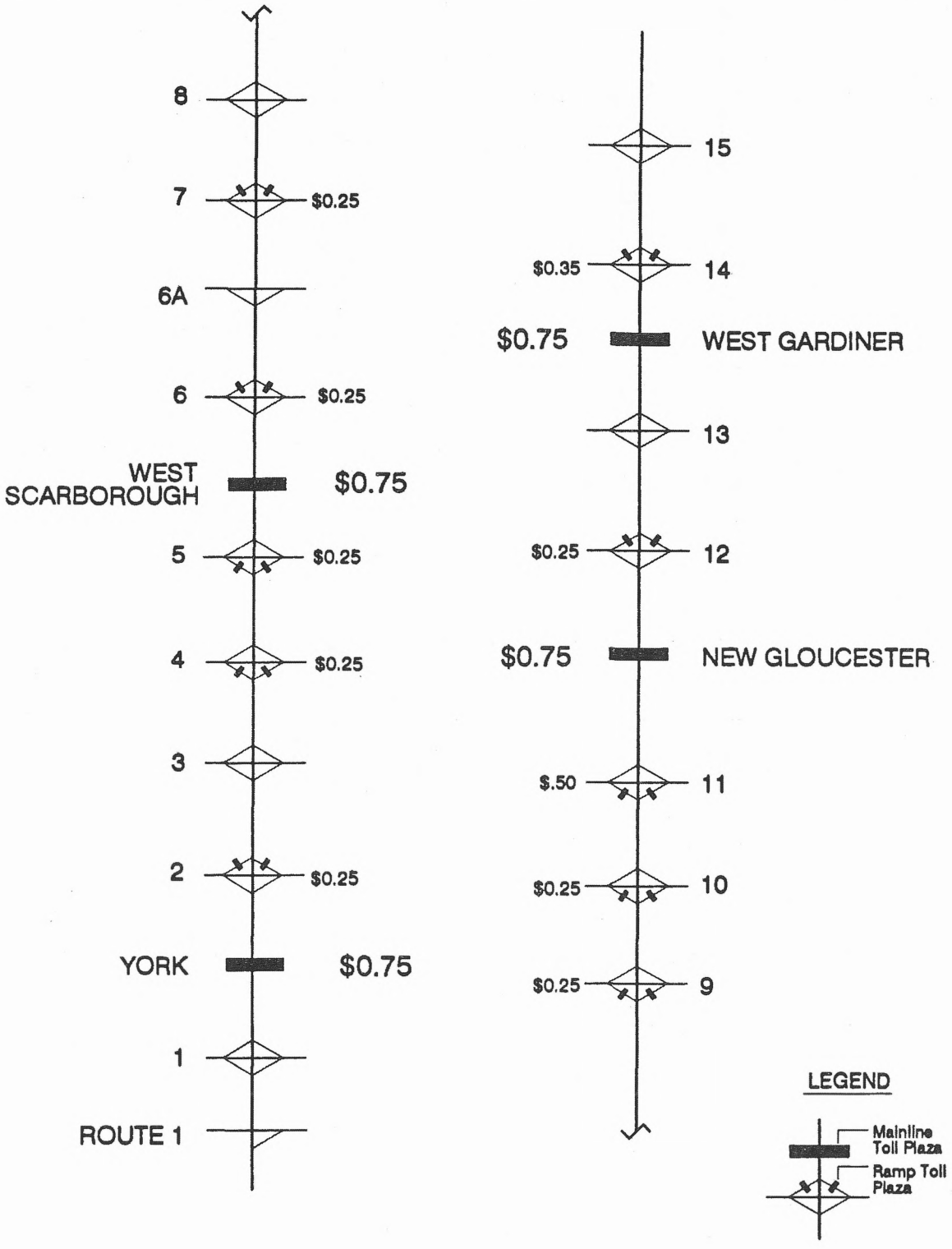
The study was divided into serveral different phases to determine the potential cost impacts caused by the conversion to a barrier form of toll collection. The initial phase was to produce an existing traffic profile to determine the traffic volumes on the mainline and interchange ramps at each toll plaza location in both directions. Once the traffic profile was produced, various toll system alternatives were developed. Four alternatives were studied with ETC and without ETC. The alternatives studied are listed below:

- Base Condition
- Alternative One - Closed Barrier System
- Alternative Two - Closed Barrier/Entry Toll Collection System
- Alternative Three - Open Barrier System



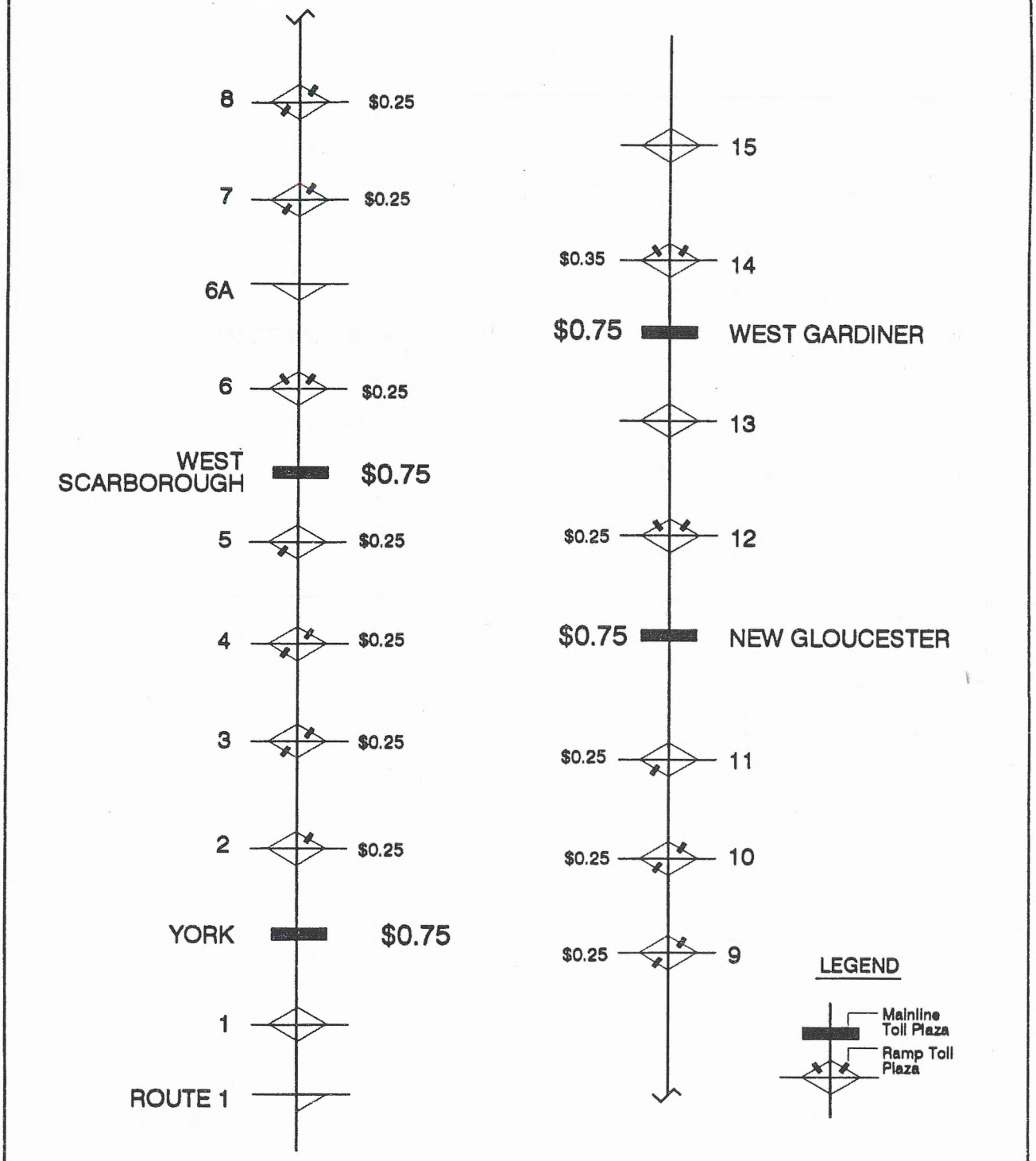
BASE CONDITION
EXISTING TICKET/BARRIER SYSTEM
MAINE TURNPIKE

WILBUR SMITH ASSOCIATES



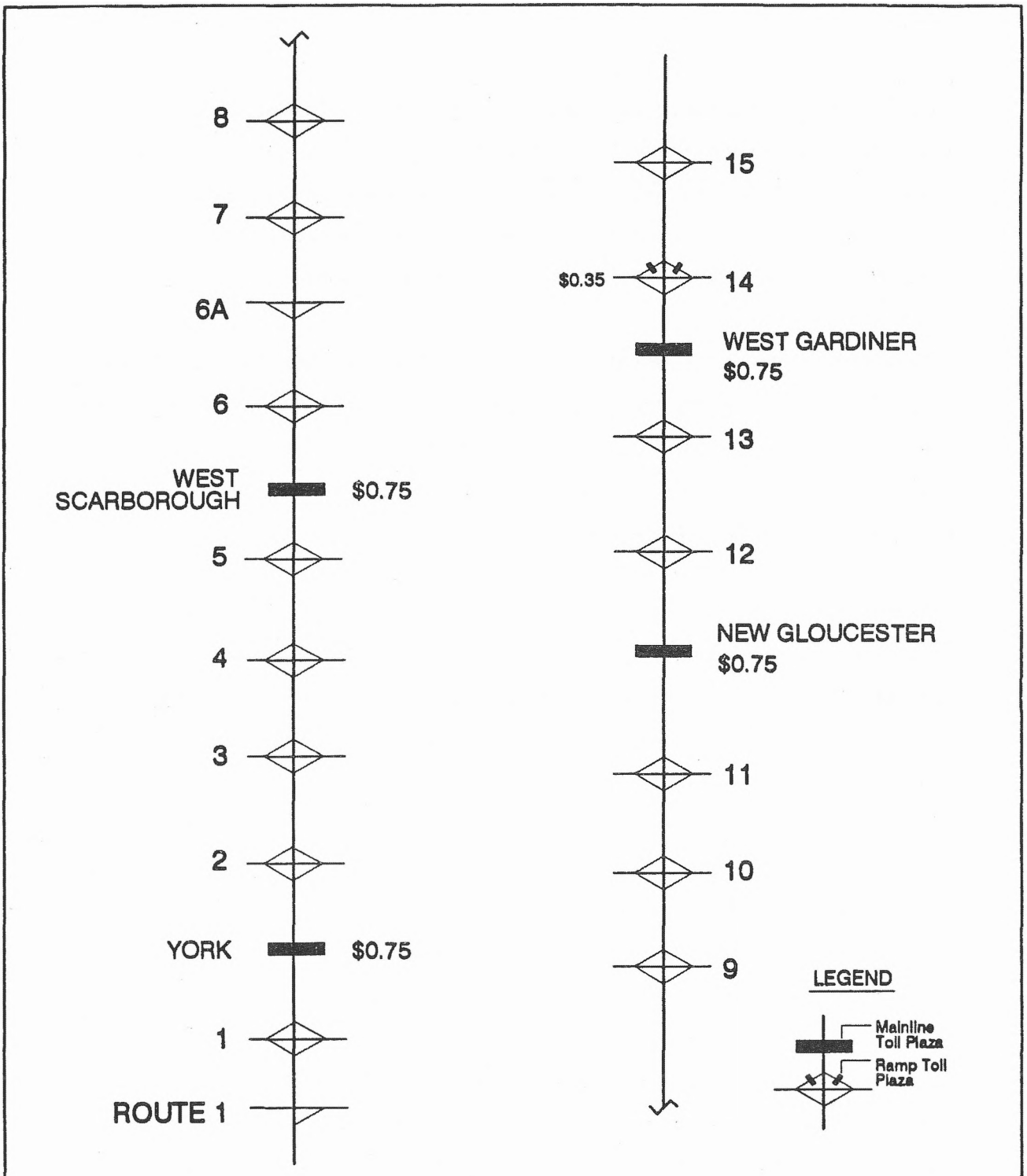
ALTERNATIVE 1
CLOSED BARRIER SYSTEM CONCEPT
MAINE TURNPIKE

WILBUR SMITH ASSOCIATES



ALTERNATIVE 2
CLOSED BARRIER / ENTRY TOLL COLLECTION SYSTEM CONCEPT
MAINE TURNPIKE

WILBUR SMITH ASSOCIATES



ALTERNATIVE 3
OPEN BARRIER SYSTEM CONCEPT
MAINE TURNPIKE

WILBUR SMITH ASSOCIATES

The first case, called the Base Condition, is the control condition where the toll collection system will remain the same as the present Turnpike conditions. The northern third of the Turnpike will remain a closed barrier system and the southern two thirds will remain a ticket toll system. The toll facilities would require modifications to accommodate the expected increase in traffic.

Alternative 1 consists of converting the entire Turnpike to a closed barrier system with a combination of mainline and ramp toll plazas. Four mainline toll plazas, three of which currently exist, will be required. Only the fourth, West Scarborough, will require all new construction. Ramp toll plazas will be constructed at all relevant interchanges so toll free travel is not possible.

Alternative 2 consists of converting the entire turnpike to a closed barrier system, with a combination of mainline and entry ramp toll plazas. This alternative will also have four toll plazas on the mainline, with West Scarborough requiring full construction. Ramp toll plazas will be constructed at all relevant entry ramps to maintain a fully closed system.

Alternative 3 is an open barrier system alternative which permits some toll free travel. Four mainline toll plazas, with only the West Scarborough Plaza requiring full construction, will be required. The ramp toll plaza at Interchange 14 will remain. All remaining interchanges will have the toll plazas removed.

The next phase in the feasibility study was to perform a traffic impact analysis for each alternative and compare it to the Base Condition. Traffic impact is the amount of change that will occur in traffic volume as a result of modifying the toll system.
The traffic impact analysis was performed on an interchange-to-interchange basis for each method of payment and type of vehicle utilizing the Turnpike. Potential traffic impacts were developed based upon a comparison of toll rates for each of the

individual Turnpike interchange-to-interchange movements, for each of the alternative systems, without ETC and with ETC. With the information obtained from the traffic impact analysis, the toll revenue impacts for each scenario were determined. Alternative 3, with and without ETC, is the only alternative where the toll revenues for the base case are larger than the toll revenues for the alternative.

The next phase was to develop the toll plaza and lane configurations for each interchange in every scenario. This was accomplished by using all of the estimated information on traffic and revenue impacts and the ETC program shifts established previously. Estimated traffic demands were prepared at 1996 and 2006 levels at each toll plaza location for each alternative. The estimates of traffic demand were developed on a peak-hour basis by travel direction to analyze the potential lane configuration at each toll plaza. The toll plaza and lane configurations were used to determine the construction, equipment, and system operating cost impacts for each scenario. Some examples of operating costs include toll collection personnel, equipment maintenance costs and coin count processing.

Based upon the results presented in the draft Toll Collection Alternative Study only the alternatives involving ETC were used in the toll collection alternative cost analysis. This analysis involved the computation of the net revenue impact for four alternatives for the first ten years of operation. The toll revenue impact was developed by computing the difference between the base toll revenue and the toll revenue for each alternative. This figure was then added to the figure for the maintenance and operating cost to compute the net revenue impact. Finally, the cost of the bond payments associated with borrowing the money for the capital cost was subtracted from the net revenue impact to develop the net revenue after bond payment for a 10 year period. This figure was then divided by 10 to develop the average yearly revenue impact.

A summary of the toll collection alternative cost analysis is presented in Table E-1. This table illustrates the estimated average yearly revenue impact for the four alternatives with ETC. The results of this analysis indicate that the implementation of the ETC with the existing ticket system will result in a revenue increase of $1,148,700. If Alternative 1 with ETC was implemented, the revenue increase would be approximately $5,103,800. The implementation of Alternative 2 with ETC would result in the largest revenue increase of $5,225,900. The implementation of Alternative 3 with ETC would result in a revenue increase of $3,396,300.

Table E–1
TOLL COLLECTION ALTERNATIVES COST ANALYSIS

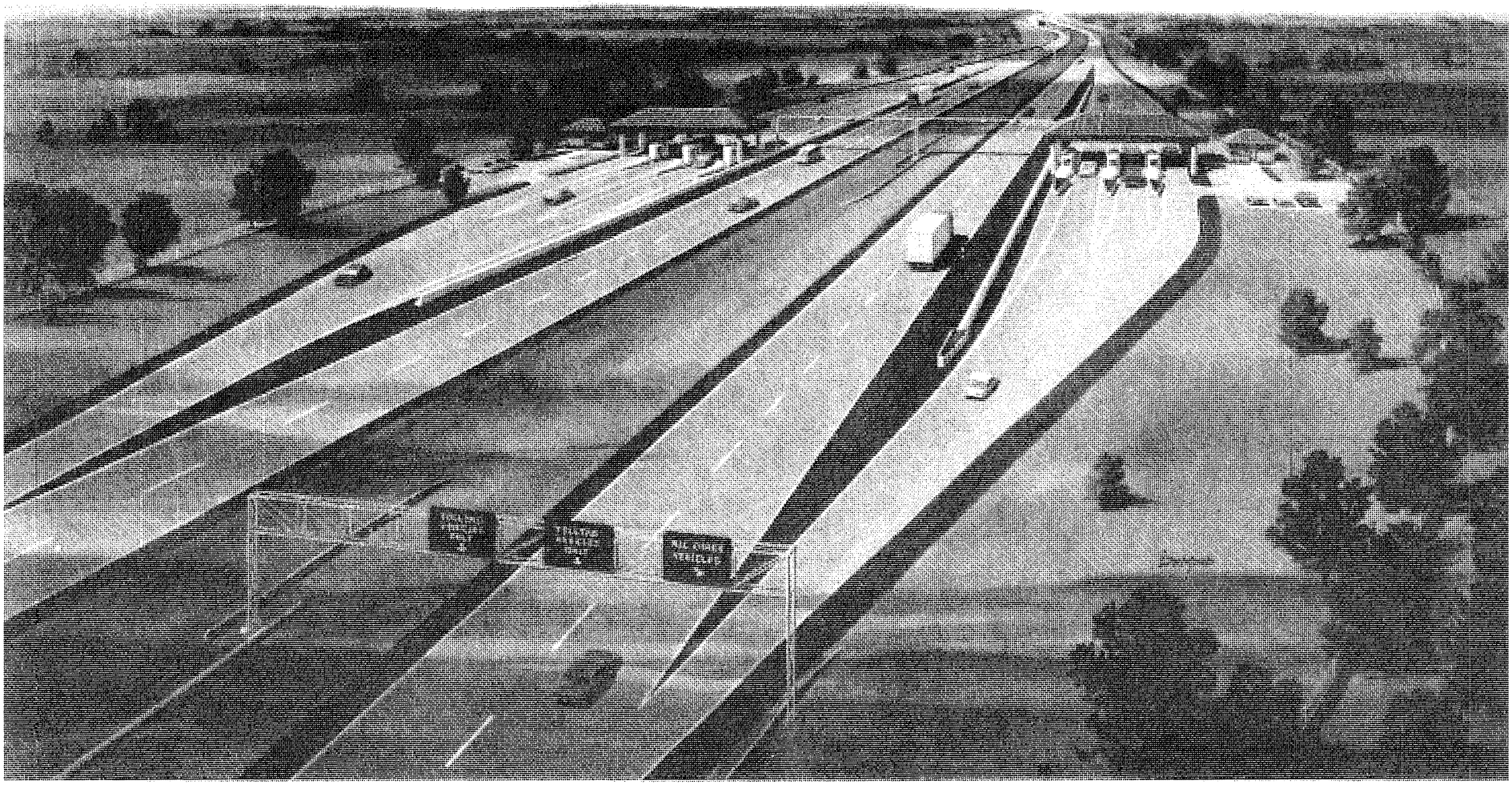
All numbers are in thousands (except staffing levels)

	BASE TOLL REVENUE (10 YRS)	ALTERNATIVE TOLL REVENUE (10 YRS)	TOLL REVENUE IMPACT (10 YRS)	OPERATING COST IMPACT (10 YRS)	NET REVENUE IMPACT (10 YRS)	CAPITAL COST	INTEREST COST (20 YRS)	TOTAL BOND PAYMENT OVER 20 YRS	TOTAL BOND PAYMENT OVER 10 YRS	NET REVENUE IMPACT AFTER BOND PAYMENT (10 YRS)	AVERAGE YEARLY REVENUE IMPACT	STAFFING LEVEL
TICKET SYSTEM	$472,910	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	323
TICKET SYSTEM WITH E.T.C	$472,910	$472,910	$0	($21,297)	$21,297	$9,793	$9,827	$19,620	$9,810	$11,487	$1,149	253
CLOSED BARRIER WITH E.T.C ALTERNATIVE 1	$472,910	$500,911	$28,001	($47,887)	$75,888	$25,140	$24,560	$49,700	$24,850	$51,038	$5,104	180
CLOSED BARRIER WITH E.T.C ALTERNATIVE 2	$472,910	$492,886	$19,976	($50,443)	$70,419	$18,299	$18,021	$36,320	$18,160	$52,259	$5,226	178
OPEN BARRIER WITH E.T.C ALTERNATIVE 3	$472,910	$446,821	($26,089)	($74,362)	$48,273	$14,378	$14,242	$28,620	$14,310	$33,963	$3,396	115

FINANCING BASED ON 20 YEAR BOND ISSUE.

Base Toll Revenue (10 YRS) -- From Net Revenue Impact Tables
Alternative Toll Revenue (10 YRS) -- From Net Revenue Impact Tables
Toll Revenue Impact (10 YRS) -- From Net Revenue Impact Tables
Operating Cost Impact (10 YRS) -- From Net Revenue Impact Tables
Net Revenue Impact (10 YRS) -- From Net Revenue Impact Tables
Capital Cost -- From Net Revenue Impact Tables
Interest Cost (20 YRS) -- Summation of annual bond payments for 20 YRS -- From Section 6.6 of the text
Total Bond Payment Over 20 YRS -- Summation of Capital Cost and Interest Cost (20 YRS)
Total Bond Payment Over 10 YRS -- Total Bond Payment Over 20 YRS adjusted for 10 YR period
Net Revenue Impact After Bond Payment (10 YRS) -- Difference between Net Revenue Impact (10 YRS) and Total Bond Payment Over 10 YRS
Average Yearly Revenue Impact -- Net Revenue Impact After Bond Payments (10 YRS) adjusted for yearly period
Staffing Level -- Number of toll collectors required for each alternative

File: NETREV.WK3 December 10, 1992



Maine Turnpike - Split Plaza Configuration
Typical Mainline Electronic Toll Collection Plaza

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