

Highway to controversy: The Maine Turnpike and the way life should be

Maine Policy Review (1997). Volume 6, Number 2

by Charles S. Colgan

Whether to widen the turnpike has been a source of heated debate for many years and, despite extensive study to clarify the issue, it remains polarized. Proponents argue that widening is critical to the economic health of the state. Opponents argue that widening will not resolve congestion problems over the long haul and advocate for alternatives such as peak-hour tolls. In this forum, Charles Colgan traces the events leading up to the current impasse, covering the arguments for and against widening and summarizing the extensive study of the issue. He concludes that widening is necessary but irrelevant to the larger debate at hand, which will not be resolved by a six-lane or four-lane turnpike.

You see the sign about a half-mile after you cross the Piscataqua River bridge from New Hampshire into Maine. Just before the first exit in Maine, a blue sign announces "Welcome to Maine: The Way Life Should Be." At that point the Maine Turnpike does not officially begin for five and a half miles, yet as one looks north along the six-lane road toward Portland, Augusta, and beyond, the sign's message is as much a challenge as a welcome. For the highway next to that sign has become the center of a controversy - now nearly thirty years old - about what is "the way life should be" in Maine.

A few miles beyond the sign, the Maine Turnpike officially begins and stretches 100 miles to Augusta. It is the most heavily traveled road in Maine, particularly on the stretch between Kittery and Portland. Twelve miles north of the sign, the road suddenly and unexpectedly narrows to four lanes at an otherwise undistinguished point. From that point to mile 42 in South Portland, where high-speed highway travel divides between the turnpike heading west of the city to Lewiston and Auburn and 1-295 and 1-95 through Portland and Brunswick, the roadway is four lanes wide, largely unchanged from when it originally was laid out in the early 1940s. That thirty miles has received more attention than any comparable stretch of road in Maine, perhaps in New England, as several attempts have been made to widen it to six lanes. All have been unsuccessful so far.

One might wonder why the turnpike has been the source of such heated debate over such a long period of time. One also might wonder whether, amid all the heat, any light has been shed on the turnpike and its role in Maine's economy and life.

This article seeks to answer these questions by reviewing the history of the Maine Turnpike Authority's attempts to expand the roadway, the most recent detailed analysis of traffic on the turnpike and alternatives for managing traffic congestion on the highway, and the major issues being debated by proponents and opponents of widening. It concludes that both the proponents and opponents of widening have used the turnpike as the symbolic center of a larger debate

between competing visions of Maine and in the process have misunderstood, mischaracterized, and distorted the key issues about the highway itself. The result is likely to be a continuation of the battle whatever the outcome of the 1997 referendum and a Maine that is the sum of the worst fears of both sides in the debate.

FIFTY YEARS OF TRANSPORTATION, TWENTY-FIVE YEARS OF DEBATE

The original impetus for the turnpike was traffic congestion, only in this case it was on Route 1. In 1941 the Legislature, borrowing an idea from Pennsylvania, established the Maine Turnpike Authority as an independent state agency to build and operate a four-lane, divided highway between Kittery and Fort Kent. The Authority began selling the bonds that would finance the turnpike and be repaid from tolls toward the end of World War II. Construction of the road between Kittery and Portland got underway in 1944, and the turnpike opened to traffic on December 13, 1947. The total cost was \$20.6 million.

The road was an immediate success, and plans soon were set in motion to extend the road to Lewiston-Auburn and Augusta, with a spur to Route 1 in Falmouth. This extension opened in 1955. Further development of what has become known as the Interstate Highway System would carry the four-lane, high-speed highway concept to Bangor and on to Houlton, but without tolls, which were forbidden by Congress on any highway funded from the interstate highway program. In 1970, the Turnpike Authority directed its consulting engineers to develop a plan for the first major improvements to the road. The engineers' top recommendation was that the original road completed in 1947 be widened to six lanes. The Turnpike Authority began work on the project at the southern end in 1971.

But this was a new era. The Legislature had enacted several major pieces of environmental legislation that required much more detailed review of the impacts of a project than were required when the turnpike was originally built. The Turnpike Authority took the position that as a state agency, it was exempt from these reviews. The newly formed Department of Environmental Protection sought an advisory opinion from the attorney general whether this was so, and the attorney general concluded that the Turnpike Authority was not exempt. Construction on the widening project continued while the case was litigated in the Maine courts until 1974, when the Maine Supreme Judicial Court not only upheld the attorney general's opinion that the Turnpike Authority was subject to state environmental laws, but also concluded that the original grant of Authority to build the turnpike did not include authorization for a six-lane road.

The Turnpike Authority completed the widening then underway, halting at mile 12. By this time, the energy crisis was driving up the cost of construction and slowing traffic growth. Widening was put on hold through the next decade with its two energy crises and two major recessions. As the economy began to recover in the wake of the 1981-82 recession, traffic growth resumed and the Turnpike Authority began looking again at the widening issue. In 1984 it authorized new studies of future capital needs. The firm of Howard Needles Tammen & Bergendoff (HNTB), which provides engineering services to the Turnpike Authority, reported in September 1986.¹ The HNTB analysis focused on traffic growth and the adequacy of future turnpike revenues. It found that a combination of planned interchange additions plus growing traffic on the southern part of the turnpike meant congestion would increase steadily and that the

widening project provided the best approach to dealing with traffic growth. The recommendation included completing the widening project plus completing the groundwork (acquisition plus grading) necessary to add a fourth lane in each direction at some time in the future.

The HNTB study encouraged the Turnpike Authority to proceed with plans to widen the turnpike. In 1987, the Legislature acted to provide the necessary legal and bonding Authority for the widening project. But the analysis and forecasts on which the recommendation was based appeared weak to a number of people who reviewed it. Lloyd Irland, a former state economist, began to raise serious questions about the adequacy of the review of nonconstruction alternatives that might be more effective in managing the peak-hour traffic congestion. Upon leaving state government in late 1986, Irland began working with a newly formed public policy research organization called the Mainewatch Institute to develop an alternative analysis to the HNTB study.

That report,² released in January 1988, questioned the widening on the grounds that traffic congestion could be better managed using techniques such as peak-hour pricing, ramp metering, and better information programs about traffic at a lower cost than widening. Mainewatch also argued that the economic costs had not been justified by comparison with economic benefits, that toll funding of the widening was inequitable, that environmental impacts had not been examined, and that alternative uses for the toll revenues to build other projects had not been examined. It concluded that a serious examination of alternatives to widening must be undertaken before the project could proceed.

Even before the release of the Mainewatch report, the Turnpike Authority had initiated a second look at the widening issues. The issues being raised by Mainewatch were receiving increased attention in the press,³ and even Authority members were having doubts. One member, Peter Danton, a former state senator from Saco, was concerned about the toll increase needed for the project and expressed the fear that if tolls were raised there would be increased traffic on local streets in Saco. In late 1987, the Authority decided to delay the first toll increase needed for the widening, and engaged the firms of Roger Mallar Associates and Governmental Services Inc. (M-GSI) to take another look at the widening project. Their report was released six months after the Mainewatch report,⁴ and directly addressed many of the issues raised by Mainewatch. However, it concluded that the alternatives to widening would not be sufficiently effective in relieving traffic. Widening continued to be the recommended alternative, although the M-GSI report recommended a somewhat scaled-back construction project that did not include adding the groundwork for the fourth lane.

By 1989, the Turnpike Authority had completed two separate studies on widening that both recommended proceeding with the project, and had received permission from the Legislature to proceed. But opposition to the idea was growing. Environmental groups, led by the Natural Resources Council of Maine (NRCM), were increasingly vocal on the need to investigate alternatives to widening before proceeding. NRCM, Mainewatch, and others began to put together a proposal to require such investigations before proceeding with the turnpike widening,

or any other major highway improvement. Dubbed the "Sensible Transportation Policy Act, a signature-gathering campaign was undertaken in 1990, and the Legislature took up the bill in 1991 and passed it on for the voters to consider that November.

The prevailing wisdom was that the turnpike referendum had little chance of passing. The Maine economy had descended into a severe recession, and concern about the economy was widespread. The idea that the public would reject a major project that the entire business community, the governor, and majority of the Legislature declared as essential to the states economic future was considered unlikely. But that is exactly what happened. There were several reasons why the referendum passed. Voters in northern Maine overwhelmingly voted against the widening, believing the project was just one more example of the advantages southern Maine gets and fearful that their road needs would be neglected. Statewide, there was widespread distrust - bordering on hostility - to state government and its leaders because of the severe budget cuts forced by the recession.

Passage of the referendum enacted the Sensible Transportation Policy Act, which affected virtually every major transportation improvement in the state. Because of the complexity of the issues involved, the Department of Transportation undertook a nearly yearlong process in 1992 of developing and implementing regulations under the new act by bringing together many people involved in transportation issues, including antagonists in the 1991 referendum debate. Once this process was completed, the Turnpike Authority again turned to the question of what to do about the road.

The Authority believed it was now legally obligated to undertake actual trials of as many of the suggested alternative transportation strategies as possible. In 1993 and 1994, the Authority initiated or expanded several projects designed to test whether the alternatives would be sufficient to manage traffic. These included expanded park-and-ride lots, funding for a commuter bus service from York County to Portland, a commitment to implement an electronic toll collection system, and a decision to undertake a two-year experiment of congestion pricing.

The proposal to implement congestion pricing on an experimental basis became a new point of controversy. The study approved by the Authority called for a five-week period in August 1995 when tolls would be raised during peak hours on weekends by two dollars per trip. At the same time, tolls would be reduced during off-peak hours using a discount coupon system that would permit toll reductions of seventy-five cents per trip (or free trips if the normal toll was less than seventy-five cents). The proposal also would have imposed a one-dollar surcharge on commuter pass holders if they traveled alone on Friday afternoon.⁵

The tourism industry mobilized against charting a higher toll on weekends, persuading the governor and Legislature to permanently ban the idea of peak-hour tolls and to prohibit any toll differentials on single-occupancy vehicles. The legislation also provided that the turnpike could meet the requirements of the Sensible Transportation Policy Act through a modeling analysis rather than by implementing any form of congestion pricing. The Turnpike Authority, however, directed that the study be redesigned to test the effects of free tolls during off-peak hours during 1995 and again in 1996, and this redesigned study was undertaken.

In 1996, the Authority again turned to a comprehensive assessment of the turnpike. Rather than relying solely on a consultant study this time, the Authority convened a Public Advisory Committee (PAC) to investigate the options and make recommendations. The PAC was comprised of representatives from the business and environmental communities, the Legislature, the Regional Transportation Advisory Committees (RTACs) established by the Sensible Transportation Policy Act, and communities from throughout Maine. With the assistance of a consultant hired to review and analyze data for the committee, the PAC provided advice on the scope of the new analysis and worked with the consultant hired to assist in the process. The PAC also was charged with providing recommendations to the Authority how to proceed once the evaluation of alternatives was completed.

In the fall of 1996, the PAC completed its recommendation to the Authority. A "preponderance" of the committee concluded that the Turnpike Authority should proceed with both the widening and further support of alternatives such as commuter buses and the reintroduction of passenger rail service south of Portland. Some members of the PAC, notably environmental group representatives, remained adamant that the case for widening had not been made and indicated they would not support any recommendation that included the widening project.

The Legislature took up the issue again during the 1997 session, again acting to authorize the widening project and the necessary bonding Authority. Faced with opponents' promises to launch another petition drive for a referendum, the Turnpike Authority itself called for a referendum to be held in the fall of 1997. At the same time, the Legislature also unanimously rejected a bill that would have reinstated permission for the Authority to implement peak-hour tolls when the tourism industry renewed its objections about the perceived negative image that would be created.

CONDITIONS ON THE TURNPIKE IN 1997 AND BEYOND

The previous section provides a brief synopsis of the major events and elements in the turnpike widening debate up to the present. It is apparent that even after a number of studies stretching over more than a decade there remains fundamental disagreement about many of the facts, let alone about what should be done with the turnpike. This section reviews trends in turnpike traffic and points out why the issue of traffic on the turnpike has been, and continues to be, a matter of concern.

[Figure 1](#) shows the growth in traffic on the Maine Turnpike (including all exits from York to Augusta).⁶ The figure depicts monthly traffic volumes from 1956 to 1996 (the period since the full 100 miles of the turnpike was completed) and the annual growth rates to show trends. The figure also places some of the major events from the history of the widening debate against the actual growth in traffic.

Traffic growth clearly has occurred on the turnpike during the past forty years. Annual trips on the turnpike have grown from 3.8 million to more than 44 million, an overall rate of more than 1,000 percent and an average annual growth rate of 6.4 percent, or about 1 million additional vehicles on average each year. Since the first effort to widen the turnpike in 1973 total traffic has grown by 256 percent, from 12 million to 44 million trips. Traffic on the turnpike varies

significantly by month, with July or August being the peak month and January or February the slowest month. Another measure of traffic growth on the turnpike is that total January traffic in 1996 equaled traffic during the peak month of travel in 1984 (August), just twelve years earlier.

However, the rate of traffic growth has slowed somewhat. The average growth rate during the 1960s was 7.7 percent; this slowed to 6.9 percent in the 1970s but accelerated again in the 1980s to an average of 8.5 percent. During the 1990s to date the average rate of growth has slowed to 3 percent. However, a slowing rate of growth does not signify fewer trips. The average growth in trips during the 1990s at 3 percent is still more than 1 million additional trips per year, compared with the 1960s average growth rate of 7.7 percent, which represented only 440,000 additional trips per year.

Concern about traffic on the turnpike arises partly because of increased traffic that comes with economic growth, but the primary issue is about peak-hour congestion during the highest-use months of the summer. Two questions about peak hours require examination. The first concerns summer traffic patterns; the second is how those patterns compare to the road's capacity.

[Figure 2](#), [figure 3](#), and [figure 4](#) show the summer traffic patterns on Fridays, Saturdays, and Sundays.⁷ The figures show the distribution of traffic across the twenty-four-hour period, using the proportion of each day's traffic in each hour. The data is the average of each day during the ten weeks from July through Labor Day in 1994, 1995, and 1996. (The turnpike's computer system only began tracking hourly data in 1994.) There are clear and consistent trends each day.

On Fridays, there is a morning peak, followed by a slow down in traffic growth during the late morning. A new and larger peak begins to form around noon and continues to build throughout the afternoon, with the highest peak from 3 p.m. to 6 p.m. It is notable that the Friday peak during the mid-to-late afternoon contradicts the conventional wisdom that the peak is driven by inbound tourists who leave work in southern New England at the end of the workday. On Saturdays and Sundays, there is no such peak. Rather, both days show a much broader "plateau" of traffic spread over a six- to eight-hour period. On Saturdays, there is somewhat more traffic in the morning, primarily southbound traffic reflecting the changeover in cottage and camp rentals on Saturdays. The peak becomes somewhat more northbound in the afternoon. On Sundays, the peak traffic is primarily southbound, beginning in the late morning and continuing throughout the afternoon and into the early evening.

The composition of peak traffic changes over the three days of summer weekends. On Fridays, the morning peak is composed primarily of commuters, but the afternoon peak is a mix of commuter traffic plus inbound tourist traffic - there is very little commercial truck traffic during this period. On Saturdays and Sundays, commuter traffic declines significantly as a portion of total traffic (as measured by commuter pass use), and tourist-related traffic makes up almost all of the peak on both days. This is particularly the case on Sundays.

The existence of distinct and consistent peak periods even extending over six to eight hours does not by itself demonstrate that peak congestion is a problem. To find this out requires comparing traffic loads with road capacity. Road capacity is not a single concept, however. Traffic engineers use three concepts to describe capacity: the physical capacity; the level of service; and

the design hour. Physical capacity is determined by a number of factors, including width of the lanes and shoulders, the geometry of the road, and terrain. In general, a road with wide lanes and shoulders running in a straight line over level terrain will have a higher physical capacity than a road with narrow lanes and shoulders, sharp curves, and hilly terrain.

The level-of-service concept describes a continuum of traffic conditions, from free-flowing traffic at the posted speed limit to highly congested, stop-and-go traffic. In most discussions of turnpike traffic, the relevant categories are LOS C through LOS F, defined as follows:

LOS C. Stable traffic flows, but small events can slow traffic. Average speeds are greater than fifty-four mph. Noticeable restrictions on freedom to maneuver, with increased driver tension. This is the level of service the Public Advisory Committee established as the target service the turnpike should be able to offer; this is consistent with the practice of other roads similar to the turnpike.

LOS D. Borderline between stable and unstable traffic flows; small increases in traffic cause significant deterioration in speed and freedom to maneuver. Average speeds greater than forty-six mph.

LOS E. Operation at capacity, with restricted speeds and no room to maneuver. Vehicles entering or changing lanes cause severe disruptions in traffic flow, which creates waves of slow-downs that propagate through the traffic stream. Average speeds about thirty mph.

LOS F. Forced or breakdown flow, with stop-and-go traffic. Entering traffic exceeds the number of vehicles traversing any given point.

The design hour represents the target period for highway design. Highways are not designed to accommodate the highest possible volume, since that would result in overbuilding. Rather, an hour somewhat short of the highest possible traffic volume is chosen as the design hour. Generally this is the thirtieth-highest hour in a year; that is, traffic volumes for each hour of a year are estimated, and the volume during the thirtieth-highest hour is chosen as the level of traffic for which the road should be designed.

[Figure 5](#) and [figure 6](#) bring these concepts together for the turnpike. They show the traffic volumes for 1995 and forecasts for 2005 and 2015 in the design hour for each segment of the turnpike from York to Exit 6A, where 1-95 and 1-295 diverge, and compare these traffic levels with the traffic volumes that would produce LOS C and LOS D travel for northbound traffic on Friday and southbound traffic on Sunday.⁸

Traffic levels for the design hour in 1995 showed traffic that flowed at LOS D in all segments south of Exit 6A, in both northbound and southbound peaks. Forecast traffic for the design hour shows that service will deteriorate to LOS E in the segments between Biddeford and South Portland by 2005 and be very close to this level south of Biddeford. (Issues surrounding forecasts of future traffic are discussed below.) By 2015, traffic will exceed capacity and deteriorate to LOS F in all segments of the turnpike south of Exit 6A. However, once traffic divides at Exit 6A,

traffic conditions will remain at LOS C or better through 2005 and only reach LOS C between 2010 and 2015.

A final, much-discussed issue with respect to the unwidened section south of Portland is safety. As traffic flow increase, the likelihood of accidents can increase as maneuver ability declines and proximity between vehicles increases. Two measures of safety describe recent trends on the turnpike. The first is the presence of High Accident Locations (HALs). These are road segments or locations at which the number of accidents exceeds both a set threshold and a statistically estimated level of expected accidents. There are ten HALs on the turnpike, all of which are in the four-lane section south of Portland. Nine of the HALs are on the northbound lanes, and eight are on segments between Biddeford and Scarborough (the most heavily traveled section of the entire Turnpike).⁹

The twelve miles of the turnpike widened in the early 1970s provide a natural experiment to test the effects of six lanes versus four lanes on accident rates. [Figure 7](#) and [figure 8](#) compare the accident rate (accidents per hundred million vehicle miles) on the four-lane section with those on the six-lane section south of Mile 12 for two three-year periods, 1987-89 and 1993-95. Southbound, there is a decrease in the accident rate between the two periods, but the six-lane section shows lower accident rates during both periods and a larger decline than on the four-lane section. Northbound, which the number of HALs indicates is the more dangerous direction, there is a slight increase in the accident rate between the periods, but again the six-lane section shows significantly lower accident rates. When the records of individual accidents in the turnpike HALs are grouped by major causes, 46 percent of accidents can be clearly attributed to road geometry or congestion, the major problems in the four-lane section.¹⁰

The current conditions of the turnpike can be summarized as follows:

1. Traffic growth has been steady, except for brief periods during economic recessions. The total traffic volume is more than ten times higher than when the road was originally designed in the 1940s. Traffic peaks during the summer months and particularly on weekends. The slowest months in the 1990s equal the peak months of less than fifteen years ago. Together, these trends constitute what might be described as the "base load" problem.
2. Peak traffic occurs on summer weekends, with peak traffic spread over very long periods of up to seven hours. Current traffic levels in a design hour show a low level of service. Projected growth rates show that capacity will be reached in many segments by 2005 and in all segments between 2005 and 2015. This is the "peak load" problem.
3. Accident data indicates the four-lane road is noticeably more prone to accidents than the six-lane stretch.

THE DEBATE OVER THE FUTURE OF THE TURNPIKE

The debate over the turnpike now turns on a variety of arguments for and against widening and for and against the alternatives to widening. This section examines a number of the major arguments for and against widening. It also looks at the arguments for and against what is perhaps the most important alternative to widening: congestion pricing. One set of issues that will not be examined are the environmental impacts. Those important issues must await another analysis.

IN FAVOR OF WIDENING

The project is economically justified

A threshold test for any public investment of this type is whether it meets basic tests of economic efficiency. This is measured by benefit-cost analysis, which compares the increased capital and operating costs of the project plus the increases in vehicle operating costs (which rise with increased speeds) to the benefits of time saved from reduced congestion, accidents, and diversion to less-efficient alternate routes. [Figure 9](#) shows the results of the benefit-cost analysis conducted for the Public Advisory Committee. The benefit-cost analysis shows that benefits will exceed costs by more than \$107 million in present value over twenty-five years at a 6 percent discount rate.¹¹ The benefit-cost ratio is 1:6, showing that the widening project passes the basic test of an acceptable investment.

Two criticisms can be leveled at this analysis, however. One is not valid, the other is valid. The invalid criticism is that the benefit-cost analysis should include the costs of increasing congestion on other roads from the increased traffic that would result from widening. In fact, there may be such costs, but they are properly considered in the benefit-cost analysis applied to projects to manage traffic on the other roads, not the turnpike. As pointed out below, the turnpike does need to be considered as part of broader transportation links. But there are a huge number of potential projects that could be undertaken to manage traffic throughout Maine (since the turnpike carries traffic from throughout Maine, virtually every road in the state potentially is subject to its influence). To try to include the benefits and costs of every potential traffic management project in order to determine the net effect across the whole system would be an impossible and, ultimately, meaningless task.

The valid criticism concerns the environmental costs and mitigation strategies that will be required to meet them. Two major environmental costs would be incurred from widening the turnpike. One is increased air pollution. However, since southern Maine is already a moderate nonattainment area under the Clean Air Act, the turnpike widening will have to be shown to have no net increase in air pollution to secure the necessary permits from the Environmental Protection Agency (EPA). There will be costs to any strategies undertaken to meet this condition, and they should be included on the cost side of the benefit-cost ledger. The other environmental cost is the loss of some twenty-three acres of wetlands. This loss has an economic value, although estimating that value is very difficult.¹² Again, there will be mitigation strategies required whose costs must be included. The net environmental costs cannot, however, be estimated with any confidence until it is clear what actions will be required by state and federal agencies to deal with the costs. For this reason, the benefit-cost analysis should be redone after it

becomes clear what will be required to comply with environmental standards to ensure the environmental costs do not exceed the \$107 million in net present value benefits currently estimated to exist.

The turnpike is the major road in and out of Maine and thus is essential to the economy.

In order to assess the economic impact of the turnpike, an analysis was done for the Public Advisory Committee comparing future growth in the Maine economy if the turnpike is widened and if it is not. The analysis was done using the econometric models of Maine developed by Regional Economic Models Inc. (REMI), one of the most widely used regional economic models.¹³ The base forecast of the REMI model assumes growth will not be constrained by major restrictions on key infrastructure like the turnpike. In order to assess the impacts of widening, an alternate forecast was prepared that modeled what would happen if the turnpike was not widened. The analysis uses a scenario of an unwidened turnpike because the model uses an assumption of growth unconstrained by infrastructure capacity. Thus, compared with a baseline unconstrained forecast, an unwidened turnpike would be characterized by reduced efficiency and higher costs in the trucking industry and reduced tourism expenditures from travelers who avoid coming to Maine because of the congestion.

The analysis for the PAC shows that a turnpike that reached its capacity between 2005 and 2015 would be accompanied by a reduction of 11,000 jobs in Maine (6,000 in York and Cumberland counties), resulting in a decline of \$211.6 million in real disposable personal income and \$456 million in gross state product. These figures may be about 25 percent high because of the inclusion of lost hotel expenditures in the tourist-industry effects (those coming for extended stays are less likely to be dissuaded by congestion than those coming on day trips), but it is clear the turnpike plays a significant role in determining the overall prospects for the Maine economy.

Alternatives have not proved to be sufficient to reduce congestion.

Under the Sensible Transportation Policy Act, the Turnpike Authority has undertaken implementing a number of the alternatives. These experiments have shown that design-hour traffic in 2005 could be reduced by the amounts shown in Table 1.¹⁴

**Table 1: Reduction in Design Hour Traffic
(number of vehicles)**

	Low	High
Commuter Bus Service	5	89
Commuter Rail Service	7	122
Intercity Rail Service	21	39
Freight diversion	20	20
Congestion pricing ¹⁵	68	81
TOTAL	121	351

These reductions compare with 1995 traffic levels that average 2,400 vehicles in the design-hour northbound (Fridays) and 2,600 southbound (Sundays), and estimated 2005 levels of 3,200 northbound and 3,400 southbound on the same days.

OPPOSED TO WIDENING

Traffic forecasts are too high; the problem is not as serious as it is made out to be

Both actual and forecast traffic growth rates on the turnpike have declined significantly since the mid-1980s when the HNTB report first recommended widening. The HNTB forecast a rate of traffic growth of nearly 9 percent per year. The subsequent Mallar-Governmental Services Inc. report lowered the projected traffic growth rate to 6 percent, which at the time was lower than what was actually being experienced on the turnpike but in line with long-term growth trends over the previous thirty years.

Neither the HNTB nor Mallar-GSI reports developed statistically based estimates derived from a forecast of the Maine economy. For the 1996 PAC process, VHB prepared a forecast of traffic growth based on the University of Southern Maine Center for Business and Economic Research long-term economic forecasts. These forecasts were prepared by the author for Economic Development Districts in Maine and for each of the Regional Transportation Advisory Committee regions established under the Sensible Transportation Policy Act in order to provide a consistent forecast for transportation planning across all areas of the state. The resulting forecast produced a growth rate in turnpike traffic of 2.93 percent, which was reduced further for the estimation of future trends to 2.75 percent. This is the growth rate underlying the projections of future capacity constraints as well as the benefit-cost and economic impact analyses.

But, it is argued, these figures are still too high. They forecast growth in total annual traffic (base load rather than peak load, which grows more slowly). There are two responses to this argument. The first, illustrated in [Figure 10](#), is to assume the growth rate of the peak is only half that of the base (1.37 percent versus 2.75 percent). Under the 2.75 percent assumption, traffic reaches LOS E in about four years and LOS F in another four years. Cutting the rate of growth in half extends the period it takes to get to LOS F to around 2013, but leaves the turnpike at LOS E from 2006 until then. Costs, in the form of traffic delays, will continue to grow each year. Since it will take about eight years of permitting and construction to complete the widening (meaning it would not be completed until 2006), delaying the widening does not solve the congestion problem, it only extends the time period at which summer traffic endures LOS E (speeds under thirty mph with frequent delays) before it becomes completely stop-and-go (LOS F).

In a real sense, however, this argument about peak growth rates misses the point. Traffic growth on the turnpike has slowed from historic levels of around 6 percent to around 4 percent because of the congestion problem.¹⁶ In other words, the argument that traffic growth is slowing is a measure of the problem, not the solution. Carried to its logical extreme, the "high growth rate" argument implies that if the turnpike was at full capacity with stop-and-go travel year-round and thus experiencing a zero growth rate, it should not be widened at all.

Much was made in the debate leading up to the 1991 referendum focused on the argument that traffic congestion only occurs on the turnpike for ten days a year and for a total of perhaps sixty hours. If the problem is this small, why spend all that money to fix it? It has become clear, however, that the congestion problem is significantly more widespread. The 1995-96 congestion-pricing study found consistent levels of peak-hour traffic congestion over ten weekends plus holidays (thirty-four days, including Labor Day and the Fourth of July), Congestion is also a problem on Memorial Day and Columbus Day weekends, with periodic problems on other weekends in June and September depending on weather. This increases the time when congestion is currently a problem to more than forty days per year.

Using the projected growth rates discussed above, VHB estimates that the number of hours below the target Level of Service C will be as shown in Table 2.¹⁷

Table 2: Hours Worse than LOS C

	SOUTHBOUND		NORTHBOUND	
	2005	2015	2005	2015
LOS D	520	435	747	550
LOS E	200	227	413	247
LOS F	111	175	557	686
TOTAL	831	837	1,717	1,483

Traffic Congestion is a natural phenomenon. People choose to drive during congested periods, so why fix it?

The Mainewatch study points out that "virtually all of those inconvenienced by congestion are aware of the congestion periods in advance, yet voluntarily choose to become ensnarled in them." Thus, if people choose to drive when the road is congested, that is their problem, not one that requires major construction to solve.

The response to this argument is usually that people do not always have the option of when they drive, as is the case with commuters. This is partly true, but insufficient. There is some evidence of ability to shift time of travel, as indicated by the shifting of the peak on Friday afternoons to earlier periods. The real problem with this argument is that it ignores fundamental conditions of economic efficiency. To see this, imagine that the Maine Turnpike was owned by a private company. Such a company would have an effective monopoly over high-speed highway travel in the corridor, and as such would act (in the absence of government regulation) to maximize its profit by overpricing and under producing its services. That is, the turnpike would have high tolls and there would be no incentive to spend money to improve service on the road. Why bother spending money to relieve congestion when consumers had no choice but to drive on the road?

This situation clearly would not be tolerated for very long if the turnpike was, in fact, a private monopoly. That is the reason it is owned by a public Authority, which manages the turnpike under a public service obligation. Rather than the profit-maximizing rule of the monopolist that leads to poor service, the service obligation of a public Authority means economic investments

that will improve services should be undertaken. As long as economically justified investments are not undertaken, there is a significant loss in economic welfare (measured by the benefits discussed above). In other words, though people may choose to drive on a congested highway, there is still an economic loss from congestion that should be addressed. Forcing the Turnpike Authority to behave like a monopolist will not result in an economic improvement.

Alternatives to widening have not been explored sufficiently.

Of the alternatives to widening that have been examined, the one that has been examined least and that has the most potential for managing traffic is congestion pricing. The reason is that the Legislature prohibited the Turnpike Authority from raising tolls during peak hours before the experiment could be conducted in 1995. What has been tested is off-peak discounted tolls, which allowed coupon holders (1995) and frequent turnpike travelers (1996) to travel free during the periods before and after the peaks on summer weekends. These experiments showed that this was insufficient incentive to alleviate congestion.¹⁸

Would congestion pricing involving peak-hour tolls be more successful as a traffic management device? There is no doubt that peak-hour surcharges on tolls would be more effective in reducing peak-hour traffic than off-peak discounts or even free travel would be by itself. But the final report of the congestion-pricing study concluded that even peak-hour tolls would not likely be an effective management device given the current turnpike configuration. With no real alternate routes, congestion pricing can only provide incentives to shift the time of travel. With peak-hour periods already extending over six to seven hours, the available time into which travel could be shifted even with peak tolls is limited. Moreover, analysis of the responses to the discount tolls showed that travelers were much more likely to shift the time of their travel on Sundays than on Fridays. Peak tolls would alleviate some of the congestion on Sundays and perhaps on Saturdays, but Fridays would remain a very difficult problem. These problems will only increase as base-load traffic growth continues.

Beyond this, the fact remains that peak-hour tolls are illegal under current law, a fact reaffirmed by the Legislature in 1997 when it unanimously refused to lift the ban on peak-hour tolls. As argued below, peak-hour tolls can be, and should be, an essential part of effective traffic management on the turnpike. But until the Legislature can be convinced of this, peak tolls are not on the menu.

The other alternative that might have an impact is passenger rail, which still has not been implemented and may yet be some years away. Passenger rail may play a large role in transportation within the southern Maine corridor, but its competitiveness against auto traffic remains doubtful. Current plans for a low-speed rail line would provide for a Portland-Boston trip of one and a half to two hours, which is only a slight improvement over the auto travel time. Passenger rail is also designed to capture trips that currently are unaccommodated for by auto travel, and thus would not necessarily draw traffic off the turnpike.

The turnpike should not be widened because it will make traffic worse on already crowded secondary roads.

The implication of this argument is that the solution to highway problems in Maine is to limit the volume of vehicles in the state to that which can be carried on a four-lane turnpike. However, increasing congestion on the turnpike does not solve the problem of secondary road traffic, since congested traffic still ultimately will be released onto secondary roads. It is certainly the case that additional work will be required to improve service on highways throughout the state, but arguing that the turnpike's problems should not be addressed until all the other roads are addressed is a classic example of "making the best the enemy of the better." Fortunately, the Sensible Transportation Policy Act envisioned a process that assured major transportation investments would be considered in the context of regional transportation needs. The implementing regulations established eight regional Transportation Advisory Committees to work with the Department of Transportation in order to assure that coordination between state and local plans takes place.

Money to pay for widening should be used on other road projects.

With more than 8,000 miles of highway, and real needs for improvements to highways and bridges throughout the state, it is certainly tempting to look to turnpike tolls in order to pay for these improvements rather than raising gas taxes. There is little doubt that the defeat of the widening in the 1991 referendum was tied in part to the view that turnpike money should be spent elsewhere. But there are legal and economic difficulties with such an approach.

It may be noted that in 1995 the Legislature authorized the Department of Transportation to borrow the next ten years of funds that were to be received from the turnpike to fund the completion of three bridge projects (the Casco Bay bridge, the Brunswick-Topsham bypass, and the third Waterville-Winslow bridge) when Highway Fund revenues from the gas tax proved inadequate. This would appear to be a precedent for diversion of future funds to other non-turnpike projects. However, this is very unlikely. The diversion of revenues to the bridge projects incorporated funds that already were being used by the Department of Transportation. New bond issues to be backed by toll revenues would run headlong into the bond covenant problem. They either would be restricted to use on the turnpike or the bonds would have to be charged as general obligation bonds.

Moreover, there is good reason to doubt that any large-scale transfer of revenues from the turnpike to other highway projects is justified. First, turnpike toll revenues are legally dedicated to the construction and maintenance of the turnpike. When the turnpike legislation was written in 1941, the road was established as a toll road with a separate Authority established to build and maintain the road. By establishing a separate legal entity with its own funding source, tolls, the state could build the road without any legal obligations to the Highway Fund or General Fund. The Turnpike Authority borrowed money using bonds backed by the pledge that toll revenues would be used to repay the bonds and maintain the highway. The Turnpike Authority does provide a fixed amount of its revenue to the Department of Transportation each year for projects related to other transportation improvements in the turnpike corridor,¹⁹ but as long as the Turnpike Authority has outstanding revenue bonds that contain this pledge, it will not be possible to divert significant funds to other projects.

There is also good reason to doubt that even a larger diversion of turnpike revenues to other highway projects would not be good policy. It is certainly not clear that equity would be served by having turnpike travelers have the tolls they pay diverted to projects in northern Maine while they continue to sit in traffic on an increasingly congested highway. Indeed, it would be hard to justify the diversion of turnpike tolls to other projects on equity grounds under any circumstances.

Moreover, it is not clear that even if the turnpike revenues could be diverted to other highway projects that widening would necessarily take second place to any other project. In any ranking of projects on benefit-cost grounds, the important variables driving the outcomes would be the number of travelers affected and the value of transportation-time improvements. If projects were analyzed and rank ordered on a net benefits basis, the turnpike widening would certainly rank very high, if not at the top of the list simply because of the volume of traffic affected by the project. There might be projects elsewhere with critical safety needs, but the only justification for using turnpike revenues for such a project, rather than drawing on other projects from the Highway Fund or raising the gasoline tax, would be to avoid potential political difficulties.

Another side of this argument is the question of whether or not the original vision of the turnpike as a road extending all the way to Fort Kent should be completed. The turnpike legislation was enacted more than a decade before the federal government undertook responsibility for building the interstate highway system, which eventually led to the extension of a limited-access highway from Augusta to Houlton. The idea of extending the limited-access highway north from Houlton to Madawaska or from Bangor to Calais continues to be much discussed, but the problem remains how to pay for it. Neither state nor federal road-building budgets could currently support it, and there is no evidence that traffic volumes would be high enough to pay for the road through tolls. Constraints on the expansion of a limited-access highway in northern Maine are not to be found in the resolution of the question of widening thirty miles in York and Cumberland counties.

We are already subsidizing congestion with the commuter pass system.

The commuter pass allows those who frequently travel on the turnpike to purchase the right to unlimited travel between any two exits during a three-month period for a flat fee. By law; the fee must be priced at 50 percent of the regular toll for two daily trips on weekdays during the three-month period. It may be argued that this is a form of congestion pricing in that it provides additional incentive to drive during peak hours on weekdays. There is undoubtedly some truth in this, although the reality of congestion on the turnpike is more complex. The peak hours that approach capacity are on summer weekends when, as indicated above, only on Fridays are commuters a significant portion of traffic volumes. Commuters account for only 5 to 10 percent of summer weekend traffic.

Moreover, it is not commuter traffic per se that is the major problem with congestion. As a number of studies have shown, it is single-occupancy vehicles (SOVs) that create the greatest problems during rush hours.²⁰ It was for this reason the congestion-pricing study proposed a cash surcharge on Friday afternoons on commuter pass holders in SOVs in an effort to provide an incentive not to change time of travel, which is very difficult with commuters, but to change the mode. However, this surcharge was outlawed along with all other peak-hour pricing. The

problem of SOV commuters is one the Turnpike Authority will need to address, but the problems of summer weekend congestion that are driving traffic toward capacity on the current roadway would not be solved by addressing this issue alone.

The widening will only solve the congestion problem temporarily; congestion will reur and then we will have to add a forth lane, etc.

The projections of traffic growth at 2.75 percent show the need for widening as early as 2005 if LOS E or worse levels of congestion are to be avoided. These projections indicate that widening will result in achieving the target level of service LOS C between 2005 and 2015, but by 2015 continued growth in traffic at 2.75 percent will return traffic levels even on the widened roadway to the current LOS D. However, the widened road almost certainly will result in a faster rate of growth than the 2.75 percent, causing peak congestion reform within less than a decade.

This phenomenon of new or improved roads experiencing renewed congestion soon after the improvement project is finished is explained by what is known as the Downs triple convergence,²¹ which is named for the economist who described it. When a road is built or improved to alleviate congestion, traffic does not simply grow at previous rates, but at faster rates because traffic is diverted onto the new road from three sources: those who had traveled at later or earlier times to avoid congestion those who had diverted to alternate routes to avoid congestion and those who had switched to public transportation. Of these the latter would have little effect on the turnpike, but the former two sources clearly would be a source of additional traffic. The traffic data clearly shows diversion in time, as evidenced by the very wide peaks of summer weekend traffic.

Downs points out that the only approach that avoids the triple convergence and the continuation of congestion is to apply congestion pricing. However, it already has been pointed out that congestion pricing under current law is not very effective and that effective congestion pricing is not legal. In addition, the already wide peaks and low responsiveness to price on some days make congestion pricing alone an inadequate response to current and projected congestion levels. If the roadway were to be widened, congestion would be temporarily relieved. People who have shifted their time of travel (which does occur on all three days) in order to avoid congestion will revert to their preferred time of travel, causing peaks to reform. It is at this point that peak tolls could spread the peaks over a longer time period (and a wider road).

The analysis thus indicates that widening the turnpike is a necessary but not sufficient response to the congestion problem. Congestion pricing has potential to alleviate future congestion on a widened road but not current levels. Only the combination of the two might provide a more stable long-term solution to traffic congestion on the turnpike. If this is the case, however, Maine finds itself in the curious position in which both of the necessary components of a solution to the turnpike traffic problem have been adamantly and successfully opposed by one group or another and effectively outlawed. Therefore, in order to complete this assessment, it is necessary to examine the arguments about peak-hour pricing. This can be done most easily by considering the arguments against peak-hour pricing.

Peak tolls won't work and will destroy the tourist industry.

The 1988 Mallar-Governmental Services Inc. study rejected peak-hour tolls as unlikely to be effective, and this has been a common view. The argument is that the turnpike traffic is predominantly made up of people who have little flexibility in their time of travel or would be insensitive to a peak toll in the overall context of what is spent on vacation.²² At the same time, there was immense concern in the tourist industry that any peak-hour toll would be seen by tourists as an insult and would simply drive people away from Maine. These twin impulses clearly are contradictory; peak-hour tolls cannot be simultaneously so small as to be ineffective and so large as to discourage tourists from coming. Yet these are the arguments that were made, as the following excerpt from the legislative debate on the bill outlawing peak tolls indicates:

"People come to Wells and to southern Maine. They pay \$500 to \$1,000 to rent a place for the week. They aren't going to change their plans when they arrive because of a \$2 charge by the Maine Turnpike at certain times of the day. If they do know about it and if they wish to avoid the \$2 surcharge, guess where they will go? They go up Route 1. I can tell you that Route 1 does not need that traffic. If people know about the \$2 surcharge they may not come at all, but if they do not know about the surcharge and they come up to the toll booth, they are hit right in the face with a charge that seems to them truly exorbitant."²³

Despite the self-contradiction in these arguments, the congestion-pricing study collected evidence on both. With respect to the question of whether people would respond to the monetary incentives at all, the off-peak free travel offered during 1995 and 1996 was accompanied by statistically significant increases in the off-peak-hour traffic on Sundays and, to a limited extent, on Saturdays. The experience on Fridays was much more mixed, with some evidence in the 1995 study of effects in the morning but no evidence of shifting traffic toward the off-peak hours in the afternoon in either year. At the same time, what shifts there were toward off-peak hours were not sufficient to reduce peak traffic volumes, largely because of the volume of traffic and length of the peak period.

Thus, the argument that people will not change their time of travel to respond to price incentives is not accurate as a generalization. People do respond to price incentives on the Maine Turnpike, just as they do when they choose to make long-distance calls in the evening or attend a low-price matinee movie. But it is also the case that the results from the congestion-pricing experiment are consistent with the observation that the flexibility to change times is an important factor, at least on weekdays.

When the Maine Legislature outlawed peak-hour tolls in June, 1995, the proposal before it was to raise tolls by \$2 on Friday and Sunday peak hours over a total of thirty-three hours on eleven days. The peak tolls were to be accompanied by more than 300 hours of off-peak discount tolls. Yet this rather modest effort to test peak tolls provoked outrage in the tourism industry. The bill that the Legislature passed not only forbade peak-toll experiments, it forbade peak tolls permanently and stated that congestion pricing would not have to be actually tried in order to fulfill the requirements of the Sensible Transportation Policy Act. It has been the case that congestion pricing has not been politically popular anywhere it has been proposed. Despite

federal funding to experiment with congestion pricing as part of the Intermodal Surface Transportation Efficiency Act (ISTEA), peak-hour tolls have been imposed on no public road in the United States.²⁴

Testing whether the public's response to the idea of peak-hour tolls would be as negative as was suggested was part of a survey conducted of turnpike travelers on the fourth weekend of August 1995. This was a survey handed out to travelers at toll plazas selected to capture the majority of the incoming and outgoing tourist traffic. Two questions were asked concerning congestion pricing. The first posited that discounted tolls might be continued in the future and asked about the preferred method for raising revenue to offset the losses that would occur. Peak-hour tolls were selected by a plurality of respondents from among five choices. Peak-hour tolls were preferred more by residents of Massachusetts and New Hampshire than those from Maine.

The second question presented a set of hypothetical peak-hour surcharges from fifty cents to three dollars and asked whether such surcharges would encourage the traveler to shift the time of travel, the route of travel, discourage them from making the trip, or would have no effect. [Figure 11](#) shows the answers to this question. The responses are very much in line with what would be expected; as the peak surcharge increases, there is less willingness to continue the trip as before and greater willingness to switch either route or time. However, at suggested peak surcharges up to three dollars, there is no significant expressed willingness to discontinue the trip altogether.

Survey research of this type is not necessarily a reliable guide to actual behavior (remember "new Coke"), but the idea of peak tolls was received with much less hostility and much more understanding than would have been suspected given the swiftness and finality with which the Legislature acted to dispose of the idea.

Peak tolls are inadequate.

Another common argument against peak tolls in Maine and elsewhere is that they are inequitable because they force people who cannot change the time of their travel or their route. There is also a sense that the road is already being paid for (through tolls or fuel taxes), so why should one have to pay extra? It is the case that if alternatives are available, they generally are used, at least up to the point at which principal routes and alternates are both congested. So in many situations, congestion pricing does try to encourage people to use alternatives that often are not there.

Economists who have developed the theory of congestion pricing have pointed out that when a road becomes crowded, each additional vehicle creates congestion delays not only for itself but for all the vehicles around it. Since space is at premium in such situations, it should command a higher price. Thus, there is no inherent inequity in asking people to pay additional amounts when space is at a premium and each additional vehicle diminishes the space available for everyone.²⁵ Still, it is clear that the perceived inequity outweighs the theoretical equity and plays a role in preventing congestion pricing from being implemented.

For this reason, it has been argued that the key to making congestion pricing work is to provide a clear-cut benefit in exchange for the peak-hour toll, and that this benefit must go beyond the reduced congestion that would result.²⁶ This was confirmed by the Maine Turnpike survey results cited earlier; peak-hour surcharges were the most frequently chosen option because the

question asked about the benefit of discount tolls rather than simply asking, "Should we use higher tolls to control congestion?" The idea that peak tolls must be tied to clear benefits to gain public support means that the only way congestion pricing might be implemented on the Maine Turnpike is in conjunction with widening.

If peak tolls were used to pay for at least a substantial portion of the widening costs, equity actually would be enhanced, since those who would get the most benefit from the widening would pay the greater share of the costs. Those who would get less benefit, such as travelers in the winter months or during the overnight hours, would not have to pay for a benefit (less congestion) they were not receiving.²⁷

CONCLUSIONS: THE ROAD AHEAD

The proposal to widen the turnpike in the late 1980s may have been justified on economic grounds at the time. But the evidence to support it was weak, and the 1991 referendum and passage of the Sensible Transportation Policy Act requiring a thorough evaluation of alternatives prior to a decision have clearly improved our understanding of the turnpike, transportation options, the consequences of the choices available to Maine, and thus the confidence with which decisions can be made. The conclusions the evidence supports are the following:

1. The Turnpike Authority should proceed with plans to widen the four-lane stretch of the Turnpike from mile 12 to mile 42 (Exit 6A) to six lanes. This means moving to the next stage of seeking the required permits from state and federal agencies - at this time environmental-impact issues, including wetland losses, and air-quality impacts will have to be addressed. If these can be satisfactorily addressed, the project should proceed.
2. The Legislature should authorize the Turnpike Authority to use peak-hour tolls. The Authority should develop a plan to integrate peak tolls and off-peak discounts to pay for the widening and manage traffic on the improved road. (Other alternatives for passenger transportation in the southern corridor also should be pursued, including passenger rail to Boston and efforts to reduce single-occupancy vehicles on the Turnpike and other roads.)

Only this combination of actions will address both the base- and peak-load problems now and in the future. Yet this has been specifically rejected by both sides in the turnpike debate. Environmental groups have been adamant that widening is not needed and that congestion pricing will solve the problem (perhaps in combination with rail service). Business groups supporting a wider turnpike, particularly the trucking and tourist industries, have been just as adamant that peak tolls not be used. Despite the evidence presented about public reaction to the idea of peak tolls on the turnpike, tourist representatives turned out in force to oppose a bill during the 1997 legislative session that would have granted the Turnpike Authority permission to use peak tolls.²⁸ The trucking industry joined them in opposition, despite the fact that most truckers do not drive during peak hours on summer weekends but would have to pay higher tolls year-round if peak tolls are not used.

So after several years of studies and actual implementation of alternatives to widening totaling tens of millions of dollars, it does not appear the debate has progressed any distance at all from 1991, or 1988, or 1974, for that matter. It is probably impossible to understand all the reasons the turnpike should continue to be such a flashpoint of controversy, but it does seem that more is in

play here than the simple question of whether thirty miles of a road ought to be six lanes or four. The turnpike-widening debate has been less about technical questions of load forecasts or the finer points of demand theory, but about a clash of values about the way life should be in Maine.

On one side are the opponents of widening, who see it as part of an inevitable deterioration of Maine's quality of life, caused largely by the automobile. Increasing auto traffic brings with it deteriorating air quality, more traffic on local roads, more suburban sprawl, and a loss of the open space and wildlife habitat many see as the most valuable part of Maine. Widening the turnpike will simply allow more of this destructive process to occur.

On the other side are the proponents of widening, who see economic growth as essential to the quality of life and who see government's responsibility to provide the infrastructure to make that possible. Widening is essential to this process, and any attempt to impose the costs of that project on those most directly affected would be a signal that Maine's public is unfriendly to growth.

Because it is a clash of values rather than a clash over the facts, the fight over the turnpike is likely to continue, whatever the outcome of the referendum in the fall of 1997. If approval for widening is given, opponents can be expected to continue to wage the battle before regulatory agencies and in the courts during the permitting process. If approval is refused, traffic growth will continue on the turnpike and will eventually force another effort to deal with the problem.

Until a better way is found to deal with this clash of values and implement the traffic strategies ten years of studies indicate would work, the only certainty is that congestion on the turnpike will continue and transform the highway into the something resembling the Southeast Expressway through downtown Boston at rush hour precisely what most widening opponents fear Maine will look like with a wider turnpike. And the Maine economy will be noticeably smaller than it would be otherwise. The turnpike will have become the road along which Maine loses, whichever direction you travel.



Charles S. Colgan is a professor of public policy and management and chair of the graduate program in community planning at the Edmund S. Muskie School at the University of Southern Maine.

Full site: Colgan, Charles. 1997. *Highway to controversy: The Maine turnpike and the way life should be*. Vol. 6(2): 8-25.

Figure 1
Monthly and Annual Turnpike Traffic

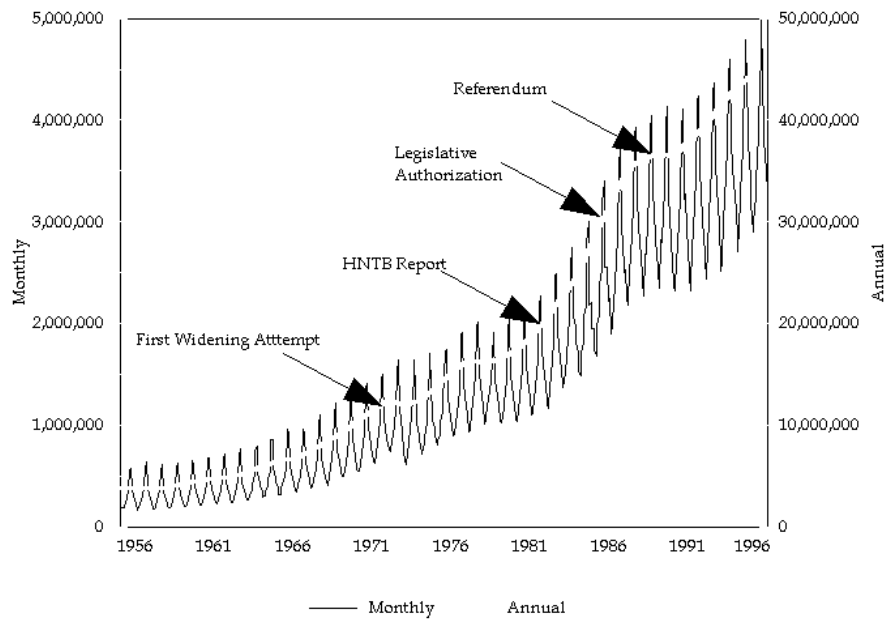


Figure 2
Traffic Patterns on Summer Fridays

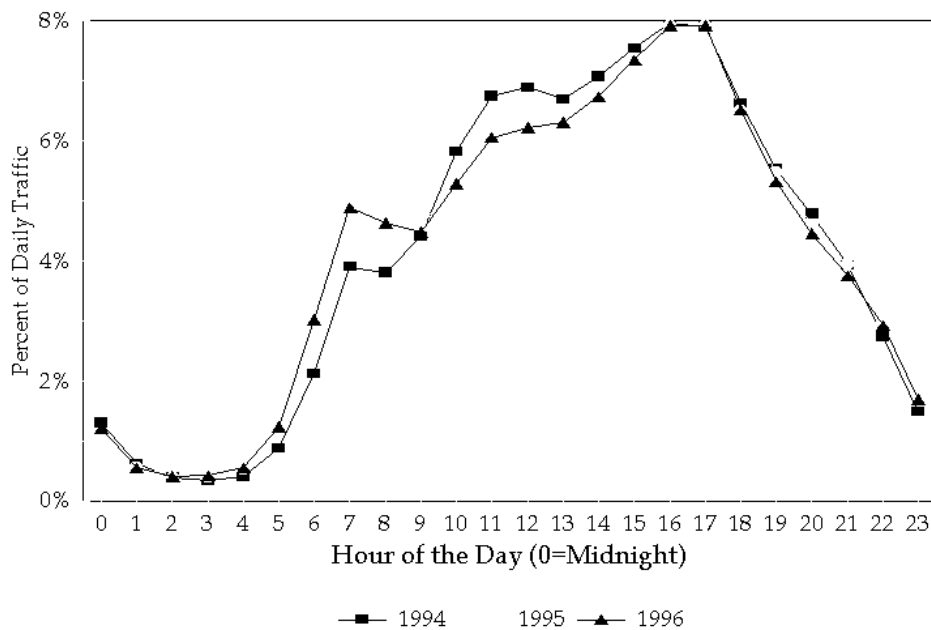


Figure 3
Traffic Patterns on Summer Saturdays

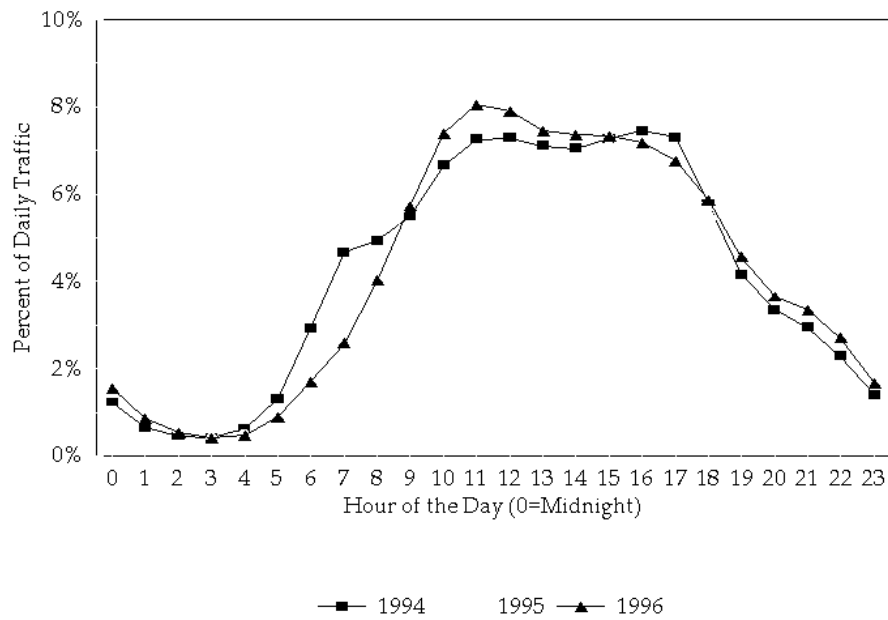


Figure 4
Traffic Patterns on Summer Sundays

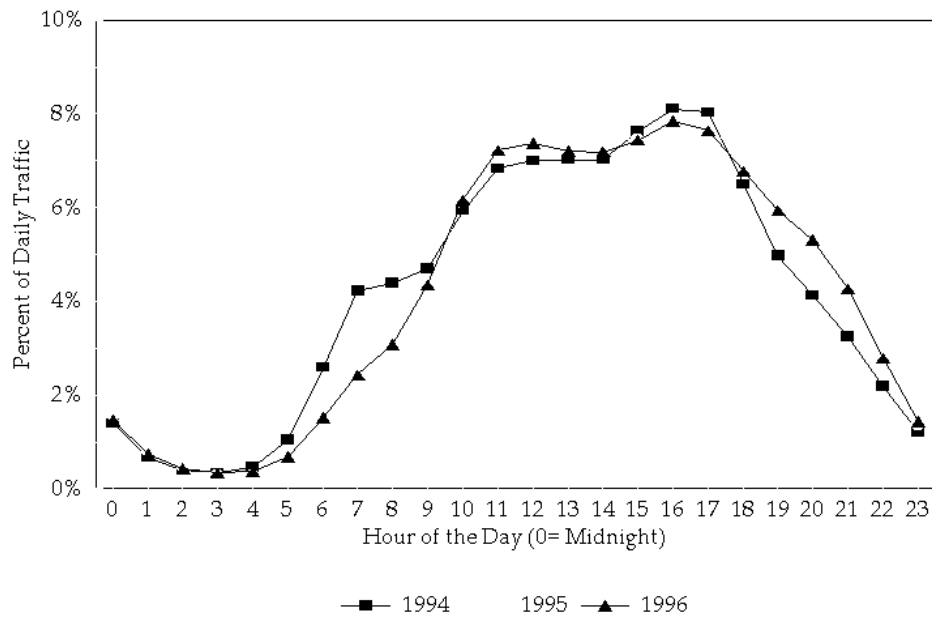


Figure 5

Design Hour: Fridays Northbound

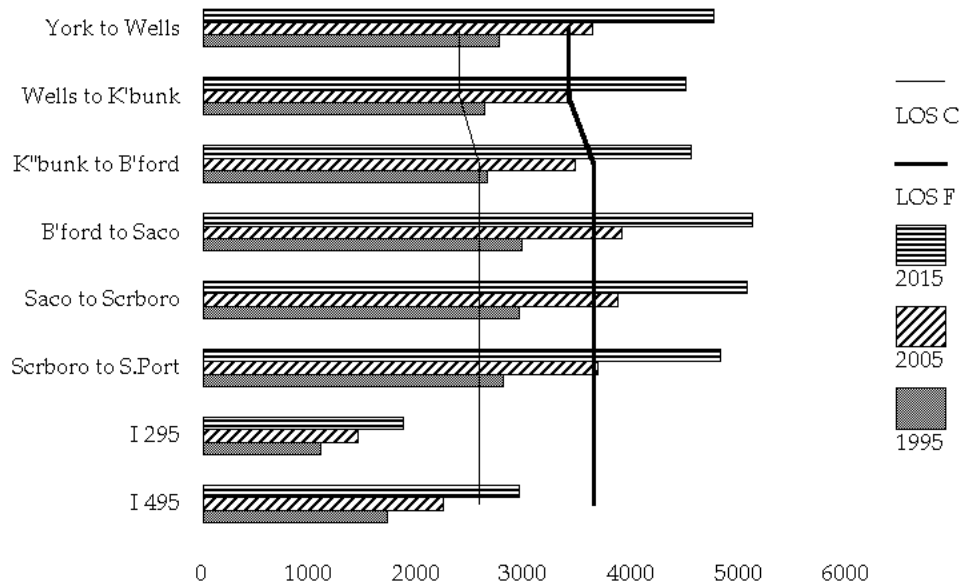


Figure 6

Design Hour: Sundays Southbound

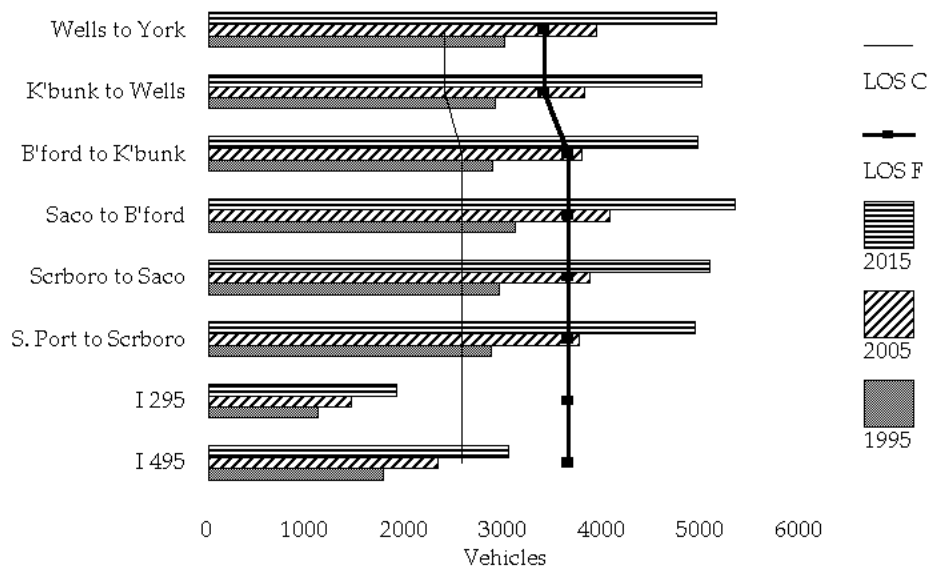


Figure 7
North Bound Safety Data

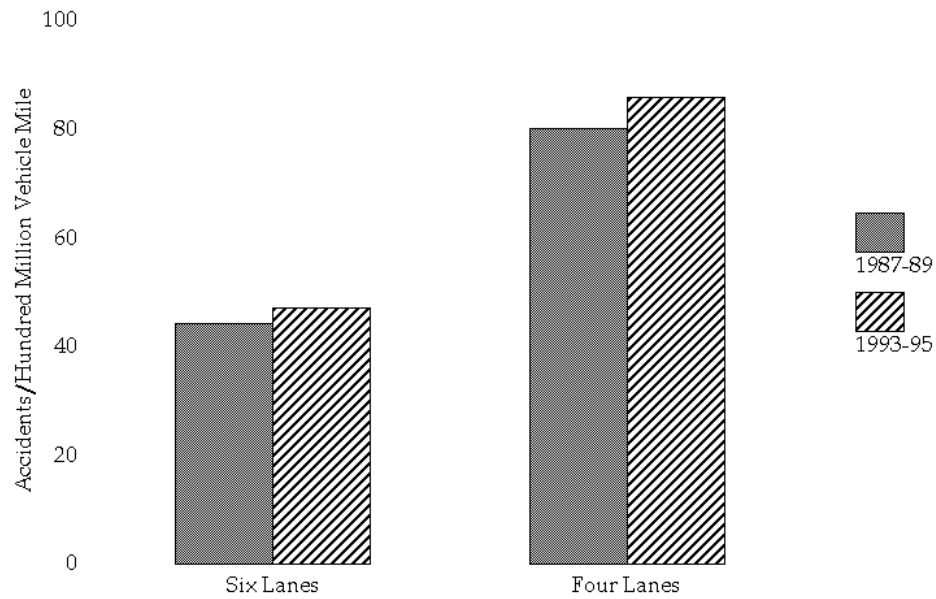


Figure 8
South Bound Safety Data

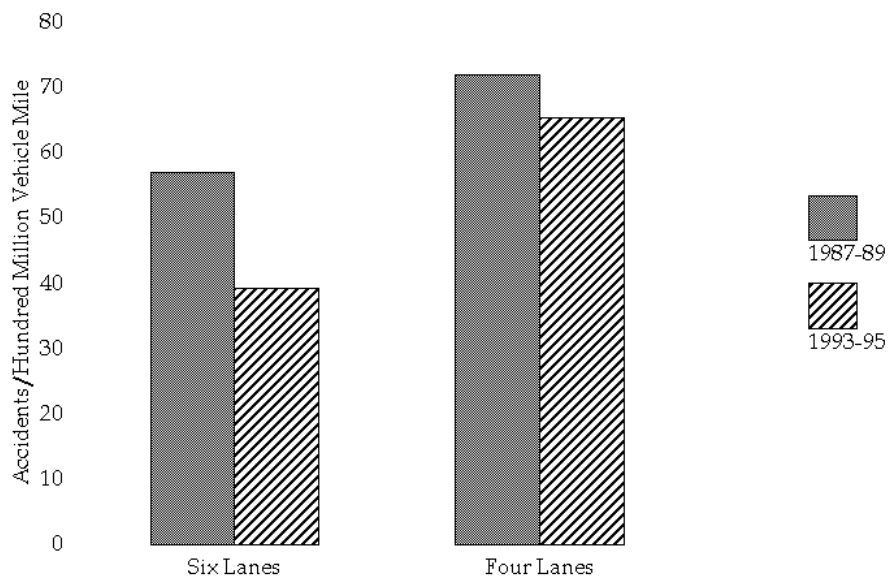


Figure 9: Cost Benefit Analysis

(25 years, discounted at 6%)

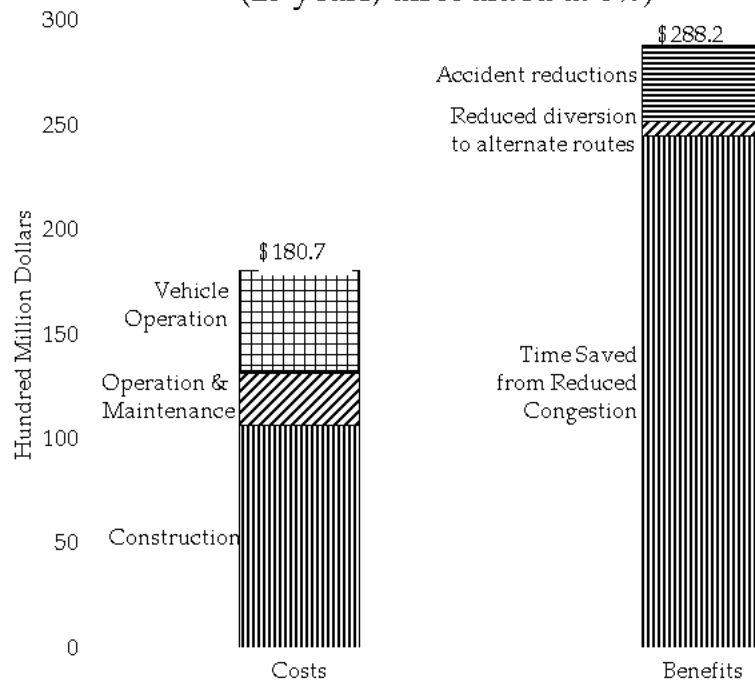


Figure 10

Growth Rate v. Capacity

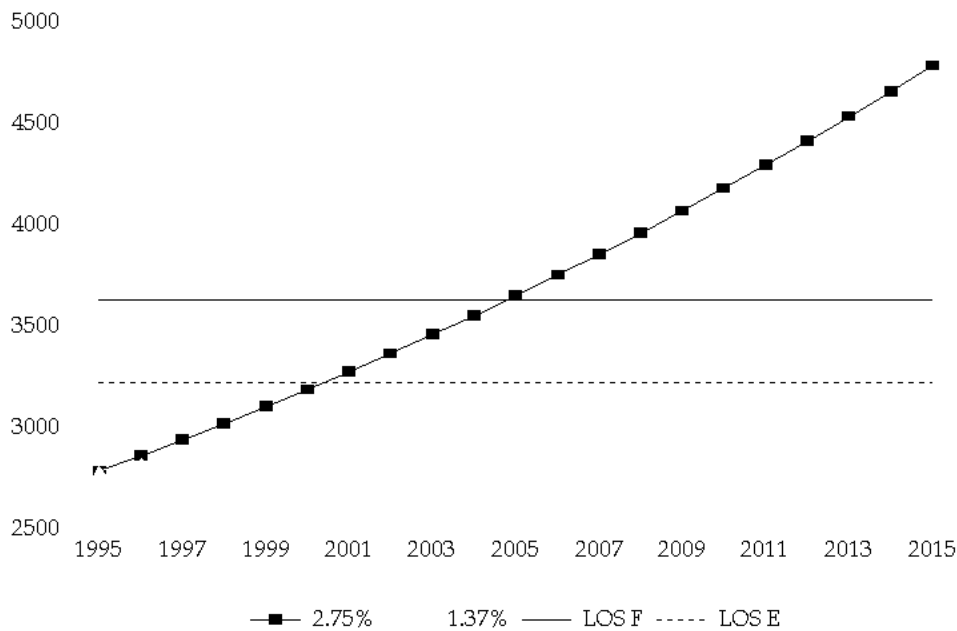


Figure 11
Responses to Suggested Peak Tolls

