

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM
SYNTHESIS OF HIGHWAY PRACTICE

80

**FORMULATING AND JUSTIFYING
HIGHWAY MAINTENANCE BUDGETS**

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FORMULATING AND JUSTIFYING HIGHWAY MAINTENANCE BUDGETS

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(HIGHWAY TRANSPORTATION)

TRANSPORTATION RESEARCH BOARD
NATIONAL RESEARCH COUNCIL
WASHINGTON, D.C.

OCTOBER 1981

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Systematic, well-designed research provides the most effective approach to the solution of many problems facing highway administrators and engineers. Often, highway problems are of local interest and can best be studied by highway departments individually or in cooperation with their state universities and others. However, the accelerating growth of highway transportation develops increasingly complex problems of wide interest to highway authorities. These problems are best studied through a coordinated program of cooperative research.

In recognition of these needs, the highway administrators of the American Association of State Highway and Transportation Officials initiated in 1962 an objective national highway research program employing modern scientific techniques. This program is supported on a continuing basis by funds from participating member states of the Association and it receives the full cooperation and support of the Federal Highway Administration, United States Department of Transportation.

The Transportation Research Board of the National Research Council was requested by the Association to administer the research program because of the Board's recognized objectivity and understanding of modern research practices. The Board is uniquely suited for this purpose as it maintains an extensive committee structure from which authorities on any highway transportation subject may be drawn; it possesses avenues of communications and cooperation with federal, state, and local governmental agencies, universities, and industry; its relationship to its parent organization, the National Academy of Sciences, a private, nonprofit institution, is an insurance of objectivity; it maintains a full-time research correlation staff of specialists in highway transportation matters to bring the findings of research directly to those who are in a position to use them.

The program is developed on the basis of research needs identified by chief administrators of the highway and transportation departments and by committees of AASHTO. Each year, specific areas of research needs to be included in the program are proposed to the Academy and the Board by the American Association of State Highway and Transportation Officials. Research projects to fulfill these needs are defined by the Board, and qualified research agencies are selected from those that have submitted proposals. Administration and surveillance of research contracts are the responsibilities of the Academy and its Transportation Research Board.

The needs for highway research are many, and the National Cooperative Highway Research Program can make significant contributions to the solution of highway transportation problems of mutual concern to many responsible groups. The program, however, is intended to complement rather than to substitute for or duplicate other highway research programs.

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The members of the technical committee selected to monitor this project and to review this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. The opinions and conclusions expressed or implied are those of the research agency that performed the research, and, while they have been accepted as appropriate by the technical committee, they are not necessarily those of the Transportation Research Board, the National Research Council, the National Academy of Sciences, or the program sponsors.

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The Transportation Research Board evolved from the 54-year-old Highway Research Board. The TRB incorporates all former HRB activities and also performs additional functions under a broader scope involving all modes of transportation and the interactions of transportation with society.

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PREFACE

There exists a vast storehouse of information relating to nearly every subject of concern to highway administrators and engineers. Much of it resulted from research and much from successful application of the engineering ideas of men faced with problems in their day-to-day work. Because there has been a lack of systematic means for bringing such useful information together and making it available to the entire highway fraternity, the American Association of State Highway and Transportation Officials has, through the mechanism of the National Cooperative Highway Research Program, authorized the Transportation Research Board to undertake a continuing project to search out and synthesize the useful knowledge from all possible sources and to prepare documented reports on current practices in the subject areas of concern.

This synthesis series attempts to report on the various practices, making specific recommendations where appropriate but without the detailed directions usually found in handbooks or design manuals. Nonetheless, these documents can serve similar purposes, for each is a compendium of the best knowledge available on those measures found to be the most successful in resolving specific problems. The extent to which they are utilized in this fashion will quite logically be tempered by the breadth of the user's knowledge in the particular problem area.

FOREWORD

*By Staff
Transportation
Research Board*

This synthesis will be of special interest to maintenance engineers, highway administrators, and others concerned with development of highway maintenance budgets. Detailed information is presented on various types of budgets and the approval processes to which the budgets are subjected.

Administrators, engineers, and researchers are faced continually with many highway problems on which much information already exists either in documented form or in terms of undocumented experience and practice. Unfortunately, this information often is fragmented, scattered, and unevaluated. As a consequence, full information on what has been learned about a problem frequently is not assembled in seeking a solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem. In an effort to correct this situation, a continuing NCHRP project, carried out by the Transportation Research Board as the research agency, has the objective of synthesizing and reporting on common highway problems. Syntheses from this endeavor constitute an NCHRP report series that collects and assembles the various forms of information into single concise documents pertaining to specific highway problems or sets of closely related problems.

Effective budgeting is essential to the well-being of every highway maintenance program. Several basic types of budgets are currently used by highway agencies. This report of the Transportation Research Board reviews the development of highway maintenance budgets and the steps involved in the approval process. A compilation of research needs related to formulating and justifying highway maintenance budgets is also included in the report.

To develop this synthesis in a comprehensive manner and to ensure inclusion of significant knowledge, the Board analyzed available information assembled from numerous sources, including a large number of state highway and transportation departments. A topic panel of experts in the subject area was established to guide the researcher in organizing and evaluating the collected data, and to review the final synthesis report.

This synthesis is an immediately useful document that records practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As the processes of advancement continue, new knowledge can be expected to be added to that now at hand.

CONTENTS

32

1	SUMMARY
2	CHAPTER ONE INTRODUCTION Background, 2 Purpose of Synthesis, 3 Definitions, 3
5	CHAPTER TWO TYPES OF BUDGETS Financial Resources, 5 Basic Types of Budgets, 6 Zero-Based Budgeting, 7
8	CHAPTER THREE THE BUDGET PROCESS Formulation of the Budget, 8 Justification of the Budget, 11 Budget Travel Route, 13 Presentation of the Budget, 18
20	CHAPTER FOUR CONCLUSIONS AND RESEARCH NEEDS Conclusions, 20 Research Needs, 22
23	BIBLIOGRAPHY
24	APPENDIX A Summary of State Responses to Questionnaire and Follow-up
27	APPENDIX B Summary of Information Gathered From Selected States by Personal Interview and by Mail or Telephone

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Adrian G. Clary, Engineer of Maintenance, and Kenneth E. Cook, Transportation Economist, Transportation Research Board, assisted the Project 20-5 Staff and the Topic Panel.

Information on current practice was provided by many highway and transportation agencies. Their cooperation and assistance were most helpful.

FORMULATING AND JUSTIFYING HIGHWAY MAINTENANCE BUDGETS

SUMMARY

There are three basic types of highway maintenance budgets in general use: line-item, lump-sum, and program/performance. Line-item (or object of expenditure) maintenance budgets are established on the basis of money instead of work to be accomplished. The funds are allocated in set amounts for personnel, materials and supplies, and equipment; there is little or no freedom to transfer funds among these line items. With a lump-sum budget, funds are appropriated in one lump sum for maintenance purposes. This allows the maintenance engineer much more flexibility, but budget preparation must be based on a sound program and accomplishments are closely scrutinized. A program budget is based on work programs, which are subdivided into activities such as crack sealing or pothole patching. The budget defines the amount of work to be performed and how much it will cost.

Development of a state highway maintenance budget usually begins at the district level, or at the headquarters' maintenance division in some state agencies where the budget is based on a maintenance management system (MMS). If an MMS is not used, the budget may be based on inspection of roads, facilities, and equipment, or on expenditures of previous years plus some combination of experience, changed conditions, inflation, and adjustment for increase in road inventory.

Justification of the maintenance budget is based on the importance of the highway network, the demands of users and abutting property owners, and the consequences of insufficient maintenance. In addition to the justification, education and marketing can inform legislators and the public on maintenance needs and the systems and formulas used to determine those needs. Charts, graphs, photographs, etc., are useful for this purpose.

Research needs include the development of budget tools to relate maintenance expenditures to long-term benefits, cost-effective maintenance strategies, and objective procedures to establish priorities among maintenance deficiencies.

INTRODUCTION

During the past two decades, most states and the federal government emphasized highway construction over highway maintenance. In recent years, the payments required for debt service on the bonds (where the construction is funded by bond sales), along with decreased revenues from fuel taxes, have caused highway maintenance to be deterred because of inadequate funds. Deferring maintenance has caused thousands of miles of state highways to become structurally deficient; these highways will require expensive reconstruction. Several states have estimated that in the near future, all of their projected tax dollars will be needed just for the maintenance of highway systems.

Some states have assumed broader maintenance responsibilities in the total transportation system; other states are moving in the direction of assuming a greater maintenance role in public (mass) transportation. If funds originally dedicated for highway purposes are allocated to other modes of transportation, this will affect the availability of funds for highway maintenance.

At the present time, state highway budgets rarely, if ever, provide sufficient funds to meet preferred standards of maintenance. Even the budgets that have been increased have not kept pace with inflation, which means that less maintenance can be accomplished for each current dollar of expenditure.

The budget-approval process starts at the district or sub-district level (38 agencies) or at maintenance headquarters (13 agencies). The budget may then be submitted to a budget review committee and then to the department's chief administrative officer. In six states the process ends at this point. In the other states, the maintenance budget is combined with the budgets of other divisions, modified as required, and submitted as part of the department's budget to the state budget officer. The governor then sends the entire state budget to the legislature, where a committee(s) may hold hearings on the budget. After the legislature enacts the budget, it is returned to the governor for signature or veto. At any step in the process, the maintenance budget may be cut. There may be a maximum amount that cannot be exceeded by the entire department, or the legislature may require a reduction in all spending for any number of reasons.

When the maintenance budget is reviewed at the department level, the items of particular interest include requests for new equipment and additional personnel, new programs, and the amount of resurfacing required. The state budget officer is concerned with any increase over the previous year's expenditures, accuracy of the figures, accounting procedures, and requests for new equipment. Legislators look for political ramifications of increased expenditures and at the number of employees and activities in those areas they represent.

The person who presents the budget to the legislature must be provided with the data to support the requested funds. Presentations are improved by soundness of the economic analysis, brevity of presentation, and clarity of any visual

aids that are used. Emphasis should be given to documentation of increases in the highway inventory and of the work that will not be accomplished if sufficient funds are not provided.

BACKGROUND

As roadways and equipment aged and deteriorated, needed highway maintenance was deferred while costs were escalating. State maintenance engineers were finding it difficult to persuade the state legislatures to increase highway maintenance budgets. State legislatures were looking at "highway funds" as a means of supporting other state programs. In some states, it was believed that highway funds should finance public transportation (buses, rail, transit, etc.) on the basis that public transportation relieves motor vehicle congestion, conserves fuel, etc.

As inflation resulted in increased costs of materials, labor and equipment, and as financial resources dwindled, the problem became more acute. Reduced supplies of motor transport fuel, implementation of programs to reduce overall fuel consumption, and increased miles-per-gallon ratings for new vehicles further reduced the funds available for highway maintenance in agencies financially dependent on user taxes, particularly in those agencies dependent on revenues based on cents-per-gallon taxes.

Many state agencies expressed concern about deferred highway maintenance. (For example, in Alabama, 50 percent of needed maintenance is being deferred; 100 percent additional funds are required to properly maintain state roads. At the time this synthesis was being prepared, \$105,000,000 was needed to resurface all the roads currently needing overlay in the state).

State maintenance engineers throughout the country have found themselves caught between the need to properly maintain the ever-growing highway system and the lack of interest in highway maintenance budgets, which resulted in insufficient funds to accomplish proper maintenance.

Most state agencies have developed maintenance management systems (MMS) in order to increase the efficient use of available resources. Maintenance management systems, when allowed to function as intended, have helped states to formulate and justify budgets by identifying maintenance needs and to proceed in a logical, systematic, step-by-step manner to develop budgets that are readily understood and supported by state legislatures (J. Story, *personal communication*). Use of the MMS appears to enhance an agency's credibility with state legislatures. However, often the MMS is not permitted to function properly, and budgets are set by legislative evaluation of funding needs or limited by revenues. In these situations, the MMS sets priorities for the use of available funds, guiding highway maintenance expenditure to the most urgent needs.

In those states that have an equipment management sys-

tem (EMS), the effectiveness of the MMS is enhanced by providing dependable equipment for physical maintenance activities and, to some extent, for betterment-type activities performed by state highway maintenance forces. An effective EMS identifies total cost-effective operations of equipment from acquisition through assignment to daily uses, including placement in shop for repairs and eventual disposal. Also, the system addresses the consumption of various resources, such as labor, parts, fuel, and outside services. The EMS aids highway maintenance supervisors in improving management by identifying cost-effective operations.

PURPOSE OF SYNTHESIS

Highways are essential to the economic viability of the country; they are the major mode of freight transport by land. However, the importance of maintaining them adequately has not always been recognized. Maintenance policy should make it possible to preserve the state highway network as an important asset today and for increasing traffic volumes in the future. The requirements of road users must be met.

The development and improvement of the highway systems have brought about increases in traffic, particularly in urban areas, and highway users have become aware of the economic importance of highway maintenance. They are critical of traffic restrictions and demand more in the way of safety and comfort. If medium- and long-term costs and benefits to the whole of society were considered, the adoption of a coherent highway maintenance policy would be easy to defend. The use of maintenance management systems is making it easier to quantify deficiencies, to set standards for action and work methods, and to set priorities.

The purposes of this synthesis are to present the various methods that states use in formulating and justifying their highway maintenance budgets and to recommend methods of supporting maintenance budget requests in order to achieve greater success in obtaining funds.

Information for the preparation of this synthesis was collected by the following methods:

- Questionnaires were sent to all states and Puerto Rico. Responses were received from 41 states and Puerto Rico (Puerto Rico is considered as a state throughout this report.) The highway maintenance budgets of these states totaled more than \$3,200,000,000 (see Appendix A).

- A follow-up to the questionnaire was conducted by telephone and mail. The summary in Table A-1 (Appendix A) indicates that a total of 1,722,555 lane-miles (2,770,000 lane-km) of state highways are being maintained in the 50 states and Puerto Rico.

- Personal interviews were conducted with state highway maintenance personnel, state highway fiscal personnel, legislators, gubernatorial budget staffs, and legislative committee staffs in Colorado, Massachusetts, Texas, and Washington. Summaries of these interviews are presented in Appendix B.

- Additional information was collected from selected states by mail or telephone (see Appendix B).

Because the composition of state highway maintenance organizations varies throughout the country, there is substantial variation in the responses by the states concerning

budget dollars and certain percentage breakdowns. Although most states delegate entire facility maintenance responsibility to highway maintenance organizations, some states have special organizations for bridge maintenance, traffic maintenance, or equipment management. Some states provide local aid for highway maintenance to municipalities or counties, whereas others contract with counties or municipalities to maintain state highways. State highway maintenance operations in Wisconsin are totally dependent on contract work, primarily with county highway agencies. Michigan contracts for maintenance with 62 of 83 counties; and several other states do the same with a portion of their maintenance projects. In some states, all roads and streets are state-owned. There are also differences among states concerning whether overlays, sealcoats, betterments, and rehabilitation fall in the category of construction or maintenance.

DEFINITIONS

Definitions of terms used throughout this synthesis are presented below:

Budget. A document outlining the amount of money that an agency proposes to spend, during a given period of time, to perform the functions that fall within that agency's sphere of responsibility. The maintenance budget is that portion of the state highway budget that includes funds for maintaining roadways, bridges, appurtenances, roadsides, maintenance stations, rest areas, and other facilities, as well as funds for traffic services and equipment. The types of budgets are described in Chapter 2. Each type of budget is intended to provide for maintenance and operation of the highway facility in its as-built or subsequently improved condition. Some states develop capital outlay budgets for the purpose of improving or expanding the highway facility, maintenance stations or garages, rest areas, and equipment. Certain portions of the work may be better accomplished under contract.

Biannual. Occurring twice a year.

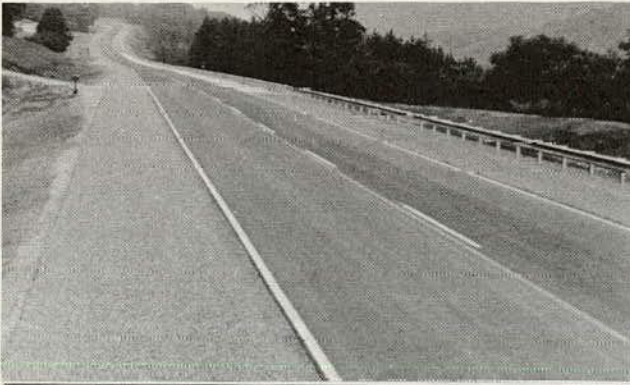
Biennial. Occurring once every 2 yr (e.g., a biennial budget covers a 2-yr period).

Biennium. A 2-yr period (e.g., a legislature meets once every biennium and/or enacts a budget covering a 2-yr period).

Highway Maintenance. A program to preserve, repair, and restore a system of roadways with its elements to its designed or accepted configuration. System elements include travel-way surfaces, shoulders, roadsides, drainage facilities, bridges, tunnels, signs, markings, lighting fixtures, etc. Included in the program are such traffic services as lighting and signal operation, snow and ice removal, and operation of roadside rest areas.¹

District. A subdivision of a state highway or transportation department responsible for all activities relating to highways and bridges. In some states, this may be called a region, or the function may be carried out by a county. For the purpose of this synthesis, it is generally the lowest agency unit that initiates the highway maintenance budget.

¹ Definition from *AASHTO Maintenance Manual*, American Association of State Highway and Transportation Officials, Washington, D.C., 1976.



M1 Maintain all roads, shoulders, bridges, guardrails, etc. at normal recommended standards. Do catch-up work at a rate that would eliminate backlogs on resurfacing, bridge upgrading and narrow-road widening in 12 years. Replace substandard guardrail over 25 years. Keep all roadways generally free of ice and snow 95 percent of the time and have limited access roads bare within two hours after a storm. Maintain sign and line painting and vegetation control at normal standards.



M2 Maintain roads, bridges, etc. at M1 level on limited access and primary highways, but reduce maintenance on secondary and rural roads. Eliminate work affecting aesthetics only. Do catch-up work to eliminate backlog of resurfacing, bridge upgrading, guardrail replacement and road-widening over 25 years. Permit snow accumulations of three inches on secondary roads and five inches on rural roads. Remove half of picnic tables from roadside rests. Do cleanup services only for safety reasons.



M3 Do only 2,200 miles of resurfacing and surface treatment. This will increase backlog by 500 miles per year. Otherwise keep maintenance at M2 level. Do catch-up work on widening, guardrail replacement and road-widening on 30 year schedule. Reduce snow removal during non-peak hours from 9 p.m. to 4 a.m. Reduce grading, restabilization and dust control work on unpaved roads by 10 percent and on shoulders by 25 percent. Do only 50 percent of required public service facility work.



M4 Keep highways in M3 condition but permit deterioration that will significantly affect capital investment. Put major emphasis on roadway maintenance with little or none on shoulders, service facilities, etc. Reduce preventive maintenance by 85 percent. Upgrade serious bridge deficiencies on 50-year schedule. Replace no guardrails. Eliminate snow removal from 9 p.m. to 4 a.m. Discontinue maintenance of route markers and other signs, and do only 80 percent of required line painting. Reduce mechanized patching by 50 percent. Clean drainages only when completely clogged.



M5 Keep highways open but in a very poor state. Deficiencies will affect highway safety. Patch and surface treat roads only on priority basis with emphasis on alleviating structural damage. Do 25 percent of required bridge maintenance and repair structural damage to bridges. Put up no snow fences and do all snow removal with department forces. Paint center line only on interstate, primary and secondary roads. Paint no rural roads. Warning signs and regulatory signs not maintained for night visibility. Do cleanup and vegetation control work only for safety. Replace guardrail only in hazardous situations.

FIGURE 1 Policy levels of service for maintenance (Pennsylvania).

State Highway Agency. The agency responsible for all activities relating to state highways and bridges.

State Maintenance Engineer. The person responsible for the formulation of the statewide highway maintenance program.

DOT. The department that includes the state highway agency as well as other transportation agencies, such as aeronautics, water transportation, mass transit, and railroads.

State Budget Director. The individual or the organization that develops the final budget for the entire state in preparation for presentation to the legislature on behalf of the governor (sometimes called the Administration and Finance Department Committee, Finance Officer, or Executive Budget Committee).

Legislative Committee. The committee charged with the responsibility of reviewing the state budget for the legislature (sometimes called Ways and Means Committee, Taxation Committee, or Finance Committee; or that part of the budget pertaining to highways, particularly if it is a separate document, may be reviewed by a Committee on Transportation).

Force Account. Work performed by agency personnel. Some states also include prisoners or CETA (Comprehen-

sive Employment Training Act) employees. In budget terminology, the cost of this type of labor is usually referred to as personal services.

Dedicated Funds. The revenue derived from taxes on motor-vehicle fuel sales and other user taxes that is placed in a special fund to be used only for highway activities. In many states, dedicated funds are used only by the state highway agency and highway agencies of governmental subdivisions. However, some states are now using these funds for other transportation-related activities; and other departments are claiming that their services, or at least a portion of them, are highway-related and they should be reimbursed from the dedicated funds in proportion to their efforts on behalf of the highway agency.

Policy Levels of State Highway Maintenance. In the responses to the questionnaire, considerable emphasis was placed on work levels of maintenance (or levels of service) that are used to develop annual work programs. The five levels of maintenance developed by the Pennsylvania Department of Transportation (PennDOT) are shown in Figure 1. Note that work levels of maintenance are more specific than these policy levels; e.g., "Paint lines 3 times per year" or "Mow grass 4 times per season."

CHAPTER TWO

TYPES OF BUDGETS

FINANCIAL RESOURCES

Dedicated Funds and Other Sources of Revenue

Most states use dedicated taxes to support highway activities. These taxes include a motor-vehicle fuel tax plus one or more of several other types of user taxes, such as vehicle-registration fees, vehicle-weight tax, driver-license fees, motor-vehicle sales tax, automotive-parts sales tax, excise tax, and ton-mile tax. All revenue derived from these sources is placed into a highway fund (sometimes referred to as the road fund or motor-vehicle fund). In some states, the highway agency exercises full control over such funds; in other states, legislative approval is required because in addition to the various departments of the highway agency that compete for the funds, often other state agencies are funded from the highway fund, including state police, motor-vehicle inspection, and even civil service or personnel departments (for the costs of testing or hiring new employees for the highway agency). In several states, dedicated funds are insufficient because of bond indebtedness.

In a few states, such as Louisiana, New Jersey, and New York, all funds to support the highway maintenance budget come from the general fund. In West Virginia, the use of a portion of the property tax for highway maintenance and the

use of a business and occupation (B & O) tax from coal hauling to upgrade coal-haul roads are being considered. A B & O tax is an income tax levied on corporations, partnerships, and individuals engaged in business occupations in the state.

When dedicated funds are insufficient, the highway agency has several alternatives: (a) to stay within the fund limitation (which may be required by law); (b) to increase user taxes; or (c) to seek additional funds from the general fund.

Several states indicated that federal aid for state highway maintenance may be an acceptable funding alternative if not accompanied by the red tape evident in other federal programs. The *Federal Register* (March 31, 1980) addresses Interstate Maintenance Guidelines required by Title 23 U.S.C. of FHWA to insure that the system is being maintained: [the] "guidelines do not impose detailed maintenance procedures, but rather set forth overall maintenance objectives which will form the basis for the development of an Interstate maintenance program in each state." Section 635.505 emphasizes the *preservation* of several highway elements and appurtenances including attendant traffic services.

The Budget Dollar — Maintenance Versus Construction

In response to the request to break down the agency budget into percentages for highway maintenance and highway construction, most state agencies reported a higher percentage for capital improvements than for highway maintenance (although some states indicated just the opposite) (Table A-1 in Appendix A). Of 35 states with a combined total of 100 percent (see column under “% Agency Budget For”), 19 states reported that highway maintenance received less than 30 percent, 3 states reported more than 50 percent, and 13 states reported that maintenance received between 30 and 50 percent. Pennsylvania responded that the 3-R construction budget is used instead of the statewide construction program, resulting in a high percentage for maintenance. The wide differences are best explained by one state that declined to indicate any percentages: “In our opinion, such figures are not valid for comparison due to the fact that accounting procedures, as well as the understanding of maintenance costs, vary greatly between the various states.”

Most maintenance engineers believe that there is no financial advantage in deferring repair work on a pavement surface if this will necessitate the rebuilding of the entire pavement a few years later.

BASIC TYPES OF BUDGETS

There are three basic types of state highway maintenance budgets in general use today: line-item, lump-sum, and program. Zero-based budgeting (ZBB) can be used with all budgets.

In the past, the line-item (or object expenditure) budget was generally the only type of budget used; however, at present it is used by 22 states and in part by two other states. A program (or performance) budget is used by 20 states and in part by four other states. Nine states make their appropriations on a lump-sum basis. Six states use a ZBB process along with their basic type of budget; eight other states use either a modified or partial ZBB process.

Thirteen states indicated that their budget system worked well, whereas three states expressed the opposite. Most states agencies appeared reluctant to answer this question. Thirty-six states prepare annual budgets and 15 states prepare them on a biennial basis.

Line-Item (Object of Expenditure) Budget

In state highway agencies using the line-item type of budget, maintenance budgets are determined on the basis of money instead of work to be accomplished. The funds are allocated in set amounts for personal services, materials and supplies, equipment, and, to some extent, contracted services. Some states list these amounts separately under one or several activities to ensure the availability of funds for such services as pavement marking or snow and ice control.

With a line-item budget, management uses available funds and individual judgment instead of work objectives or comparative levels of service. The ultimate decisions on money are made at top levels of management, but the work deci-

sions, for the most part, are made by the lowest level of supervisors.

Line-item budgets, which may include expenditures for personnel, equipment, and materials, can be restrictive without much flexibility. For example, this type of budget might allocate funds for snow and ice control using the following format:

<i>Personnel</i>	
Permanent	\$XXX
Temporary	\$XXX
Overtime	\$XXX
<i>Equipment</i>	
Rentals (state-owned equipment)	\$XXX
New (purchase)	\$XXX
Replacement (purchase)	\$XXX
Hired (or contracted)	\$XXX
<i>Materials</i>	
Sodium chloride	\$XXX
Calcium chloride	\$XXX
Premixed chlorides	\$XXX
Abrasives	\$XXX

Purchase, maintenance, repairs, and operating costs of equipment are included in the rental rates for state-owned equipment if there is a revolving fund with an equipment management system; otherwise, additional line items are included in the equipment or “shop” portion of the budget. On occasion, an agency may be required to list equipment needs, both new and replacement, by units and in order of priority.

The state maintenance engineer cannot exceed the allotment for any line item; for example, the allotment for materials cannot be increased even if there is an excess of funds for the purchase of equipment. However, in some states, this can be accomplished with the approval of a legislative committee and/or the state budget director.

Lump-Sum Budget

With this type of budget, funds are appropriated in one lump sum for maintenance purposes. Although this budget allows the maintenance manager greater flexibility, budget preparation must usually be based on a sound program, and accomplishments are closely scrutinized.

Program/Performance Budget

Within the last 15 years, almost all state highway agencies have developed a maintenance management system. This has led to changes in budget approaches, particularly in the program or performance budget, which is based on work programs. Work programs are broken down into activities, such as crack sealing, pothole patching, and surface treatments, all of which are based on predetermined measurements of work for each activity.

The program budget defines the amount of work that is planned and expected to be performed. Top management makes the decisions on the levels of service and work methods. This budget not only indicates what is to be accomplished, but also what it will cost. It can also indicate the

work that will not be accomplished if the prepared budget is significantly reduced.

Some program budgets may call for a total dollar amount for each program; e.g., for snow and ice control. The total dollar amount would include all of the items mentioned in the example presented under the line-item budget; however, the state maintenance engineer has the choice to use the funds as deemed necessary to meet conditions for a specific program—not as appropriated by each object of expenditure as in a line-item budget.

In Washington and other states, a program budget is submitted to the legislature, but the appropriation for all highway maintenance activities is received as a lump sum.

ZERO-BASED BUDGETING

Zero-based budgeting (ZBB) usually projects several levels of possible expenditures and corresponding levels of maintenance. Louisiana at one time submitted five cost levels of highway maintenance as a percentage of current needs: 70, 85, 100, 110, and 110+ percent. The state now uses three levels: 85, 100, and 100+ percent. Other states submit varying levels.

Although ZBB is not used to a great extent, 14 states reported its use in conjunction with various types of budgets (Table 1). Whereas some states go back to ground zero in justifying budget needs, some states use ZBB only after fixed costs are considered.

The budget is basically prepared in the usual manner. Then several levels of expenditure or work are established based on answers to the following questions:

- How much must we do?
- How much can we afford to do?
- How much should we do?
- How much did we do last year?

These questions are applied to each program, whether it is an activity designed to protect the integrity of the facility or to provide a traffic service. A cost-effectiveness analysis of each major work activity is required to justify the quantity standard each year.

TABLE 1
NUMBER OF STATES USING ZERO-BASED
BUDGETING (ZBB) WITH VARIOUS TYPES
OF BUDGETS

Budget Type	Full Use	Partial Use	Modified Use
Program	4	2	1-1/2 ^a
Line-item	2	2	1/2 ^a
Lump-sum	0	1	1

^aNevada is included in both line-item and program types of budgets because the state uses a modified ZBB combined with a budget that is part line-item and part program.

Some states reported that ZBB is effective if used from bottom to top of the budget process; however, most states noted that the system fails either at the top levels of management in the DOT or in the legislative process, and that the benefits of ZBB do not justify the large amount of paper work, time and effort required.

Whether ZBB, as a tool for budget justification, is an aid or a hindrance depends on the extent to which administrators and legislators understand the system and are willing to take the responsibility for their decisions. Some states make full use of this procedure in the development of budgets, whereas in other states it is used only partially because administrators and legislators do not understand the method. Even though it is state policy, one state does not use ZBB at all; another does not use it to any great extent. However, one state reported that in lean years, ZBB has been an aid in preventing further budget cuts. ZBB requires a large amount of detailed paper work and makes budget preparation more complicated and time-consuming. Even the states that submit a full ZBB to the legislature may find that cuts are made in line items (or by object of expenditure), which places the onus of functional cuts on the highway agency. The success of ZBB also depends on the budget expertise of the legislators to whom the budget is presented.

THE BUDGET PROCESS

Budget planning starts with the determination of needs by the operating units of transportation agencies. These needs are then combined by the state Department of Transportation for presentation to the governor or state budget director, and then usually presented to the legislature in a "budget message" from the governor. The legislature analyzes the budgets of all departments in relation to financial resources, such as income from motor-vehicle fuel and excise taxes, to ensure a balanced budget. After the budget is approved by the legislature, it is submitted to the governor for final approval and signature in the same manner as any other piece of legislation.

The process for budget enactment is shown in Figure 2. The dashed lines depict the paths by which advice, guidance, and projections are furnished before budget preparation; they also depict the paths for any directives for changes after preliminary budget submissions are reviewed. The solid lines indicate the route of the budget from physical inception to enactment by the legislature and signature of the governor. The dotted lines show that the budget as approved by the governor (often called the appropriations act) in effect dictates policy to the state DOT by indicating the level of highway maintenance that can be performed with the funds appropriated. Although some steps needed for approval are eliminated in states where legislative and/or gubernatorial sanction is not required, the functional steps are the same.

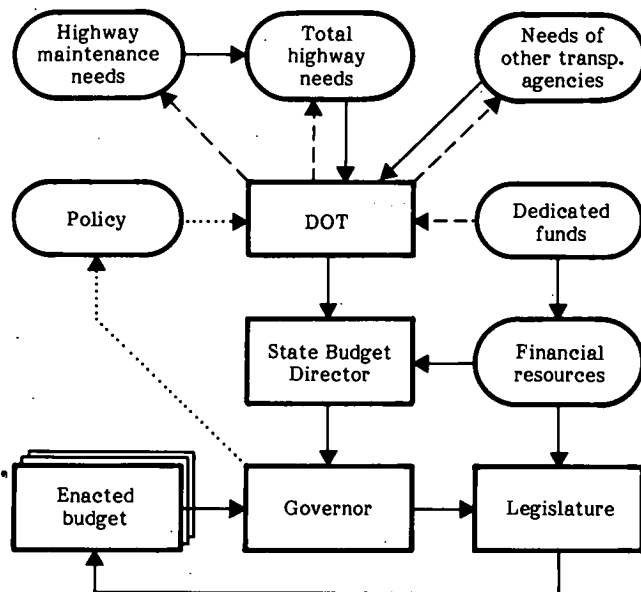


FIGURE 2 Flow chart depicting usual process for state budget enactment.

FORMULATION OF THE BUDGET

Development of a state highway maintenance budget usually begins at the district or subdistrict level, or, in some states with maintenance management systems, at the maintenance division level. In the latter case, the initial draft of the budget is often referred to the districts for input and comments. In a few states, the district submits its needs for materials and minor repairs; then personnel and equipment costs are developed at the state maintenance division level.

Annual budgets are required in 36 states and biennial budgets in 15 states. In Washington and Hawaii, where biennial budgets are used, a 6-yr financial plan must be submitted with the budget.

After the budget is initiated by the state maintenance engineer, it takes 1 to 2 yr before requested funds are available. Equipment cannot be ordered until funds for purchases are budgeted, even though equipment will not be delivered until a year or more after the order is placed. Thus future planning by state maintenance engineers is essential.

If budget preparation is not based on a maintenance management system, one of the following methods is currently used:

- The previous year's expenditure plus experience.
- Inspection of roads, facilities, and equipment.
- The previous year's expenditure plus changed conditions.
- Expenditures of previous years plus inflation rates with adjustments for increased road inventory.

Most states have highway maintenance budget review committees, which generally consist of a few district engineers, the maintenance engineer, and one or two individuals from the agency's budget or fiscal units. At the time the agency's entire budget is being formulated, personnel from higher management levels join the committee.

State maintenance engineers generally indicated that they can and do formulate budgets based on the needs of their highway systems; however, they do not receive adequate funding to properly maintain the highways through enactment of the budget. Iowa's budget proposal for FY 1980 and 1981 contains an explanation of the consequences of not approving an item in the budget package (Figure 3). This can be translated into "products" that will not be forthcoming if highway maintenance does not receive the necessary funds. Such a presentation for equipment was made by Massachusetts in 1966 when gearing for completion of the Interstate system (Figure 4).

See Appendix B for more details on budget formulation in several states.

**FISCAL YEARS 1980 AND 1981 BUDGET REQUEST
DECISION PACKAGE
IMPROVEMENT LEVEL**

Bureau Operations
Office/District Field Maintenance
Cost Center 5500

<p>Program Description and Goals : Provides a system of signing, line marking, roadway lighting, debris removal, and safety appurtenances. <u>Goals:</u> To provide the traffic services to safely guide and protect the highway user.</p>	Performance Measures		1979 BUDGET	1980 REQUEST		1981 REQUEST	
				THIS PACKAGE	CUMULATIVE	THIS PACKAGE	CUMULATIVE
	TRAFFIC SERVICES	N.H.	494,499	85,306	579,805	85,306	579,805
<p>Short Term Objectives to be Accomplished if this Package is Approved Provide resources to begin elimination of the maintenance backlog, and provide additional support for the expanded construction program.</p>							
<p>What are the Consequences of not Approving this Package? Continued backlog of sign replacement and upgrading, and traffic marking resulting in a less convenient facility and increased public complaints.</p>	Resource Requirements		1979 BUDGET	1980 REQUEST		1981 REQUEST	
				THIS PACKAGE	CUMULATIVE	THIS PACKAGE	CUMULATIVE
PEOPLE	PERMANENT		1798	33	2069	33	2069
	NON-PERMANENT MAN-YEARS		42	6	54	6	54
DOLLARS	SALARY:						
	PERMANENT		27,142,691	505,056	31,246,459	505,056	31,246,459
	NON-PERMANENT		360,660	51,468	463,632	51,468	463,632
	OVERTIME		788,000	15,760	851,040	15,760	851,040
	TOTAL SALARY		28,291,351	572,284	32,561,131	572,284	32,561,131
	SUPPORT		16,356,129	318,112	22,146,079	318,112	22,146,079
TOTAL		44,647,480	890,396	54,707,210	890,396	54,707,210	

FIGURE 3 Budget request–decision package for FY 1980 and FY 1981 (Iowa). (Note explanation of the consequences of not approving an item in the budget package.)

MAINTENANCE EQUIPMENT NEEDS

BASED ON GROWTH OF INTERSTATE SYSTEM
(Completion date for Interstate System - 1972)

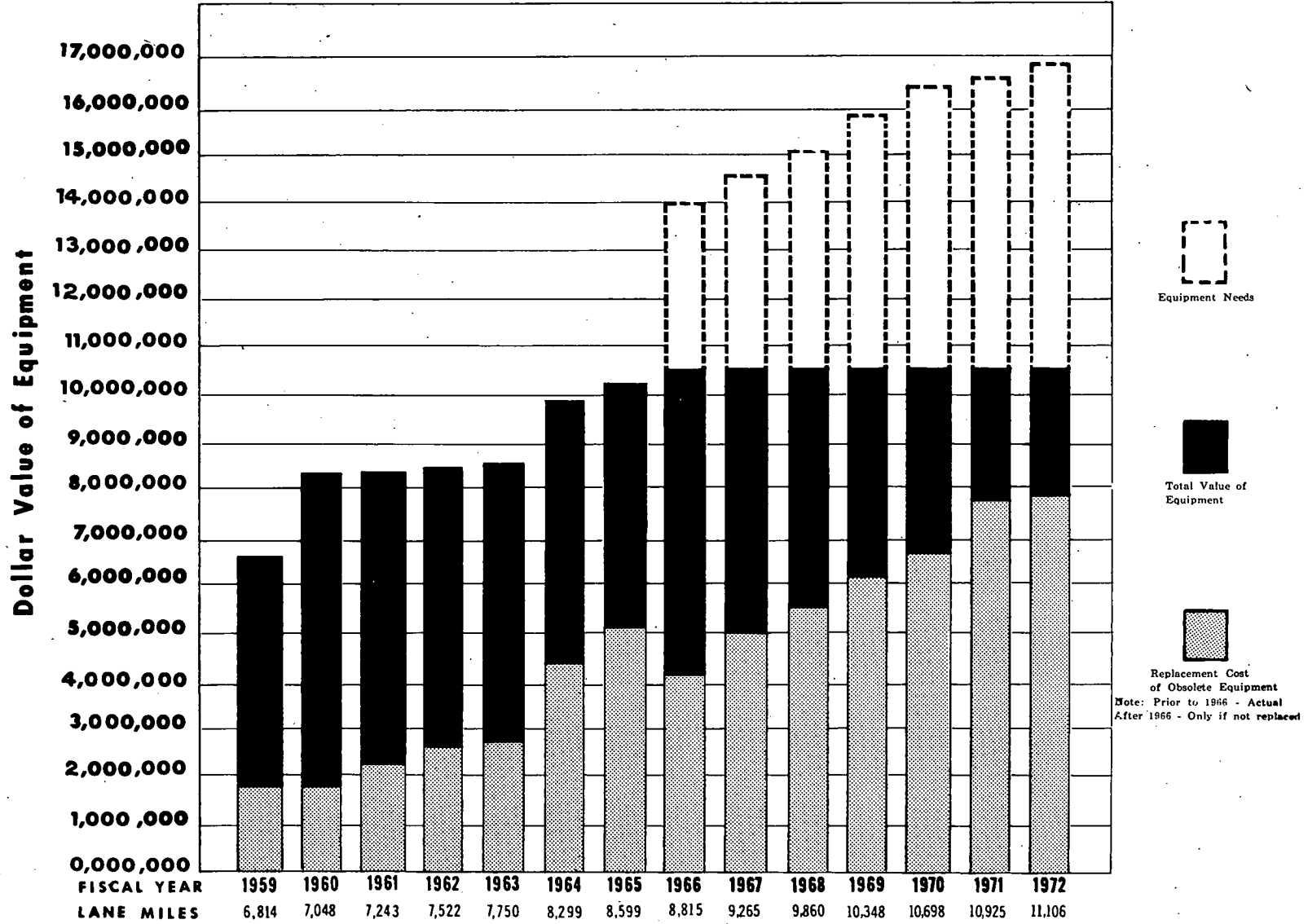


FIGURE 4 Maintenance equipment needs based on growth of Interstate system (Massachusetts, 1966).

JUSTIFICATION OF THE BUDGET

As in any well-managed business or organization, all highway maintenance expenditures must be justified. First, this entails estimating the value, in terms of use, of the capital represented by the state highway network. The importance of the highway network in the economic life of the state must be justified and the demands made by users and abutting property owners must be specified. The consequences of prolonged insufficient maintenance must also be explained. Finally, a policy that acknowledges and satisfies the requirements expressed within the state must be proposed.

Day-to-day maintenance operations are usually based on a set of standards developed by the highway agency. From these standards emerge levels of maintenance to which the motorist becomes accustomed and expects. It is then the responsibility of the state maintenance engineer to promote a practical and economical level of maintenance and to justify that level.

A few states reported that the level of service for highway maintenance varies with the class of road; yet there was an underlying indication that if it is accepted that the primary purpose of highways is to carry traffic, then highway maintenance expenditures should be directly related to the traffic volumes, not necessarily to the class of road.

While the desire to hold the line on tax increases is greater in some states than in others, executive and legislative leaders have been demanding assurances of the credibility of highway maintenance budgets. Thus a combination of education and marketing or selling is required, in addition to providing the justification for a budget, if state maintenance engineers are to receive the necessary funds to properly maintain the highways and to provide the services that motorists expect.

In several states, including Texas and Washington, a year-round gubernatorial staff for budget analysis and a legislative staff for budget review stay in close contact with the state highway agency, thus aiding the justification, selling, and marketing process. If such support does not exist, the state maintenance engineer must be aware of what information the legislature needs and what information individual legislators want from highway maintenance representatives concerning the various programs planned under the proposed budget. To aid the state maintenance engineer in justifying expenditures, legislators should be supplied with information on highway maintenance in order to understand the system, formula, sufficiency ratings, and/or the maintenance management system, etc.

Justification is necessary if the needs of highway maintenance are to be met. Budget experts look for the mathematical justification; the media and the average motorist or voter derive more meaning from graphs, charts, diagrams, and pictures; and the average legislator may require both.

The statistical data required to inform legislators and taxpayers, in a credible and comprehensible manner, of the continuing deterioration of the highway system and the inability, due to lack of funds, to arrest or even slow down the rate of deterioration can be supported by the use of visual aids. Visual aids might include before- and-after photographs of snow storms, surface repairs, etc.; photographic comparisons of obsolete equipment and modern equipment; photo-

logs of undermaintained roads; and charts, diagrams, and graphs showing price increases for materials, equipment, personal services, etc. Visual aids, if done properly and artistically, can supplement newspaper, radio, and television press releases in promoting proper highway maintenance budgets. One state effectively uses overhead projectors with transparencies to highlight new programs and to present data to support budget increases.

Bar graphs can aid in the justification of a budget (see Figures 5 and 6). Figure 5 shows a decrease in personnel in Louisiana; Figure 6 shows an increase in the number of lane-miles being maintained per employee. These charts can be used in conjunction with other data to show that maintenance was reduced because of a 40 percent increase in each employee's work load.

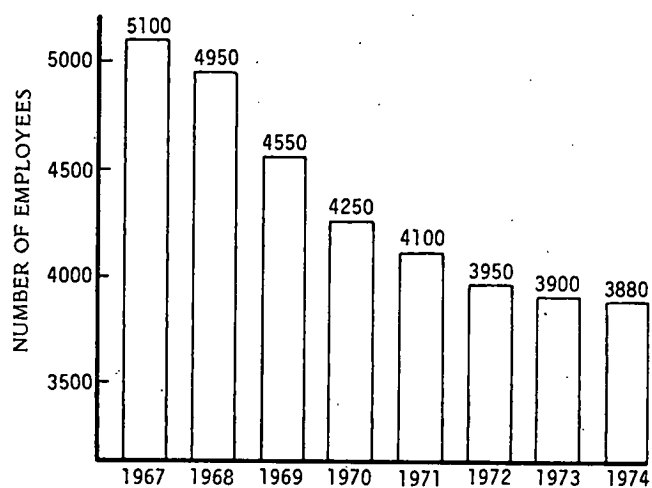


FIGURE 5 Decrease in district maintenance and administrative personnel as a result of attrition (Louisiana).

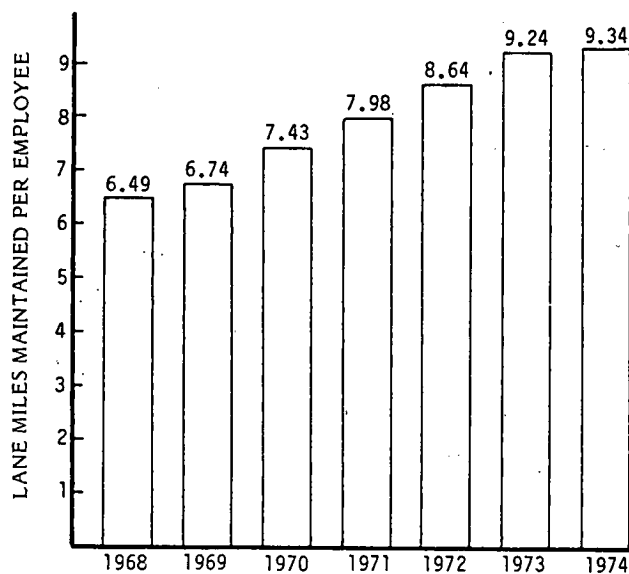


FIGURE 6 Maintenance-force work-load trends (Louisiana).

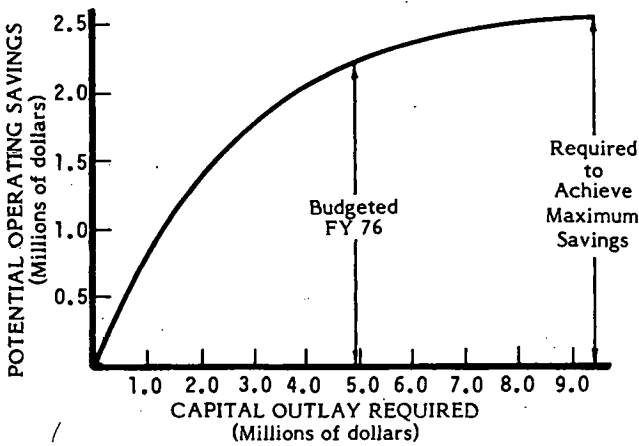


FIGURE 7 Capital outlay for equipment replacement versus potential equipment-operating savings (Louisiana).

Figure 7 shows the manner in which potential equipment-operating savings can be expected to vary in relation to different levels of capital outlay for equipment replacement. In Louisiana, for example, the budgeted capital outlay funds in 1976 amounted to approximately 52 percent of the capital outlay required to replace every item that was economically

justified. At the budgeted level, Louisiana could only save approximately 88 percent of the potential total savings. Once this relationship is described, a marginal analysis can be performed for alternate budget levels in order to explain to legislators the impact of differing allocations. This type of information is readily available from an equipment management system.

Figure 8 shows the difference between the number of employees used to maintain Maine's "summer highway system" and the number of employees who maintain the highways in the winter. In combination with other data, this figure can be used to show that highway maintenance operations became more efficient because of increased mechanization, multiple use of equipment, more sophisticated equipment, better-trained personnel, or improved techniques.

Visual aids depicting dollar pie charts (Figure 9) and a proposed budget at two levels (Figures 10 and 11) can add emphasis to budget presentations.

Figure 12 depicts a decrease in manpower in New Jersey; more important, the shaded portion of the graph represents a work deficit that was actually deferred maintenance for the period of 1971 to 1979. The 1979 manpower level supported less than 75 percent of the actual need, and more than 25 percent of the work needed was deferred. At this rate, every 4 yr the state will lose 1 yr of needed highway maintenance work.

Program deficiencies can be shown vividly with diagrams;

TOTAL MDOT EMPLOYEES

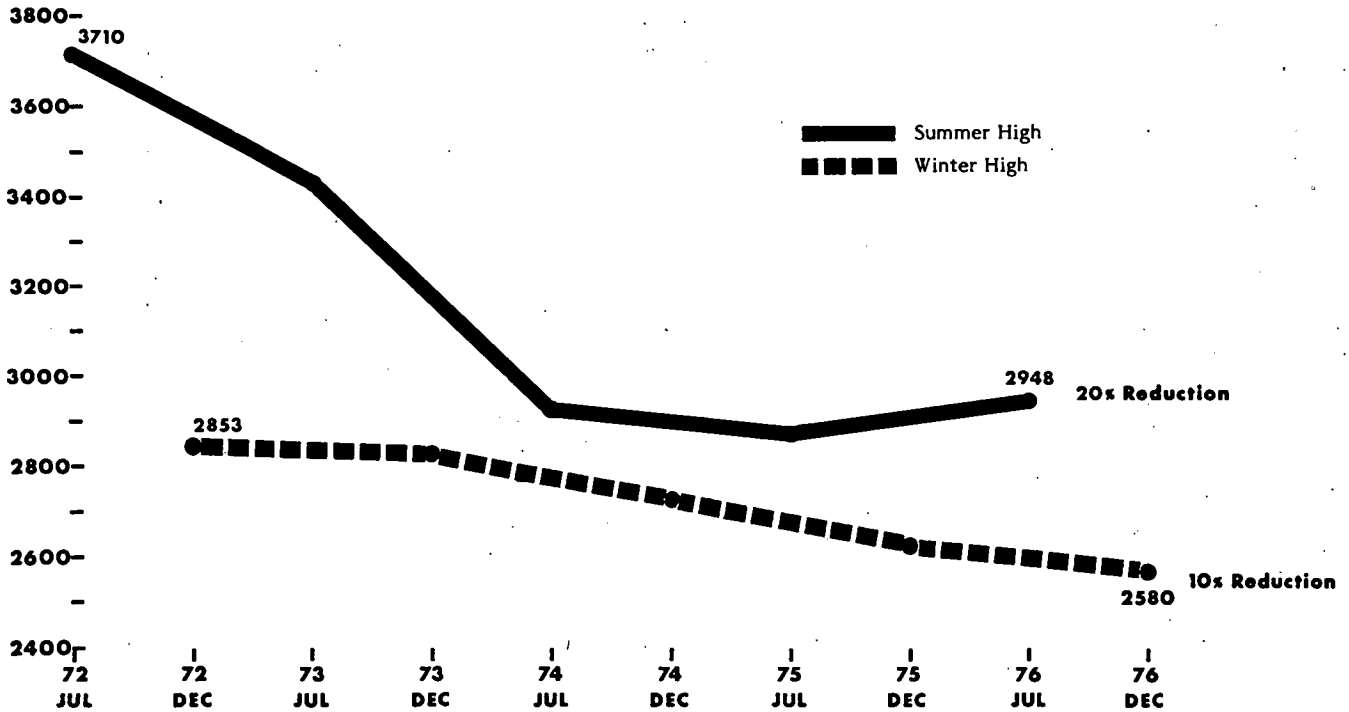


FIGURE 8 Total number of employees needed for state maintenance of the "summer highway system" as compared to the number of employees needed for maintenance of the highways in winter (Maine).

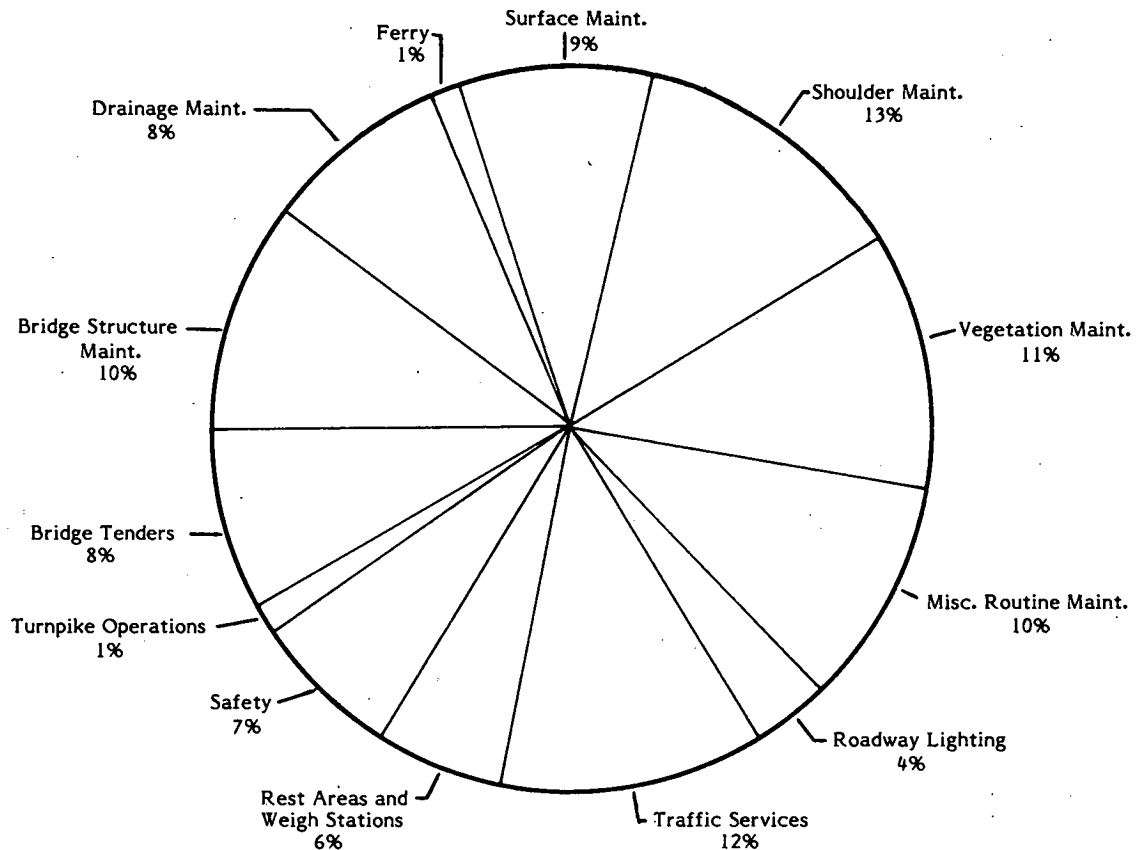


FIGURE 9 Routine maintenance and toll operations expenditures (FY 1978-1979, Florida).

Figure 13 shows that almost 25 percent of the necessary line striping was not accomplished, even with overtime, in New Jersey in FY 1978. This type of graph can be used to demonstrate the need for additional personnel or equipment, or the need for contract maintenance during the peak season.

Figure 14 shows that the mileage of lines to be striped increased substantially in New Jersey, although there was a leveling off as the Interstate system neared completion. Graphs of this type can be used to emphasize a movement toward increased maintenance and rehabilitation of roadways. If there were no increase in personnel during the growth period, the data in Figure 14 would explain why work was left undone (as shown in Figure 13). Similarly, an increase in the number of bridges (or other capital items) without a corresponding increase in personnel would mean that only critical and emergency repairs will be made, and preventive maintenance will be neglected.

Nonpavement maintenance is neglected more often than pavement maintenance. For example, Figure 15 shows that in New Jersey, 40 percent of the mowing was not accomplished in 1978.

BUDGET TRAVEL ROUTE

In 35 states the budget originates at the district level. In three states budget preparation starts at a level below that of a district; in 13 states the initial preparation is made at the

state maintenance engineer's level. Of these 13 states, six states send the entire budget draft to the districts for review and comment, and two send portions of the budget proposal to the districts.

There are several steps that a highway agency must take before a budget is enacted. Regardless of how the budget is developed, the state maintenance engineer must submit a budget through the chief administrative officer or designee. If a state has dedicated funds, the process may end at that point, as is the case in Colorado, Missouri, South Carolina, Tennessee, Virginia and Wyoming.

Before the budget is submitted to the legislature, it must be determined that sufficient funds have been requested for DOT functions, in addition to highway maintenance, for the budget period. At this point, in some states, the highway maintenance budget is subject to reduction in order to make funds available for new highway construction or other capital improvements. However, the cost of deferring maintenance is continually rising because of deterioration of roadways and bridges and inflation. The total costs are not easily identified, as many costs are absorbed by the public in the form of damage to vehicles and travel delays. It is during this financial review, before submission of the budget, that some states organize committees or round-table workshops with all involved administrators and managers. If a maximum spending limit has been imposed on the agency by a higher authority, programs are modified to stay within that figure;

and state maintenance engineers must be able to justify their budgets to obtain the needed funds.

The next step in the process of budget enactment is submission of the budget—usually to a statewide budget officer, within the executive office, who combines it with requests from other departments and the desires of the governor. The governor then sends the total state budget to the legislature, where it is usually referred to a legislative finance committee. The committee may hold public hearings on all or portions (by department) of the budget or it may refer portions to other legislative committees for recommendations. For example, the budget may be sent to a committee on transportation to ensure that proposed capital improvements are necessary or to a committee on taxation to ensure that there is sufficient revenue to support the budget and its projected programs. In some states, including Washington, a legislative transportation committee may be solely responsible for reviewing the highway budget. In the case of bicameral legislatures, this procedure is usually carried out in the lower house and then repeated in the state senate. If the two chambers do not agree, then a joint committee is formed to resolve

differences. After recommendations by the finance committee, a vote is taken in the legislature. If enacted by the legislature, the budget is sent to the governor for signature or veto.

The budget process in several states is different from that of the majority of the states. In Colorado, the state maintenance engineer submits the budget to the highway department budget officer; the budget is then submitted to the state highway administrator and the highway commission, and finally to the governor without need for legislative approval. In Missouri, South Carolina, and Wyoming, approval is needed only from the state highway administrator; in Tennessee and Virginia, final approval must come from the DOT; and in North Carolina and Utah, the legislature has the final say.

However, most state budgets follow a course from the state highway administrator and/or the DOT level to a state budget officer, the legislature, and then to the governor. Legislatures in 45 states and governors in 46 states must approve the budget before the funds become available for expenditure.

	ALLOCATIONS			
	76 ACTUAL	77 EST.	78	79
Highway Programs-Operating	\$61,720,306	\$63,808,521	\$66,639,111	\$69,923,497
Other Agencies and Contributions	9,501,989	9,485,065	11,727,649	11,890,512
Total	71,222,295	73,293,586	78,366,760	81,814,009
REVENUES				
Fuel Taxes	51,270,720	49,400,000	52,120,700	52,618,100
Licenses, Registrations and Other Revenue	23,919,679	21,043,599	21,154,124	21,259,213
Surplus	2,146,762	1,815,960	0	0
Totals	77,337,161	72,259,559	73,274,824	73,877,313
DIFFERENCES				
			(\$5,091,936)	(\$7,936,696)
			Sub Total (\$13,028,632)	
Highway and Bridge Improvement Program		\$17,100,000		(\$25,000,000)
		(\$2,700,000)		
			Total (\$38,028,632)	

FIGURE 10 Staff budget—Phase I (Maine, 1978–1979 biennium).

Roadblocks Along the Way

At any step in the enactment process, the state highway maintenance budget may be reduced. Although all cuts are made in-house in the six states that do not require legislative approval of budgets, any modifications of work priorities must be explained, and programs must be justified in order to be retained. Beyond the DOT level, the reasons for cuts may vary: e.g., the state budget director may predetermine a total dollar amount that each agency must not exceed; the legislature may require the total expenditures be reduced by a dollar figure or require that certain programs, or even line items, be reduced by a percentage; or the governor may cut the legislative pork barrel. The governor may also veto any specific line item, part of or the total program, or even the total budget; however, this privilege is rarely exercised. Support may come from a legislative committee on transportation, yet a legislative finance committee may limit the commitment of funds to the amount expended by the agency in the past.

At each step in the budget enactment process, questions may be asked concerning the highway maintenance function;

these queries may result from observations by top management, legislators, or the media, or from complaints by constituents or disgruntled employees. Concerns may include observations of idle employees and equipment in need of repair, the need to resurface a rough road in a legislator's district, the correction of a local flooding condition, or the possibility of building a road at a new location instead of spending heavily for maintenance of an old road. The state maintenance engineer must be prepared to justify budget requests at all levels.

One problem in getting budget requests approved is legislative concern for low-priority items that have high visibility. For instance, a legislator may place more emphasis on litter collection than on preventive maintenance for bridges.

Some staff maintenance engineers believe that it hurts the budget process when there is bad publicity or legislators react negatively to complaints or observations of alleged improper use of equipment or idle workers. Negative attitudes are encountered when the budget enters the political arena—from the state budget officer through the governor's office. Usually these attitudes are the result of observations of state highway maintenance crews by legislators. Maintenance

	ALLOCATIONS			
	76 ACTUAL	77 EST.	78	79
Highway Programs-Operating	\$61,720,306	\$63,808,521	\$65,132,161	\$68,335,697
Other Agencies and Contributions	9,501,989	9,485,065	11,727,649	11,890,512
Total	71,222,295	73,293,586	76,859,810	80,226,209
	REVENUES			
Fuel Taxes	51,270,720	49,400,000	52,120,700	52,618,100
Licenses, Registrations, and Other Revenue	23,919,679	21,043,599	21,154,124	21,259,213
Surplus	2,146,762	1,815,960	3,000,000	3,000,000
Totals	77,337,161	72,259,559	76,274,824	76,877,313
	DIFFERENCES			
			(\$ 584,986)	(\$3,348,896)
			Sub Total (\$3,933,882)	
Highway and Bridge Improvement Program		\$17,100,000		(\$22,000,000)
		(\$2,700,000)		
			Total (\$25,933,882)	

FIGURE 11 Reduced budget—Phase II (Maine, 1978–1979 biennium).

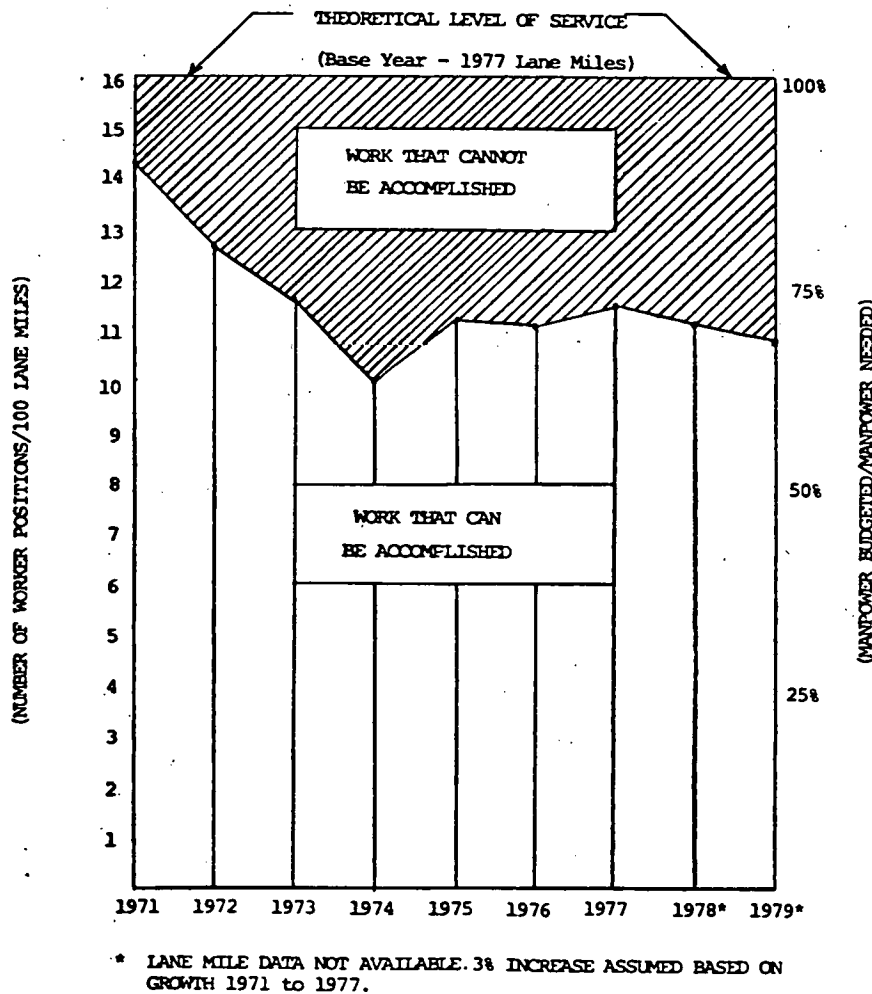


FIGURE 12 Work deficit (deferred maintenance) caused by reduced manpower (New Jersey).

crews are constantly exposed to the traveling public and thus are closely scrutinized. When a crew is observed lounging under a tree, passersby may not realize that this may be a normal lunch break or work break; instead, it is assumed that the crew is wasting the taxpayers' money, which may or may not be true. Low-quality labor has produced negative attitudes among citizens who have transmitted these attitudes to their political representatives. It is possible for one observation by a citizen or politician to be blown completely out of proportion.

Negative perceptions hinder passage of the budget. Sometimes state highway personnel may inform legislators of local problems, pet peeves, etc., which may result in the legislator receiving incorrect information. However, these complaints can sometimes be used to enlist legislative support for a desired low-priority project. One state agency noted that a complaint about potholes resulted in an increased surface-treatment program.

In one state, civil service procedures preclude adjusting salaries on an area basis or providing other incentives where maintenance quality is poor or turnover high. Thus the high-

way agency is left with no means to improve the quality of labor; the only alternative appears to be increased contract maintenance. This state agency reported that the vast majority of negative attitudes expressed in the areas indicated on the questionnaire relate to "the poor public relations record of our maintenance crews in the field."

One state agency reported that the low quality of labor was a hindrance to its work program. The highway agency recommended a salary increase in an effort to hire better personnel; legislators responded that the agency should "improve your production and quality of work and then we will increase the pay."

Issues of Interest

At the agency level, requests for unusual or new equipment, additional personnel, and funds for new programs are issues of immediate interest. Next to be considered is the amount of pavement to be resurfaced.

Sometimes reductions are made in state highway maintenance requests without regard to the impact on continuing

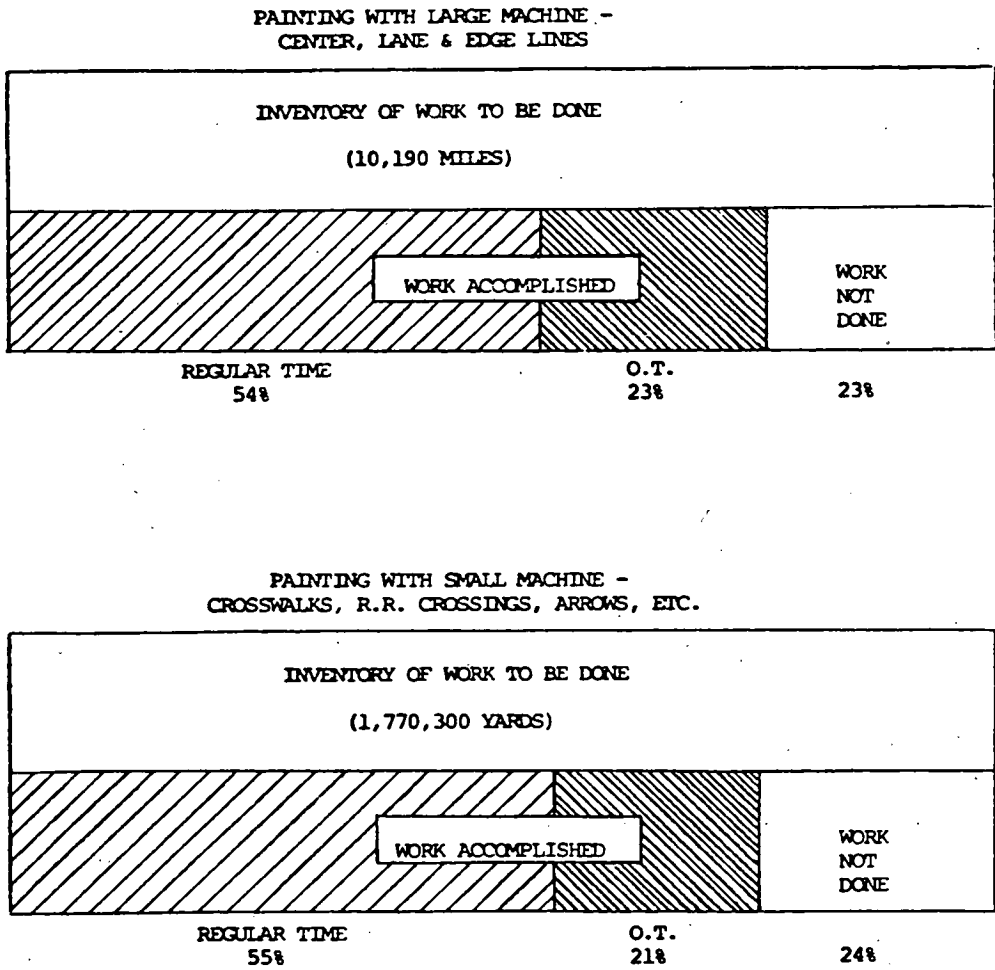


FIGURE 13 Line-striping needs versus accomplishment for FY 1978 (New Jersey).

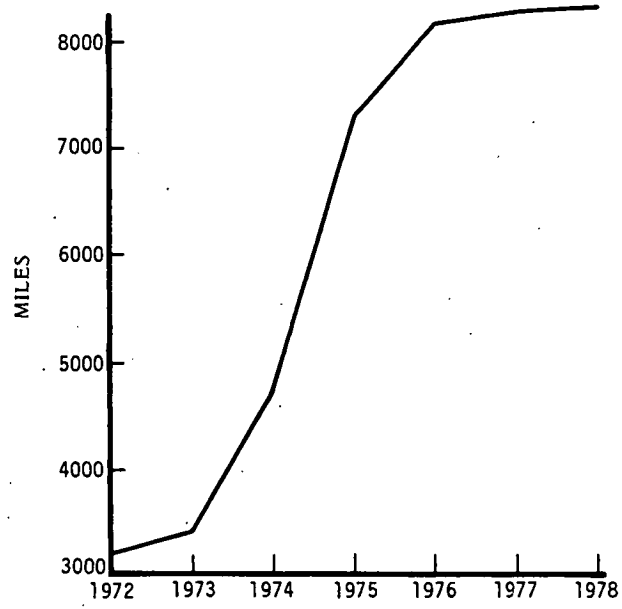


FIGURE 14 Increase in mileage of lines to be striped (New Jersey).

programs in order to meet some other goal of the agency. This occurs when the department is required to stay within a predetermined fund limitation. Most administrators look at the objectivity, rationality, soundness of economic analysis, and practicality of the budget approach. However, they must also get the job done with the available funds and at the same time carefully consider work plans and regional distribution of benefits. At times, they just seek to keep the highway system reasonably presentable at minimum cost.

State budget officers are primarily interested in any increase over the previous year's spending level; the other

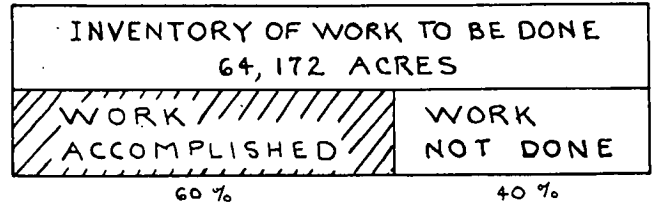


FIGURE 15 Roadside mowing—needs versus accomplishments for FY 1978 (New Jersey).

areas of interest are the accuracy of the figures, proper accounting procedures, and any unusual requests for new equipment.

Legislative committees look for the political ramifications of any increase over the previous year's spending. Although they are interested in getting the most productivity for the least amount of dollars, they want to ensure that the agency is operating within the intent of legislative direction. Specifically, they examine the number of employees and regional activity, looking closely at the area they represent. In some states, there is no contact between the program managers and the legislative committees; state maintenance engineers indicate that this results in contradictory positions (e.g., not appropriating funds for new equipment, although the request for personnel to operate the equipment has been approved).

Governors usually rely on appointed commissioners or secretaries to prepare a budget that is in balance with the expected revenue. Seldom do governors show much interest in the highway maintenance portion of a budget; but when they do, they want information concerning the operating efficiency and its response to public demand. Governors are usually sensitive to controversial issues and expressed public interests, and are interested in the political impact of increases in the budget, especially if additional personnel are required. Consequently, some governors have proposed an increase in contract maintenance in order to reduce the total number of employees.

The press seldom takes an interest in the highway maintenance budget unless catastrophic conditions, local issues, large quantities of money, disasters, or continual deficiencies that relate to safety are involved. When reporters do show an interest, it is usually to ascertain that the budget is adequate to meet minimum needs and that there is no unusual increase in the total budget.

The motoring public will complain about speeding state vehicles, dirty rest areas, crews standing idle, poor lane lines, too many or not enough signs, and items of personal interest, but never appears to show any concern about the highway maintenance budget. Some state maintenance engineers report that they have never received an inquiry regarding the highway maintenance budget. In winter, there is interest in snow and ice control, and spring brings interest in potholes, litter collection, and rest-area maintenance, but there are never any questions about the highway maintenance budget.

There is no organized constituency that campaigns for highway maintenance programs at the state level. Even the trucking industry appears uninterested. However, some state maintenance engineers believe that automobile and trucking associations would react if there were any drastic reductions in the highway maintenance budget.

Some of the typical questions often asked by highway agency top management, the state budget officer, and/or legislative committees regarding the state highway maintenance budget include:

- Why has the budget increased over last year?
- Why do you need this new program now when you have done without it in the past?
- Why do you need more personnel? . . . more equipment?

- Where can we cut the budget by 5 percent . . . by \$10,000,000?

- Why can't we simply lower the levels of maintenance or the standards of maintenance and thus reduce the budget?

- Are you sure this is what you need?

- Can you do with less?

- How would a 10 percent cut in maintenance affect the highway system?

State highway maintenance engineers respond in different ways to the above questions. Some estimate the number of person-years that would be eliminated by a cut in the budget, assign those figures to the lowest-priority programs, and explain the effect of the reduction on those programs. By means of graphs, charts, and other visual aids, some state maintenance engineers show the effects of inflation, the need for more or less personnel and/or equipment, the increase and projected increase in lane-miles or in inventory, the work that will not be accomplished if the program is underfunded, etc. Some state maintenance engineers develop cost-benefit analyses, whereas others cite specific programs or projects as examples. Photographs are used to some extent, and making photologs of deficiencies on certain roads to compare with photologs of highways in good condition is an alternative method of documenting highway maintenance.

Ten years ago the principal complaint of budget analysts was that work programs were not sufficiently quantified. Currently, with maintenance management systems operational in almost every state, highway maintenance budgets are based on quantified work programs. The MMS has removed most of the guesswork from budget needs, assisted in the formulation of budgets, facilitated budget justification, and provided the basis for opposition to budget reductions. State highway maintenance engineers report that the MMS is of great benefit in developing sound justification for budget requests.

One state agency suggested that the budget process would be improved if state maintenance engineers could obtain rational, organized, and systematic input from elected officials and the public *before* the budget is finalized.

PRESENTATION OF THE BUDGET

The person chosen by an agency to appear before legislative committees is not always the person who can best present highway maintenance needs. Some agencies reported that the presenter usually has excellent qualifications; others indicated that although knowledgeable, the person has no special expertise in highway maintenance. Some state agencies described the presenters as administrators or budget people with a general knowledge of highway maintenance but unfamiliar with details.

The person who presents the budget beyond the DOT level must be provided with data to support the necessity for the requested funds and the accuracy of the figures. Maintenance standards can be documented as shown in Figure 16 to aid the presentation. The presenter should have an extensive knowledge of highway conditions in order to make an effective presentation for the required highway maintenance funds; usually this is the last opportunity for the state maintenance engineer to "speak" for the budget. In 15 states the

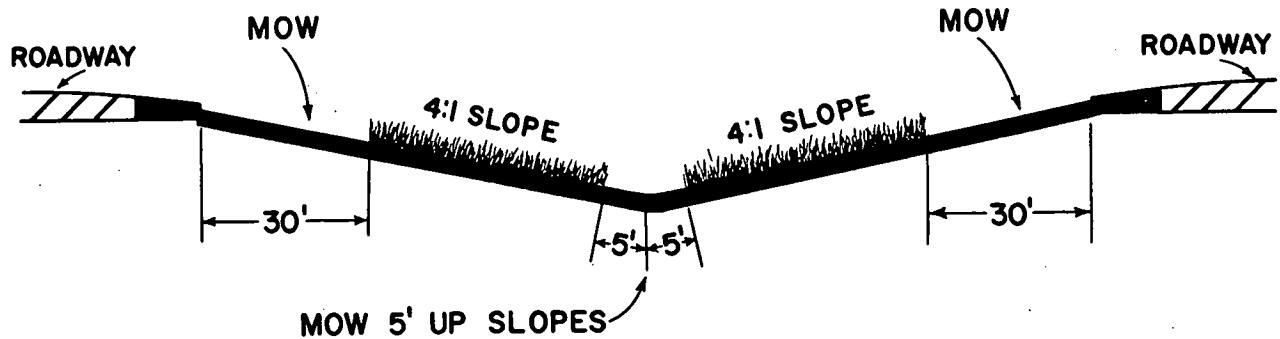


FIGURE 16 Diagram of maintenance standards used as a visual aid (Massachusetts).

state maintenance engineer appears before legislative committees, but only in a support capacity for higher authority. In three of these states, the state maintenance engineer may also make presentations; and one state agency sends its full-time highway maintenance budget analyst.

The presenter must plan ahead for the expected questions and the appropriate responses to those questions. Research should be conducted to determine possible problems in the districts of the individual members of legislative committees. The person presenting the budget must also be aware of lobbyists for special interests (e.g., those representing outdoor advertising agencies who wish to have trees removed so that advertising signs will be visible).

In most states, the chief administrative officer makes the budget presentation to a highway or transportation commission, state budget office, or legislative committee. The chief administrator, or the financial manager who may also make the presentation, is usually considered to be well-qualified, but often is not well-informed on the myriad of details accompanying the highway maintenance function. Although quite often the budget is submitted as a book full of statistics, successful administrators conduct workshops at every level in the agency to set the tone for the presentation. This in-house planning facilitates presentation once the budget process goes beyond the agency level. Increases in the budget are supported at legislative hearings with oral and written justifications and charts, posters, and other visual aids that emphasize key elements of the budget.

The formal budget presentations required at public hearings or before legislative committees create a forum for speechmaking and demonstrations of fiscal righteousness by legislators. Minor adjustments to the budget may result from formal presentations; however, major decisions are made in closed-door sessions with top management, budget staff personnel, and key legislators. Even states with "open meeting" laws make strategic decisions at informal meetings well ahead of the tactical matters formally presented in the actual budget document.

Zero-based budgeting methods are used in varying degrees. In general, highway maintenance personnel claim that these methods are not understood above the agency level and also, at times, within the agency. ZBB generates a great deal of paper work and although it is burdensome on those who have to develop the budget, it is a useful tool in convincing the chief administrative officer of the need for high-

way maintenance projects. When cuts are made in the highway maintenance budgets, ZBB is generally disregarded. Those making the cuts do not want to decide on specific reductions in highway maintenance; they wish only to reduce the dollar amount.

The budget presentation should include alternative materials and new processes that indicate a more effective solution to changed conditions. For example, when there is a shortage of asphalt, the presentation could indicate the substitution of dense-graded base course using calcium chloride and fines as the binder; or the presentation could suggest the use of sulfur-asphalt in bituminous concrete with less expensive local sand when there is a shortage of good-quality aggregates.

Presentations at the legislative level are improved by the soundness of the economic analysis, brevity of the presentation, and clarity of visual aids used to support special needs. Data such as pavement-rideability indexes and skid-resistance numbers aid in obtaining the support of the chief administrative officer, but are not of much value beyond the agency unless they can be related graphically (see discussion under Florida in Appendix B). Increases in the highway inventory should be identified in order to justify additional person-year needs. Work that will not be accomplished if sufficient funds are not available can be shown graphically (see Figure 13). Such documentation should be the main thrust when it is possible that budget requests may be substantially reduced. Otherwise the accent should be on the positive and innovative aspects of operational needs. An excess of facts and figures is just as detrimental as insufficient justification.

Some state maintenance engineers claim that legislators are not sensitive to presentation techniques, and that budget decisions are generally based on political expediency instead of on the rationality of the presentation.

One of the first questions usually asked by legislators is: Where can we cut? Usually, there is an attempt to reduce the budget by reducing the level of service on selected highway maintenance activities. Full justification is demanded if there is a proposed increase over the previous year's expenditures, any unusual programs, or betterments. For proposed improvements, geographic location must be given in addition to answers to the usual when, why, and how much questions, because some legislators may want expenditures in their own districts to be increased.

In one state a legislator who thought that the state was spending too much money for administration, engineering, and highway maintenance, considering the condition of the highways, proposed a 5 percent reduction in the operational portion of the budget in order to get the DOT either to justify its expenditures or to change its mode of operation. The legislator claimed that in time, the highway agency would be forced to operate by the procedure of "demonstrating that every dollar is spent so the ultimate benefit is derived for overall transportation needs. Only with this approach will the public ever be reasonably expected to further support the highway program. The future of the state highway system will hinge on public confidence in the ability of the department to manage its affairs."

In some states, there is no organized constituency to endorse the highway maintenance program; thus most state maintenance engineers contend that they must fight the battle almost alone. State agencies reported that no trucking or automobile associations have ever appeared before a legislative committee on behalf of the highway maintenance program. One state maintenance engineer indicated that he had never received an inquiry of any kind from any association in regard to highway maintenance. However, it appears that

associations would support highway maintenance on request by the agency.

Visual Aids

Most state governments use forms for submission of their budgets that are usually designed by the state budget director to facilitate the effort of combining all the various departmental budgets. In turn, the highway agencies use their own forms to collect the information they need for the state forms. Increasingly, states are performing this function electronically and subsequently are submitting printouts. However, this paper work, which makes for dull reading and results in tiresome digging for information, hinders the gathering of data by those who might be sympathetic to the need for sufficient highway maintenance funds.

Few states indicated the development of visual aids; and those that did so, with a few exceptions, did not rely on them to any great extent. An effective program of visual aids is necessary in the successful marketing of highway maintenance (see previous discussion under Justification of the Budget).

CHAPTER FOUR

CONCLUSIONS AND RESEARCH NEEDS

CONCLUSIONS

Not one state maintenance organization noted any serious problems with the mechanics of formulating budgets; all indicated that state maintenance engineers were capable of preparing budgets. Of much more concern was the packaging and marketing of the budget.

Each state has a different organizational structure and method of operation, which includes the overall DOT organization, various modes of transportation, and the state highway maintenance organization. Although most agencies conduct all highway maintenance operations under a single maintenance organization, in some states specific divisions are responsible for various maintenance operations, such as bridge, traffic, or roadside maintenance. Some state agencies perform maintenance work using only state employees, others perform a portion of the program under contract, and one state contracts all work with the counties. In addition, sources of funds, accounting procedures, climate, topography, state governmental organization, and politics vary greatly among the states.

Despite these differences, all state maintenance engineers must go through a budget formulation process, which may be accomplished either by the use of numerous forms and a large amount of paper work, starting at the district level (or

lower), or at the headquarters level by means of a computerized procedure that uses a maintenance management system and justification provided by the state maintenance engineer to produce a budget.

Budget formulation is based either on an objective maintenance management system and equipment management system or on one of the subjective methods discussed in Chapter 3. A maintenance management system can aid in the formulation and justification of budgets, and the added feature of an equipment management system can assist a highway agency in realizing a reduction in costs.

A budget must be formulated on a solid base in order to simplify the justification process. State administrators and legislators, although politically conscious at all times, are more likely to pay attention to the economics of the times, the soundness of the budget process, and the documentation thereof than to be persuaded by anything that is said or done at the public hearing concerning the budget. Many agencies have noted that major budget decisions are not only made "behind closed doors" but also well in advance of any required public hearing, even in states with an "open meetings" law.

Most states usually let a many-paged brochure of figures

and words do the selling of routine highway maintenance needs and, more often than not, betterments and new programs. It is only when a specific program is in danger of not being enacted that a decision is made to package and market the needs for that particular program. However, specific techniques can be used in selling physical maintenance programs, including brochures illustrated with pictures, charts, and diagrams; slide presentations; movies; round-table discussions with top administrators and/or legislators supported by transparencies on overhead projectors; and field trips.

Once enacted, the lump-sum type of budget allows the agency the most operational flexibility; the program budget provides somewhat less flexibility; and the line-item budget provides the least flexibility.

The responses to the questionnaire sent to state agencies did not indicate much enthusiasm for zero-based budgeting because of the huge amount of required forms and paper work, the lack of understanding by almost all involved, and the opinion that this method is not responsive to justifiable needs. The modified version is believed to be an improvement, but, in general, the ZBB is considered ineffective. The use of ZBB breaks down in the legislature because legislators are unwilling to be involved in decision-making at the activity or functional level, which would require them to cut specific programs or objectives. Legislatures continue to make budget cuts by reducing appropriations for labor, equipment, or materials (object of expenditure) instead of cutting specific objectives or programs.

Governors, legislators, and top administrative staff are concerned with the economics of the entire highway budget. Therefore, the budget presentation must justify the need for increased appropriations for highway maintenance, particularly if new or increased taxes will be necessary. If state maintenance engineers take the attitude that "this is our budget—it's up to someone else to get the money for us," they are apt to be subjected to external decision-makers (legislators and state administrators) outside the DOT, who may say: "You have X dollars, build your budget on that figure." On the other hand, if the budget is built without constraints, they may say: "We have cut your budget, do well with what we gave you." They may not realize the extent to which the budget cut reduces the highway maintenance program. Thus the agency may be left with insufficient funds for the maintenance program, with the result that the highway maintenance agency must devote its efforts to documenting the work that will *not* be accomplished. A more positive approach would be to show the conversion of resources to "products" coupled with the edification of key legislators, key members of their staffs, and key members of state budget offices in the budget formulation process.

The major emphasis of the responses to the questionnaire was on the need for additional funds for highway maintenance. The biggest problem in obtaining sufficient funds was reported to be inflation compounded by insufficient return from the motor-vehicle fuel tax. The most commonly suggested way to solve this problem was to change from a fixed tax per gallon of fuel to a percentage of the cost per gallon. Although this might have been an easy solution in 1978 and early 1979, it lost some legislative favor when fuel costs started to rise rapidly in the spring of 1979. However, some states still intend to pursue the change to the percentage

method; at least one state (Massachusetts) has recently enacted this measure.

There are many ways to increase the value of the highway maintenance dollar, including good preventive maintenance and obtaining more input by state maintenance engineers at the design stage of highways or bridges. Also maintenance engineers should routinely investigate the need to mow as often or as much as current policy dictates; the buying of roadside plantings; the utilization of certain rented equipment for short-term work; contracting for peak, seasonal activities or jobs that require special equipment, such as large-tree removal; and the expansion of centralized purchasing to see if funds can be saved to pay for critical highway maintenance activities.

Increasing productivity by means of a 4-day workweek in the summer can reduce costs. This schedule eliminates two rest breaks and travel from yard to job and return for 1 day, which increases productivity, particularly on projects such as bituminous or cement concrete work where time can be lost in setting up or taking down. Another method of reducing costs is the recycling of pavements or other materials, particularly if this results in energy savings. Other methods include specifying equipment with increased power-plant efficiency and the purchase of equipment that can be utilized year around (except such specialized equipment as salt spreaders).

The responses to the questionnaire by state agencies indicated some support for federal aid for highway maintenance, particularly if it is not accompanied by the red tape that is customarily evident in other federal programs. The 3-R program of resurfacing, restoring, and rehabilitating, although not maintenance in the true sense of the word, has been helpful in relieving the drain on highway maintenance budgets. One state agency suggested that it was time to redirect the construction program toward the improvement of the present highway system; i.e., correct alignments, make safety improvements, and widen and overlay within existing rights-of-way with a minimum of work on drainage structures. Although this is an attempt to stretch the construction dollar over more miles, in effect it would be an in-house 3-R program to preserve the existing highway network.

It is becoming increasingly difficult to document improved productivity. For example, when the first mechanized street sweeper was purchased, it could easily be justified by comparing its cost with the savings realized by the subsequent elimination of labor positions. However, as more sophisticated models are manufactured, it becomes more difficult to prove increased productivity. Even more complex is proving that increased productivity is the result of better management, methods, or materials, particularly when some of the decision-makers that are in office at the time of budget presentation will be out of office when the benefits are realized.

State maintenance engineers must be conscious of their legal and environmental vulnerability, and, in addition, must be aware of their responsibility to the public. Even though nonreplenishable sources of highway construction materials are diminishing in many parts of the country, state maintenance engineers are still expected to provide quality and quantity at the least cost for the social benefit of the community. They must strive for an optimal level of highway

maintenance by justifying the benefits of improved maintenance while demonstrating the disadvantages of insufficient maintenance. Experienced highway maintenance engineers are aware of the importance of preventive maintenance and repair at the time of need—not after extensive damage is done and the need becomes one of repair by replacement.

Some state maintenance engineers believe that the budget process would be significantly improved if rational, organized, and systematic input from elected officials and the public was available *before* the budget was finalized. Some of these engineers note the need for a highway maintenance “constituency” to support increased emphasis on maintenance. Planned use of the media at budget time can certainly be an asset, but highway maintenance is a year-round function and thus should be supported by a year-round budget selling job. Periodic press releases and presentations to service, social, or civic clubs with slides and/or movies can be part of the marketing of highway maintenance, especially if the highway agency has a good public information officer.

The state agencies with the least budget problems are those that do not need legislative budget approval. Even though these agencies have dedicated funds from user taxes, state maintenance engineers still must justify their highway maintenance budgets to the chief administrative officers. Highway agencies are feeling the pinch of reduced revenues as a result of reduced motor-vehicle fuel consumption.

State agencies that use dedicated funds and require legislative approval have found that some of those funds are being used to support highway patrols, mass transportation, etc. Dedicated funds are fine if they remain that way, but constant reduction can only hurt the highway maintenance function. In contrast, in Oregon in 1979, state police and state park expenses were removed from dependence on highway revenues; the general fund was used to finance these expenses. This was done in order to provide increased funds for the highway agency.

Almost all state maintenance organizations indicated the need for increased financial resources. Some support federal aid for highway maintenance, whereas others are seeking an inflation-sensitive system of taxing motor-vehicle fuel. It is recognized that with inflation and gasoline conservation efforts, a cents-per-gallon tax is a decreasing tax.

RESEARCH NEEDS

It is evident that research is needed to guide maintenance managers in making budget decisions, projecting costs and revenues for future budgets, and marketing the budgets.

Additional study on the presentation of the state highway maintenance needs (packaging and marketing of maintenance) is recommended. This study should be aimed at identifying the information required by highway administrators and key legislators. A pictorial representation of maintenance needs and maintenance levels of service for different classes of highways over both the short- and long-range might be included. Methods should be developed for the preparation of high-quality visual aids that promote and/or sell highway maintenance budgets and that depict costs, personnel needs, equipment needs, projected revenue,

materials, effects of deferred maintenance, and levels of service.

Research is necessary to develop more effective procedures for the justification of a meaningful budget, including determining state highway maintenance expenditures and the resultant benefits over the long term, monitoring trends of national highway conditions, determining whether conditions are improving or declining, and relating highway maintenance work to traffic volumes in a rational manner. Development of a procedure to establish priorities among highway maintenance and construction programs and within the highway maintenance function is recommended.

State maintenance engineers need to have information concerning the effects of oil shortages and price increases on operations. For example, one effect is increased use of public transportation, which requires the maintenance of parking lots for car pools and park-and-ride lots for buses and rail transit. Other recommended studies include an investigation of the effects of increased work flexitime practices on state highway maintenance operations; e.g., will the current peak traffic hours be extended so that there is less time for maintenance work between peaks on commuter roads? An in-depth study of the advantages and disadvantages of federal aid for state highway maintenance is necessary to determine if such aid is cost beneficial. Some state maintenance engineers have indicated a need for a uniform basis of comparing the highway maintenance costs of the states.

A recent series of meetings between highway engineers and administrators conducted by the Transportation Research Board and the Federal Highway Administration focused attention on specific research needs for the preparation of highway maintenance budgets.¹

• Development of Cost-Effective Maintenance Strategies

Objectives

1. Identify major maintenance activities.
2. Identify significant measurable deficiencies associated with maintenance functional activities.
3. Establish corrective maintenance work units and unit costs to correct identified deficiencies.
4. Establish a method to determine future conditions if needed corrective measures are deferred.
5. Assess the impact of doing or not doing work on safety, protection of capital investment, public support, aesthetics, etc.
6. Explore impacts of alternatives and deferring of maintenance work on future maintenance and rehabilitation costs.

• Demonstration Project to Develop and Test Methodology for Obtaining and Measuring Public Attitudes on Maintenance Service Levels

Objective

Provide decision makers with data on public acceptance of maintenance service levels.

¹*Highway Maintenance Research Needs—1980*. Final report prepared for the Federal Highway Administration. Transportation Research Board, National Academy of Sciences, Washington, D.C. (May 1981).

- Development of an Objective Procedure to Establish Priorities Among Maintenance Deficiencies

Objective

Establish numeric functions to be used to qualify maintenance efforts that would satisfy the requirements for maintenance within available resources.

- Highway Performance Level

Objectives

1. Identify maintainable elements of a highway facility and the functions of the elements.

2. Identify procedures for measuring the condition of maintainable elements.
3. Quantify the impact of various levels of service on the maintainable elements.
4. Develop a methodology that will summarize the overall benefits for various levels of service.

- Synthesis of Energy Requirements in Highway Maintenance

Objective

Report on available information describing energy requirements associated with maintenance equipment, materials, and activities, and identify areas where additional information is needed.

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APPENDIX A

SUMMARY OF STATE RESPONSES TO QUESTIONNAIRE AND FOLLOW-UP

Questionnaires were sent to all state maintenance engineers. Replies were received from 41 states and Puerto Rico. The total amount of the highway maintenance budgets of the 42 agencies was reported as \$3,207,000,000; the average was \$76.5 million. Some of the variance in the answers to the questionnaire appears to be the result of different methods of recording data. Many variations exist in the bookkeeping and budget procedures among the states that responded. The following summary is based on the replies to the questionnaires received from the 41 responding state agencies. Also see Table A-1 for a summary of the responses in addition to information gathered from the follow-up.

1. *What is your total state highway maintenance budget? Please give approximate percentages for personnel, materials, equipment (operating budget), and for contract work.*

The maximum maintenance budget was reported to be \$372,000,000, and the minimum was \$19,700,000. The maximum percentage of maintenance work performed by contract was 100 percent and the minimum was zero (see Table A-2 for the distribution). Nine states spend more than 60 percent of their operating budget on personnel, and 25 states spend more than 50 percent (Table A-3).

2. *(a) Does your agency's maintenance management system help or hinder the budget process? How? (b) Does your agency use an equipment rental system, equipment management system, or some other administrative program that provides financial resources support funds? If so, explain.*

The states that have a maintenance management system indicated that data from this system aid in development of budget. State agencies that are initiating this system suggested that it will be a useful aid when fully operational.

Those states that have a revolving fund as part of the equipment management system reported favorably on the fund. Some state agencies have the means to develop a fund but are reluctant to do so at this time.

3. *Is your agency using zero-based budgeting? What process (program, line-item, other) of budgeting is used in your state? Please describe it briefly. Does it work well?*

Of the 14 states that use zero-based budgeting, eight states partially use the procedure or a modification of it. Nineteen states have line-item budgets, 18 have program budgets, and

TABLE A-2
HIGHWAY MAINTENANCE
WORK PERFORMED BY
CONTRACT

%	No. States
<10	15
10 - 25	12
>25	10

8 have lump-sum budgets. Six states have some combination of program and either lump-sum or line-item budgets.

Thirteen states indicated that their budget system worked effectively, and three states indicated dissatisfaction. Most state agencies chose not to answer this part of the question.

4. *Who has the final review of the state highway maintenance budget within the transportation agency? If higher review is required, who has the final approval?*

All state agencies indicated that their budgets needed approval of the state highway commission or the head of the DOT; except for six states, legislative and gubernatorial approval is required (see Table A-1).

5. *Does your agency have dedicated funds for highway maintenance? If not, how is your state highway maintenance budget financed? Does maintenance have to compete for these funds?*

TABLE A-3
BREAKDOWN OF OPERATING BUDGETS

Expenditure Item	Average %	Maximum %	Minimum %
Personnel	53.3	68.2	37.5
Materials	28.5	59.0	11.7
Equipment	16.4	28.0	11.0

TABLE A-1 SUMMARY OF RESPONSES TO QUESTIONNAIRE INCLUDING RESPONSES TO FOLLOW-UP^a

STATE	Subdistrict	District	State Maintenance Headquarters	State Highway Administration	DOT Level	State Budget Officer	Legislative Committees	Legislature	Governor	Type of Budget ^b						% Agency Budget For		Lane-Miles Maintained	
										Lump-Sum	Line-Item (Obj. Exp.)	Program/Performance	Zero-Based	Annual	Biennial	Maintenance	Construction		
ALABAMA			1	2		3	4	5	6			X	X	X		12.5	87.5	27,755	
ALASKA		1	2	3		4	5	6	7		X				X			2,216	
ARIZONA		R	1	2	3	4	5	6	7	X		X		X		21	39	16,299	
ARKANSAS		1	2	3	4	5	5	6	7			X	P	X		81	19	34,470 ^c	
CALIFORNIA	1	2	3	4	5	6	7	8	9			X		X		23	77	52,152	
COLORADO		1	2	4		3			5			X	P	X		23	77	25,000	
CONNECTICUT		1	2	3	4	5	6	7	8					X				10,114	
DELAWARE		1	2	3	3	4	5	6	7			X	X	X		12	55	9,754	
FLORIDA	1	2	3	4	5	6	7	8	9		X	P			X	10	60	34,500	
GEORGIA		1	2	3	4	5	6	7	8		X		P	X				42,137	
HAWAII		1	2	3	4	5	6	7	8		X				X	15	85	2,176	
IDAHO	1	2	3	4	5	6	7	8	9		X	P	P	X		25	75	11,400	
ILLINOIS		1	2	3	4	5	6	7	8		X			X		11.4	88.6	40,870	
INDIANA		1	2	3		4	5	6	7			X			X	39	61	29,600	
IOWA		P	1	2	3	4	5	6	7	X			M	X		20	80	25,000	
KANSAS		1	2	3	4	5	6	7	8				X	X				23,400	
KENTUCKY		1	2	3	4	5	6	7	8			X	M	X		27	73	53,751	
LOUISIANA		R	1	2	3	4	5	6	7		X		X	X		25	75	36,858	
MAINE			1	2	3	4	5	6	7				X		X	47	18	21,521 ^d	
MARYLAND		R	1	2	3	4	5	6	7		X			X		23.5	76.5	14,584	
MASSACHUSETTS		1	2	3	4	5	6	7	8		X			X		21	79	11,600	
MICHIGAN		1	2	3	4	5	6	7	8		X			X		48.5	51.5	27,164	
MINNESOTA		1	2	3	4	5	6	7	8		X				X	30	70	29,881	
MISSISSIPPI		1		2		3	4	5	6		X			X		9	91	22,265	
MISSOURI		P	1	2									X		X	30	70	72,674	
MONTANA		1	2	3		4	5	6	7		X				X	16	84	18,298	
NEBRASKA		R	1	2	3	4	5	6	7		X			X		20	80	21,745	
NEVADA		1	2	3		4	5	6	7		P	P	M	X				14,250	
NEW HAMPSHIRE		1	2	3		4	5	6	7		X			X		37.6	62.4	8,735 ^e	
NEW JERSEY		1	2		3	4	5	6	7			X	X	X		27	12	10,220	
NEW MEXICO		1	2	3		4	5	6	7		X	P		X		30	70	29,825	
NEW YORK			1	2	3	4	5	6	7			P	X	X		40	60	40,146	
NORTH CAROLINA		R	1		2		3	5	4	X					X	31		158,151	
NORTH DAKOTA		1	2	3		4	5	6	7		X			X		18.7	74.1	15,501	
OHIO		1	2		3	4	5	6	7		X				X	40	60	42,314	
OKLAHOMA		1	2	3	4	5	6	7	8			X		X				26,432	
OREGON			1	2	3	4	5	6	7	X					X	24	75	19,250	
PENNSYLVANIA		1	2		3	4	5	6	7			X		X		73	27	98,141	
RHODE ISLAND		1	2		3	4	5	6	7		X			X				3,034	
SOUTH CAROLINA			1	2						X				X		33	67	82,400	
SOUTH DAKOTA		1	2		3	4	5	6	7			X	X	X		33	67	18,140	
TENNESSEE		1	2	3	4							X		X				24,629	
TEXAS		1	2	3	4	5	6	7	8	X			P		X	22	78	163,800	
UTAH		1	2	3	4	5	7	8	6			X		X		14	86	19,898	
VERMONT		R	1	2	3	4	5	6	7	X					X			5,958	
VIRGINIA		1	2		3						X				X	35	65	110,942	
WASHINGTON		1	2		3	4	5	6	7			X			X	36	64	16,684	
WEST VIRGINIA		1	2	3	4	5	6	7	8			X		X		26	74	55,600	
WISCONSIN		1	2	3	4	5	6	7	8	X					X	57	43	25,520	
WYOMING		1	2	3								X		X				15,154	
DIST. OF COL.																			
PUERTO RICO		1	2	3	4	5	6	7	8		X		X	X		36	64	6,637	

^aNumbers indicate order of budget process. R = review of 1.^bP = partial; M = modified.^cIncludes 3000 lane-miles of frontage roads.^dWinter lane-miles = 7,838.^eWinter lane-miles = 7,866.

Thirty-two states have dedicated funds to support their highway programs. Although there is some variation, a highway fund is the source of the entire highway budget in most states. In some states, a portion of this fund is used to support highway-related agencies, such as a police agency. Several state agencies specify that a portion of the fund be dedicated to maintenance; in other states, additional revenue from a general fund is necessary. Except in isolated cases, there appears to be a great deal of competition for dedicated funds.

6. What special steps does the maintenance engineer take to create a favorable reaction when preparing the budget for presentation to higher authority?

No special or outstanding steps appeared to be taken by maintenance engineers other than the usual documentation and justification of their budget requests. Little information was forthcoming on the use of visual aids; however, some agencies did send a few photocopies as examples of visual aids.

7. Does the maintenance engineer get the opportunity to appear before legislative committees during the budget review process? Does he make the presentation or is he in support of higher authority? If he does not make the presentation, who does and is that person qualified?

Fifteen state maintenance engineers appear before legislative committees in support of higher authority; three of these engineers indicated that, at times, they also made presentations. Almost all indicated that the person making the presentation to the legislature was qualified; however, one state maintenance engineer indicated that this was not so, and two states indicated that the presenter was only partially qualified.

8. Please explain in detail the biggest problem in obtaining sufficient funds for maintenance in your state and suggested ways to solve that problem.

Although the replies were stated in various terms and most agencies did not answer the question directly, most states indicated a need for additional funds for maintenance.

APPENDIX B

SUMMARY OF INFORMATION GATHERED FROM SELECTED STATES BY PERSONAL INTERVIEW AND BY MAIL OR TELEPHONE

PERSONAL INTERVIEWS

In order to obtain information on a variety of budget formulation methods and procedures, the state agencies of Colorado, Massachusetts, Texas, and Washington were chosen to be interviewed on the basis of their preliminary answers to the questionnaire.

In Colorado, the program type of budget is used and is submitted annually. ZBB is partially used, and no legislative action is required for budget approval. At the time this synthesis was prepared, an MMS had been implemented for 1 yr. Ninety-nine percent of the work is performed by force account.

Massachusetts uses a line-item budget, which is submitted annually. ZBB is not used. Legislative approval of the budget is required. An MMS, not currently used, is in the development stage. Twenty-six percent of highway maintenance operations is performed by contract.

In Texas, a lump-sum budget is used, which is prepared on a biennial basis. The state has a unique method of providing needed highway maintenance funds; a highway cost index is used to offset inflation. Both an MMS and an EMS are in the development stages. Ninety-eight percent of the maintenance work is performed by force account.

Washington uses a program budget, which is prepared on a biennial basis. An MMS has been used for the past 10 yr; an EMS with a true revolving fund is also used. The state agency reported that both systems had a high level of credibility with the legislature.

Colorado

Although the Colorado Highway Commission is not required to submit its annual budget to the state legislature for approval, the highway maintenance budget is carefully reviewed at various stages from conception to final approval by the commission. The budget is sent to the governor for further approval; the governor can delete items from the commission's approved budget, but cannot add to it.

The Highway Commission is comprised of nine members, each appointed for a 4-yr term. Upon election, the governor can immediately appoint five members; after 2 yr he can appoint the other four members. Thus the governor has "control" over the commission for his entire term. The actual administration of the Highway Commission is performed by an executive director appointed by the governor. The commission meets once a month.

Colorado is divided into six districts, each having a district engineer. Two of the districts have two maintenance sections because of the topography in the western part of the state; the other four districts each have one maintenance superintendent who is not an engineer but someone who has advanced through the ranks of the highway maintenance forces. The state performs 99 percent of the highway maintenance

work with its own work force, rarely resorting to contract work.

The district engineer reports directly to the assistant chief engineer for operations, the same person to whom the state maintenance engineer reports. The assistant chief engineer reports to the chief engineer, Department of Highways, who reports to the executive director, who in turn is directly responsible to the Highway Commission and the governor.

The state maintenance engineer has no line function but acts in a staff capacity. Within this office, a maintenance management system engineer prepares a work program budget for each district based on historical data as well as updated costs for materials, labor, and equipment. This is sent for review by the district engineer and the maintenance superintendent, who modify the budget based on local conditions or changes in inventory. At this point, the budget is forwarded to the state maintenance engineer; it is carefully analyzed to ensure that all facets of the highway maintenance function are properly provided for and that they are within the limitations of the funds available.

The chief engineer and the assistant chief engineer then review the requests generated by the MMS, the requests of the districts, and any additional needs based on lane-miles that may have been recently increased or are about to be increased. The executive director is kept informed of any unusual circumstances in the budget process and, along with the chief engineer, the assistant chief engineer, and the department budget director, reviews the budget to ensure that it is within the expected revenue limits.

It is the chief engineer's responsibility to present the budget to the highway commission, which meets for this specific purpose, and to justify any proposed increases. The commission is reluctant to add any full-time positions except for those required for the increased mileage that has been opened to traffic during the previous year. The highway commission will not commit all of the expected revenues; instead it retains a reserve for unexpected highway expenditures, such as those resulting from a sharp increase in the rate of inflation, which can be requested by the highway maintenance department by submittal of a supplemental budget. After the highway commission approves the budget, it is sent to the governor for approval.

Every spring and fall, the highway commissioners take a 3-day tour of the state highways, inviting members of the legislature to join them in their own districts.

Major repairs are usually financed by either construction or 3-R funds through the contract method and are not done by force account or reimbursed out of highway maintenance funds. An example of this type of work is the repair and resurfacing of the deck of a viaduct structure. Certain state highways are maintained by county or city highway agencies, which are reimbursed by the state.

In an effort to get the most value out of each dollar spent, a task force was developed. Elimination of snow removal on certain mountain passes between the hours of 6 p.m. and

6 a.m. and a drastic reduction in mowing operations are two examples of decisions made by the task force.

The resources to support the budget come primarily from a fuel tax of \$0.07 per gal, a ton-mile tax, and license and registration fees. Recently, instead of increasing the fuel tax, the legislature instituted a sales tax on automobile and automotive parts for a 3-yr period. The revenue is placed in a highway user fund with the state patrol, Department of Revenue, and highway safety being funded off the top before construction or highway maintenance needs are considered. Roughly, the income is apportioned two-thirds to the state and one-third to county and highway agencies. In 1980, the commission asked for a \$0.01 increase in the fuel tax for the following year, another increase of \$0.01 for the following year, and then a change to an 8 percent tax with a maximum limit of \$0.12. Instead, there was a transfer of \$60 million from the general fund surplus to the highway user fund. The highway maintenance department will receive 60 percent (or \$36 million) of that amount for maintenance and major reconstruction.

The highway maintenance budget, as finally adopted, is divided as follows: personal services, operating expenses, travel expenses, property improvements, and snow and ice control personal services and operations. The budget is neither a true line-item type of budget nor a program budget, except for snow and ice control.

Operations under snow and ice control include the usual costs for materials, contract work, etc. Also included are funds for rental of equipment used by the districts; the dual-rate system is used—assignment charge and usage rate. These funds go into an equipment reserve fund that pays for the purchase of new or replacement equipment. Purchases are not subject to approval by the Highway Commission. Standard types of equipment, such as pickups and patrol trucks, are purchased through the state purchasing agent; specialized highway maintenance equipment is purchased by the Highway Commission purchasing agent; and all obsolete equipment is sold at auction.

Although subject to a regimen in the formulation and justification of the highway maintenance budget similar to the process in most states, the state agency does not have to go through the selling procedures necessary in states that must secure legislative approval. This eliminates hearings before committees that are involved with many other matters. Everyone involved in the budget process is knowledgeable in the needs of highway maintenance.

Massachusetts

The Department of Public Works, within the Secretariat for Transportation and Construction, is the operating agency for the state highway system in Massachusetts. The department has a commissioner and four associate commissioners, all appointed by the governor, who are full-time employees for a term coterminous with that of the governor. The commissioner is the chief administrative officer; a chief engineer is in charge of the operating divisions, and a director of administrative services is in charge of support activities.

Until July 1980, the motor-vehicle fuel tax was \$0.085 per gal and was dedicated to the highway fund. About \$0.0288 was expended on state highway maintenance; \$0.005 was

recently taken from maintenance to support state aid to municipalities. The deficit in the overall highway fund, if any, is made up by an annual transfer from the general fund. In July 1980, Massachusetts adopted the percentage type of fuel tax, which is now 10 percent of the wholesale cost of fuel.

Massachusetts operates from a line-item budget with very little flexibility for highway maintenance operations. The budget is separated into programs. Personnel is a line-item that is divided into two separate subsidiary expenditures: permanent and temporary. Temporary expenditures are further subdivided into items for additional temporary employees and for overtime work. Snow and ice control expenditures are divided into three subsidiary expenditures: materials, contract services for highway cleaning and catch-basin cleaning, and equipment rental.

The maintenance of safety pavement markings is divided in much the same manner, with the FY 1981 budget request as follows:

Appropriation	Subsidiary	Object Code	Amount
6030-7301	12	601 Contracts	\$200,000
6030-7301	12	608 Materials	755,000
6030-7301	16	731 Equip. Rentals	10,000
6030-7301		Total	\$965,000

The justification for each of the object codes was given as follows:

Object Code 601 (\$200,000). In view of the great volume of roadway requiring pavement marking, it is unrealistic to assume that department forces could efficiently accomplish the work load on their own. The seasonal nature of the work is such that completion is required within a comparatively short period of time. It would be economically unsound for the department to employ additional crews or to purchase certain required specialized equipment. This request is for funds for contract services to supplement the work performed by department forces.

Object Code 608 (\$755,000). This request is based on anticipated requirements for safety traffic-line painting materials, projected to FY 1981. The materials are required for department force account traffic-line painting activities, and are necessary to provide pavement markings that meet safety standards. The costs of such materials (paint, reflective beads, reflective pressure-sensitive tape, thermoplastic) continue to rise annually, and the volume of work increases with each new lane-mile of highway added to the state highway system.

C.R. paint (white)	32,500 gal	@ 5.40	= \$146,250.00
C.R. paint (yellow)	45,000 gal	@ 5.00	= 225,000.00
Hot paint (white)	26,000 gal	@ 3.00	= 78,000.00
Hot paint (yellow)	24,000 gal	@ 3.00	= 72,000.00
Reflective beads	750,000 lb	@ 0.17	= 127,500.00
Toluene	20,000 gal	@ 2.20	= 44,000.00
Thermo-powder	10,000 lb	@ 1.25	= 12,500.00
Temp. tape	200 rolls	@ 25.00	= 5,000.00
Stamark	20,000 (12-in.)	@ 1.80	= 36,000.00
Stimsonite repl.	5,000 ea.	@ 1.50	= 7,500.00
Miscellaneous			1,250.00

Object Code 731 (\$10,000). This amount represents the estimated cost for the rental of safety traffic-line painting

equipment required on certain projects as a supplement to state-owned equipment. Especially during the summer painting season, it is necessary to rent additional specialized equipment in order to keep pace with the seasonal work load. The rental rates for this specialized pavement-marking equipment continue to rise in light of current inflationary trends.

The *approved budget* was received as follows for the safety pavement marking account:

6030-7301	For expenses in connection with traffic line painting, including the cost of materials \$900,000 (Highway Fund 100.0%)
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Note that all funds come from the highway fund, not from the general fund. Also note that the ultimate appropriation is \$65,000 less than requested and that there is no indication of where the cut should be made.

The highway maintenance division can transfer from one object code to another (within a subsidiary), but if needs dictate a transfer from one subsidiary to another, approval is needed from the secretary of transportation (head of state DOT) and the state budget officer (from the governor's office).

The highway maintenance budget is initiated at the district level by the district maintenance engineer after conference with the various foremen and engineering assistants. It is submitted by the district engineer to the state maintenance engineer for review to ensure that the total amount requested for the eight districts does not exceed expected revenues. The state maintenance engineer inserts the requests for funds needed for contractual services. The budget is then submitted to the chief administrative officer for careful review before being forwarded to the state budget director and to the bicameral legislature where the two Ways and Means (Finance) committees are charged with the responsibility of ensuring that the budget is sound. A joint public hearing for the two committees is usually held with the five highway commissioners in attendance. The maintenance budget is included in the total highway budget, which is supported by dedicated funds; however, it is incorporated with the general appropriation act as a single piece of legislation.

Although there is a Transportation Committee in each house of the state legislature, the two committees do not, as in Washington or Texas, become involved in the highway operating budget process. Senators and representatives who are not on the Ways and Means Committees do not appear at the public hearing on the highway budget, but do discuss matters of interest with key members of that committee. There appears to be a desire to have the Transportation Committees hold the public hearings on the highway budget, but to be under the Ways and Means Committees in the overall appropriation act. The legislature appears reluctant to relinquish its control over spending and give the highway department the flexibility needed for effective and efficient management. Legislators believe that more attention will be devoted to maintenance in the future because most highway maintenance operations are visible and smaller passenger vehicles are more affected by roads with poor rideability qualities than are standard-size cars.

After the budget has been passed by the legislature, the

governor has the option to approve it, veto by line item, or veto the entire budget.

The dedicated funds, derived from the fuel tax, driver-license fees, motor-vehicle registration fees, etc., are placed in the highway fund. Expenditures for debt service, state police, construction, and state aid to municipalities, etc., are taken off the top; the state Division of Personnel takes a percentage for the administration of that part of the civil service department devoted to highway personnel; and a percentage goes to a few other minor divisions before maintenance is considered.

The state's new MMS is expected to be fully operational in FY 1983. This should enable the state to develop a program budget that will provide flexibility not currently available in state highway maintenance operations. It will also improve overall management capabilities and aid in the justification of budgets. Legislative action is required to make the change from a line-item to a program/performance type of budget.

Past equipment rental rates were so low that they were not practical; however, revised rates became effective at the beginning of FY 1981. The state does not have an EMS. There is a central repair shop and each district has a repair shop. Any type of equipment can be repaired in these shops; however, because of the lack of personnel, some units are repaired by private shops. When the budget is prepared, each piece of equipment must be listed as a replacement or a new piece of equipment. Cuts are usually made in the equipment classified as new. Each replacement item must be listed in order of priority. Any changes in the approved list, which is prepared about 9 months before final budget approval, must be approved by each Ways and Means Committee. It is believed that an EMS with a true revolving fund would eliminate the unnecessary red tape and delays caused by such requirements, improve the overall efficiency of the equipment, and, in turn, reduce the unit cost of maintenance operations.

Texas

During the biennial sessions of the state legislature, funds are appropriated for operation for the Department of Highways and Public Transportation. Dedicated funds are derived from motor-vehicle registration fees and three-fourths of the motor-vehicle fuel tax, which is \$0.05 per gal.

In 1977 the legislature passed a bill that provides additional funds from general revenues for operation, construction, and maintenance of the highway system. This legislation provides for the department to receive a funding level of \$750 million in constant 1979 dollars. The 1979 dollars are increased by a cost index that is based on the weighted combined costs of operations, maintenance, and construction for the appropriate fiscal year compared to the same costs in FY 1979. The cost index is used to assure the constant funding level for the highway system. The following formula is used: the amount to be transferred is equal to \$750 million times the highway cost index minus the dedicated revenue.

Because the department is mandated by state statute to maintain the state highway system, maintenance is assigned the highest funding priority within the department. Highway maintenance funding levels established during recent years have been based on historical cost data and adjusted for

inflationary trends and the desired level of maintenance work program.

The relatively simple process of budget approval and legislative appropriation for state highway maintenance followed in the past is becoming more complicated. The state appears to be on the threshold of experiencing problems similar to those in other states in the identification of highway maintenance needs in a documented manner for the purpose of justifying the need for increased highway maintenance funds.

Although the state currently does not have an MMS, plans are under way to implement such a system in order to develop a budget to meet the needs of the 25 districts in a more equitable manner. The Highway Maintenance and Operations Division is not satisfied with the current method of determining the amount of funds to allocate to each district. The department strives to give each district as much flexibility as possible; this is reflected in the final state budget as enacted by the legislature and approved by the governor. It is recognized that the flexibility to react to rapidly developing highway maintenance needs is necessary in any highway maintenance work program.

As submitted by the department, the highway maintenance budget is a line-item budget, which is general in nature and contains only the following items: personnel; gas, oil, and lubrication; consumable supplies (gravel, paint, bituminous concrete, signs, etc.); travel; other operating expenses (contract maintenance); and capital outlay (maintenance-equipment purchase). The approved budget is returned in the form of a lump-sum budget containing only the following items: maintenance management (administration) and maintenance work.

The amount budgeted for maintenance work has almost doubled in the past 2 yr. It is one of only two activities involving personnel that is not currently limited by the legislature. However, the department reduced the total number of employees from 20,270 in 1969 to about 14,420 in 1980; the number of highway maintenance employees was reduced from 9,500 to 7,400. The state performs 98 percent of maintenance work with its own forces and relies on contract work for 2 percent of the total work load.

The department enjoys a reputation for effective highway maintenance operations and management with the budget staffs of the governor and the legislature as well as with the press and the public. However, the department is working on improved guidelines for operations in order to develop uniform levels of maintenance on similar systems within the various districts. One goal is to develop a pavement evaluation program so that priorities can be assigned within the work load. Pavement maintenance constitutes about 45 percent of the maintenance budget.

The department is required by the Legislative Budget Board to utilize the zero-based budget system related to the current level of funding and 90, 100, and 110 percent of current needs; however, the department notes that the system has not been successful. When zero-based budgeting was first introduced, it was considered beneficial because it explained the "how" and "why"; but because of the cap on expenditures, this approach is no longer providing meaningful benefits. The governor's program and budget staff recommended that the department use zero-based budgeting, if possible, and also develop measures of performance.

The state engineer-director is the chief administrative of-

ficer for the department and is responsible to the governor and the commission. The commission, which meets once a month for 2 or 3 days, is comprised of three members, each appointed by the governor for a 6-yr term. Because the terms are staggered, the governor does not have "control" of the commission for the first 2 yr of his 4-yr term. The state engineer-director has two assistants: one for administration and one for operations. There are 25 district engineers who are responsible for highway activities within their districts. The staff functions at the headquarters level are supervised by division heads.

The budget process begins when the district maintenance engineer interviews the foreman in charge of each maintenance section to determine needs based on historical data, observations, and changes in work-load inventories. The district then submits a proposed budget, within funding guidelines established by headquarters, to the Safety and Maintenance Operations Division, which, in turn, modifies the proposal based on historical data available in that office.

The budget is then sent to the financial division of the department where it is assembled with other division budgets. Final preparation is coordinated with the engineer-director and his two assistants. The budget then goes to the commission to be reviewed from a policy point of view and to ensure that it is within general guidelines and prescribed funding levels. If there are any questions, the chief engineer of safety and maintenance operations is requested to supply the answers or justification. Sample questions might be: What would happen if the budget were to be cut 10 percent? Are there any other ways of doing certain maintenance operations? No major changes, however, have ever been made at this stage, as the commission generally accepts the figures as prepared by the Safety and Maintenance Operations Division.

At this point, the budget becomes a dual process. It is submitted to the governor's Planning and Budget Office and the Legislative Budget Board, jointly supervised by the lieutenant governor as chief of the state senate and by the speaker of the lower house. Both groups give the budget a fairly detailed review with any necessary justification for the highway portion being supplied by either the department's financial division or the engineer-director.

There are three public hearings on the budget: (a) by the joint staffs of the governor and the legislature; (b) by the Legislative Committee on Transportation, which is considered the appropriating committee by the House Appropriations Committee; and (c) by the Senate Finance Committee. The state engineer-director is responsible for making the presentations at each of the hearings.

Although the department uses general measures such as lane-miles, the first hearing concentrates on such details as required gallons of paint or tons of patching materials. The Transportation Committee is more program-oriented, seeking justification that the proposed operations are sound. The Finance Committee looks at the dollar needs as they relate to other departments, particularly because the revenue from the fuel tax has leveled off and shows a decreasing trend of about 5 percent per year.

The Texas Good Roads and Transportation Association actively lobbies and appears at public hearings on behalf of the department. Complaints from the constituents are not considered negative; instead they are used to justify the need

for more funds for improved maintenance, usually at the expense of construction. Usually the major negative complaint is that there are an excessive number of workers on a specific project; however, this type of complaint has no effect on the budget process.

The governor's Planning and Budget Office develops an independent review of the budget. Generally, the budget, insofar as highway maintenance is concerned, is accepted by both groups without any extensive changes.

The budget is initially developed as a program budget, but when submitted above the department level, it must conform to the outline mentioned above. Therefore, in reality, the Safety and Maintenance Operations Division must develop two budgets. This became a problem during the division's first attempt to install an MMS in that it was difficult to transfer the data to the legislative budget format.

At one time, the budget appropriated by the legislature for highway maintenance was in terms of "estimated-to-be." Then a cap was put on expenditures and inflation was not considered for 2 yr. Now an inflation factor is taken into consideration for the second year of the budget.

The department has an Equipment and Procurement Division that develops equipment policy and purchases and disposes of equipment. Each district submits its equipment needs to this division during preparation of the budget. Except for unusual repairs or specialized equipment, the district maintains the equipment in the district shop, and preventive maintenance is performed at the section level. There is no revolving account; the single rental rate system is based on usage. Operational costs are charged on a class basis, and ownership costs are considered. Purchases come under the capital outlay program of the Safety and Maintenance Operations Division. When equipment becomes obsolete or surplus, the DOT is required to offer the equipment to counties and other governmental subdivisions at a considered salvage value. If no interest is shown, the equipment is either sold at auction or through sealed bids. The latter method is used mostly for special equipment such as dozers or graders.

Washington

In the past, the state legislature met in biennium sessions and biennial budgets were passed. During the preparation of this report, the state constitution was amended so that the legislature now meets in 2 yearly sessions. These sessions allow an agency to ask for and receive two supplemental appropriations. Each budget submission must be accompanied by a 6-yr plan of programs and costs.

Until 1978 the state had a \$0.09 motor-vehicle fuel tax. The expanding economy that followed World War II, together with construction of a modern highway system that encouraged vehicular travel, resulted in increased fuel-tax revenues. But with the arrival of the energy crisis, followed by inflation, revenue from the fuel tax leveled off and then began to drop. The 1978 legislature passed a variable tax based on a percentage of the cost of fuel with a maximum of \$0.12 per gal. This maximum has been reached; the need for additional funds will necessitate either an increase in the limitation or some other means of taxation. Revenues from the fuel tax are placed in the motor-vehicle fund and dedicated to highway purposes. Revenues are distributed as shown in Figures B-1 and B-2.

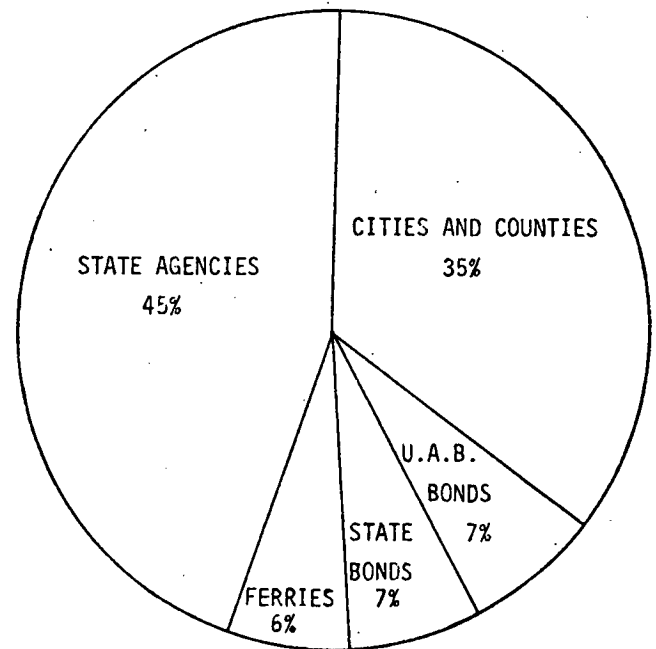


FIGURE B-1 Distribution of fuel-tax revenues in Washington. The category of state agencies includes the State Patrol, Department of Licensing, Department of Transportation, and other highway-related programs.

Ten years ago the state DOT highway maintenance budget was \$52 million for the 2-yr program; today (FY 1980) it is \$122 million. Although the budget has doubled and the total number of personnel has decreased, the DOT reports that the level of service currently being provided is the same as that provided 10 years ago, because of the use of more sophisticated equipment and operational techniques and more effective management through use of a maintenance management system. This system is called the maintenance information and control system (MICS).

The MICS, in use for 10 yr, develops the dollar needs and person-year needs for each highway maintenance function, such as pavement maintenance, snow and ice control, and sign maintenance. The DOT develops a program budget for the 2-yr period to justify budget requests, but after the budget is enacted, the department is given a lump-sum appropriation in order to provide more flexibility to highway maintenance operations.

From the initial preparation of the highway maintenance budget until it is submitted by the department to both the state Office of Financial Management and the Legislative Transportation Committee (LTC), the budget is subjected to several reviews.

Each district in the state has a district administrator and a district maintenance engineer. The district maintenance engineer and the assistant state maintenance engineer provide one review of the budget; the district administrator and the state maintenance engineer provide another review. The Management Services Division prepares summaries and analyses of the budget for review by the secretary of transportation, deputy secretary, district administrator, and state

maintenance engineer. The approved plan is forwarded to the Transportation Commission. If there are questions, the state maintenance engineer furnishes the answers. Further review might involve the district administrator.

The Legislative Transportation Committee (LTC), which is not a Finance Committee or Ways and Means Committee, acts on the WSDOT budget. The LTC conducts the public hearing on the budget because the highway budget is a separate document from the general budget. The management services manager makes the WSDOT presentation before the LTC. In turn, the LTC supplies any needed justification at the time of debate before the full legislature.

The LTC has a full-time director of budget and fiscal analysis who has the responsibility for following the development of the budget from its inception to final enactment. The LTC director works with the WSDOT staff and joins the state maintenance engineer in visits to the six district administrators in order to become familiar with each of the budget programs. The LTC is more concerned with the soundness of

the budget process than with the final figures; this is based on the belief that if the budget is developed in a sound, logical manner, it will be practical and cost-effective.

The efforts of the LTC director of budget and fiscal analysis are essential in communicating the department's budget to the LTC. Because of his knowledge about the department's procedures, the LTC director is able to answer the questions of individual legislators and to relay legislative concerns to the department. It is believed that a short and simple method of presentation at the public hearing coupled with visual aids speaks louder and clearer than volumes of statistics.

Although negative reactions, such as complaints about dirty rest areas, signs that need washing, or employees not working, must be acknowledged and dealt with, they do not have any adverse effect on the budget process.

One idea under consideration is the possibility of developing visual aids for enhancement of the budget process. A series of transparencies could show the range of problems

1979-1981 BIENNIUM
(\$ IN MILLIONS)

NOVEMBER 15, 1979

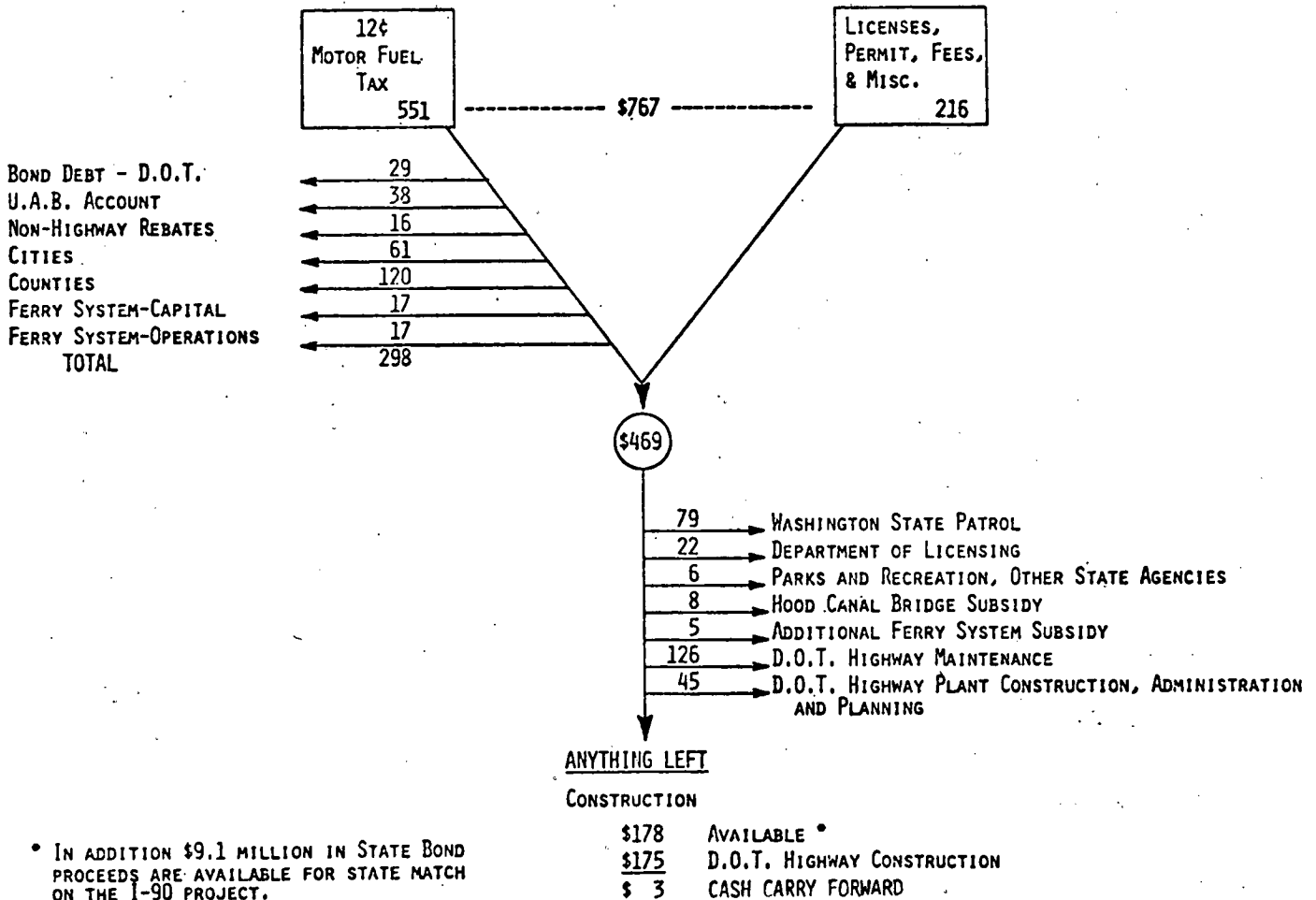


FIGURE B-2 Motor-vehicle fund—state revenue forecast and distribution (Washington).

encountered in pavement repair; e.g., from minor cracking to major cracking to potholes to raveling to deterioration. The various preventive solutions, including complete replacement, could be illustrated. The cost per yd² to accomplish each method of repair could also be presented to indicate the progressively increasing amounts of work required and the higher costs that will be incurred if timely physical maintenance is not performed.

To ensure a balanced budget, there is a state requirement that the budget be reviewed at the end of the first year and between legislative sessions. Although inflation is taken into consideration for the second year of operation, there might be an overrun in the first year. Such a review entails much paper work, but it prevents overspending during the second year. If there is an overrun in the first year, it must be justified by the state maintenance engineer who has thorough knowledge of each district's program and problems, including climate, population, and types of highways.

Until a few years ago, the budget was developed on a needs basis. At the present time, the WSDOT must make the budget fit the expected revenue. It is believed that the several reviews enable the WSDOT to get the most out of each available dollar. With the legislative staff monitoring the budget process from inception and having confidence in the process, the highway maintenance budget has never been cut. The LTC director may look for items that could be deferred—items that will not be detrimental to the integrity of the highway facility. He is fully aware of the problems caused by inflation and by the leveling off or reduction in fuel consumption, and the problems associated with any proposed increase in the fuel tax.

The WSDOT notes that because the MICS is more objective than previous systems and because the Legislative Transportation Committee comprehends the system, there is currently much better communication between the department and the committee.

Although the highway maintenance function does not have the glamor associated with the construction of a new highway, it is no longer considered second to construction. The legislature has recognized the need and consequently the importance of maintaining the state highway system.

Although there is no support for the highway maintenance budget outside of the WSDOT, it is strongly believed that any severe cutbacks would be opposed and the need for increased funds would be supported by both highway-user organizations and trucking associations.

The WSDOT has a transportation equipment fund (TEF), which is a true revolving fund. The TEF is used to purchase, maintain, repair, and sell through auction all motorized equipment used by the WSDOT for highway maintenance and engineering functions. The users of the equipment pay rent to the TEF, which supports all costs of equipment ownership including inflated replacement costs and some expansion of the fleet. For most types of equipment, the dual rental rate system is used, which includes a rate for assignment and a rate for use. Because the fund is self-supporting, it is not subject to legislative approval.

The LTC director has encouraged communication between the WSDOT highway maintenance administrators and the legislature by organizing a meeting every 2 yr to explain the MICS and its use in budget development to key members

of the legislature. This procedure, which ensures that top WSDOT administrators are fully aware of the process, has resulted in a high degree of credibility for the MICS—in fact, so much credibility that department administrators sometimes have the impression that planning highway maintenance activities for the next biennium is a precise art. Thus when accomplishments are not consistent with the plan, there is much criticism. To improve this situation, the highway maintenance staff intends to refine levels of maintenance, taking into consideration “outside” factors such as traffic volumes.

MAIL AND TELEPHONE RESPONSES

Information on various budgeting procedures was gathered by mail or telephone from the following states: Alabama, Arizona, California, Florida, Illinois, Kansas, Louisiana, Michigan, New Jersey, New York, Ohio, Oklahoma, Oregon, South Dakota, Tennessee, Virginia, West Virginia, and Wisconsin.

Alabama

Approximately 1 to 2 yr before the start of a fiscal year, the routine maintenance budget is developed in its entirety in the Bureau of Maintenance at the headquarters level of the state highway department. The process makes considerable use of the MMS and its related computer programs. The budget is submitted to the department's accounting bureau where it is combined with the budget requests from other bureaus and then transmitted to the Executive (State) Budget Office. The budget of the highway department is normally submitted unbalanced and shows anticipated revenues compared to the larger amount of requests. At a later date, the Executive Budget Office returns the budget request for balancing, thus giving the highway department the option to select the areas of adjustment.

Although the state has dedicated taxes for highway purposes, including a tax of \$0.07 per gal on motor-vehicle fuel, commitments from elected officials not to raise taxes limit any revenue increase; therefore, the governor's staff and the legislative committees make an apportionment to each department. Any additional funds needed by the highway department must be made available by special appropriation from the general fund or from revenue-sharing monies.

To some extent, the highway department has implemented zero-based budgeting in support of the program budget. Funds allocated to the highway department for routine highway maintenance are less than the proposed, realistic, or requested amount. The political process, including current attitudes and the political atmosphere, has considerable influence on the amounts of money allocated for highway purposes, including routine highway maintenance.

The highway director and chief accountant normally make the presentation of the highway budget to the Executive Budget Office and the legislative committees. Budget cuts are made as a lump-sum from the total budget. In FY 1979 a budget increase of 2.3 percent fell far short of the 16 percent increase in the requested level of service.

Arizona

The Arizona DOT budget is both lump-sum and program/performance. In the highway maintenance management system, the annual work program/performance budget is an expression in financial terms of the resources required (labor, equipment, and materials) to accomplish the annual work program.

The annual work program is based on the application of quantity and performance standards for each highway maintenance activity as adapted to the inventory of maintenance features on the highway system. The program defines the type and amount of work anticipated in order to provide the desired level of maintenance service on a recurring routine annual basis. The annual work program is expressed in work units required for each activity per year. Program development involves the following elements: maintenance activities, maintenance features, maintenance feature inventory on the highway system, quantity standards, planned work units, performance standards, and resource requirements.

Resource requirements are calculated first in terms of crew-days and man-hours by applying average daily production standards and typical crew sizes to the planned work units. For those activities with planning values expressed in estimated man-hours, the resource requirement is established from historical data and the district maintenance engineer's judgment of the annual need. Annual equipment and material requirements are forecast by applying performance standards to the number of crew-days programmed. In addition, in a similar manner, resource requirements are forecast for nonroutine highway maintenance activities.

The annual work program plus the nonroutine program make up the total work program for highway maintenance. This total, expressed in financial terms, is the lump-sum that is requested for appropriation by the state legislature. This lump-sum appropriation is then distributed to the various districts in terms of the resource requirements for the total work program developed in that district. The DOT and all other state agencies rent equipment from a statewide equipment department.

California

The California Department of Transportation (Caltrans) uses an MMS, which is divided into programs and activities applicable to the program type of budget. Included under the department are transportation planning, aeronautics, highways, and mass transportation. Highway maintenance is only one element of the total highway program (Figure B-3).

The department is currently operating on the "top down" principle; that is, the department is informed of the amount of money available for highway maintenance and must prepare its budget accordingly. Although there is a Budget Review Committee, the director has the final approval before sending the budget to the legislature. In addition, the state has a Transportation Commission, comprised of appointed officials, to oversee the transportation programs in the state. The commission reviews the budget and reports its recommendations to the legislature.

Caltrans, along with the state Department of Finance and the legislative analyst (an employee of the legislature), appears at the hearings held by the Assembly Ways and Means

Subcommittee and the Senate Finance Subcommittee. These subcommittees report their recommendations to the full committees, which take action to bring the budget bill to the floor of the state assembly and senate. Caltrans provides information to each branch of the legislature. Each branch prepares a budget and then a Joint Conference Committee works out any differences between the two versions.

The budget that is approved by the legislature allocates person-years and funds to the element level (Figure B-3). Highway maintenance is one element and includes all of the maintenance activities associated with a highway system. If an element runs out of money in any given year, the Department of Finance has the authority to make adjustments of up to 10 percent among elements; however, the legislature must be informed of the adjustment. Adjustments in excess of that amount must be approved by the legislature.

Florida

All budget requests are submitted in a format developed by the governor's Office of Programming and Budget. Although prepared in a program-type format, the budget is often treated as line-item in order to achieve overall budget reductions. This usually affects capital outlay programs for buildings and equipment, because large items are prime candidates when reductions are necessary.

In the past, state highway budgets were not subject to legislative review; maintenance programs received the necessary funds for increases in personnel and equipment as the highway system expanded. However, since 1964 legislative approval has been required for maintenance programs; and requests for maintenance funds must be based on the leveling off of revenue and the increased costs of operations. The Transportation Committees of the state senate and house act as subcommittees of the Budget Committee, hold public hearings on the DOT budget, and make recommendations to the full legislature. In recent years the legislature has supplemented the dedicated funds with significant amounts from the general fund for specific purposes, such as acceleration of interstate construction to capture more federal funds. This has made it difficult to fund maintenance programs fully because the DOT is required by state law to match all federal funds available for construction. To improve this situation, more funding for the DOT would be needed or the requirement to match all federal funds for construction would have to be eliminated.

As in other states, Florida has no vocal constituency for maintenance programs. Local news media are more concerned with the elimination of the "dead-man's curve" type of problem, which seems to exist almost everywhere; and complaints from the motoring public usually relate to confusing signs, dirty restrooms, or employee "loafing." These are the voices that legislators hear and often remember at budget time.

In this environment, special efforts are required to obtain funding for maintenance programs. For example, several years ago the dump-truck fleet was converted from 4-yd³ gasoline-powered vehicles to 8-yd³ diesel-powered units. The necessary capital funds were obtained from the legislature by providing a detailed cost analysis with emphasis on potential personnel reductions.

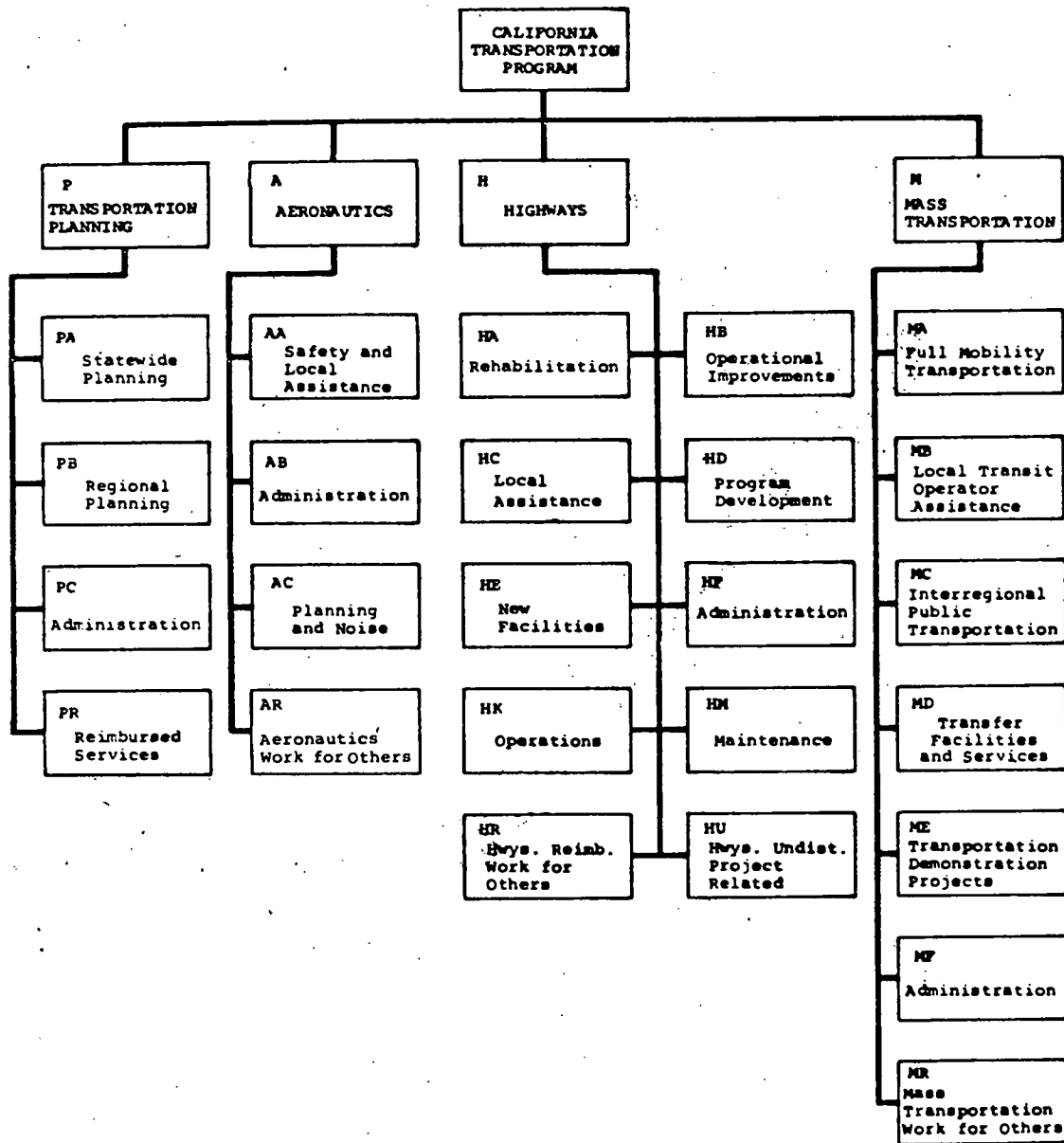


FIGURE B-3 Departmental program structure (Caltrans).

A brochure prepared by the Florida DOT Maintenance Office in 1976 detailed the need for a large resurfacing program on the primary system. Although all the desired funds were not provided, this type of brochure is an effective method of demonstrating maintenance needs. On the cover is a photograph of a road that is in extremely poor condition and appears to require more than resurfacing (Figure B-4). The first page of the report contains the following two paragraphs:

The citizens of the State of Florida have a tremendous investment in their highway system. Unfortunately, resurfacing has been inappropriately classified as an improvement that could be delayed until tomorrow. "TOMORROW HAS ARRIVED." Much of the system is

in jeopardy of being lost because of this philosophy. Funds must be directed toward maintaining our capital investment as well as providing comfort, convenience and safety for the highway user. Highways deteriorate in a manner similar to any other constructed object. Periodic improvements must be timely to prevent pavement failure that would require total reconstruction. Not only does it cost more to reconstruct rather than resurface at the appropriate time, inflation consumes dollars as well and the user is exposed to hazardous conditions.

Lack of sufficient funds in the past has left Florida's highways in a deteriorated and hazardous condition. Simply stated, a large portion of the primary system is in need of resurfacing or reconstruction. Funds are not available to offset the rate of deterioration, much less restore the system to an acceptable condition. As a result, the backlog of needs has increased to the proportions displayed on a

graph. [See Figure B-5.] Funds planned for resurfacing are compared with funds required for resurfacing due to the backlog, annual need and inflation. It is apparent that planned funds are grossly inadequate to meet the need. As can be readily seen, 227 million dollars are required in Fiscal Year 1975-76 to satisfy the total accumulated need. Concern for meeting resurfacing needs is generated not only by desire to protect the investment and improve comfort and convenience, but also by a genuine need to improve public safety.

Included in the brochure are photographs that show roadways in need of resurfacing and depict rutting, cracking, and potholes. More important, the brochure contains photographs of highways that would *not* be resurfaced because of insufficient funds; these were included for each district to demonstrate to legislators that not only was the resurfacing problem statewide, but it also existed in their own areas (Figure B-6). It was shown that during the previous year an additional 7 percent of the system had fallen below the "critical rating level" (Figure B-7). The rate of deterioration is obvious when shown in a graph (Figure B-8). This approach can be adapted to the packaging and marketing of a state maintenance budget.

Illinois

A line-item annual budget, amounting to about \$95 million, is used. The state DOT performs 88 percent of its highway maintenance work with its own forces and the remainder under contract. An MMS is used; however, neither an EMS nor a revolving equipment fund was in use at the time this report was prepared.

Cost-benefit data are presented with the proposed budget along with the impacts of various levels of funding. A periodic Maintenance Needs Study is also developed.

The difficulty of documenting the effects of lower service levels is considered a problem in justifying the budget. This is because the effects of deferred, preventive, and repair maintenance often are not manifested until several years later when top officials and budget officers who make the decisions have been replaced.

Kansas

Under the state DOT program budgeting system, the basic highway maintenance budget is developed by the districts in

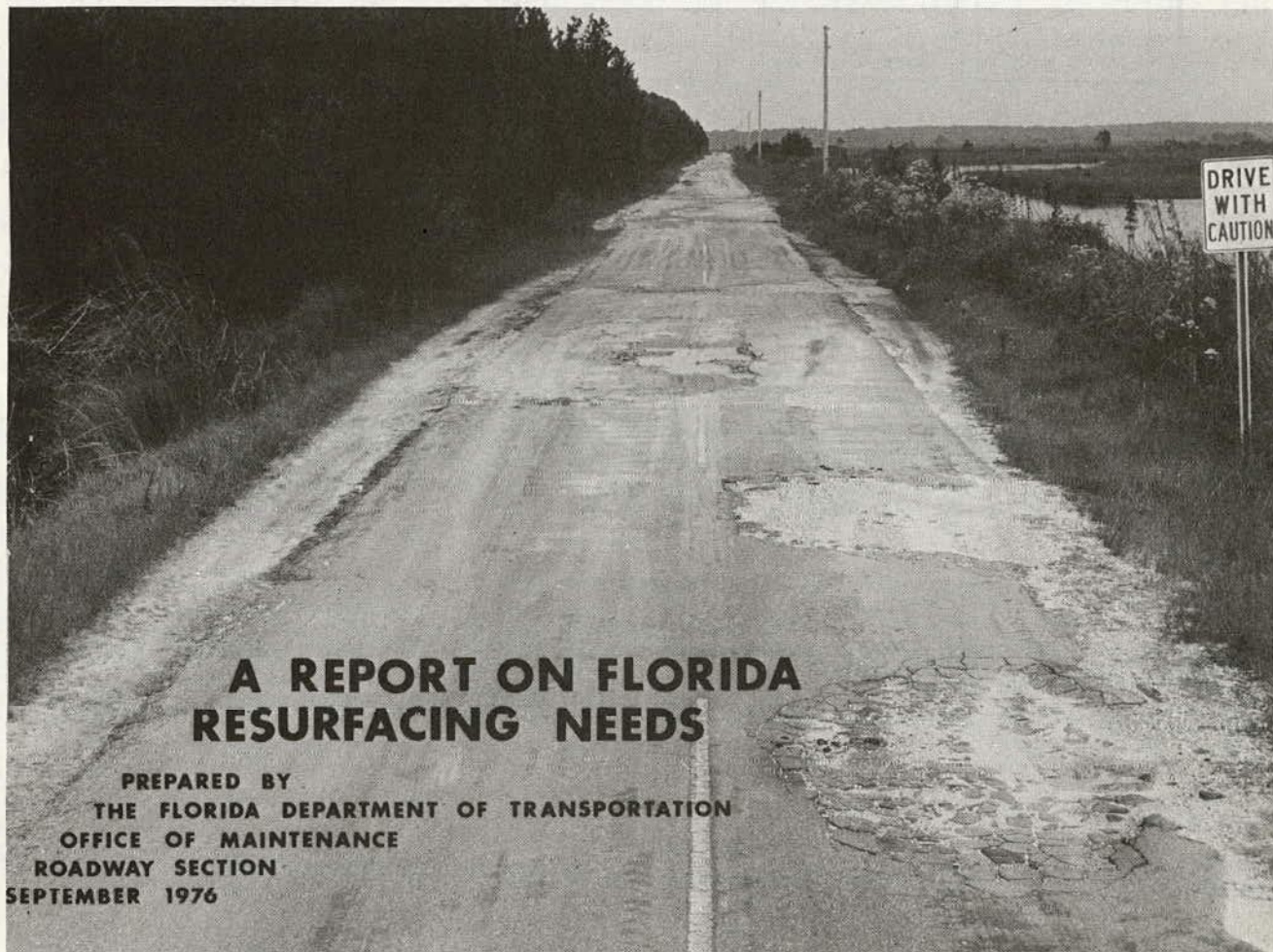


FIGURE B-4 Cover of a brochure prepared by Florida DOT to justify the need for a resurfacing program.

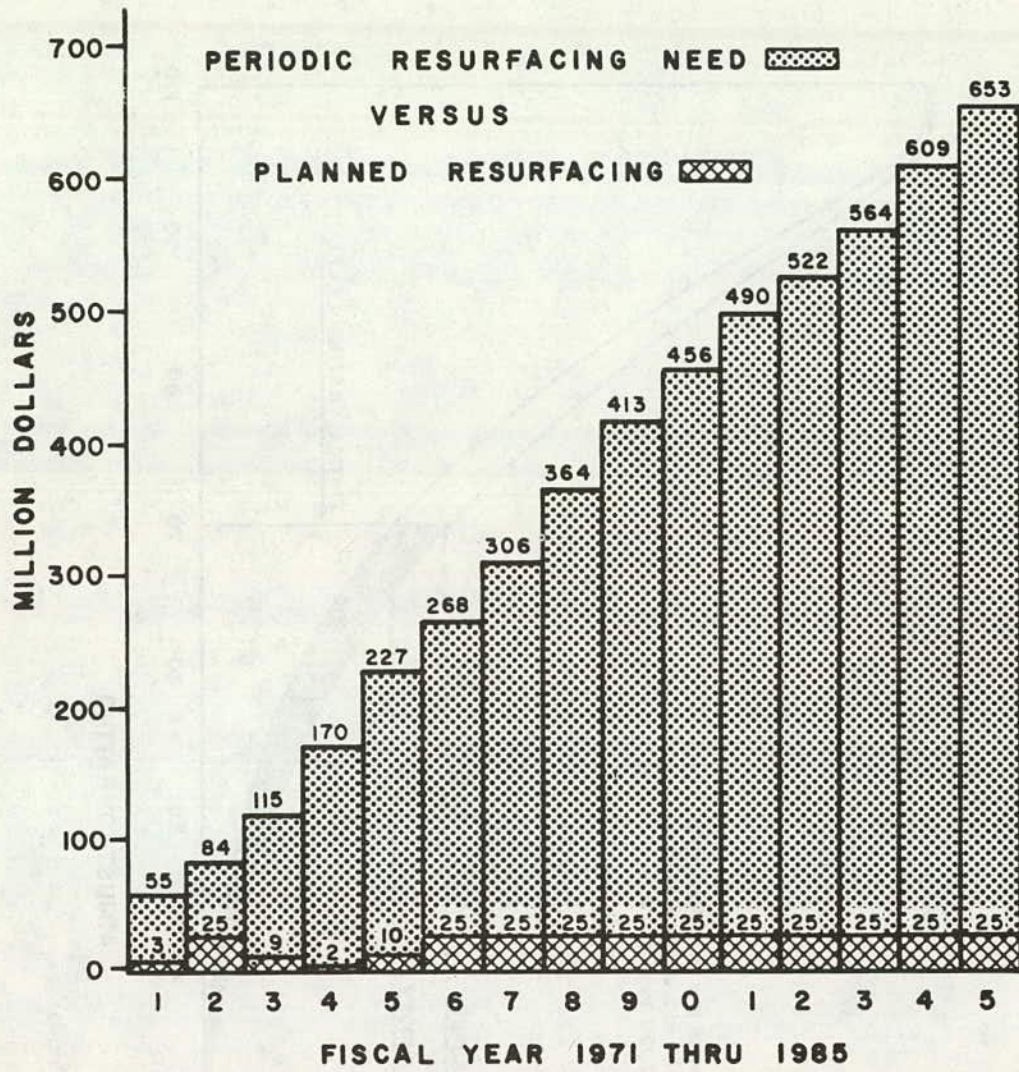


FIGURE B-5 Periodic resurfacing need (in dollars) versus planned resurfacing (Florida).



Section 72070 Duval Co.
SR-5 US-1 M.P. 50.2 to M.P. 50.5



Section 38030 Taylor Co.
SR-20 US-27 M.P. 0.0 to M.P. 0.8

FIGURE B-6 Examples of deteriorated highways that will *not* be resurfaced because of insufficient funds (District Two, Florida).

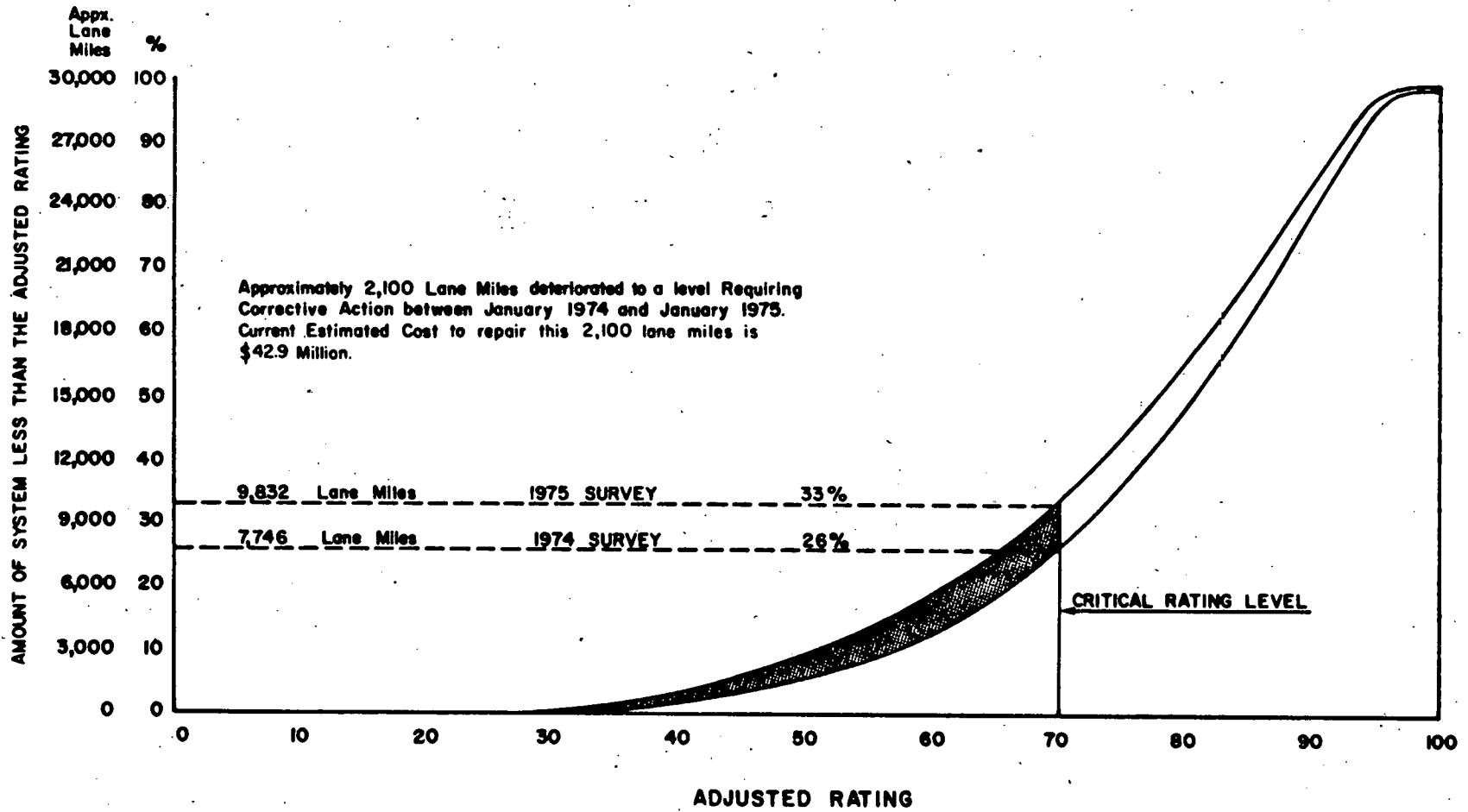


FIGURE B-7 Comparison of pavement condition surveys (Florida).

PERIODIC RESURFACING NEED

VERSUS

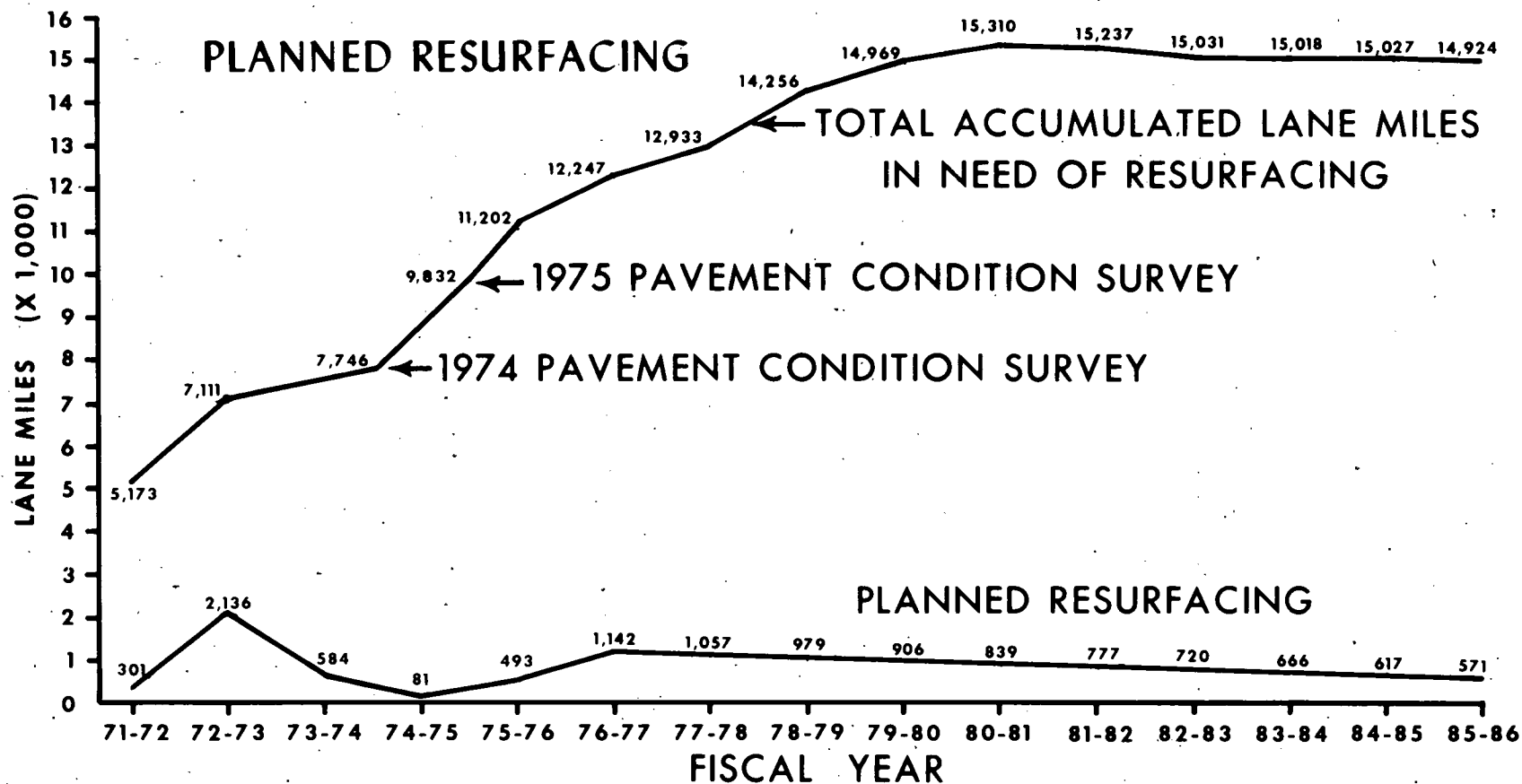


FIGURE B-8 Periodic resurfacing need (in lane-miles) versus planned resurfacing (Florida).

consultation with the maintenance headquarters department. Each district is required to prepare a 5-yr continuing work plan as well as a comprehensive annual work plan. The budget reflects the yearly requirement of resources necessary to carry out the approved program.

The budget is reviewed internally by a committee composed of the secretary of transportation, state transportation engineer, director of operations, state maintenance engineer, controller, and district representative. A representative from the Budget Division, Department of Administration, also takes part in this internal review so that major program revisions can be discussed and agreed on before the formal budget preparation.

The final budget document for all departments is compiled and submitted by the Fiscal Management Department to the Budget Division, Department of Administration. During and after the review by the Budget Division, communications with the KDOT may be on a formal or an informal basis.

The governor's budget recommendations are then prepared and presented to the legislature in January. The KDOT appropriation bill originates in the lower house and generally reflects the governor's recommendations. At this point, the Ways and Means (Finance) Committee begins review of the proposed budget. A considerable amount of time and effort is required of KDOT personnel during the 3 months the legislature is in session. Staff appearances before the Ways and Means Committee may include both the individual state senate and house committees as well as a Joint Conference Committee. Usually, the state maintenance engineer will appear in a support capacity as needed, and may also be asked to speak to certain issues. These appearances are both formal and informal; in some cases visual aids are used.

In the past any cuts in the budget have been on a line-item basis. However, with the current use of the program type of budget, the procedure may change.

After all hearings and appeals are completed, the appropriation bills are passed. The governor may veto an appropriation bill on a line-item basis; however, this has rarely occurred.

Louisiana

The state Department of Transportation and Development has a line-item (object of expenditure) annual budget, but utilizes zero-based budgeting methods to aid internal justification of budget requests. This has made the budget process more complicated and time-consuming in that five levels of requests determined by the objectives of work performances have had to be prepared: 70, 85, 100, 110, and 110+ percent. Recently, the five levels were reduced to three levels: 85, 100, and 100+ percent. Budget requests are based on the need (a) to preserve the investments that have been made in state highways and bridges; (b) to provide a uniform level of safety, comfort, and convenience to motorists; and (c) to ensure that maintenance is performed in the most economical manner.

Major objects of expenditure in the \$94 million budget are personnel, material, contractual services, travel, and overtime. Normally, the department is free to transfer funds within object class, but may not transfer funds to another major

object class without approval from the legislative Committee on Transportation.

It is believed that the MMS helps in the budget process by providing capability to relate dollars and manpower to needed work. The EMS provides managers with information for making the most economic use of the appropriate funds. A ratio of replacement cost to retention cost (cost of having failed to replace at optimum point) is established for those units that have exceeded economic service life, thus producing a priority ranking of equipment units competing for the same replacement dollar. Also, the replacement analysis serves as an objective and quantitative method of making administrators and legislators aware of replacement needs, which, in turn, forestalls the tendency to cut replacement funds whenever budget balancing becomes difficult.

The introduction of the EMS has helped to prevent the reduction of funds for equipment purchase; it also has revealed a backlog of \$25 to \$30 million in replacement needs. The DOTD has asked for the capability to eliminate the backlog over a 2-yr period with substantial savings in the next 5 to 10 yr; however, the proposal had not been accepted at the time this report was prepared.

Michigan

The Michigan Department of State Highways and Transportation contracts for highway maintenance with 62 of the state's 83 counties and with some municipalities for the maintenance of state trunk lines. In the remaining 21 counties, highway maintenance is performed by employees of the department. In the municipalities that do not have maintenance contracts, the county under contract to the department, or the department forces, maintains the trunk lines within the municipality.

The counties and municipalities under contract own and operate their own equipment. Annual equipment costs are based on total expenditures divided by the hours of use. This rental rate is used for billing purposes when the contract agency's equipment is used on the state trunk line in the performance of highway maintenance activities. When a county or municipality performs work on its own road system, it charges its own account the same rental rate. If the contract agency is requested to do special construction work, it performs the work and bills the project for the equipment hours used at the rates developed. In counties where state employees are used, a similar rental rate development system is used.

The Michigan Department of State Highways and Transportation has always shown an accurate account of its needs and, except during the years of general budget reductions, has had no great difficulties in presenting its budget. The budget is usually accepted by management and submitted to the legislature with few, if any, changes. The main thrust of the formulation of the highway maintenance budget is to exhibit the consequences that will occur if highway maintenance requests are substantially reduced. Increases needed to offset projected inflation are not considered by the department; instead, they are added by the state Department of Management at the time of formal presentation to the legislature to update costs of such items as personnel, supplies, materials, travel, etc.

New Jersey

The state DOT presents the budget at various levels, using a zero-based technique, with much justification for the total request. This type of presentation has not been very successful. After the budget is formally submitted through the Office of Fiscal Affairs, the commissioner of transportation presents the budget, using a zero-based program format, to the legislature. In general, a constant level of funding has been sustained.

In the past, the DOT has had some success in the equipment area, using visual demonstrations or artistic renditions of costs and pictures of equipment. The most successful technique for presentation of budget needs was a visual technique used in conjunction with a bond issue. In general, the visual technique suited to the layman has worked best.

Budget presentation has been substantially hampered by the procedure of simple submission of highway maintenance identified needs with justification by written documentation. Zero-based budgeting, supported by written documentation, also has not been very successful, largely because of the huge amount of paper work generated by the required ZBB justification.

The DOT developed a slide presentation to highlight the systemwide rehabilitation needs within the context of limited financial resources in 1979 in support of a \$475 million bond-issue proposal. This was presented to the public at various locations through the state by top-level DOT administrators in an effort to gain support in favor of the legislation. The portions of the slide presentation related to highway maintenance are described below. The actual slides were in color;

however, the illustrations included here suggest some ideas for packaging and marketing the highway maintenance function. The presentations were followed by a question-and-answer period.

Disposition of New Jersey's State Highway User Tax (Figure B-9)

In 1980 motor-fuel taxes, motor-vehicle fees, and motor-fuel user fees generated transportation-related revenue amounting to approximately \$580 million. Of this sum, \$334 million was made available for transportation-related uses (\$264 million for the Department of Transportation and \$70 million for the Department of Motor Vehicles and State Police). The balance of transportation-related revenue was diverted to nontransportation purposes; since 1948 a total of more than \$3 billion has been diverted from transportation uses in this manner.

Appropriations Versus Constant Dollars (Figure B-10)

The solid line (top) depicts actual department appropriations (\$86 million in 1962 versus \$264 million in 1980). The solid line (center) indicates what portion of the actual appropriation is available for highway operations; and the dotted line (bottom) represents the actual value of that highway-related appropriation in constant dollars allowing for inflation. This slide illustrates several points: (a) Whereas annual appropriations have risen regularly since 1962, the share available for highway operations is rising at a much slower

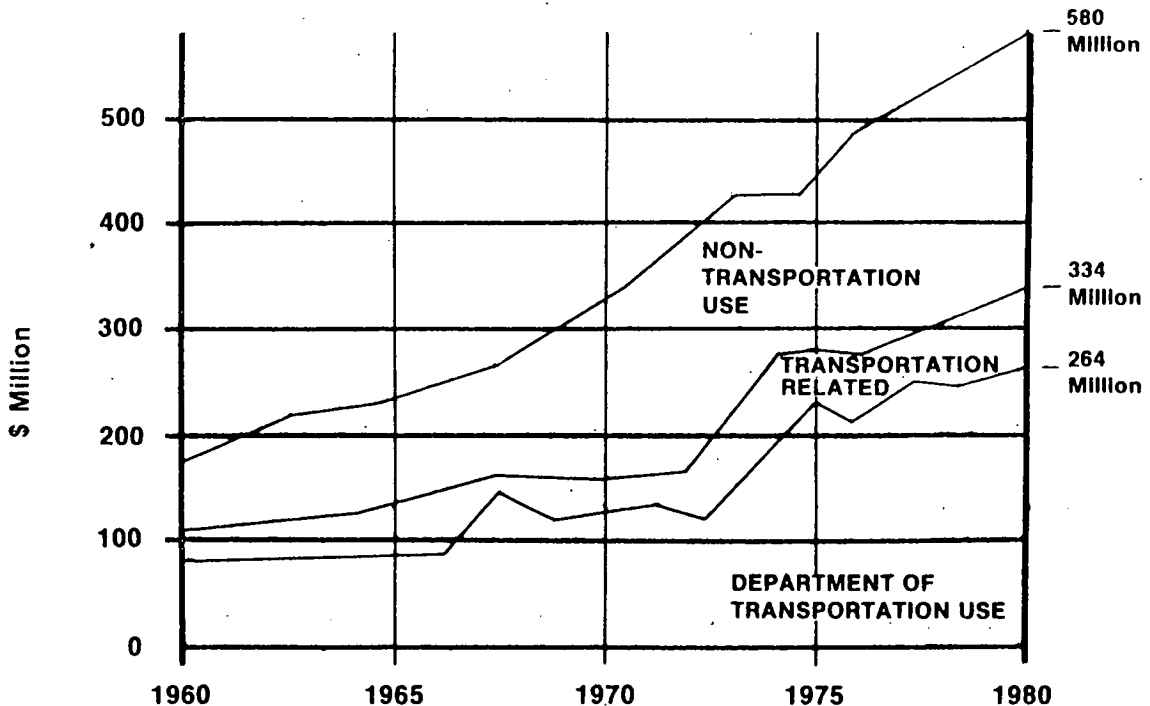


FIGURE B-9 Disposition of New Jersey's state highway user tax.

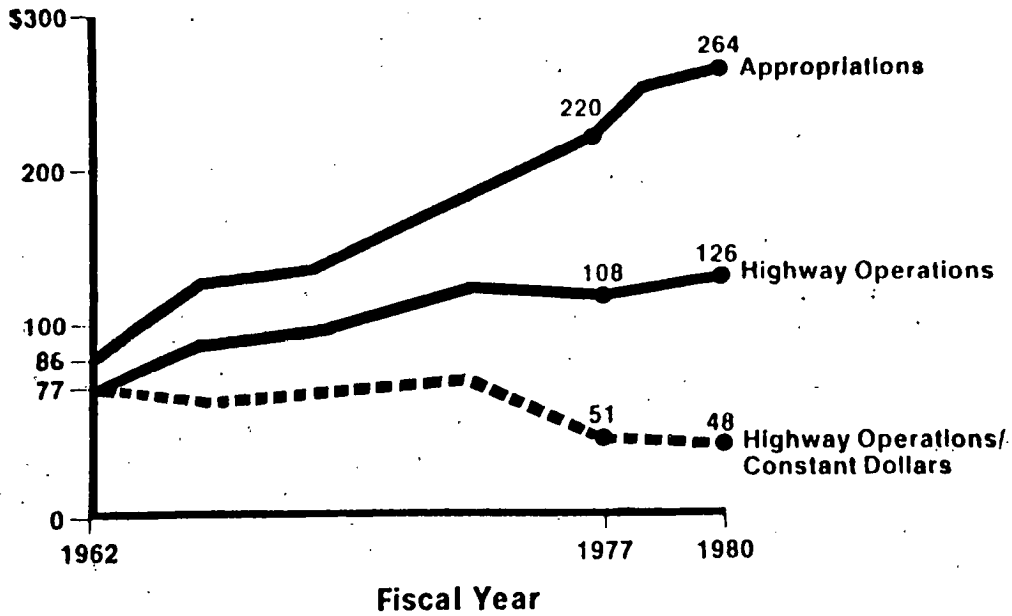


FIGURE B-10 Appropriations versus constant dollars (New Jersey).

pace (largely due to the growth of rail and bus subsidies as a percentage of the budget since 1970). (b) Although there has, in fact, been a slight rise in actual appropriations available for highway purposes, in constant-dollar terms when the inflation factor is considered, the purchasing power of the highway-related appropriation in 1970 is significantly less than that of 1962 (from \$77 to \$48 million).

relatively constant maintenance staffing. Increases in productivity and improvements in technology enable the department to absorb part of this burden; however, in many instances, critical highway maintenance responsibilities are deferred, postponed, or performed with less frequency than necessary (e.g., bridge painting, highway striping, grass mowing, litter collection, patching, resurfacing, etc.).

Lane-Miles Maintained Versus Maintenance Staffing (Figure B-11)

This slide highlights the dramatic growth of the lane-miles of highway that must be maintained within the context of

Manpower Deficiencies in Highway Maintenance Functions (Figure B-12)

There was no explanation for this slide, perhaps because it is self-explanatory in showing the small amount of work that

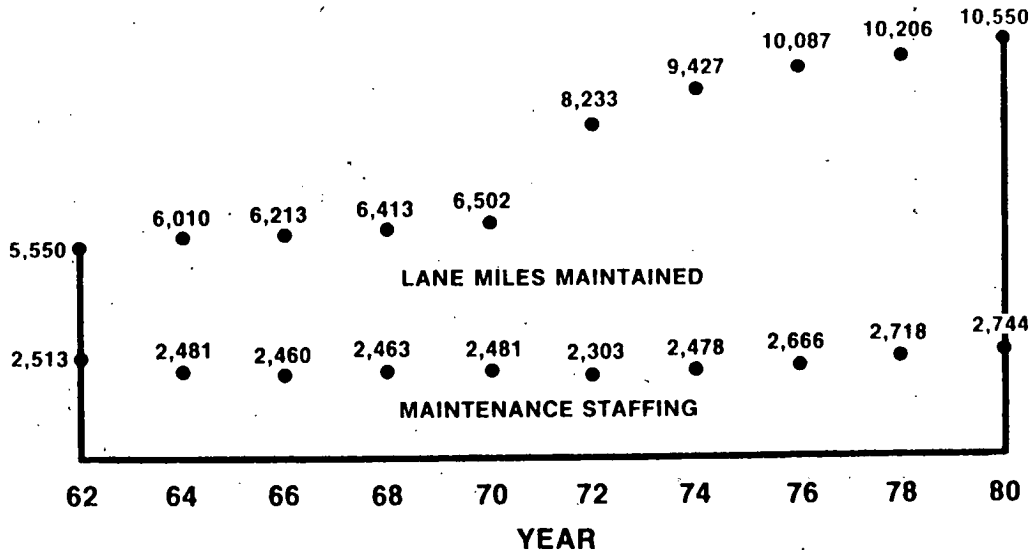


FIGURE B-11 Lane-miles maintained versus maintenance staffing (New Jersey).

Function	Accepted Standard	Actual Performance
Grass Mowing	6 Times/Year	3.5 Times/Year
Joint/Crack Sealing—Asphalt	3500 Lane Miles/Year	530 Lane Miles/Year
Joint Sealing—Rubber	990 Lane Miles/Year	50 Lane Miles/Year
Painting Edgelines	Once a Year	Once Every 2 Years
Litter Pickup	4 Times a Year	2.25 Times Per Year

FIGURE B-12 Manpower deficiencies in highway maintenance functions (New Jersey).

will be done in contrast to the work that should be done. The figure dramatizes the work that will *not* be done as a result of insufficient manpower.

Vehicles Per Mile of Road (Figure B-13)

New Jersey has the highest concentration of vehicles per mile of road (based upon vehicle registrations) of any state in the nation: 125 vehicles per mile of road compared to the U.S. average of 35. As shown in the figure, of the other states in the densely-populated, highly-urbanized Northeast, New Jersey's closest competitor is Connecticut, with 105 vehicles per mile of road.

Consequences of Various Annual Resurfacing Spending Levels (Figure B-14)

There is an existing backlog of \$150 million in resurfacing needs. The department's current program (\$5 million per year) does not keep pace with the needs; this will result in an increased backlog amounting to \$250 million by the year 2000. The 7-yr capital program (funded during the first 4 yr by bond issues), along with an additional \$17 million per year to the year 2000 (in 1980 dollars), would be required to eliminate this backlog.

Bridges Requiring Replacement or Repair (Figure B-15)

This slide shows the total number of state, local, and railroad bridges in the system, and specifies the number of state bridges requiring replacement or major or minor repairs. Both local and railroad bridges are being examined to determine the extent of repairs required; it is expected that a majority of both local and railroad bridges will require some form of repair or, in certain cases, replacement.

Consequences of Annual Bridge-Repair Spending Levels (Figure B-16)

This slide, like the previous slide on resurfacing (Figure B-14), shows the order of magnitude of the bridge-repair backlog facing the New Jersey DOT. Without any spending, the backlog continues to escalate; however, the department's 7-yr capital plan (funded during the first 4 yr by bond issues) would begin to eliminate the problem; and, with stable funding each year, the backlog would be eliminated by the year 2000.

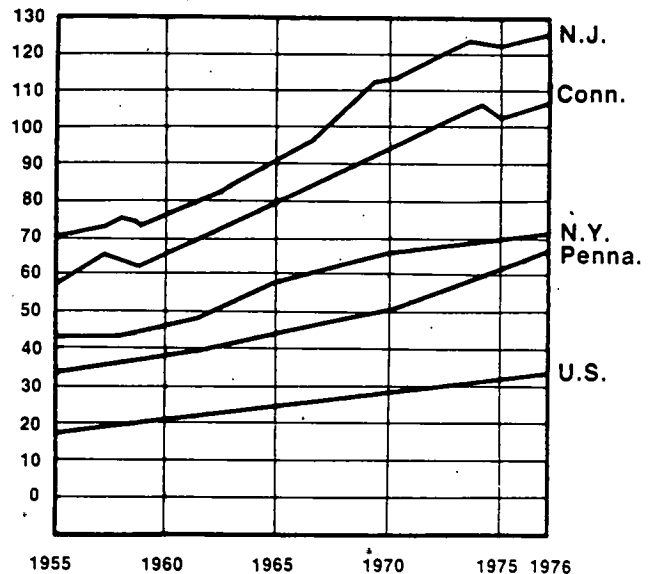


FIGURE B-13 Vehicles per mile of road (New Jersey).

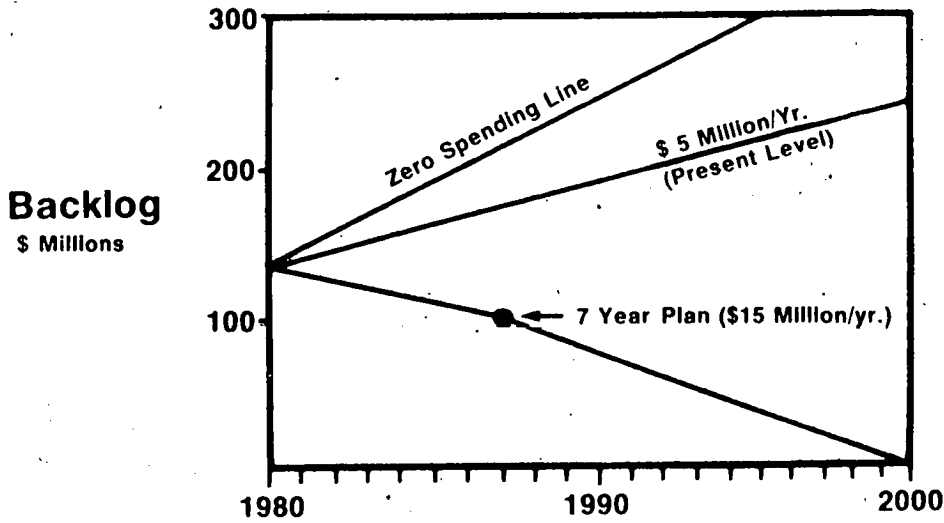


FIGURE B-14 Consequences of various annual resurfacing spending levels (New Jersey).

	Replacement	Major Repairs	Minor Repairs	Total Bridges in System
State	53	433	1160	2246
Local	(————— 2890 —————)			3786
Railroad	(————— 612 —————)			680

FIGURE B-15 Bridges requiring replacement or repair (New Jersey).

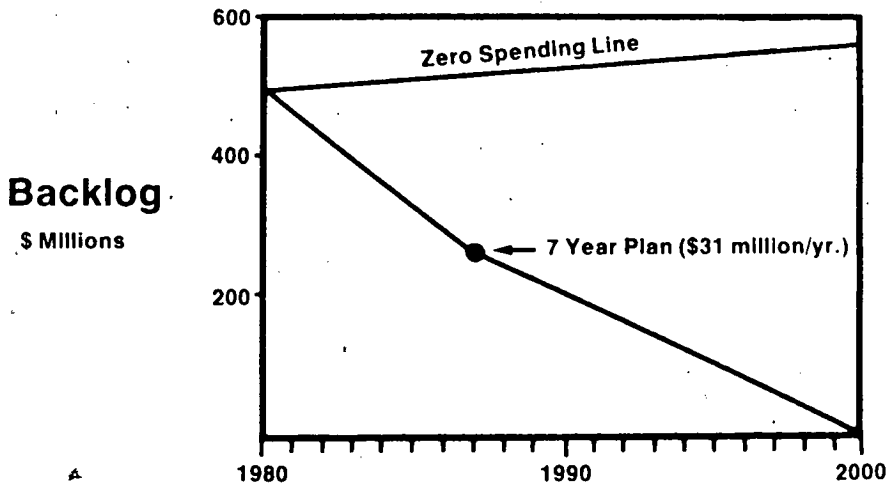


FIGURE B-16 Consequences of annual bridge-repair spending levels (New Jersey).

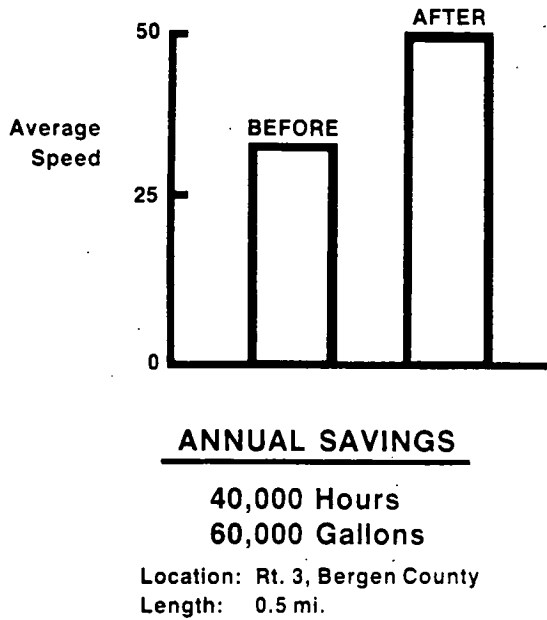


FIGURE B-17 Benefits of widening (New Jersey).

Benefits of Widening (Figure B-17)

In addition to rehabilitation and preservation of the existing physical plant, there are significant benefits that result from efforts to improve the capacity and safety of the existing system. This slide illustrates such a benefit: as a result of a widening accomplished in 1974 on Route 3 in Bergen County, average speed increased from 30 mph to 50 mph, which translates into driver savings of 40,000 hr and 60,000 gal of fuel.

Effect of Inflation on Construction Costs (Figure B-18)

This slide shows that with an inflation factor of 7 percent, \$1.00 of construction costs in 1980 will increase to \$3.87 in

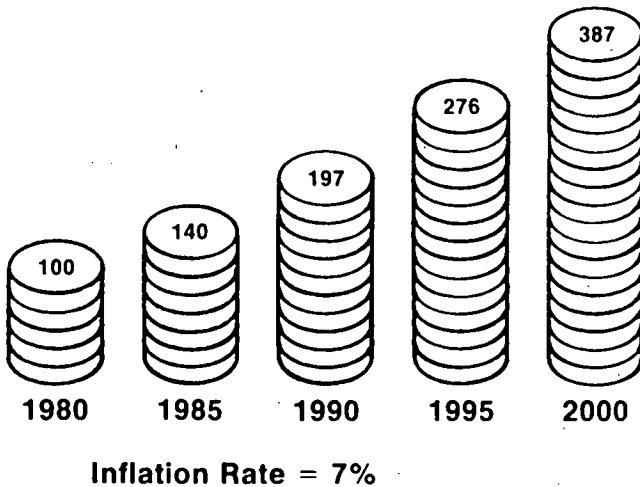


FIGURE B-18 Effect of inflation on construction costs (New Jersey).

the year 2000 (this would apply to highway maintenance as well as construction).

New York

The state DOT does not have any dedicated funds; all state highway maintenance is supported by general revenues. When the state maintenance engineer submits a budget request, it is drawn up along straight program/performance budgeting lines.

In the governor's budget, highway maintenance personnel are listed by line-item that fixes the title and location for each employee. Although an employee may work on different portions of the program (pavement, roadside, etc.), there are some restrictions on the use of employees because of civil service titles. Funds appropriated for other than personal services are budgeted by maintenance program (pavement, shoulders, roadside, etc.) and may not be interchanged without budget office approval.

The budget is prepared and submitted in program format, but the appropriation act is in partial program format. The format of New York's DOT budget request is presented in Tables B-1 and B-2. A brief description of each program is presented below.

State Purposes—Regular

For 1980-1981, a total appropriation of \$130,622,000 was recommended to meet the increasing costs of maintaining and repairing the state's highway system. The recommended fiscal changes in the 11 highway maintenance activities are presented in Table B-2.

The recommended personal services appropriation for 1980-1981 was \$68,723,000, an increase of some \$778,000. The increase, consisting of \$1,052,000 for regular salaries and \$69,000 for overtime compensation and temporary service, is partially offset by a savings in personal services of nearly \$343,000. The recommended appropriation should enable the department to continue the 1979-1980 personnel level of 5,384 filled positions through 1980-1981.

Administration

This program includes management and administrative responsibilities for all phases of the state's highway maintenance program. Also in this category are funds necessary to maintain and operate the buildings and grounds that support the field maintenance services. An increase of \$506,000 was recommended to meet inflationary price increases in necessary supplies, especially heating oil.

Pavement Maintenance

Pavement maintenance includes all maintenance activities related to protecting the surface of the state's highways, including armor coat, surface treatment, and pothole repair. An increase of \$1,151,000 was recommended to meet in-

TABLE B-1
STATE PURPOSES—REGULAR—SUMMARY OF APPROPRIATIONS AND CHANGES 1980-1981
RECOMMENDED (DOLLAR AMOUNT IN THOUSANDS) (NEW YORK)

Program	Total		Personal Service		Nonpersonal Service		Maintenance Undistributed	
	Recom- mended	Change	Recom- mended	Change	Recom- mended	Change	Recom- mended	Change
Administration	\$16,022	-\$190	\$11,603	-\$252	\$ 4,419	+\$62	--	--
Planning and Development	8,047	- 138	6,708	- 53	464	- 65	\$875	-\$20
Real Estate	6,329	- 132	6,076	- 108	253	- 24	--	--
Design and Construction	60,113	- 703	55,892	- 715	4,221	+ 12	--	--
Traffic and Safety	11,511	+ 99	7,590	+ 94	3,921	+ 5	--	--
Highway Maintenance	130,622	+5,807	68,723	+ 778	--	--	61,899	+5,029
Equipment Management	37,575	+5,484	7,360	+ 113	30,213	+5,371	--	--
Waterway Operation and Maintenance	11,517	+ 255	10,094	+ 81	1,423	+ 154	--	--
Regulation	1,228	- 56	1,150	- 56	78	+ 2	--	--
Rail	1,434	+ 70	1,375	+ 68	59	+ 2	--	--
Special Parkway Maintenance	4,014	+ 121	1,925	- 8	2,089	+ 130	--	--
Westchester/Taconic Pkwy. Maintenance	5,000	+1,166	3,048	+ 811	1,952	+ 355	--	--
Total	\$293,410	+\$11,765	\$181,544	+\$751	\$49,092	+\$6,004	\$62,774	+\$5,009

flationary price increases and to permit the department to continue an accelerated program of pavement repair through armor coating. This increase should enable department forces to resurface approximately 730 lane-miles of roadway. Because the riding surface is the most important part of the highway system, it is vital that pavements be maintained at an adequate level to assure safe and comfortable travel.

Roadside Maintenance

This program consists of all maintenance activities performed on the state's rights-of-way but off the roadway. Included are mowing and cleaning of rights-of-way; maintaining fencing, rest areas, guide rails, and impact attenuators; chemical weed control; tree pruning and removal; and repair of culverts and other drainage facilities. Funds were provided to continue the Green Thumb program for comfort-station maintenance at its 1979-1980 level. The recommended appropriation level was \$1,946,000, an increase of \$313,000, which reflects the impact of inflation.

Shoulder Maintenance

This program includes maintaining the strip of gravel or pavement that runs adjacent to the riding surface of a highway. Shoulders with sufficient strength are needed to reduce day-to-day maintenance. The recommended appropriation, an increase of \$181,000 to meet inflationary price rises, should enable the department to continue its shoulder maintenance program.

Traffic Control

This program includes pavement striping as well as the maintenance and installation of traffic signs and route markers. An increase of \$345,000 was recommended to keep up with rising inflation rates and to ensure that faded pavement striping is repainted.

Bridge Maintenance

The department is responsible for the maintenance of approximately 6,300 bridges on the state highway system and

more than 300 bridges on the barge canal system. It was recommended that funding for this program be continued at the 1979-1980 level, with a modest inflationary increase of \$20,000. This should permit department forces to upgrade such bridge maintenance activities as repairs to decks, joints, and drains. The funding level should result in a reduction in contract bridge painting because of fiscal constraints.

Snow and Ice Control—State Forces and Contract

Snow and ice control on state highways is performed by state maintenance forces or by towns and counties under contract. In order to pay outstanding vouchers from several counties for snow and ice control services for the previous year (FY 1979-1980), a \$950,000 increase was recommended. An increase of \$928,000 was also recommended for the purchase of snow and ice control materials by state forces to meet an increase in state responsibility and higher prices for materials.

Arterial Maintenance

The DOT contracts for the maintenance of state arterial highways within the limits of any city, including New York City, that maintains both arterial highways and the Interstate highway system within its boundaries. The reimbursement rate of \$0.40 per yd² of pavement maintained was continued in 1980-1981. An increase of \$300,000 was recommended to fund an emergency bridge-repair agreement with New York City. Expanded arterial maintenance contracts that were signed with various cities in 1979-1980 should cost an additional \$155,000.

Special Projects

Special projects are carried out to enhance the quality of state highways by increasing serviceability, prolonging usable life, reducing highway maintenance costs, and promoting safety. The recommended funding level for this program accounted for a \$3 million transfer from the Capital Construction Fund for rehabilitation and improvement of state highways in 1980-1981. This should enable the department to repave approximately 65 miles of highways.

Accident Damage Recovery

An increase of \$200,000 was recommended for the accident damage recovery system, which encourages department employees to promptly repair damages caused by accidents on the state highway system and then to obtain reimbursement from insurance companies. It is estimated that this program should generate the return of over \$600,000 to the general fund in 1980-1981.

TABLE B-2
STATE PURPOSES—REGULAR—MAINTENANCE
UNDISTRIBUTED—SUMMARY OF APPROPRIATIONS
AND INCREASES FOR HIGHWAY MAINTENANCE
PROGRAM BY ACTIVITY 1980-1981 (NEW
YORK)

Program	Total Amount	Increase
Highway Maintenance		
Administration	\$ 2,496,000	\$ 506,000
Pavement Maintenance	11,200,000	1,151,000
Roadside Maintenance	1,946,000	313,000
Shoulder Maintenance	2,556,000	181,000
Traffic Control	3,730,000	325,000
Bridge Maintenance	1,164,000	20,000
Snow and Ice Control-- State Forces	11,467,000	928,000
Snow and Ice Control-- Contract	15,900,000	950,000
Arterial Maintenance-- Contract	4,390,000	455,000
Special Projects	6,650,000	--
Accident Damage Recovery	400,000	200,000
Total	\$ 61,899,000	\$ 5,029,000

Equipment Management

The Equipment Management Program maintains all departmental heavy equipment, develops standards for utilization of equipment, coordinates equipment assignments to meet the statewide needs of all units within the department, and purchases gasoline, diesel fuel, and other supplies needed for the operation of the fleet. With an equipment-repair facility in each of the department's 10 regions and mechanics in all 66 highway maintenance residencies, this program is responsible for maintaining an equipment fleet having an estimated replacement cost of \$160 million. Federal reimbursement of almost \$1 million is expected for the operating costs of state automobiles and equipment used on federal-aid highway projects.

In 1980-1981 the department continued several projects to improve the productivity of program staff and increase the equipment uptime rate without a major investment in new equipment. A computerized equipment replacement system is being implemented for several major types of vehicles to determine the items to be replaced. Installation will begin on a new computerized central parts inventory control system. The gasoline and diesel fuel inventory systems are being revised to better control fuel usage.

A total appropriation of \$37,575,000 was recommended for 1980-1981 to maintain and repair the department's equipment fleet and to replace equipment incurring excessive operating and repair costs.

The recommended appropriation for personal services, an increase of approximately \$113,000, included a general

salary increase of \$120,000 and \$9,700 for temporary positions to begin implementation of the parts inventory control system. These costs were partially offset by a reduction of \$24,000 in funds for overtime.

An increase of \$3,597,500 for supplies, materials, and travel reflected the rapidly increasing inflation in prices for gasoline, diesel fuel, and repair parts, and the maintenance of a fleet that has aged during the past several years.

In order to sustain the efficiency and effectiveness of the department's field programs, it was necessary to increase funding for the purchase of highway equipment by \$1,722,000. For the past several years, austerity has forced the department to defer replacement of aging equipment, resulting in higher repair costs. The funding for equipment recommended for 1980-1981 was based in part on a sophisticated system that utilizes repair costs in determining when to replace a vehicle. The recommended appropriation should permit the department to replace items of equipment when they become uneconomical to operate, especially equipment used in paving operations. Funding was also provided to purchase a sufficient number of large dump trucks with snow plows to maintain state highways that were previously handled under county snow and ice contracts.

Ohio

The state divides the funds from a \$0.07 per gal tax on motor-vehicle fuels among municipalities (based on vehicle registrations), counties, and the state. The state portion is dedicated to debt service, construction, support of the highway safety fund, and state highway maintenance.

With a total of 42,314 lane-miles of highway to maintain in 12 districts and a total budget of a little over \$92 million, the state DOT has a program-type budget that is divided into personal services, equipment use, and materials. An MMS is being developed.

South Dakota

After the budget is formulated, informal discussions are held by the department budget director, chief engineer, and secretary. The budget director files the results of these discussions with the Bureau of Budget. Informal discussions are then held between the governor and the Bureau of Budget, resulting in the governor's recommendation to the legislature. The SDDOT secretary makes a formal presentation to the legislative Appropriations Committee followed by explanations from the various office heads. During the legislative session there are visits to the Appropriations Subcommittee by SDDOT personnel to further discuss the budget; detailed explanations are provided on request. It is believed that this routine, together with the lack of formality and the chance to visit "one-to-one," has been responsible for the success of the process.

Virginia

The state Department of Highways and Transportation uses the lump-sum method of biennial budgeting and ap-

propriating. Appropriations are subdivided into interstate highway maintenance, primary highway maintenance, and secondary maintenance with the proviso that unused balances remaining in any given fiscal year shall be added to the allocation for the next year.

In effect, Virginia develops two budgets: one to develop the funds for the biennium appropriations act, and one for an actual work plan.

The highway maintenance division develops the total budget figures for the biennium, which are presented informally to the chief engineer. The amounts are not usually changed. The General Assembly then approves the highway maintenance budget.

The detailed highway maintenance operating budget is prepared in the spring of each year. The detailed budget is presented to the director of operations and then to the chief engineer in an informal manner. However, the state maintenance engineer must justify increases in the various types of work. For instance, if the highway maintenance organization proposes to increase the allocation for resurfacing, data must be presented to show the necessity for the increase; e.g., increased asphalt or stone prices or additions to the highway system.

After approval by the chief engineer, this budget is sent to the state Highway and Transportation Commission, which usually approves the highway maintenance portion of the budget without any questions. The only limitation of this detailed operating budget is the amount in the biennial budget approved by the legislature. However, in recent years, because of the increased rate of inflation, the amounts in the biennial budget have been insufficient to meet maintenance needs. This shortfall is usually anticipated and a supplementary request is presented to the legislature while it is still in session.

The highway maintenance division then prepares an amended budget estimate, which is presented informally to the director of operations and chief engineer. Upon approval, the General Assembly is asked to amend the biennium budget. This is done by the legislature with little question or interest because, by statute, highway maintenance has first priority on the dedicated funds used to finance the Department of Highways and Transportation.

West Virginia

West Virginia, operating under a performance budget, has an annual plan for each of 10 districts. There are 55 counties in the state. Each district consists of four to seven county highway maintenance organizations, an average of four interstate highway organizations, a sign shop, a bridge maintenance organization, and a special maintenance force. There are 600 activities in the work plan, which shows planned resource commitments to various highway maintenance activities in the district. The state annual plan is a combination of the annual plans for each district.

Wisconsin

The state DOT contracts individually with the 72 counties for all highway maintenance activities involving general up-

keep (housekeeping activities), winter maintenance, and a large portion of the special maintenance; e.g., road-mix overlays, seal coats, and shoulder surfacing. However, the DOT contracts with the private sector for highway maintenance work that cannot be handled by the counties; e.g., bridge-deck replacements and nominal 1½-in. bridge-deck overlays.

A joint machinery rental committee classifies most of the equipment and determines the rental rate for each piece of equipment.

Every month, each county submits a requisition containing the actual cost of labor, machinery costs based on rental rates, and any materials that the county may furnish. The county also charges 2 percent of the requisition cost for records and reports. These records are put into the computer; county costs are determined and reimbursed on this basis.

All county work is supervised by engineers and technicians from the district offices. The state has eight district offices administered by a district director and a staff for highway maintenance, right-of-way, administration, construction, planning, and design.

There are no problems in developing highway maintenance budgets. The biennial budget, based on need, is developed in cooperation with the central and district offices. Annual operating programs are developed for the various highway maintenance programs, and these must fall within biennial executive budget amounts. The budget must be approved by the legislature and the governor. The counties do not have any role in the budget except, perhaps, to make recommendations.

There is no full-blown MMS, nor is there a need for an EMS, as the state does not own any highway maintenance equipment.

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