Roadway Management for Local Roads

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Local government managers responsible for low-volume roads in the United States are facing a dilemma. On the one hand, there is growing pressure to repair roads and provide an improved level of service. On the other hand, there is public pressure to reduce taxes. A roadway management system has been developed in response to the need for a better system to manage roadway budgets, maintenance, and selection of improvement projects. The system provides assistance in determining annual budgets, providing long-range planning, and selecting the improvements that are most cost-effective. It is simple enough to be understood and implemented by local officials with a limited technical background. Local values and goals are incorporated into the project selection process. An easy-to-use roadway surface condition rating scheme is an integral part of the management system. This evaluation tool allows local officials to review the overall condition of their roadways in light of their goals and future needs. The roadway management system has been successfully implemented by three local agencies in Wisconsin. Early results indicate that it has enabled local officials to better understand the need for improvements, establish objective priorities, and justify significant increases in the local road improvement budgets.

Local units of government responsible for maintaining the bulk of low-volume roads in the United States are faced with the following problems:

- Continuing pressure from individuals who want priority placed on fixing their roads;
- Continuing demands for more and better roads;
- Increasing expectations on the acceptable level of maintenance, even for low-volume, low-function roads;
- Increasing demands for accountability of the public dollar;
- Increasing need to get maximum benefit for every dollar of tax money collected;
- Continued inflation; and
- The problem of how to place priority on needed improvements given limited funds.

At the same time, they must balance the following problems:

- Continuing pressure to hold the line on property taxes;
- An almost certain reduction, if not total loss, of state and federal revenue-sharing;
- Little hope for any significant increase in state-administered transportation and highway aids; and
- The possible reduction or elimination of federal aid secondary programs and dollars.

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When pressured by these two strong and realistic forces, highway managers often find themselves responding to emergency needs; programming projects or improvements in response to political pressures; deferring timely maintenance and needed projects; experiencing an overall deterioration in the quality of highways; and using funds in an often less than efficient manner to respond to the most pressing projects or issues.

These problems exist at all levels of government. Towns, villages, cities, counties, and even states wrestle with these problems. However, many states, larger municipalities, and a limited number of counties have recently begun to develop some form of rational and objective method of programming, budgeting, and managing highways over an extended period of time. Smaller communities and those with a limited administrative staff have generally not had the time and resources to allow them to develop a comprehensive highway management program.

When local elected officials are faced with this dilemma, they commonly respond by trying to pressure state and federal agencies for more money. In reality, however, the evolving philosophy at both the state and federal level is that local units of government should bear the major responsibility for funding local road maintenance and improvement needs, particularly those needs that exist on low-volume roads.

Local officials should consider a number of options to solve these growing problems and pressures. For example, they can minimize their maintenance responsibilities by vacating existing roads, controlling new additions to the system, and establishing special assessments. They can also increase the efficiency of existing operations through equipment sharing, joint purchasing, and contracting out for certain tasks and projects. These are realistic and proven ways of improving efficiency.

Although many units of government have effectively initiated one or more of these measures, the growing disparity between roadway needs and fiscal resources is increasing almost universally.

In response to this need, a system has been developed to manage budgeting, maintenance, and roadway improvement projects for small communities in Wisconsin. The initial work was completed by the Northwest Wisconsin Regional Planning Commission (NWRPC) in 1984. The Wisconsin Transportation Information Center, a technology transfer center sponsored by the Federal Highway Administration, in cooperation with NWRPC, is providing training. The system had been adopted by a city, town, and county by mid-1986.

OBJECTIVES

The roadway management system has several prime objectives. It must first be helpful in determining annual budgets that meet community objectives. It must also be useful in providing long-range (2- to 5-year) planning for roadway improvement needs.

Although the concerns of local citizens and elected officials should be incorporated into the process, it is intended that poor investments that result from political pressure be minimized.

CHARACTERISTICS OF THE SYSTEM

Although many pavement management systems exist today, the unique characteristics of agencies that deal with low-volume roads must be considered. The following characteristics are considered important.

Simplicity

Local officials who have a limited technical background must be able to understand the procedures developed. In addition, it is important that the system not require the use of a computer initially. If the system can be explained in simple terms, and does not require any special equipment, two significant barriers to use by local officials will have been overcome. The use of a microcomputer is helpful, but a system that works on paper during the beginning stages can easily be converted to a microcomputer when and if the opportunity exists.

Current efforts are focused on the development of an initial roadway management system and the encouragement of its implementation. Although detailed analysis procedures such as pavement deflection, roughness, and economic optimization can also be useful to a low-volume road system, they are not needed immediately. The system can later be expanded to include these more sophisticated elements. In fact, it is anticipated that most local officials will actively seek improvements to and expansion of the system once its merits have been proven.

Local Implementation

Local elected officials and agency staff should be able to implement the system without extensive assistance from outside experts. Although some help is required during the initial development, the intent of this system is that most local highway officials will be able to use it independently in subsequent years.

Local Priorities

An effective system must incorporate the local community's issues and priorities. It will not be used in the future if local officials do not feel it is their system and reflects their values. The results must make sense to the officials in order for them to be accepted and implemented.

ROADWAY MANAGEMENT SYSTEM DESCRIPTION

The roadway management system for local roads includes the major steps involved in most other systems: inventory, classification, evaluation of roadway conditions, establishment of priorities, development of deficiency criteria, analysis, and recommendations of short- and long-range roadway improvements.

Inventory

The roadway inventory begins by creating short roadway segments that are similar in character. These segments vary in length; they can be several blocks in urban areas or between 1 and 3 miles in rural areas. The number of segments directly affects the volume of data that must be analyzed. Each segment must be reasonably consistent throughout its length in such important criteria as surface type, surface condition, construction history, and function. No segment should be longer than what would normally be undertaken as an improvement project. Although these guidelines appear vague, little difficulty has been experienced in determining reasonable roadway segment lengths.

Each segment needs an identification number and location. An identification number may be tied to an existing identification scheme or it may be arbitrary. It can also differentiate between different functional classifications of roadways.

The location of each roadway segment must be clearly identified. The use of roadway intersections is the most readily available and useful method of identification. Additional survey information, such as the section number, could also be useful but it is not essential.

Roadway mileage data are also required. Existing planning information can provide mileage to the nearest hundredth of a mile. If this information is not available, conventional automobile odometer mileage data can be used. However, estimates to the nearest five-hundredth of a mile should be made.

Other inventory information that is collected must be related to the data needs anticipated in the analysis phase. Therefore, it is suggested that inventory forms not be developed until the analysis is clearly defined. An example of an inventory form is shown in Figure 1.

Historical information on roadway maintenance and improvements should be included on the inventory form. Although this information is not likely to be used in detailed data analysis, it is extremely important for decisions at the project level. Some of this improvement history information can be collected in the office before the field inventory, but much information also can be collected during the field review. Site visits have a way of triggering the memory of local officials. Enough space should be left on the inventory form for comments because single ratings for a roadway segment often do not adequately reflect varying conditions. Comments can also be very helpful in project-level decisions.

Classification

A roadway classification scheme should be considered part of the roadway management system. The local road system may already have a functional classification system. However, previous functional classifications may not be sufficient for pavement management. Although almost all low-volume roads are classified as local in a functional statewide system, distinct differences may exist that indicate local priorities. The range of traffic volumes and functions is likely to be wide. Local officials are generally aware of these differences and can provide a refined roadway classification with little difficulty. In many cases, this classification is extremely important in ranking improvement needs.

A simple classification scheme may only involve identifying major and minor roadways. Local officials can add other

Town of Rutland
Highway Inventory Data

Inventory Date:_____
By:_____

SEGMENT & LOCATION

Road/Name:_____ Segment:_____
From:_____ To:_____
Length:_____ Section No._____

USE & CLASSIFICATION — Ranking Points

Road Classification:_____ _____
ADT:_____
Access To:_____

ROADWAY DATA

Surface Type:_____ _____
Surface Condition Rating:_____ _____
Drainage Rating:_____ _____
Comments_____
_____
_____

GEOMETRICS

Surface Width:_____ _____
Shoulder Width:_____ _____
Urban Roadway Width:_____ _____
Horizontal Alignment Rating:_____ _____
Vertical Alignment Rating:_____ _____
R/W Width:_____
Comments_____
_____
_____

OTHER

Comments_____ _____
_____
_____ TOTAL RANKING POINTS _____

IMPROVEMENT HISTORY

Year:_____ _____ _____
Work Completed:_____ _____ _____
_____ _____ _____
Estimated Cost:_____ _____ _____

FIGURE 1 Sample inventory form.

categories for areas that serve developed platted areas and dead-end roads, for example. Traffic counts would also be useful in this process. However, travel patterns and functions are generally well-known locally. Roads that are used by commuters for short-cuts and roads that serve local industry, schools, or emergency services are all easy to identify. These roads are likely to receive different priorities for improvement than those that serve a more limited purpose.

Roadway Condition

Condition data need to be collected on all segments of the roadway system. How much condition data are required is determined by the type of analysis and by the criteria established by local officials. This cannot be determined until final decisions on techniques for ranking local needs are completed.

Many techniques for assessing roadway surface condition are currently being used as agencies develop their own roadway management systems. A relatively simple surface condition rating system has been developed that worked well in its initial applications. Local officials can be trained in a relatively short time and actual data collection has presented few problems.

A copy of the rating system is shown in Figure 2. The judgments and evaluations that are normally used by roadway maintenance personnel are incorporated in the condition evaluation. It is usually apparent to the local roadway manager whether the surfaced road needs routine maintenance, seal-coating, overlaying, or complete reconstruction. This rating system reflects these judgments and is built on the existing capabilities of local road personnel.

The pavement surface condition rating is organized in the following manner. Ratings 9 and 10 indicate new or like new condition. Ratings of 7 or 8 indicate the need for routine

	Surface Rating	Quantifiable Distress Measures	Generalized Surface Condition
Good	10	None	New plant mix
	9	None	New cold mix or like new asphalt
	8	a) No surface raveling (loss of fines) b) Less than 100 feet/station of longitudinal cracks less than 1/2" in width c) 1-5 transverse cracks/station < 1/2" in width	Good surface for most of segment Can be maintained with routine maintenance and patching
	7	a) b & c from above (8) b) Slight to no surface raveling (loss of fine aggregate) c) Existing patches in good condition	
	6	a) More longitudinal cracking, i.e. 300'/station crack width < 1/2" b) Transverse cracks 6-10/station and less than 1/2" in width c) Existing patches in fair condition d) Slight surface raveling	Surface showing signs of ageing, but could experience extended life with timely seal coat and routine maintenance
	5	a) a, b, & c from above (6) b) Moderate surface raveling c) First signs of block cracking, less than 25% of the area effected	
	4	a) Longitudinal cracks now greater than 1/2" and < 200'/station b) 1 to 5 cracks/station and > 1/2" c) Block cracking between 25 and 50% of the surface area effected d) Existing patches in fair condition	Significant ageing and surface deterioration. Needs new mat or overlay. Beyond the point where a seal coat would be cost effective.
	3	a) Longitudinal cracking more than 200'/station and > 1/2" b) Transverse cracking 6-10/station and > 1/2" c) Block cracking greater than 50% of the area d) Alligator cracking less than 25% of the area	
	2	a) Alligator cracking more than 25% b) Transverse or longitudinal cracking banded c) Extensive patching, most in poor condition	Surface is totally deteriorated. New mat or overlay would not be adequate. Needs totally new road surface and improvements to base.
Poor	1	All of the above plus rutting greater than 1 inch	

FIGURE 2 Sample of pavement surface condition rating.

maintenance. Ratings of 5 and 6 indicate the need for preservation (seal coat). Ratings of 3 to 4 indicate candidates for overlay. Ratings of 1 to 2 indicate that complete reconstruction is necessary. Once the general category has been determined, the final rating is a matter of selecting the high or low value within that category. Quantifiable distress measures are helpful in making this selection.

This simple approach to surface rating makes it easy to identify maintenance and improvement projects. This information, together with priority ranking data, can then be used to provide short- and long-range budget needs.

There is a separate surface rating evaluation for gravel roads. A ranking of 1 to 5 is considered sufficient to describe the major categories of unsurfaced road conditions. Details of surface ratings for unsurfaced roads are provided in the following table. In this context, unsurfaced means unpaved. Unsurfaced roads in Wisconsin generally are gravel roads.

Surface Rating	*General Surface Condition*
5	Very sound road; good drainage, good base, and good gravel.
4	Fairly good road; good drainage, good base, but needs gravel.
3	Majority of road needs sand lift and gravel.
2	Little or no drainage; majority of road needs drainage work; needs sand lift and gravel; and width is possibly inadequate.
1	Little or no actual road profile or cross-section; needs almost total reconstruction, including drainage, base and sand lift, and gravel.

Other features must also be evaluated in the field. Horizontal alignment, vertical alignment, and drainage are important for rural projects. A set of rating schemes used in the Federal Highway Administration's Highway Performance Monitoring System was adopted. These schemes use fairly simple instructions and straightforward evaluations. They generally use word descriptions, such as poor, fair, good, and excellent. This rating system is further described in Table 1.

Priorities

A manager must consider a wide range of factors to determine the priority of roadway improvements. Most of the factors normally considered important by local officials are listed in Table 2. A ranking scheme can be developed by assigning weights to each of these factors. These weights are combined with the previously determined condition evaluation to develop individual improvement projects.

The commitment of local officials to using a roadway management system depends on the credibility of the system. Any ranking activity must generate projects that reflect local values and the common sense of the elected officials. Therefore, the initial determination of weighting factors and selection of ranking criteria must be made by the local officials.

The first three applications of this roadway management system evolved into three significantly different ranking schemes. For example, the county system developed criteria that were greatly disposed toward safety. The small city placed heavy emphasis on paving unsurfaced roads. The town developed

TABLE 1 ALIGNMENT AND DRAINAGE RATINGS

Rating	Description
Vertical Alignment	
Excellent	All grades (rate and length) and vertical curves meet minimum design standards appropriate for the terrain. Reduction in rate or length of grade would be unnecessary even if reconstruction is required to meet other deficiencies, such as capacity and horizontal alignment.
Good	Although some grades (rate and/or length) and vertical curves are below appropriate design standards for new construction, all grades and vertical curves provide sufficient sight distance for safe travel and do not substantially affect the speed of trucks.
Fair	Infrequent grades and vertical curves that impair sight distance and/or affect the speed of trucks if truck climbing lanes are not provided.
Poor	Frequent grades and vertical curves that impair sight distance and/or severely affect the speed of trucks and truck climbing lanes are not provided.
Horizontal Alignment	
Excellent	All curves meet appropriate design standards. Reduction of curvature would be unnecessary even if reconstruction is required to meet other deficiencies, such as capacity and vertical alignment.
Good	Although some curves are below appropriate design standards for new construction, all curves can be safely and comfortably negotiated at the prevailing speed limit on the section. The speed limit was not established by the design speed of curves.
Fair	Infrequent curves with design speeds less than the prevailing speed limit on the section. Infrequent curves may have reduced speed limits for safety purposes.
Poor	Several curves uncomfortable and/or unsafe when traveled at the prevailing speed limit on the section, or the speed limit on section is severely restricted because of the design speed of curves.
Drainage	
Good	Fully adequate drainage and cross-section design. No evidence of flooding, erosion, ponding, or other water damage.
Fair	Height of grade line, cross-section, or culvert capacity somewhat below the standard that would comply with standards if rebuilt. Drainage structures are structurally sound. Some added maintenance effort required because of drainage and sedimentation problems.
Poor	Evidence of severe flooding, ponding, erosion, or other drainage problems. Drainage structures may be in poor condition. Considerable excess maintenance effort required because of drainage and sedimentation problems.

TABLE 2 ROADWAY EVALUATION FACTORS

Criteria	Measures
Condition	
Surface condition	Surface rating (1-10), PSR, PCI, Asphalt Institute
Structural adequacy	Deflection tests, pavement layer thickness
Drainage adequacy	HPMS rating
Surface type	PCC, plant mix bituminous, road mix, seal coat, gravel, soil
Age	Years since last resurfacing
Geometrics	
Horizontal alignment	HPMS rating, number of curves per mile
Vertical alignment	HPMS rating, number of hills per mile
Lane width	Feet
Shoulder width	Feet
Passing opportunity	Percent passing
Functional	
Arterial	Major roadway—provides mobility
Collector	Minor roadway
Local	Provides property access—limited through traffic
Dead end	Serves one property—limited use
Service	
Ride	PSI, panel rating (1-5)
Safety	Accident rate, repeat accident location, may substitute geometrics for accident potential
Load limits	Posted bridges and roads
Parking	Designated space available
Right of way	Adequate to maintain drainage and vision
Snow drifting	Deep cuts, steep back slopes, brush
Spot problems	Various localized problems causing reduced level of service

criteria that favored preserving investments on higher function roadways. Although all three systems had many similar elements, the emphasis on particular elements varied greatly. This local sensitivity furthers local acceptance of the process and recommendations.

The factors that are used to set priorities generally fall into three or four broad categories: roadway condition, safety, function, and service. These categories were found to work well. Roadway condition relates to surface condition, structural adequacy, and drainage. A surface condition rating can be used with a drainage evaluation to cover this important category.

Safety analysis can present significant problems for low-volume roads. Detailed accident data are often unavailable. In addition, analysis techniques developed for high-volume roads may not be appropriate for low-volume roads. Surrogates for traffic accident data could be used, such as alignment, pavement geometrics, and identification of spot hazards. Intersections can also be evaluated separately if a significant problem exists.

Roadway function generally includes the previously mentioned functional classifications. Traffic count data could also be useful, if available. Service to local industry, schools, and commuter routes must be considered. The service category could include the general level of service provided and other spot conditions, such as ride quality, surface type, and snow drifting.

A scale of 0 to 100 is recommended for ranking improvements of individual segments. It has been found useful to use a low score to indicate a high level of need for improvement. An example of this approach is shown in Figure 3. Figures 4 and 5 are examples of earlier versions that used the opposite

A. PAVEMENT (55 Ranking Points)

Pavement Surface Condition Rating	Points
10	40
9	39
8	37
7	35
6	29
5	23
4	16
3	10
2	4
1	0

Gravel Surface Condition Rating	Points
5	40
4	20
3	15
2	10
1	0

Drainage Rating	Points
Excellent - 4	10
Good - 3	7
Fair - 2	3
Poor - 1	0

Surface Type	Points
Hot Mix Asphalt	0
Cold Mix Asphalt	3
Gravel	5

B. GEOMETRICS (25 Ranking Points)

Surface Width (Rural)	Points
22	10
20	7
18	4
16	0

Roadway Width (Urban)	Points
44	19
40	16
36	11
32	7
30	3

Shoulder Width (Rural)	Points
6	9
4	7
2	4
0	0

Horizontal (Curves)	Points
0-1 Curve/Mile	3
2 Curve/Mile	2
1 Turn, or 3 Curves/Mile	0

Vertical (Hills)	Points
No steep grades or hills	3
1 steep grade per mile	2
2 or more steep grades per mile	0

C. ROAD CLASSIFICATION (15 Ranking Points)

	Points
A - Major	0
B - Minor	5
C - Plat	10
D - Local	15

D. SPOT CONDITIONS (5 Ranking Points)

		Points
Safety	Frost Heave	0 - 5
Pot Holes	Rough Ride	
Bumps	Snow Drifting	
Poor Culvert	Narrow Right of Way	

FIGURE 3 Sample of Town of Rutland ranking and deficiency criteria.

SEGMENT No. _____

			POSSIBLE POINTS	ITEM SCORE
A. PAVEMENT (21 points maximum)				
1) Age (2 points maximum)				
• Over 20 years			2	
• 10 to 20 years			1	
• 0 to 9 years			No points	_____
2) Pavement Condition (11 points maximum)				
Rating	Points	Rating		
• 1	11	• 6	6	
• 2	10	• 7	5	
• 3	9	• 8	4	
• 4	8	• 9	No points	
• 5	7	• 10	No points	_____
3) Pavement Width (8 points maximum)				
• Less than 20 ft.			8	
• Less than 22 ft.			4	_____
B. SAFETY (25 points maximum total - can be combined)				
Accident Record (Within last three years)				
• 1 or more preventable death accidents			10	
• 2 or more preventable personal injury accidents			10	
• 2 or more preventable property damage accidents			5	_____
C. GEOMETRICS (31 points maximum total)				
1) Horizontal Alignment (13 points maximum) (Posted curves per Mile)				
• Three or more occurrences			13	
• Two or more occurrences			8	
• One occurrence			3	_____
2) Vertical Alignment (13 points maximum) (Steep grades Per Mile)				
• Three or more occurrences			13	
• Two or more occurrences			8	
• One occurrence			3	_____
3) Shoulder Width (5 points maximum)				
• No shoulder			5	
• Less than 2 ft. shoulder			3	
• Shoulder 2 ft. to 4 ft.			1	_____
D. TRAFFIC VOLUMES (16 points maximum)				
• Over 2000 ADT			16	
• 1500 - 1999 ADT			13	
• 1000 - 1499 ADT			10	
• 500 - 999 ADT			7	
• 250 - 499 ADT			4	
• Less than 250 ADT			No points	_____
E. FUNCTIONAL CLASSIFICATION (7 points maximum)				
• Arterial			7	
• Major Collector			5	
• Minor Collector			3	
• Local Road			No points	_____
TOTAL SCORE:				_____

FIGURE 4 Sample of Washburn County segment score sheet.

approach. It is helpful to first distribute the 100 points to each major category, and then weight individual factors within the category.

Some adjustment of the overall ranking is likely to be necessary after the early analysis. These adjustments should not be considered a weakness in the system, but a necessary result of the subjective nature of the ranking process.

Deficiency Criteria

An evaluation of existing conditions necessitates a comparison with desirable or acceptable conditions. Geometric standards usually exist for surface width, shoulder width, and maximum grades. Alignment and drainage can be compared to excellent condition descriptions in Table 1. Other factors are more subjective. Experience with local officials has indicated that they have little difficulty in establishing relative evaluation criteria. Examples of specific criteria are shown in Figures 3, 4, and 5.

Analysis and Recommendations

The identification of roadway improvements could be either a simple or a complex process. A simple approach, which is useful

Segment Name: _____ Date _____
Segment No.: _____

A) FUNCTIONAL CLASSIFICATION
(30 points maximum)

	Possible Points	Segment Points
1) City Classification C	30	
2) City Classification D	15	
3) City Classification E	0	_____
B) ROADWAY DATA (65 points maximum)		
1) Surface Width		
• Less than 75% of Standard	5	
• 76 to 99% of Standard	2.5	
• 100% or more of Standard	0	_____
2) Travel Lanes		
• Less than 75% of Standard	5	
• 76 to 99% of Standard	2.5	
• 100% or more of Standard	0	_____
3) Parking		
• Both sides	2	
• One side	1	
• No parking	0	_____

4) Surface Type

City Class	Bitum	Gravel
C	10	20
D	5	15
E	0	0

5) Surface Condition

Bituminous	Gravel
1-25	1-25
2-22	2-20
3-19	3-15
4-16	4-10
5-13	5-5
6-10	
7- 7	
8- 4	
9- 1	
10- 0	

_____

6) Drainage
8 - Erosion problems
4 - Need ditching
2 - Needs curb and gutter
0 - Satisfactory
_____

C) MISCELLANEOUS DEFICIENCIES (5 points maximum) _____
TOTAL SEGMENT SCORE _____

FIGURE 5 Sample of City of Washburn segment score sheet.

on a small roadway system, is to list all segments that fall into each of three surface rating categories. Roadway segments rated 5 or 6 are candidates for preservation (seal coats); those rated 3 and 4 need resurfacing; and those rated 1 and 2 need reconstruction. A review of this list allows the manager or local official to select projects directly. Annual work programs can be developed using average cost estimates for each category of work (seal-coating—$5,000/mi, resurfacing—$40,000/mi, reconstruction—$100,000/mi). This approach may be similar to existing procedures, but it has the advantage of documenting existing conditions. In future years the lists will show if more projects are being added to the needs list than are being completed. This basic approach could be useful in starting a roadway management system.

A more detailed analysis involves a comparison of existing conditions with the deficiency criteria. The weight assigned to each deficiency is then used to rank each roadway segment. Specific improvement projects will then evolve from the list of segments in order of rank.

It is important that a description of the overall current condition of the roadway system be produced. This can be done in graph form; examples are shown in Figures 6 and 7. Local officials will be better able to determine and justify adequate budget requirements with this information. This information is also valuable in assessing trends. Changes in overall roadway conditions may indicate progress or deterioration. This information is also useful in setting future budget levels.

Probably the most difficult task in this process is that of developing a general budget range that can be maintained over a reasonable period of time. The overall objective of the entire process is to develop budgets that are relatively consistent and to avoid budgeting and management by crisis. In many if not most cases, municipal budgets are based on a percentage increase or decrease over the past year's budget. The process described in this document is intended to establish a budget that is primarily based on documented needs.

The analysis described earlier identifies roadway segments in need of improvement. The size of an annual budget will depend

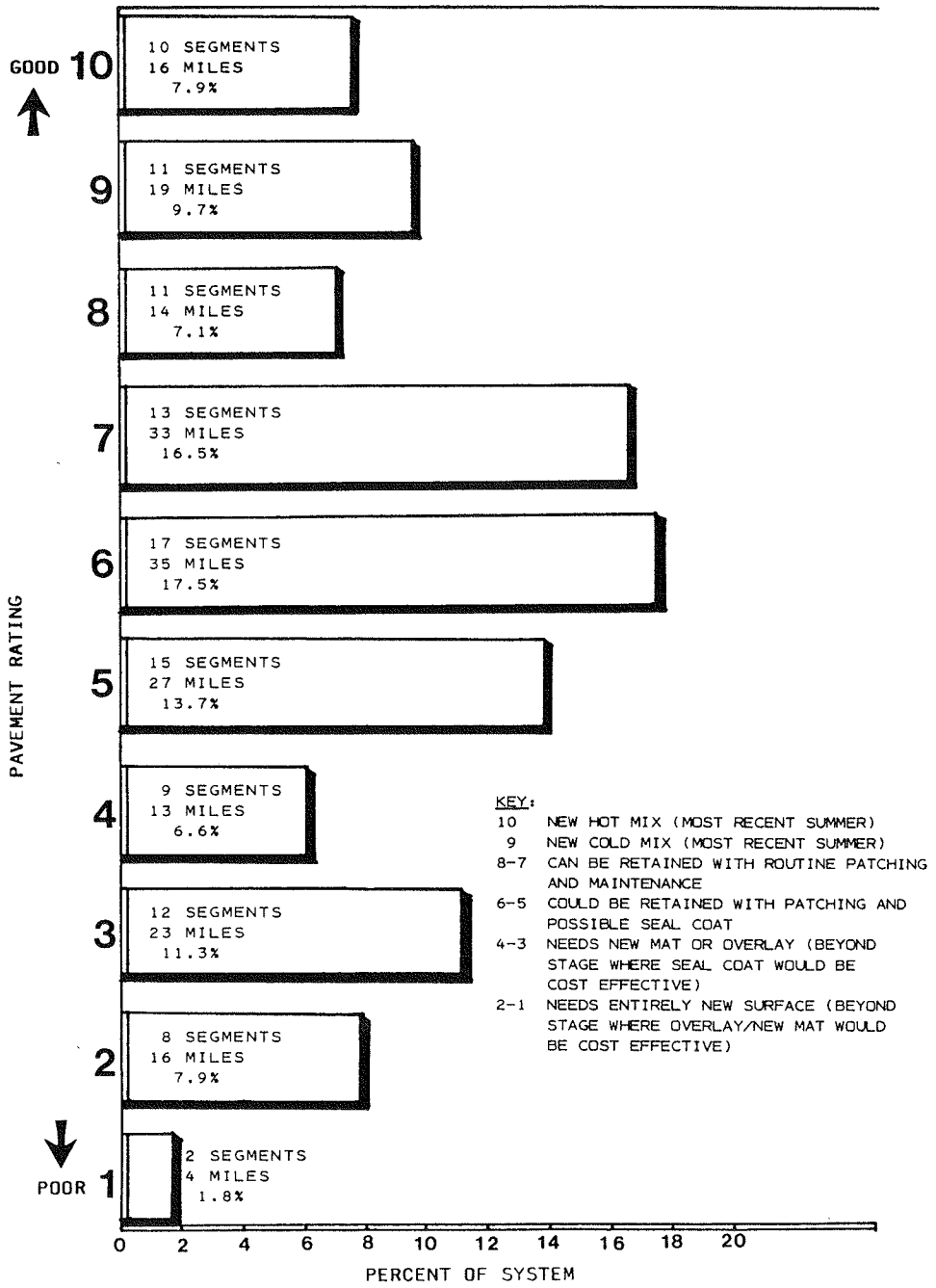

FIGURE 6 Washburn County pavement conditions.

on how fast this need is met and the rate of future roadway deterioration. Initial budget estimates can be developed by trying to complete all currently identified needs in 3 to 5 years. A review of the local agency's goals will determine if this approach is adequate and feasible.

It has been estimated that it is necessary to budget between $1,500 and $2,500 per year per mile of paved roadway in Wisconsin. This estimate is for improvements only and does not include routine maintenance costs such as crack sealing, patching, mowing, and snow removal.

It is also important for communities to compare their budget expenditures with those of other, similarly sized communities. This puts budgeting needs in perspective and is often helpful in justifying appropriate expenditures. However, comparisons should be made with communities that are meeting their goals and have a desirable roadway system.

IMPLEMENTATION

Most local highway agencies require some technical assistance in implementing a roadway management system. Because most agencies have a limited technical staff, the need for assistance can be great. Experience has shown that persons from a wide range of sources can be assembled to provide this technical assistance. Technical staff from universities, regional planning

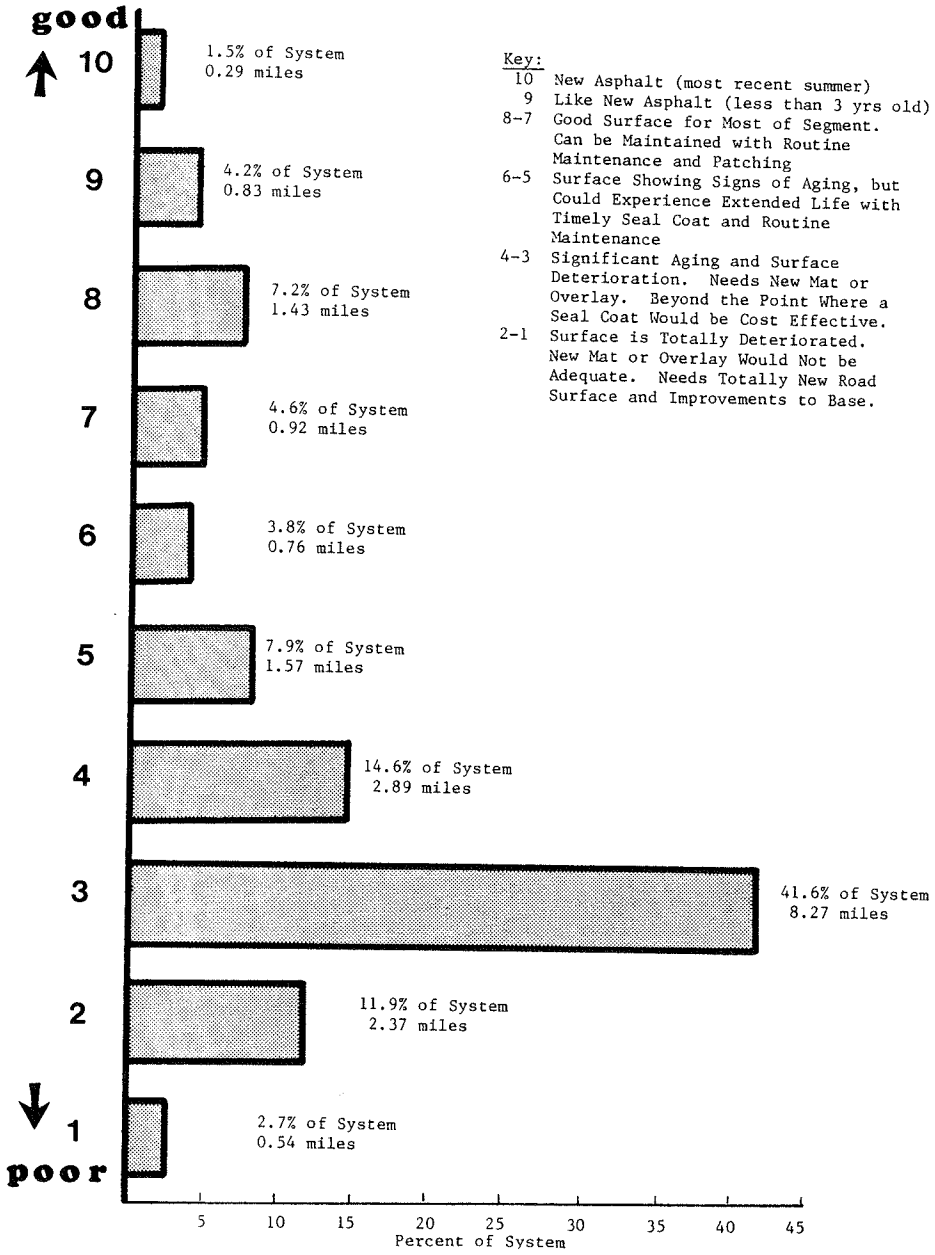

FIGURE 7 City of Washburn street conditions.

commissions, state transportation departments, larger local agencies, and consulting firms have performed effectively as project leaders.

The typical activities required for implementing a roadway management system are shown in the flow chart in Figure 8. The process usually requires four to six meetings with local agencies. The initial meeting is important to establish the scope of the study and responsibilities. The roadway system should also be discussed at this meeting. A roadway classification system should then be started. Through the discussion of the roadway system and its different functions, the project leader can begin to develop not only a roadway classification scheme, but some insights into local priorities and goals. Local priorities should be reflected in final decisions, not the bias of those providing technical assistance.

Deficiency criteria and rating systems will evolve at subsequent meetings. It is helpful to provide a range of criteria from which local officials can review and select. A useful starting point is provided in Table 2. Each local agency is likely to focus on different elements or emphasize different issues. They should, however, be appraised of generally accepted standards.

Once the criteria are established, the technical assistance team will help collect and analyze field condition data. A slide series was successfully used to train local officials in how to rate pavement surface conditions. Examples of pavements in each category should first be presented. Then other roadway examples should be shown and rated. Consistent ratings can be achieved in a 1-hour training session.

The extent of the data analysis required obviously varies with the complexity of the system. The analysis primarily consists of tabulating data and assembling the output into a format that can be understood by local officials. Experience has shown that complete implementation normally requires six 2-hour meetings. Data analysis has been in the range of 10 to 20 hours. The

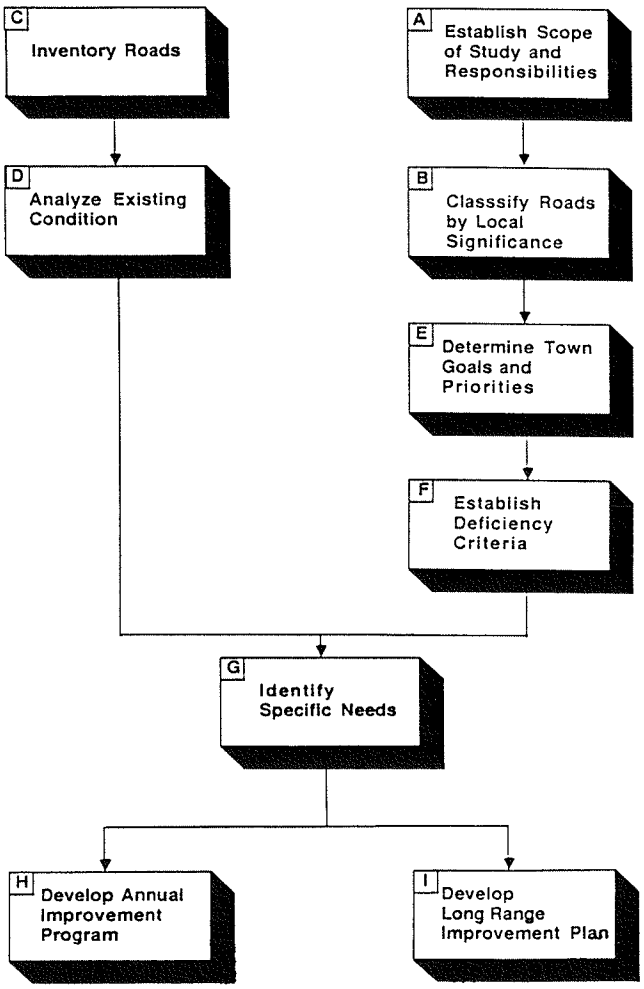

FIGURE 8 Town of Rutland road management study outline.

collection of field data on condition assessment can vary significantly. However, experience has shown that about 1 to 2 days of field data collection are required for every 100 mi of road inventoried.

RESULTS

The roadway management system was fully implemented by the three agencies by mid-1986. The process was accepted by local elected officials and is being used to manage and budget roadway improvements. The agencies are providing the time and needed staff to continue its use.

The benefits cited by the local officials center on an improved understanding of the roadway improvement needs, objective determination of priorities, and additional commitments toward meeting those needs. For example, the city's 1986 street budget increased threefold and the town's increased fourfold.

CONCLUSIONS

The following conclusions can be drawn from experience in the development and implementation of the roadway management system for local communities in Wisconsin.

- A significant need exists for the use of a roadway management system by local governments. The sincere and enthusiastic interest and support of local governments clearly demonstrates this need. Requests for assistance in implementing a similar system currently exceed the ability to provide it.
- The basic system was able to meet the needs of a variety of local agencies in Wisconsin, including a town, city, and county. The system has been used to develop roadway improvement programs and has been accepted by local elected officials. Although a more sophisticated system is useful, a basic approach has been successful in increasing the interest of local officials in a roadway management system. Refinement and improvement of the system are possible after the initial system has been accepted.
- A simplified pavement surface condition rating system has been developed. It uses the judgment and experience of existing maintenance personnel, and provides an organized and understandable way of assessing current conditions. The surface condition rating can be used alone or in conjunction with a more comprehensive management system.
- The development of future budgets and priorities is relatively easy once the existing conditions are described and understood. Of equal importance is the fact that budgets and priorities are based on objective criteria and standards that were combined with roadway condition data.
- A significant technical assistance effort is required to implement this system with local agencies. A wide variety of technical personnel has been successful in providing this assistance.

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