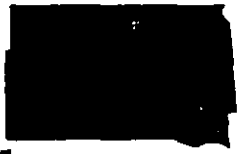

LOCAL ROAD NEEDS STUDY

SD-90-11

Design and Maintenance Guidelines and 20 Year Funding Needs

Submitted to:

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August 1991

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

A. Survey of Other States
B. County Update Survey Forms
C. Data Base Summary Information
D. Yearly Maintenance and Rehabilitation Report by County

PART 1
DESIGN AND MAINTENANCE GUIDELINES

1.0 INTRODUCTION

The rural community in South Dakota plays a vital role in the State's economy. The transportation network can control economic development to a degree in a rural economy. A key link between the rural community and the urban areas and markets is the transportation system. If the level of service is not maintained at a sufficient level, it will begin to effect the economy of the State and the Counties.

Transportation and movement of goods and people is of utmost importance to survival of rural states such as South Dakota. Transportation methods take various forms, but the most visual in South Dakota are the roadway networks. People have become used to having high expectations of the levels of service and having road networks available for their use at all times. Many changes have occurred in the last 20 years that have impacted the levels of service and accessibility. Examples are population shifts to urban areas, consolidation of farms, rail road line abandonments, wider and heavier agricultural equipment, heavier truck loads, and larger school buses, just to name a few. The heavier and wider loads have placed a significant strain on the structural capacity of the roads and bridges. This in turn leads to a decline in the level of service if funds to sufficiently maintain an expected level of service are not provided.

The problem is extended at the county levels in that highway funds are in direct competition with other needs in the county. Increased demands in education, health care, and other program costs have put a strain on county budgets. This further aggravates the funding picture for maintaining an acceptable level of service on a deteriorating transportation network.

There are two methods to maintain or improve the current levels of service: The two alternatives are to modify standards so that more can be done with current budget levels or increase funding or a combination of both. If improvements in the levels of service cannot be made by either of these methods, the only other alternatives are to reduce the roadway network mileage, reduce the levels of service, or turn hard surfaced roads back to gravel.

All of these issues were the reasons for the development of the 1984 Local Roads Needs study that was conducted by the South Dakota Department of Transportation. The 1984 study attempted to determine funding needs for the county transportation

network. The study collected a wealth of information pertinent to county needs. The reported funding needs apparently were not accepted very well and as a result, the study was not used to secure additional funding. On a positive standpoint, the study did identify needs and began to investigate methodology for determining them.

The South Dakota Highway Superintendents Association realized the importance of pursuing the 1984 needs initiative further. Hence, this study was outlined and put to contract. The study is a cooperative effort of the South Dakota Department of Transportation and the South Dakota Highway Superintendents Association.

2.0 OBJECTIVES

The objectives of this study encompassed several areas including bridges and highways, designs, standards, policy, and needs determination. The objectives were:

- To identify factors which are significant in defining appropriate levels of service for county roads and bridges
- To develop standards, especially design criteria and maintenance standards, which define levels of service appropriate to county roads and bridges applicable throughout South Dakota
- To estimate county funding requirements, based upon the standards which are developed and upon state surveys of county road and bridge condition

The scope of the study entailed development of the objectives for the County Federal Aid Secondary and County Primary systems only, as directed by the Technical Panel in charge of the study.

3.0 LITERATURE REVIEW

A literature review was conducted on research relevant to rural bridge and road standards. The review was three-fold with the first being a search of the TRIS (Transportation Research Information Services), produced by the Transportation Research Board. The search turned up 121 related research products relating to low-volume roadways. A brief synopsis of the relative research products is listed below.

In a study conducted in New Zealand (1) it was shown that the percentage of travel on roads considered substandard by users is on the increase. Despite the decline in service, the budgets allocated to funding rural roads were also on the decline. It became necessary for road engineers to revamp some aspects of the geometric design to meet the challenge of increasing levels of service with decreasing funds. The question of road safety implications was evaluated as an implication of reducing geometric guidelines. It was suggested that when road safety is considered across the whole network of roads, the reduction in standards was likely to be cost effective in terms of safety also.

A Canadian study (2) reported that approximately 76 percent of the road system in Canada has been classified as rural low-volume roads. In the past, a uniform set of design standards for these roads was not available. The lack of standards has resulted in various guidelines established by the various agencies. These standards may or may not have been compatible with the roadway functionality and also had the effect of nonuniform treatment of roads between road jurisdictions.

In a study on low-volume bridges (3) it was reported that low-volume bridges are currently designed according to the same specifications as urban highway bridges. As a result many of the low-volume bridges designs are overly conservative and uneconomical. In the report, value engineering principles were used to develop and select economical bridge systems. Jointless bridges received very high ratings and are strongly recommended for the 60 to 100 foot span bridges. A pre-cast voided slab system and a timber deck and steel stringer system received the highest ranking on the 30 foot spans. The study also proposed methodology for selecting the type of system that is most suitable for the area and a priority scheme to select which bridges should be replaced first.

A Canadian study (4) on the effects of various geometric and environmental factors on speeds of 2-lane rural highways provided some insight into the impact the various features have on speeds. One important thing is that this study was done on highways with traffic volumes of 1200 vehicles per hour. They developed a multiple linear regression model relating measured speeds to the upstream influencing factors of the highway. Land use adjacent to the road and the legal speed limit were found to have the most significant impacts on speed. Grade, access from other roads, and lane width followed in that order. These 5 factors accounted for 85% of the variation in speed. Road curvature, presence of an extra lane, sight distance, center line markings and lateral obstructions were not found to have statistically significant effects on speed.

As a trial (5) in the late 1960's, the design standards for specified low-volume roads were lowered in order to reduce the costs and hence increase the length of roads which could be surfaced. One and two layer pavement designs were adopted. Based on the experience with these roads and a thorough structural evaluation of the performance, the low-standard designs were shown to be an economic alternative to the typical design standard. The present worth of total costs was shown to be 26 percent cheaper than on a pavement built to the normal standard. Recommendations are made for the design of pavement for low standard roads in farming areas having a relatively low rainfall.

NIMPAC (6) is a road planning model developed in Queensland Australia to operate on the DAASRA data bank system of road inventory. NIMPAC does this by comparing each road section against assessment standards, identifying deficiencies, and costing measures to correct them. It is possible to vary the assessment standards and the design standards of improvement projects, in successive iterations, to investigate the effect of the changes on road "needs", and to equate assessed needs to the order of available funds. The principal findings are confirmations of the rather modest road standards which can be attained on the highway used in the study, at prevailing levels of road funding. The results of this study were also used to try to develop a model for doing this type of study by using a sample of the network rather than the entire data bank.

Sovereign immunity (7) of local governments has been diminishing. This article discusses some action which may be taken to limit the potential of and prepare defense for liability lawsuits. Low volume roads present a unique situation. Criteria

designed for low volume rural highways should be used in establishing programs and defenses for liability. The use of "design standards" may place governments in less a defensible position. Design criteria or design guides permit more flexibility and the use of professional judgement which is more defensible. Some actions one can take to better protect ones self are setting priorities, establishing and documenting design guides, and creating and following a road condition inspection system.

With a constrained budget (8), high design standards for new roads are achieved at the expense of other needed works. The result is that the overall quality of the road system deteriorates with respect to the whole, even though some parts become very good. A design philosophy was examined in which a basic road system exists, but upgrading it structurally is a significant task. It involved selecting a design speed based primarily on driver's expectancies related to the road environment, and only secondarily on the functional class. This enabled a more economic design of constrained sections even on important roads, and inherently safer designs for less important roads.

An Iowa study (9) evaluated accident rates on secondary roads and found they are related to the average value of farm land per acre and to the configuration of the secondary road system. Accident rates on the primary system are apparently not related to these variables. The lack of correlation for the primary system can probably be attributed to the higher design standards used throughout the state. Primary road design, maintenance, and signing standards are much more consistent, while the same standards on the secondary road system vary from county to county. It was concluded that to reduce the total accident rate on the secondary road system in Iowa, more funds need to be allocated for the proper counties.

Research was conducted (10) to examine prevailing rural design standards to determine their economic justification. A sampling of current standards for roadbed width and surface type shows wide variation in roadbed width. The desire to prevent accidents is among the primary reasons for providing wide roadbeds, including wide shoulders. The findings of the accident frequency analyses are 1) non-intersection accidents of any sort are rare events on lightly-traveled rural roads, 2) only a portion of these accidents would be eliminated by wider roadbeds, 3) only infrequently is roadbed width listed by the reporting officer as one of the factors contributing to accidents that do occur, 4) there are very few vehicles that are parked

or moving slowly, and 5) narrow roadbeds do not necessarily have a poorer over-all accident experience, in terms of accidents per vehicle mile, than do wider ones.

Low volume is defined as less than 400 Average Daily Traffic (ADT), yet some two million miles of rural road, or two-thirds of the total in the United States, fall within this category. A study (11) explored the rationale underlying the standards for roadbed width and found that they have almost no scientific, engineering, or economic base. Rather they are blended from past practices, political considerations, and the financial "facts of life". Also standards such as those of American Association of State Highway and Transportation Officials (AASHTO), are usually among the most exacting. The findings present a set of derived costs and benefits to highway agencies through a range of roadbed widths and demonstrate that, from an economic standpoint, there is little or no justification for wide roadbeds and none for shoulders. The study concludes that present-day standards for low-volume roads which are expected to remain rural in character should be modified as follows: 1) abandon the concept of continuous constant width cross sections. They are costly since they require that a road be reconstructed from end to end. Substitute standards based on spot improvements, and 2) if there are to be standards for roadbed width, they should stipulate maximums rather than minimums and encourage the use of narrower roadbeds where they can be shown to be economical.

More than 2,900 of the 3,000 counties in the United States have responsibility for managing road systems (12). Most of these systems consist of low-volume roads. The condition of rural roads has a direct influence on the cost of living, for farm products are generally transported to the market-place via low-volume roads. Since 1967, county low-volume roads have had to conform to design standards initially recommended for high-volume roads. This conformance has stunted road improvement progress and increased project costs as much as 100 to 200 percent.

One of the most interesting conclusions or comparisons is the amount of similarity between what is happening in South Dakota and research findings from Australia and some developing countries. If one thinks about this further, one can draw several conclusions as to application of some of the existing research done in these other areas even though they are a world apart. Many parallels can be drawn relative to rural settings, traffic volumes, effect of standards on levels of service, climate, etc.

The literature review also included contacting some of the other state highway agencies with systems similar to South Dakota's and obtaining their standards for review. A letter was sent out to all state highway agencies requesting their standards for low-volume roads and bridges. This was one of the disappointing features of the information searched. Many states responded but most of the information was of little value to this study. Most of the respondents cited the 1984 AASHTO Geometric Design of Highways and Streets as the standard or guideline in there respective states. There was nothing of significance reported in alternative standard guidance. Nothing at all was cited concerning maintenance standards. The search tends to indicate that an endeavor such as this has not been undertaken anywhere. A summary of the information that was submitted by each of the states is attached in **Appendix A.**

The third and final search for related literature was conducted in-house at the research facilities located at the ERES Consultants, Inc. library. This information was used to develop original concepts to this study.

4.0 COUNTY INTERVIEWS

With the aid of the project Technical Panel, five counties were selected that were representative of the rural and metropolitan geographical distribution. The counties involved in the study were Pennington, Haakon, Roberts, Charles Mix, and Yankton. A series of meetings were scheduled with each county selected. Items of discussion were existing construction and maintenance practices, public expectations, existing levels of service, what level of service is the minimum tolerable, perceived needs, and other factors needed to define appropriate levels of service.

The primary focus of the task was on roads and bridges. However, the entire spectrum comprising needs was addressed. Areas such as signing, cost of winter maintenance on roadways constructed to the various current standards, and other maintenance activities were surveyed in this task.

A brief synopsis of some of the highlights discussed in each of the counties is as follows.

County 1

- They try to chip seal every 4 to 5 years and feel that they keep up pretty well with this program.
- They regravel on a frequency of about every 10 years, high volume roads every 3 years, and low volume roads every 15 years.
- County 1 had some interesting views of townships in that they are getting more funding than they are using.
- Comments on structures included that some of the standards seem aggressive, but in large are pretty good, their bridges are in pretty good condition, and sometimes it is cheaper to do the work themselves than involve Federal funding.
- Many of their roads have a history of starting as a chip seal.

- Full width overlay patching has had much better performance. They have used an AMZ patching unit, which uses chips and emulsion, with success also.
- A transportation committee has been set up to review the county operations.
- They had several comments about their budgeting process; don't even think about recommending what is needed, experience pressure to downgrade budget, budget based on past history, could use half again as much funding.
- The typical AC overlay project is 3 to 5 miles, a 1.5 in overlay is used on a good roadway structure, 3 inches maximum on weak roadway structures.
- They cannot afford to reconstruct.
- They check with the county engineers (consultants) on standards to use in rehabilitation.
- The hierarchy of use or primary concerns for level of service is traffic, school bus routes, and mail routes, in that order.
- Sight distance is an important consideration.
- They consider a roadway for a bituminous surface when the ADT approaches 100 to 150.
- They tend to blade their primary gravel roads 7 times a year, gravel them every 5 to 6 years with 4 inches of new gravel, and also pull shoulders at a cost of $3000/mile prior to re-gravel operations.
- They do surface treatments every 4 to 5 years.
- They would like to have a 24 foot top on higher volume roads, then in a range of 22 to 24 foot on mid volume roads, and 18 to 20 foot on the lowest volume roads.

- They could use about 25% more bituminous patch material on their high and mid level volume roads. They would like to chip seal every 3 years and overlay at 75 ADT.

- They indicated there was no consistency in the application of load limits, but they are placed on blotter and AC roads.

- They felt there were three things that affect standards; function, terrain, and traffic levels of both cars and trucks.

- Weed control affects maintenance of low volume roads; they could cut blade cost by 1/3 if they did not have to blade at times to control weeds.

- They have a center and edge line striping program only when they can pick up on a State contract.

- Their bridge standards are the same as the State standards and they are acceptable as long as the railings are not to high.

- The most frequent public complaints are dust control, weeds, and wash boards.

- The Commission currently decides whether or not any particular roadway gets paved.

- Their current equipment budget is about one half of what it should be.

- Signing is in pretty good condition and they use MUTCD standards.

County 2

- The 1984 study was worthless, they could not possibly match any of the funds and the level of funds was much more than needed to provide a satisfactory level of service.

- They currently use all Federal Aid money for bridges and approaches.

- The roadway grades are pretty good for the most part.
- Main road bridges are satisfactory but the local roads bridges are much worse.
- Each blade can maintain about 130 miles of road. They get over every couple weeks in the spring then about once a month.
- Main roads (Federal Aid Secondary (FAS) and County Highway) should have a 24 to 26 foot top. With local roads, a 20 foot top is sufficient.
- They gravel roads every 10 years with 4 inches, pull shoulders every 3 to 4 years, use screened gravel for roads. If a road has never been graveled they put on 6 inches and then they regravel it in 4 years.
- They have an approximate backlog of 10% of the system needing regrading and graveling.
- School roads are important in making decisions about what to do.
- They have problems with blow dirt; they do not use load limits but prefer controlling speed, and they would like to turn all roads to gravel.
- Signing is in pretty good condition and they use MUTCD standards.
- They have a three year purchase plan for equipment, but they need to double the funding for equipment purchases.
- On FAS routes they use 28 to 32 foot bridge widths. They have a county bridge standard that is 24 foot in width. All bridges less than 24 foot should be rebuilt. An example of the cost difference between the county and FAS bridge standards is $65,0000 for county standards versus $120,000 for FAS standards.
- The 15 foot clear zone is ridiculous for bridges.

- They consistently find that it is cheaper to use 100% local funds on projects than it is to provide the match on a Federally funded project using FAS standards.

- They would like to see practical needs projections.

- Roadway ditch slopes should be either 4:1 or 3:1.

- Mowing and weeds are done once a year.

County 3

- They measure or develop road priorities based on ADT, condition, and balancing out projects within the county.

- Their gravel roads are bladed every 3 weeks if < 50 ADT and every 2 weeks if > 50 ADT. Re-graveling is done on a 3 to 4 year cycle with 2 to 4 inches of material. They would do a major should pull and gravel operation once every 10 years. Gravel roads are viable with ADT levels < 75. They have turned some blotter roads back to 6 to 7 inch gravel roads and have covered bituminous roads that are breaking up with gravel.

- They use ADT levels of 250 to 300 as a target level for eligibility for bituminous paving. When upgrading a blotter road, they typically use a 2.5 inch overlay. Try to maintain a 26 foot top with 4:1 ditch slopes. They were in a 5 year seal program but it has been lengthened because of budget constraints.

- Blotter roads average 25 to 30 years old. They rehab at 17 to $18,000 per mile by filling ruts and sealing approximately on a 6 year cycle. They would like to go to a 1/2 inch overlay prior to seal as a rehab strategy.

- They are currently grading roads in the 26 to 27 foot width. Farm equipment needs the width (24 ft minimum).

- Equipment replacement is the first thing to go. They were on a 20 year replacement cycle for the larger equipment but are closer to a 40 year cycle now.

- They consider their current backlog to be 41 miles of gravel roads needing regrading on which sight distance is a problem, about 100 miles of bituminous roadways needing regrading to overlay, and about 200 miles of blotter roads needing to be redone.

- They feel that the AASHTO standards are too high, bridge requirements on township roads and guardrail are excessive, the vertical curve requirements are livable, and the clear zones are tough to meet, especially in towns.

- They are eliminating some bridges and letting the water go over the roads by installing low water crossings.

- They use screened gravel.

- Bus and mail routes play an influence to a degree.

- Mowing is done once a year. Signs are acceptable and they use MUTCD standards. They stripe centerline primarily with edge lines only in narrow grades and in hills. Striping is done only in conjunction with State contracts.

- Load restrictions are used and they are enforced strictly.

County 4

- They have not done any new paving recently. They would like to overlay a blotter top roadway after 15 to 20 years time. A 5 years seal cycle is a target frequency.

- They use standards developed by a consulting firm.

- They have a 80 ft right-of-way width on hard surfaced roads and are using 80 ft on all regrading that is done. They shoot for 4:1 slopes on high volume roads and 3:1 on secondary roads. They use AASHTO design guidelines for

the FAS routes and this is acceptable. On oil FAS roads they have a 34 ft top and on gravel FAS roads a 26 ft top.

- They consider that a 20% increase in budget would take care of the roadway backlog needs.
- They blade gravel roads every 2 weeks and try to maintain 3 inches of gravel on the roadway at all times. High traffic roads get re-graveled every 6 to 7 years while low traffic gets less frequent re-graveling, and they will pull shoulders prior to graveling.
- They keep a 3 year road plan at all times and do a visual evaluation every year to continually update the plan.
- They prioritize roads to upgrade based on ADT and condition.
- They keep the commissioners more involved by using the 3 year road plan, every month the foremen turn in progress reports, helps the commissioner sell the program to the public and be more informative.
- They could use 1/3 more funds for equipment updating.
- School and mail routes get priority snow removal.
- They do a top cut in the spring and two rounds in the fall on mowing, asphalt roads are mowed 3 times a year.
- They do striping on State contracts and should do every 3 to 4 years.
- They have a lot of minor structures and try to update as many of them in a year as possible.
- Improvements are based on 25% ADT, 20% special usage, 20% population distribution, 5% anticipated future need, and 25% condition.
- Blotter roads typically have a 6 to 8 inch base, and would receive a surface treatment every 15 years.

- Bridges are a very important feature and are following State standards.
- Regrade to 26 feet at $15,000 plus $4000 to gravel.
- They use load restrictions of 6T on blotter and 7T on asphalt.
- Abandonment of roadways is not a desirable option.
- Signs are pretty much acceptable but they do have problems with bridge end markers.

County 5

- Bridges are replaced with 24 ft structures, abandonment is only temporary, can build 3 bridges with county funds for the price of 2 FAS bridges, on high traveled roads > 200 ADT bridges are built 32 ft wide, do not extend guardrail out beyond the end of the bridge, eliminate death trap box culverts, redo end markers 2 times a year.
- They are about where they should be with equipment.
- The surface condition of roads is considered to be in excellent condition.
- Roads with 200 ADT or less should have a 20 to 22 ft top and a 4:1 ditch slope, 200 to 1500 ADT 24 ft top 4:1 ditch slope and 1 ft shoulders, > 1500 ADT 24 ft top, 4:1 ditch slopes, and 6 ft shoulders. Vertical sight distance is important. They would like to use 100 ft right-of-way when regrading.
- Blotter roads are almost always overlaid. Dust is a consideration for overlaying with bituminous materials. They use a 2 inch standard overlay with 3 inches if there is a lot of truck traffic.
- They try to do overlays every 20 years, and every 25 years if less than 500 ADT. AC roads are sealed then / cracks sealed in 3rd yr/ cracks sealed in 6th yr/ reseal in 10th year/... and will continue the program until the profile deteriorates.

- Most gravel roads have ADT's less than 100. They do spot graveling only.
- At 500 ADT they look at regrading up to FAS standards. If regraded , 100 to 250 ADT roads are regraded to 28 to 32 ft top with 4:1 slopes.
- School bus routes make a difference in bridge replacement.
- Projects that are overlaid are selected based on roughness, surface condition, and traffic volumes.
- Their pavement marking program is to cover the center line and the edge lines every 4 years. They do it with Federal dollars.
- Signs are acceptable and they use MUTCD standards.
- The consider they have a 63 mile backlog of regrading.

Summary

The primary area of concern that can be concluded from the interviews would be maintenance standards for both the FAS and the County Primary systems. The AASHTO standards seemed acceptable for the FAS routes but they were excessive for the other areas of the county system. Bridge standards, based on State standards, are acceptable for the most part. Any exceptions to State standards for bridges were for lower volume bridges. There did not seem to be a concern for development of standards or guidelines for some of the other areas such as safety, guardrail, mowing, etc. One interesting item that arose is the apparent need for increased funding for equipment by 1/3 to 1/2, which would amount to an average of $100,000 to $150,000 additional funding per county per year. All those interviewed indicated vehicles operate typically at speeds of 50 to 60 mph.

5.0 IDENTIFICATION OF LEVEL OF SERVICE FACTORS

The factors identified in the literature review and the county interviews provided the basis for determination of the experimental factors which are deemed to be the significant. These factors were then used to identify reasonable levels of service. Potential service level factors are traffic volumes, roughness, surface condition and type, geometric standards, maintenance effort, and bridge sufficiency ratings. The factors potentially may be different across the state. For example, the heavier grain movements and soils in the eastern portion of the state may justify different factors than the more typical rangeland found in the western portion of the state.

Geometric Level of Service

Level of service is categorized in terms of capacity or service levels A through F with A being the most desirable. The issue that needs to be investigated is more than how many cars can a roadway carry, which is often the first thought that comes to mind when thinking of capacity or levels of service. Speed is a measure of the level of service that can be related to the A through F levels. Speed is one of the most significant factors in route selection and how it is viewed by a driver. The value of a road network is its ability to carry people and goods conveniently and economically. Travel time is the bottom line in route selection and is also a measure of how attractive a route is to the user. Speed is a direct measure of this, and it can be described or defined by level of service. A simple explanation of what is characteristic of each level as it appears in the AASHTO Guide (13) is as follows:

Level A — Operating speeds of 60 mph or higher. 75 percent of passing maneuvers can be made with little or no delay. Under ideal conditions, a service volume of 400 passenger Vehicles Per Hour (vph), total two-way, can be achieved.

Level B — Operating speeds of 50 mph or higher. Volumes may reach 45 percent of capacity with continuous passing sight distance. Volumes of 900 vph, total two-way, can be carried under ideal conditions.

Level C — Flow still stable. Operating speeds of 40 mph or above with total volume under ideal condition equal to 70 percent of capacity with

continuous passing sight distance, or 1,400 passenger vph total two-way.

Level D — Approaching unstable flow. Operating speeds approximately 35 mph. Volumes, two-direction, at 85 percent of capacity with continuous passing opportunity, or 1,700 passenger vph total two-way under ideal conditions.

Level E — Operating speeds in neighborhood of 30 mph but may vary considerably. Volumes under ideal conditions, total two-way, equal to 2,000 passenger vph. Level E may never be attained. Operation may go directly from Level D to Level F.

Level F — Forced, congested flow with unpredictable characteristics. Operating speed less than 30 mph. Volumes under 2,000 passenger vph, total two-way.

The important feature from the descriptions shown above is not the volume of vehicles but rather the operating speeds. Low-volume roads will never operate at anywhere close to vehicular capacity, but the capacity may be influenced by safe operating speeds. This would be due to having a lower design speed for the facility than the public is used to driving. As noted by the county interviews and practical experience, most drivers will tend to drive in the range of 50 to 60 mph on rural settings unless otherwise influenced (4). The primary feature influencing the level of service by this type of definition is the selected design speed.

Design speed is by definition the maximum safe speed that can be maintained over a specified section of highway when conditions are so favorable that the design features of the highway govern. The design speed that is selected should be a practical one with respect to the terrain, the adjacent land use, and the function of type of roadway. For example, one could expect a freeway to be designed at 70 mph throughout its entire length, two-lane highways at 60 mph in the rural areas and 45 mph through cities, etc. Roadways at the county level can logically have some variation in design speeds built in such as FAS routes may typically function more as arterial or as straight shots to town for example. County Primary routes may be functioning more as a collector or a means to get to a State highway or County FAS route. The difference in function or routes could justify a difference in design speeds and could be used to justify a lower design speed.

In an ideological sense, the design speed should be consistent with the speed the driver expects to be able to drive at. In a rural state such as South Dakota, driver expectations of speed approach the 50 to 60 mph ranges. These design speeds for the County FAS routes may be within reach current funding levels to maintain at AASHTO standards. The majority of the counties interviewed and the Technical Panel indicated that the AASHTO standards (13) are preferable for use on the county FAS roadway network.

Constraints influence the selection of design speed. Examples of some of the various constraints are environment, esthetics, social or political impacts, and economics. The economic constraint is of primary consideration in this study. One of the original concerns with the 1984 Needs Study was that the resulting funding levels reported were unrealistic in the minds of many people at both the county and state level. The main criteria for determination of need were the standards that each roadway segment was compared to when analyzing needed improvements. To achieve realistic and practical budget levels, one has to start with realistic and practical design and maintenance guidelines. This study has revealed that it is acceptable to use AASHTO (13) standards for design of the County FAS Routes, but they are excessive for many of the County Primary Routes.

The design speed is the basis of the geometric guidelines in that if the design speed changes, nearly all design elements of the highway are subject to change. The logical place to start when determining geometric guidelines for the County Primary System is the design speed of the roadway.

The primary features, as far as the County Primary System is concerned, that would be affected by a change in design speed would be vertical alignment and roadway width. These two features, when substandard, are also the most costly to correct. The interviews indicated that the counties could live with some of these deficiencies on the County Primary System. A reduction in the design speed would lower geometric guidelines and at the same time bring the funding needs more in line with local expectations. It is recommended that design speeds be throughout the length of a roadway segment. However, signing can control speed for example, in an isolated area of a sharp hill in a roadway to 30 mph, but the remainder of the segment be safely traversed at higher speeds. The net effect may be that only a segment of the road is at minimum design speed and the remainder is at a much higher design speed. The result is the level of service is higher on the average than indicated by

the minimum design speed. Another positive consideration is that the majority of the users of the County Primary Routes are familiar with substandard restrictions on routes they travel.

Design speed is the overriding factor determining the level of service as far as geometries are concerned. Secondary factors identified by the study when roadways were grouped into classes of geometries and maintenance guidelines were total traffic, truck numbers, functional class, and terrain.

Maintenance and Condition Levels of Service

Another measure of service that must also be defined influences rehabilitation and maintenance levels based on surface condition.
Typically before any type or level of maintenance or rehabilitation is conducted, a decision is made to "do something". Once it has been decided to "do something", the next decision is "do what?" The decision tree needed for the "do something" and "do what" questions is in fact the maintenance guidelines which will be explained in the next section.

To facilitate the determination of funding needs realistically, one needs to consider condition. For example, an asphalt roadway was overlaid 2 years ago but it is geometrically substandard. If condition is not taken into account and geometry is this same roadway would be considered an immediate backlog of need. This is not practical as the public would not stand for going out next year and regrading or widening it to meet current standards. The sensible approach is to improve the roadway when the surface condition becomes such that an improvement is warranted both by geometry and condition. With this thought in mind, the condition of the roadway was added to the information that was requested from the counties (**see Appendix B**) in the information update. The condition is defined as the Pavement Condition Rating (PCR) on a 1 to 5 scale.

Rating the condition of a roadway by the use of PCR allows greater flexibility in the system to model local practices. An example how this was used in Indiana to trigger possible maintenance strategies are shown in table 1 (14).

TABLE 1

PCR*	Average Speed	Maintenance Operation
3.5	>40	No Maintenance
3.0	>40	Light Grading & Local Repairs
2.5	36-40	Grading & Local Repairs
2.0	28-35	Heavy Grading
1.5	24-27	Rehabilitation

*NOTE: The PCR that is indicated is the cut off or lower range for this type of maintenance operation. The scale is similar to the scale that will be used in South Dakota in that a 5 represents the best condition and 1 is the worst condition.

Measurement of Service

The manner in which the health of a transportation network is classified by a term called "level of service." The measurement of service is made by the factors that are most prominent in what to measure, and how to measure it. The determination of the factors was made by the interviews with the counties, a review of the 1984 Needs Study, comments made by Technical Panel members, and the expertise of the consultant. The determination was also based on the desired end product of the study. Each of the factors considered to be significant to the outcome of the study are explained further and were part of the information updates. The factors new to the update are explained in further detail where appropriate.

• **Mail Route, School Route, or Economic Generator**: This information was requested for a number of reasons. Several of the counties indicated that school routes are sometimes given priorities for improvements. Economic generators can also get priority consideration, for example, if they bring heavy loads onto the roadway.

• **Top Width** (the width of the roadway surface that is considered to be the driving lanes of the roadway, this should not include any usable shoulder width)

• **Shoulder Width** (the usable width of roadway for shoulders, count as width available on each side of roadway, not as sum of both sides)

• **Roadway Inslope** (the slope of the roadway from the edge of the surface to the ditch bottom in whole number increments such as **2:1, 3:1, 4:1, 5:1, 6:1,** etc)

• **Right-of-Way** (the total available right-of-way width available for most of the segment, do not include temporary easements, or short jogs in the alignment)

• **Surface Type** (use one of the 1 - 5 classification numbers from the reverse side of the work sheets)

• **Urban Areas** are areas within boundaries set by the responsible state and local officials having a population of 5,000 or more.

• **Rural Areas** are those areas outside the boundaries of urban areas.

• **Vertical Curvature** (use one of the 1 - 5 classification numbers from the reverse side of the work sheets, record the prevailing or worst classification, **#/mile** is asking for the number of locations per mile that the conditions exist) The vertical curvature is of the primary contributors to regrading expense. It is felt necessary to have a rating and number of locations they occur on the average. This information will make it possible to make some estimates for spot regrading if deemed feasible.

• **Minimum Sight Distance** (an estimate of the minimum vertical sight distance at the most restrictive location on the roadway segment, for example the sight distance at a hill top on the roadway may be 500 ft.) This information will make it possible to estimate the length of area that will need to be regraded and also what design speeds are possible.

• **Horizontal Curvature** (use one of the 1 - 5 classification numbers from the reverse side of the work sheets, record the prevailing or worst classification, **length/mile** is asking for the total length of locations per mile that the conditions exist) This is another of the more expensive items to correct geometrically. The information collected will allow an estimation of the cost to treat isolated areas.

• **Terrain** (use one of the 1 - 5 classification numbers from the reverse side of the work sheets of the type that best suits the roadway) The primary function of this feature is to relate terrain to standards. Another function is that it provides insight into describing the counties location and uniqueness. The terrain is primarily what distinguishes a western, from a river, from a eastern county. It also will aid in differentiating within a single county.

• **Drainage/Snow** (use one of the 1 - 5 classification numbers from the reverse side of the work sheets of the type that best suits the roadway) This factor describes the level of maintenance effort required, and may also be used as a trigger to regrade a roadway segment.

• **Assumed Design Speed** (an assumption of the speed that the roadway was designed to operate safely, this should take into account geometric features like sight distance, width of road, etc.)

• **ADT** (provide an estimate of the average annual daily total traffic for the segment)

• **% Trucks** (provide an estimate of the percent of trucks are of the total ADT)

• **Graded Width** (provide the top width of the finished dirt grade to the nearest foot)

• **Surface Thickness** (provide the thickness of the surface course only if it is asphalt or concrete and if it is greater than 1 inch thick to the nearest .1 inches, do not include surface treated or blotter roads, the thickness should be the total thickness of either the asphalt or the concrete, a bituminous base or a cement treated base used as a surface is appropriate to count here also)

• **Base Thickness** (provide the thickness of the granular base or to record the thickness of gravel on a gravel road)

• **Last year of Improvement** (fill in the year that the last improvement was made, for example an overlay on asphalt, a seal on a blotter road, or re-graveling a gravel road)

• **Next Improvement Scheduled** (fill in the next year that any significant work will be done which effects the roadway surface)

• **Surface Condition** (use one of the 1 - 5 classification numbers from the reverse side of the work sheets that best describes the condition of the roadway)

• **Number** (provide the total number of minor structures (box culverts, culverts, small bridges, all less than 20 feet in length that are on the roadway segment, structures 20 feet and longer are considered major structures and that information will be provided directly from the State's bridge inventory)

• **Number in Need of Improvement** (provide the total number of minor structures that need replacement on the roadway segment)

• **Load Restrictions** (use one of the 1 - 5 classification numbers from the reverse side of the work sheets that best describes how restrictions are used on the roadway) This is a factor that can be used to determine improvements. For example one of the counties interviewed had all roadways posted at one level with on exception of a roadway that was in such poor condition structurally it was restricted much further.

• **Regrade** (Indicate by a yes or no as to whether you would consider this segment as a necessary desirable candidate for regrading) This factor can also be used to trigger regrading, but it can also be used to check the needs logic used in determining funding levels.

• **Priority Route** (use one of the 1 - 5 classification numbers from the reverse side of the work sheets that best describes how the roadway functions within the county, consider such factors as ADT, number of dwelling served, etc) This could also be used to rehabilitate a roadway to a level higher than the standards would allow. An example could be route to a hospital, or one used by military personnel.

• **OMAD eligible** (indicate by a yes or no if the roadway has received or is eligible to receive funding from the OMAD program for missile access routes) One of the factors that came up in the interviews was that some roadways could be improved with this type of Federal funding. It is important to identify how many and which roads are eligible. **OMAD project funding may no longer be available as missiles are phased out of western South Dakota.**

The factors that were determined to be representative and necessary for determining levels of service have been identified and can now be used to develop the two areas of the study. They are the design and maintenance guidelines and the funding needs. The factors will be further tested as to their significance and sensitivity, during the funding needs analysis.

6.0 BRIDGE DESIGN AND MAINTENANCE GUIDELINES

The elements of bridge structures are length, width, elevation, alignment, and angle of intersection. These elements must be designed and maintained to satisfy the functional requirements of the supported facilities and the geometric or hydraulic requirements of the bridged-over facilities or natural features.

After interviewing some of the counties, it was determined that the design and maintenance guidelines for bridges should follow the South Dakota County Bridge Standard. One thing that should be emphasized is that the total bridge widths should not be less than the full roadway approach width (lanes and shoulders) plus two feet on each side. This can enhance farm equipment movements and minimize capacity problems through the bridge corridor area.

7.0 MINIMUM ROADWAY DESIGN AND MAINTENANCE GUIDELINES

Minimum design and maintenance guidelines for roadways serve several functions. They aid in determining when a roadway should be rehabilitated, what it should be rehabilitated to, and suggested maintenance activities. They should be considered guidelines and not a set of rules. Each county and roadway is unique and will influence the practicality of the guidelines. There are other uncontrollable factors that influence the maintenance guidelines, such as the climate and unforeseen demands on the roadway such as economic development and unexpected government grain program call ins during load restriction times.

The information analyzed in the development of the levels of service and the identification of significant factors lays the groundwork for the design and maintenance guidelines. The first step in the development is to categorize a roadway properly. The primary factors identified to be significant in categorizing the roadways are the ADT, Average Daily Truck Traffic (ADTT), and the type of terrain. The primary factors were identified in the interviews and agree with nation wide perspectives. The type of terrain describes the terrain and climatic differences across the State of South Dakota. The flat, rolling, and mountainous terrains tend to correlate with the east river, central or river area, and west river areas of the State respectively.

The secondary factors that are associated with each of the primary factors were also identified. The factors included items such as width, ditch slope, surface type, etc. There are several items that are included in the AASHTO guidelines (13) that are not yet included in these standards. The factors presented in this report were identified as being most significant during the course of this study.

No design standards were developed for the FAS roadways. These roadways should be designed according to the 1984 AASHTO manual "A Policy on Geometric Design of Highways and Streets."

7.1 Design Guidelines

The design guidelines presented in table 2 were developed based on information obtained from the literature reviews of different states, 1984 AASHTO Standards, and primarily from interviewing county personnel in South Dakota.

Minimum surface width. This is the minimum total surface width including usable shoulders. Because it has great influence on the safety and comfort of driving, surface width must be wide enough to handle passenger and industrial vehicles.

Design Speed. Design speed is the maximum safe speed that can be maintained over a specific section of roadway when conditions are so favorable that the design features of the roadway govern. It is a function of topography, geometric design features, and surface type of the roadway.

Ditch Slope. This the slope from the usable part of the roadway or shoulder to the ditch bottom. It must be designed to ensure the stability of the roadway and to provide a reasonable opportunity for recovery for an out-of-control vehicle.

Curve Radii and Maximum Degree. These elements depend on the speed and the super-elevation of the roadway. They intend to provide smooth curvature without skidding. The values presented in table 2 were taken from table V-6 of the AASHTO 1984 manual using a super-elevation rate of .08 percent.

Maximum Grade. This is the downhill or uphill slope of the roadway. It affects speed and the geometric features of the roadway. It should be recognized that on long or fairly steep grades, drivers tend to travel somewhat faster in the downhill than in the uphill direction.

Stopping sight distance. The minimum sight distance available on a roadway should be sufficiently long enough to enable a vehicle traveling at or near the design speed to stop before reaching a stationary object in its path. The values presented in table 2 were taken from table V-2 of the AASHTO 1984 manual.

7.2 Maintenance Guidelines

The maintenance guidelines presented in table 3 were developed as a results of the interviews with several county personnel.

Surface Type. Three different surface types are used; asphalt, blotter, and gravel. The surface type is a function of the Average Daily Traffic, Average Daily Truck Traffic, and the type of terrain. The determination of surface type was made as a result of the interviews and engineering factors. For example, within the same traffic level there may be different surface type specified. The type of surface suggested was based on 18 kip axle loadings, climatic factors such as rainfall and snowfall, and the type of subgrade that the pavement structure was on.

Minimum PSR. The minimum Present Serviceability Rating (PSR) is an estimate of the travelling public's subjective assessment of the pavement condition. It is a value between 1 and 5 with 1 representing very poor and 5 representing very good pavement. It is used to trigger maintenance activities.

Gravel Frequency. This represents how often gravel roads should be re-graveled. It is a function of traffic and the type of terrain. The re-gravel operation involves applying a 4 inch layer of gravel.

Seal Frequency. This represent how often asphalt and blotter roads should be sealed. The seal operation consists of applying a type of surface treatment to correct surface problems. Surface treatments can be chip seal, slurry seal, or fog seal.

Overlay frequency. This represent how often asphalt roads should be overlayed. Overlays are used to correct many pavement deficiencies either surficial or structural. The overlay operation consists of applying a 2 to 3 inch dense-graded, hot mixed asphalt concrete. The thickness of the overlay should be determined by experienced county personnel based on local overlay performance throughout the years.

Blade Frequency. This represents how often each month gravel roads should be bladed. Blading gravel roads is done for ridebility, safety, and structural capacity.

Crack Sealing. Crack sealing is done to prevent water and chemicals from entering the pavement structure causing several distresses. Crack sealing is usually done more frequently on roads with high traffic volume.

TABLE 2. MINIMUM ROADWAY DESIGN GUIDELINES - COUNTY PRIMARY SYSTEM

CAT	ADT	ADTT	TYPE OF TERRAIN	MINIMUM ROAD SURFACE WIDTH (ft)	DESIGN SPEED (mph)	DITCH SLOPE	INTERSECTION CURVE RADII-MAXIMUM DEGREE (ft-degree)	MAXIMUM GRADE (percent)	STOPPING SIGHT DISTANCE (ft)
AA	>1000	all	All	40	55	6:1	985-6	4	550
A	401-1000	L-H	Level	26	55	4:1	985-6	5	550
B			Rolling	26	45	4:1	616-10	7	400
C			Mountainous	26	35	4:1	360-17.5	12	250
D	251-400	L-H	Level	24	50	4:1	764-7.5	6	475
E			Rolling	24	40	4:1	468-12.25	9	325
F			Mountainous	24	30	4:1	252-22.75	12	200
G	151-250	H	Level	24	40	4:1	468-12.25	7	325
H			Rolling	24	40	4:1	468-12.25	9	325
I			Mountainous	24	30	4:1	252-22.75	12	200
J		L	Level	24	40	4:1	468-12.25	7	325
K			Rolling	24	40	4:1	468-12.25	9	325
L			Mountainous	20	30	4:1	252-22.75	12	200
M	50-150	H	Level	20	40	3:1	468-12.25	7	325
N			Rolling	20	40	3:1	468-12.25	9	325
O			Mountainous	18	30	3:1	252-22.75	12	200
P		L	Level	20	40	3:1	468-12.25	7	325
Q			Rolling	20	40	3:1	468-12.25	9	325
R			Mountainous	18	30	3:1	252-22.75	12	200
S	<50		Level	18	40		468-12.25	7	325
T			Rolling	18	30		252-22.75	10	200
U			Mountainous	18	30		252-22.75	12	200

TABLE 3. ROADWAY MAINTENANCE GUIDELINES - FAS AND COUNTY PRIMARY SYSTEM

CAT	ADT	ADTT	TYPE OF TERRAIN	SURFACE TYPE	MINIMUM PSR	GRAVEL FREQUENCY (years)	SEAL FREQUENCY (years)	OVERLAY FREQUENCY (years) *does not change surface type	BLADE FREQUENCY (per moth.)	CRACK SEAL FREQUENCY (years)
AA	>1000	L-H	All	Asphalt	3.0	2	4	15	6	3
A	401-1000	L-H	Level	Asphalt	3.0	2	6	18	6	3
B			Rolling	Asphalt	2.8		6	20		4
C			Mountainous	Asphalt	2.6		6	20		4
D	251-400	L-H	Level	Asphalt	2.8	2	6	18	6	3
E			Rolling	Asphalt	2.6		6	22		4
F			Mountainous	Asphalt	2.4		6	22		4
G	151-250	H	Level	Asphalt	2.6	2	6	20	5	4
H			Rolling	Asphalt	2.4		7	25		5
I			Mountainous	Asphalt	2.2		7	25		5
J		L	Level	Blotter	2.5	2	4	16	5	4
K			Rolling	Blotter	2.3		5	20		5
L			Mountainous	Blotter	2.1		5	20		5
M	50-150	H	Level	Blotter	2.1	4	5	20	4	4
N			Rolling	Gravel	1.9	5	7	20	4	4
O			Mountainous	Gravel	1.7	4			4	
P		L	Level	Blotter	2.0	7	5	20	4	5
Q			Rolling	Gravel	1.8	7			3	5
R			Mountainous	Gravel	1.6	6		20	3	
S	<50		Level	Gravel	1.5	5	7	20	2	5
T			Rolling	Gravel	1.5	7			2	
U			Mountainous	Gravel	1.5	6			2	

8.0 CONCLUSION

The minimum design and maintenance guidelines presented in this report were developed based on different sources as mentioned earlier and primarily from the South Dakota counties existing design and maintenance practices. Because these guidelines fall within the counties' current practices, they should be used at all times.

The guidelines are intended to enhance the overall condition of the county road network. This is accomplished by providing the public with safe and comfortable roads, predicting annual budgets based on the existing condition of the roads and the required future needs, and providing a common guidelines the counties and the state can use.

PART 2 - 20 YEAR FUNDING NEEDS

9.0 INTRODUCTION

The primary function of a transportation network is to move people and goods from origin to destination in a safe, timely, and comfortable manner. To accomplish this, the facility must be maintained in a condition compatible with the overall goal. The first phase of the study identified guidelines for defining the design and maintenance criteria for an acceptable transportation network. The second phase of the study was to determine the funding needed to achieve and maintain the condition. The portion of the transportation network targeted by the study was the county primary roads.

The analysis and determination of funding needs, was based on a field inventory of the county primary system. Then the current inventory was compared to the maintenance and design guidelines.

10.0 COUNTY SURVEYS

The county surveys that were developed in Part 1 (**see Appendix B**) provided the sole source of information used in representing the current condition of the primary county roadway system. Bridge information was provided directly from the South Dakota Department of Transportation. All of the counties in South Dakota were asked to complete the survey update forms and send them back in. A total of 44 out of the 66 counties responded to the survey for a 67% response. Follow-up calls and letters were sent by the technical committee to encourage submission of information, but it was not entirely successful. All of the survey information received was entered into a micro-computer data base.

A total of 15,576.6 miles of data was received that was usable in the analysis. An additional 367.2 miles of information was categorized as "bad" data. "Bad" data can be defined as information on given a segment of roadway was missing a critical piece of information. A breakdown of the good data by surface type is shown below.

Gravel	9248.8
Blotter	3530.1
Asphalt	2691.7
Concrete	106
TOTAL	15,576.6

Every effort short of guessing at information was used to recover roadway segments with missing or bad data. One of the assumptions made early on was that the integrity of the entire needs portion was related to the quality of the inventory. Therefore, data was not of guessed at, or making any gross assumptions about the information. All in all, it is felt that the quality of the data used in the needs analysis supplied by the counties is representative of the current condition.

A portion of the information requested in the surveys was an update of the 1984 Needs Study information with the remainder being new information. The two primary pieces of new information requested was the condition of the segment, and whether it was felt the segment of road should be regraded. Both of these items weigh significantly on the timing of improvements and the extent of the improvements in the operation of the funding needs model.

11.0 NEEDS MODEL

The needs model is the heart of the analysis. The funding needs that were developed are in direct response to the logic and the decisions made within the needs model. The needs analysis can be thought of as a multi-step process. The various steps used in South Dakota are:

- inventory data base
- design guidelines
- maintenance guidelines
- performance curves or future deterioration trends for each segment of roadway
- construction and maintenance scheduling decision process and the anticipated life of the various treatments
- cost of construction and maintenance
- annual maintenance and construction needs

Each of the various steps in the process required a number of decisions to be made. The rationale used in the decision steps were the design and maintenance guidelines, county interviews, the technical committee, and engineering criteria. The needs model was developed with several governing requirements:

- It must be understood by the counties and state
- It must follow local ways of doing work
- It must be able to adapt to the various engineering characteristics found across the state
- It must provide an adequate level of service for the county primary system

- It must provide realistic and credible maintenance and construction programs
- It must provide a consistent and accurate portrayal of needs
- The needs must be derived as objectively as possible without gross assumptions

The three major decision trees shown on **Figures 1, 2, and 3** were the basis for the decisions made by the computerized routine used in calculating needs. All decisions and rules were governed or decided by one or more combinations of uses of information from the design and maintenance guidelines, the Technical Panel, the county interviews, and the engineering expertise of the consultant.

There are several significant decisions or rules that were made in the development of the model that need to be identified. The **first** is that once a surface type determination was made according to the design and maintenance guidelines, it did not change. For example, once a road is designated as a blotter surface by the guidelines, it stays as such for the entire analysis period. It does not get upgraded to an asphalt surface at some later date. Doing such an update would be contrary to the design and maintenance guidelines. The **second** is that current surface types can be downgraded to another surface type. For example, asphalt can become a gravel surface if when an improvement is triggered in the analysis and the roadway segment should in fact be "gravel" according to the design and maintenance guidelines. It was strongly felt that consistency had to be maintained to retain credibility in the results.

11.1 Cost Information

Cost information plays a significant role in any need process. Its as simple as an improvement is needed at a certain dollar cost to get the job done. The costs that were used in the South Dakota Needs Model were costs that are typically encountered in the state by the counties. In order to determine costs, a definition of the work entailed is necessary. Definitions of the various work items are as follows:

- **Routine Blading** — This activity entails the routine blading of gravel roads. The frequency of blading is the annual times per month a segment is bladed on a year around basis. Costs are based on a 24 ft, mile long segment.

- **Crack Sealing** — Crack Sealing as used in this study means to rout the crack and seal with a high type sealant such as a ASTM 3405 or similar specification sealant. The specifications are similar to those used by the South Dakota Department of Transportation. Crack pouring as defined by pouring road oil in the cracks every year is not considered to be an effective long term practice as it has to be done every year and it does not seal the crack. This technique applies either to a blotter or asphalt surfaced roadway.

- **Chip Seal** — Chip sealing on either a blotter or asphalt surface roadway is defined as applying specification oil and aggregate chips to the surface of the pavement. The costs are calculated differently for this treatment and are calculated on only the roadway lanes.

- **Resurfacing Costs** — These costs vary depending on the type of resurfacing that is occurring. The asphalt overlays typically 2.5 in (asphalt to asphalt), blotter treatment of 6 inches gravel, prime, and chip seal (blotter to blotter), and 4 inch gravel (gravel to gravel) are pretty straight forward. There are also upgrade situations in which the roadway meets all geometric standards and the surface is simply upgraded with the various treatments. In the cases of a down grading of surface type; *asphalt to blotter,* the roadway would be ground up in place and a blotter type treatment would be applied; *blotter to gravel,* the blotter would be ground up and some gravel added in the grinding process if necessary; and the *asphalt to gravel,* the roadway would be ground and gravel added to prevent adhesion of the ground asphalt surface.

- **Reconstruction Costs** — These work types are the most expensive and include regrading of the roadbed to meet the design guidelines. Only those roadways not meeting the design guidelines are to be reconstructed.

It is important to note that all costs were converted to a cost per square foot for the purpose of the analysis. Costs could then be varied from section to section based on the total roadway width. If this is not done, the cost of an overlay would be the same for a 20 foot wide road as a 40 foot wide road. The actual costs that were used in the analysis are shown on Table 4.

TABLE 4 - IMPROVEMENT COSTS

MAINTENANCE COSTS	DOLLARS PER 24 FOOT WIDE MILE	DOLLARS PER SQUARE FOOT
Routine Blading of Gravel Roads	$26	.000213
Crack Sealing a Blotter Road	$2500	.019729
Crack Sealing an Asphalt Road	$2500	.019729
Chip Seal on a Blotter Road	$9000	.071023
Chip Seal on a Asphalt Road	$9000	.071023
RESURFACING COSTS		
Asphalt to Asphalt	$60,000	.473485
Blotter to Asphalt	$60,000	.473485
Gravel to Asphalt	$60,000	.473485
Asphalt to Blotter	$35,000	.276200
Blotter to Blotter	$25,000	.197285
Gravel to Blotter	$25,000	.197285
Asphalt to Gravel	$20,000	.157828
Blotter to Gravel	$15,000	.118371
Gravel to Gravel	$20,000	.157828
RECONSTRUCTION COSTS		
Asphalt	$185,000	1.459912
Blotter	$145,000	1.144255
Gravel	$120,000	.946970

PLEASE NOTE: All the costs show on Table 4 include all incidental costs. By this it is meant that the costs reflect materials, cost of equipment, labor, benefits, depreciation, striping, signing, etc. These costs can be thought of as all inclusive, finished product costs.

11.2 Needs Determination

The definition of **Need** in this analysis is simply "*What does it cost over a 20 year period to bring roadways to the design and maintenance guidelines and also provide some of the routine maintenance ?*" The process used to determine need was a computer program which followed the decision criteria set up in the needs model.

All of the roadway segments and information that were identified by the counties responding to the survey updates were entered into the data base. The miles that were considered in the analysis by county supplying them are shown on Table 5 as the miles of "Good" data. The total county system miles shown on Table 5 were obtained from the State's Rural Miles and Vehicle Miles of Travel by County summary table. There are minor discrepancies in some instances between the miles reported as total county system miles and the number of miles supplied by the counties. However, the discrepancies are minor and do not influence the needs. The total miles of roadway analyzed by the needs model were 15,576.6. That represents 69% of the total county system mileage that was used in the determination of need.

The needs that will be presented represent only the actual miles in the analysis, not the total mileage amount unless otherwise specified. The need that was determined does not include the total transportation need. Items such as snow removal, signs, mowing, guardrail, certain administrative costs, etc. are not included in the projected needs.

The model was run on the entire data base and a funding need was developed. The results of the analysis are shown for the counties participating in the study on Table 6. The needs are reported as a total for the 20 year period and also as an annual need. It is important to note that all costs are based on current dollars. There has been no attempt to enter an inflation rate or discount rate into the findings. Also shown on Table 6 are the current annual budgets submitted by the counties along with the survey information. It was difficult to determine exactly what the current budgets entailed, but the total amount supplied is shown. The budget amounts submitted were either for 1990 or 1991.

A brief comparison of need from what is current to what is needed reveals significant variation as shown on Table 6. Several of the counties appear to have near sufficient funding compared to those requiring significant increases to maintain the current mileage to the design and maintenance standards. **It is important to emphasize that the need represented is only for construction and maintenance of roadways.** Funding needs for bridges are not included in any of these funding needs, nor are any of the other items like snow removal that were mentioned above.

The funding need that was determined in this study representing the 15,576.6 miles totals 1.65 billion dollars for the 20 year period. An extrapolation can be made to represent the need for the entire county system. The sample size of the analysis is 70%, which is a substantial percent of physical inventory. A simple ratio calculation of need ((15676.6*1.65)/22,679) to expand the dollar amount to the entire 22,679 mile county system results in a total need for roads of 2.43 billion dollars. This need is similar to the amount of need indicated in the 1984 Needs Study. However, when one considers that construction and maintenance costs over the last 7 years have more than doubled in some cases, the need is less than reported in 1984. What this study does show is that the need has not diminished over the years and continues to grow.

11.3 Evaluation of Funding Needs Projected

The determination of funding needs for a 22,000 + mile county road system required a "reality check" to make sure that the needs that are reported truly represent the "perceived needs". In this case the perceived needs are represented by the maintenance and design guidelines that were developed. The guidelines are representative of what was found during the study and were not felt to be excessive by those involved in their development.

Rather than look at the total funding need, it is important to look at the individual items to identify where the dollars are needed. The individual breakdowns are shown on Table 7 for the roadways used in the analysis. It is also important to look at the needs based on maintenance needs and construction needs. The breakdown of the funding needs indicates that 24% of the needs are maintenance needs while 76% of the needs are for construction improvements. The construction needs can also be subdivided into 4 categories which are down grading the surface, maintaining the existing surface, upgrading the existing surface, and regrading substandard roads to meet the design guidelines. The cost associated with each construction category is as follows:

Downgrading Existing Surface
Asphalt to Gravel: 309,499
Asphalt to Blotter: 2,841,129
Blotter to Gravel: 398,124

TOTAL: 3,548,752

Maintaining Existing Surface
Asphalt: 172,923,000
Blotter: 69,988,730
Gravel: 467,977,248

TOTAL: 710,888,978

Upgrading Existing Surface
Blotter to Asphalt: 50,582,000
Gravel to Blotter: 27,867,867
Gravel to Asphalt: 75,179,000

TOTAL: 153,628,867

Regrading Substandard Roads
Gravel Roads: 140,942,000
Blotter Roads: 19,132,754
Asphalt Roads: 225,507,305

TOTAL: 385,582,059

Several words of caution need to be expressed when using these figures. The first is that these represent only the roadway miles used in the analysis. The second is that if these four groups of costs are changed, something must take their place. For example, if it is decided for some reason not to regrade any substandard roads, the 385 million cannot be subtracted completely out, these miles of roads have to be maintained throughout the 20 year period and their is definitely a cost associated with this.

In addition to the roadway needs, there is also a need for bridges. The needs for bridges were provided by the South Dakota Department of Transportation. The needs are reported as a backlog of needs and also as accruing needs. The bridge needs for the County Bridges is as follows:

Backlog: 202,447,000
1992: 4,385,000
1993: 4,720,000
1994: 5,056,000
1995: 5,391,000
1996: 5,727,000

TABLE 5 - COUNTY MILEAGE FIGURES

COUNTY	TOTAL COUNTY SYSTEM MILES	TOTAL MILES GOOD DATA	TOTAL MILES BAD DATA
Aurora	459	453.4	
Brookings	379	378	
Brown	663	674.6	2.7
Brule	444	504	1
Buffalo	88	172	
Clark	465	457.2	
Clay	245	240.1	
Codington	384	389.9	
Corson	416	334.7	
Davison	310	325.8	
Day	538	539.7	
Deuel	237	248.2	
Douglas	226	233.5	
Faulk	360	357	
Grant	441	455.6	
Gregory	387	398.6	
Hamlin	258	263	
Hand	388	399.2	3
Hutchinson	401	472.9	
Hyde	216	210.2	
Jerauld	259	257.3	
Kingsbury	364	358.9	
Lake	342	290.5	.08
Lawrence	234	256.4	
Lincoln	311	315.4	

Lyman	420	342	45
Marshall	307	318.4	
McCook	298	293.3	4
McPherson	385	350.9	3.7
Miner	289	304	
Minnehaha	359	341.7	14.5
Pennington	564	363	1.7
Perkins	544	548	4
Potter	248	245	
Roberts	475	480.3	
Sanborn	304	305.5	
Spink	732	682	13
Sully	319	306.5	
Todd	194	172	258 *
Turner	308	311.5	
Union	220	219.2	
Walworth	336	330.2	6.8
Yankton	298	306.8	
Ziebach	192	370.2	9

* Todd county was missing PSR information on most of the miles reported as bad data. It was impossible to estimate PSR information without making gross assumptions, therefore, the bad data was not analyzed.

TABLE 6 - FUNDING NEEDS
(based on good mileage from table 5)

COUNTY	1992 PROVISIONAL BUDGET	AVERAGE ANNUAL NEED	TOTAL 20 YEAR NEED
Aurora	813,897	1,948,646	38,972,915
Brookings	1,620,180	1,705,247	34,104,936
Brown	2,700,000	3,528,534	70,570,680
Brule	752,845	2,260,400	45,208,008
Buffalo	183,500	732,753	14,655,057
Clark	852,127	2,329,554	46,591,085
Clay	938,971	1,259,505	25,190,070
Codington	1,144,924	1,879,897	37,597,946
Corson	558,584	1,295,527	25,910,539
Davison	869,637	1,509,354	30,187,083
Day	746,761	3,541,831	70,836,625
Deuel	747,613	933,885	18,677,699
Douglas	599,050	1,425,565	28,511,302
Faulk	653,014	1,477,962	29,559,244
Grant	1,100,000	2,814,355	56,287,103
Gregory	944,109	2,750,312	55,009,235
Hamlin	925,796	2,111,775	42,235,502
Hand	876,025	1,566,037	31,320,730
Hutchinson	2,005,900	2,198,595	43,971,906
Hyde	429,450	875,745	17,514,906
Jerauld	585,850	1,138,521	22,770,428
Kingsbury	879,000	1,999,853	39,997,062
Lake	883,079	1,309,223	26,184,459

Lawrence	1,353,532	2,543,459	50,869,187
Lincoln	1,408,750	2,302,636	46,052,729
Lyman	631,375	2,805,888	56,117,765
Marshall	685,600	1,329,506	26,590,122
McCook	963,850	1,649,746	32,994,928
McPherson	930,485	1,577,297	31,545,942
Miner	984,266	1,405,126	28,102,514
Minnehaha	2,740,658	2,676,101	53,522,027
Pennington	2,497,742	3,168,707	63,374,149
Perkins	944,458	1,883,864	37,677,288
Potter	491,851	951,399	19,027,973
Roberts	1,124,864	2,517,608	50,352,161
Sanborn	607,000	1,283,901	25,678,019
Spink	1,313,466	2,563,110	51,262,193
Sully	684,210	1,556,445	31,128,895
Todd	490,592	841,924	16,838,488
Turner	1,119,893	1,385,125	27,702,509
Union	1,263,442	1,204,320	24,086,403
Walworth	623,148	1,511,001	30,220,021
Yankton	1,424,100	2,308,577	46,171,542
Ziebach	172,708	2,422,360	48,447,191

*** The needs shown for Kingsbury, Lyman, Spink, and Ziebach are potentially skewed high. There was missing ADT information and a Statewide average of 168 was used for missing AADT information. This resulted in all classes being considered as a class H roadway as shown on the Design and Maintenance Standards.**

TABLE 7 - CONSTRUCTION AND MAINTENANCE NEEDS

MAINTENANCE ITEMS	
Seal Coat on Asphalt	98,220,187
Crack Sealing on Asphalt	42,877,610
Routine PCC Maintenance	12,530,920
Crack Sealing on Blotter	33,443,100
Seal Coat on Blotter	98,942,088
Routine Blading of Gravel Roads	110,152,009
CONSTRUCTION ITEMS	
Resurface Asphalt to Gravel	309,499
Reconstruction to Gravel	140,942,000
Resurface Asphalt to Blotter	2,841,129
Resurface Blotter to Gravel	398,124
Resurface Asphalt to Asphalt	172,923,000
Reconstruction to Asphalt	225,507,305
Reconstruction to Blotter	19,132,754
Resurface Blotter to Asphalt	50,582,000
Resurface Blotter to Blotter	69,988,730
Resurface Gravel to Gravel	467,977,248
Resurface Gravel to Asphalt	75,179,000
Resurface Gravel to Blotter	27,867,867

12.0 CONCLUSIONS AND DISCUSSION OF NEEDS

Maintaining a transportation network at an acceptable level of service is an enormous task. It takes careful planning and constant consideration of tradeoffs to develop an effective transportation program. The portion of the state's transportation network that was focused on in this study was the County System. This system consists of 22,679 miles of various types of roads. The current worth of the system at today's dollars is in excess of **2 billion** dollars. This represents a tremendous investment over the years by the state of South Dakota in transportation. The transportation network has served the state well and will continue to do so in the future. In order to ensure that the current system is maintained and modernized to today's traffic and loadings, improvements must constantly be made.

These improvements do not come without sacrifice. We are currently living in difficult economic times mandating that every effort is made to stretch the funds as far as possible. At the same time costs keep rising, the transportation system continues to deteriorate. This study has been developed in such a manner to try to encompass all of the needs and difficulties faced by the Counties in the maintenance of the County System. Every effort has been made to make all of the products of this project as real to life as possible, without any frills, yet projecting real needs for the transportation system.

The funding levels identified by this study amount to 1.65 billion in today's dollars for the preservation of the 15,576.6 mile system analyzed in the study and 2.43 billion dollars when extrapolated to the entire 22, 697 mile network. This means that slightly more than an average of $5300 needs to be expended annually for the next 20 years on each mile of the 22,697 mile network for maintenance and construction. In addition to these needs, the total backlog and accruing needs for county bridges from 1992 to 1996 are 228 million dollars. These dollars reported are all based on today's dollars with no attempt to include inflation.

The current condition reported by the counties and the project future condition based on these funding levels are shown on Table 8. The Present Serviceability Rating (PSR) is as reported initially by the counties survey of their roadways. The funding levels projected will maintain the current condition of the roadways over the analysis period.

TABLE 8 - PRESENT SERVICEABILITY RATING

YEAR	AVERAGE PSR	YEAR	AVERAGE PSR
1992	3.6	2002	3.4
1993	3.6	2003	3.9
1994	3.5	2004	3.7
1995	3.6	2005	3.8
1996	4.1	2006	3.6
1997	3.9	2007	3.4
1998	3.7	2008	3.4
1999	3.6	2009	3.2
2000	3.6	2010	3.9
2001	3.6	2011	3.7

The needs were categorized into construction and maintenance needs, with maintenance representing approximately 24% of the total need. The construction need was further reduced into 4 basic categories representing downgrading, upgrading, maintaining existing, and reconstruction to design guidelines. When each individual category is scrutinized, the funding need portrayed is a realistic number. Efforts to reduce the need by extending the time between overlays for example, should be cautioned against. The time between all the improvements has been set to conform local conditions and practices. If the times are extended, a more intensive improvement will be needed to bring it back up to an acceptable level of service. For example, reconstruction may be required instead of an overlay due to extensive damage of the existing asphalt.

A frequent question that is asked is "*What would happen if the current effort of funding and surfaces are maintained as is ?*". If this approach is taken the funding that would be needed would actually increase as shown on the next page. The primary reason for this is that there are enough high volume roads that would not be upgraded from a gravel surface. The higher the volume the more bladings and regraveling are required. In this instance, it is more cost-effective to upgrade than maintain.

Maintain Current Practices and Policies

Improve Type	20 Year Needs
Resurface Asphalt to Asphalt	211,562,750
Crack Sealing on Asphalt	26,028,091
Seal Coat on Asphalt	59,093,738
Routine PCC Maintenance	12,530,920
Resurface Blotter to Blotter	105,295,959
Crack Sealing on Blotter	30,852,716
Seal Coat on Blotter	81,329,847
Routine Blading of Gravel Roads	179,116,681
Resurface Gravel to Gravel	1,066,997,402
TOTAL	1,772,808,104

Another important factor in this needs analysis is that roads were allowed to downgrade from higher type surfaces. It is recognized that attaining this level of funding to preserve the County System is not attainable and that some type of a compromise will have to be made. There is sufficient information contained throughout this study to help in developing these alternatives. However, maintaining this many miles of roadway may not be feasible either. The current transportation network is probably the same extent it was 25 years or more ago. Population changes, density of farms and small towns, and land use has changed dramatically over the last decade or so, especially in rural states such as South Dakota. One alternative, although very unpleasant, is to reduce the number of miles on the County System and perhaps other systems as well. Parallel routes, multiple accesses, etc. may no longer be affordable. People may be forced to drive a little further to reach their destinations. The current investment in the existing transportation network must be preserved before it deteriorates to a level that it is lost and requires extensive expenditures to preserve it.

13.0 REFERENCES

1. Rahmann, W. H., *Rural Road Design Standards and Value for Money.* New Zealand Road Symposium 1987. Volume 4

2. Bews, D., Smith, G., and Tencha, G., *Development of Geometric Design Standards for Low-Volume Roads in Canada.* Transportation Research Record VOL 2 No. 1106 1987.

3. GangRao,HVS., Zelina, T.R., Ward, R., and Howser, V., *The Development of Economical Low-Volume Road Bridges, Final Report.* FHWA/DF-87/002; CTIP Study F-1.

4. Yagar, S.and Vanar,SEH. (Waterloo University, Canada). *Geometric and Environmental Effects on Speeds of 2-Lane Highways.* Transportation Research. Part A: General VOL. 17A No. 4 July 1983.

5. Paterson, WDO. and Maris, G., (National Roads Board, New Zealand Transvaal Roads, Department. *An Evaluation of Low Standard Pavements in the South-West Transvaal.* Civil Engineer in South Africa VOL. 22 NO. 9 Sep 1980.

6. Krosch, A. D., (Queensland Main Roads Department, Australia) *Experiences with NIMPAC and Implications of Alternative Standards for Rural Highways in Queensland.* Bureau of Transport Economics, Australia Allara Street Canberra A.C.T. 2601 Australia May 1980.

7. Larsen, M. B., (Illinois Department of Transportation) *Liability Implications for Low Volume Rural Highways.* ASCE Journal of Transportation Engineering VOL. 106 NO. 6 Nov 1980.

8. Rahmann, W. M., (Queensland Main Roads Department, Australia) *Some New Approaches to the Design of Rural Roads.* Australian Road Research Board, 1979 Conference Paper.

9. Bezkorovainy, G., *More Money for "Poor" Country Roads?.* Better Roads VOL. 43 NO. 4 Apr 1973.

10. Oglesby, C.H. and Altenhfen, M. J., *Economics of Design Standards for Low-Volume Rural Roads.* Highway Research Board NCHRP Reports 1969 NO 63.

11. Oglesby, C. H. and Altenhfen, M. J., *Economics of Design Standards for Low-Volume Rural Roads.* Highway Research Board NCHRP Reports 1969 NO 224.

12. Harrington, W. G., *Modern County Road Systems.* Transportation Research Board Special Reports N160.

13. *A Policy on Geometric Design of Highways and Streets, 1984.* A publication of the American Association of State Highway and Transportation Officials.

14. Riverson,John D.N., Sinha,Kumares C., Scholer,Charles F., Anderson, Virgil L. *Evaluation of Subjective Rating of Unpaved County Roads in Indiana.* Transportation Research Board NO 1128, 1987

APPENDIX A
DESIGN STANDARDS FROM OTHER STATES

CONNECTICUT

Daniel L. Coffey
Director of Engineering
Bureau of Highways
203-666-7200

Follow standards of local government. If no criteria - **AASHTO** standards. Can order **Bridge Design Manual** (cost: 2.85)and/or **Guidelines for Highway Design** (cost: 13.01). Send to:
Treasurer, State of Connecticut
24 Wolcott Hill Road
P.O. Drawer A
Wethersfield, CT 06109-0801

RHODE ISLAND

Edmund T. Parker, JR.,P.E.
Deputy Assistant Director
Transportation/Public Works
401-277-2023

State does not have separate design standards. They reference **"A Policy on Geometric Design of Highways and Streets, 1990" (AASHTO).**

NEW MEXICO

Raymond L. Alexander, P.E.
Specifications Engineer
508-827-5321

State does not have separate design standards. Reference **"A Policy on Geometric Design of Highways and Streets, 1984 (AASHTO).**

MASSACHUSETTS

Frederick J. Nohelty, JR.
Highway Design Engineer
No phone

AASHTO, 1984 has been incorporated into **"Massachusetts Department of Public Works Highway Design Manual"** with some modifications. A copy has already been forwarded to SDDOT.
1989 copy of Manual (cost: 40.00), send to:
Commonwealth of Massachusetts
Cashier's Office
Massachusetts Department of
Public Works
Room 5441 10 Park Plaza
Boston, MS 02116-3973

NEVADA

Michael W. McFall
Assistant Director (Engineering)
or
Steve Oxoby
702-687-5490

Department utilizes **AASHTO (1984).**

VIRGINIA

Gerald Fisher
State Secondary Roads Engineer
No phone

Roads & Bridges Standards (cost: 15.00), send to:
Treasurer of Virginia
Mr. E.C. Cochran
Location and Design Division
Virginia Department of Transportation
1401 E. Broad Street
Richmond, VA 23219
ATTN: Mr. Glen F. Williams

ALABAMA

John F. Courson
Secondary Road Engineer
No phone

AASHTO (no year). Waivers to these standards are granted by DOT on a project/project basis. No specific design standard available for all county funded projects - DOT has no jurisdiction or control over counties' roads programs.

NEW HAMPSHIRE

James A. Moore, Administrator
Bureau of Municipal Highways
603-271-3734
Fax: 603-271-3914

AASHTO (no year).

CALIFORNIA

J.F. McManus, Chief
Division of Local Programs
916-445-6495
or
Ron Lemmon
916-445-9451

AASHTO. Most roads are controlled by terrain. If AASHTO standards cannot be used speed is regulated accordingly and safety devices are provided.

GEORGIA

Walker W. Scott, JR., P.E.
State Road and Airport Design Engineer
No Phone

Guided by **AASHTO (1990)** and **AASHTO "Roadside Design Guide". Roadway and Bridge Standard Details** (cost: 43.00), **Roadway Standard Details** (cost: 35.00), individual copies of **Standard Details** (cost: .30 each plus handling). Send to:
Treasurer, GA Department of Transportation
Office of Road and Airport Design
Room 446
GA Department of Transportation
No. 2 Capitol Square
Atlanta, GA 30334

ILLINOIS

William T. Sunley, P.E.
Engineer of Local Roads and Streets
No Phone

Design Standards for Roads and Bridges for projects funded with State Motor Fuel Tax Funds and for projects funded with Federal Funds.
Included are:

1. **Design Guidelines for Rural Roadways - General Requirements**
2. **Geometric Requirements (Rural)**
3. **Minimum Design Policies for Rural Bridges - General Requirements**

These standards developed using **AASHTO Guide**.

MARYLAND

Anthony M. Copizzi, Chief
Highway Design Division
301-333-1370

Geometric Design Guide for Special Projects
This guide is used in the design of low-volume rural roads in conjunction with the appropriate **AASHTO** guide.

INDIANA

John J. White
Plan Development Manager
317-232-5533

DOT RRR Minimum Design Standards that will be used on all spot improvement projects on highways not scheduled for extensive reconstruction within 20-30 years. **AASHTO (1984)** is used for major reconstruction. For low-volume roads, the provision of these documents is used.

IOWA

Larry K. Jesse, P.E.
Services Engineer
515-239-1256

Index of Standard Road Plans
Indexes for Bridge Standards

Instruction Memos that include:

1. **Farm to Market Design Aids for New or Completely Reconstructed Rural Secondary Roads**
2. **AASHTO Guidelines for Rural Collectors**
3. **Area Service Aids for New or Completely Reconstructed Rural Secondary Roads**
4. **Resurfacing Table (<4")**

KANSAS

Larry W. Emig, P.E.
Chief of Local Projects
No Phone

Design Guidelines for:

1. **New or Completely Reconstructed Secondary Roads**
2. **New or Completely Reconstructed Off-System Roads**
3. **Rehabilitation, Restoration, and Resurfacing of Secondary Roads**
4. **New or Completely Reconst. Secondary/Off-System Curb and Gutter Roads and Streets**
5. **State Transportation Plan (3R) Minimum Design Standards**
6. **KDOT Policies for the Rehabilitation of Highways and Bridges for Other than Interstate and Freeways of KA**

LOUISIANA

Al J. Dunn
Chief Design Engineer
504-379-1301

Design Standards for:
1. **Freeways**
2. **Arterial Roads and Streets**
3. **Collector Roads and Streets**
4. **Local Roads and Streets**

All standards were developed from **AASHTO (1984)** and are currently being reviewed in accordance with **AASHTO (1990)**.

MISSISSIPPI

Irving Harris, JR.
Assistant Roadway Design Engineer
Fax: 601-359-2233

Geometric Design Criteria for:
1. **Rural Collectors (New Construction - Reconstruction)**
2. **Rural Arterials (New Construction - Reconstruction)**
3. **State Aid Collector Roads (FAS Routes) - (New Construction - Reconstruction)**
4. **State Aid Local Roads (Non-FAS Routes) - (New Construction - Reconstruction)**

MONTANA

David S. Johnson, P.E.
Preconstruction Engineer
No Phone

Roadway Info:
1. **Geometric Design Standards for Montana Interstate, Primary, Secondary Roads**
2. Typical X-section of a secondary road.

Bridge Info:
1. Bridges must meet a minimum loading standard of HS-20.
2. Width requirements are the same as for roads.
3. On certain off-system bridge replacement projects with very low traffic volume (ADT<50), the Federal Highway Administration has approved design exceptions for the bridge widths < 24'.

NEBRASKA

Lynn D. Freeman
Bridge Engineer
402-471-4567
Fax: 402-479-4325

Minimum Design Standards for Rural Roads and Bridges

NEVADA

Michael W. McFall
Assistant Director (Engineering)
or
Steve Oxoby
702-687-5490

Nevada DOT utilizes **AASHTO Green Book (1984)**

NEW HAMPSHIRE

James A. Moore, Administrator
Bureau of Municipal Highways
603-271-2107
Fax: 603-271-3914

NHDOT utilizes **AASHTO Design Standards for Rural Roads and Bridges**

NEW MEXICO

Raymond L. Alexander, P.E.
Specifications Engineer
505-827-5321

NMDOT utilizes **AASHTO (1984)**

NEW YORK

Phillip J. Clark, P.E.
Director, Preliminary Plan Review Bureau
No Phone

NYDOT utilizes **AASHTO (no year given)**

OKLAHOMA

Larry G. Curtis, P.E.
Engineering Manager
Engineering Support Branch
Rural Design Division
405-521-6759

Detailed information about:

1. **County Bridge Standards**
2. **Standard Bridge Drawings**
3. **Standard Road Drawings - 2 volumes**

OREGON

Tom Edwards
Roadway Design Supervisor
503-378-6558

1. **AASHTO (no year)**
2. **General Design from the Oregon Highway Design Manual**

Standards from the Manual and AASHTO apply to all projects.

Bridge Section uses standards specified in **AASHTO Design Manual.**

RHODE ISLAND

Edmund T. Parker, JR., P.E.
Deputy Assistant Director
Transportation/Public Works
401-277-2023

AASHTO (1990)

SOUTH CAROLINA

Robert I. Pratt
Assistant Road Engineer - Design
No Phone

1. **Secondary Road Plan Agreement**
2. **Engineering Policy and Procedure Memorandum for Design Control Elements**

TEXAS

Mark A. Marek, P.E.
Engineer of Geometric Design
512-463-8585

Design Standards for Rural Highways - Width of Travel Lanes and Shoulders on Rural Two-Lane Highways (Includes Design Speed and Traffic Volume)

UTAH

E. Don Julio, P.E.
Local Government Projects Engineer
801-965-4000

1. **State of Utah Standard Specifications for Road and Bridge Construction (1979)**
2. **Addendum to Standard Specifications (1985)**
3. **Set of Standard Drawings**
4. **Secondary Road Plan**

VIRGINIA

Gerald E. Fisher
State Secondary Roads Engineer
No Phone

Can purchase **VA Roads and Bridges Standards** (cost: 15.00). Send to:

Treasurer of Virginia
Mr. E.C. Cochran
Location and Design Division
Virginia Department of Transportation
1401 E. Broad Street
Richmond, VA 23219
ATTN: Mr. Glen F. Williams

WISCONSIN

R.L. Cook, P.E.
Standards Development Engineer
608-266-2651

1. **County Trunk Highway Standards from WI Administrative Code**
2. **Facilities Development Manual** (includes Design Criteria for Collectors, Arterials, Local Roads, Town Roads, Paved Shoulders, Typical X-sections, etc.)

WYOMING

Ronald L. Kiscki
Chief, Management Services
307-777-4393

Design Guide for County Roads

ARKANSAS

Paul H. DeBusk
Engineer of Roadway Design
501-569-2000

Secondary Road Plan

WASHINGTON

Stan A. Moon
Assistant Secretary
Local Programs
206-753-6123
or
George Crommes
Standards Engineer
206-753-0143

1. **Urban Design Standards**
2. **Rural Design Standards**
3. **City and County Design Standards for the Construction of Urban and Rural Arterials and Collectors**

MISSOURI

Jim Roberts
Division Engineer, Design
314-751-6555

1. **Federal Aid Highway Off-System Bridge Replacement and Rehabilitation Program**
2. **Missouri Standard Plans for Low Traffic Bridges**

Design guidelines for Local Roads and Streets are obtained from **AASHTO "A Policy on Geometric Design of Highways and Streets"**

WEST VIRGINIA

Donald A. Rude
or Randolph T. Epperly, Jr.
Director
Roadway Design Division
304-348-3505

1. **Structural Directive 13 (SD-13)** - criteria for bridge rails
2. **Design Directive 6-4 (DD-6-4)** - roadway typicals for low volume roads
3. **Geometric Design Criteria (DD-6-5)** - local service roads with design speeds of 20-40 MPH
4. **Drainage Design Manual (p. 2-5)** - design frequency for drainage structures

Guidelines:

Bridge widths - the minimum horizontal clearance is 15'. This allows the maximum legal width of 14' to pass between bridge rails.

OHIO

Theodore J. Stitt, P.E.
Acting Deputy Director
Division of Planning and Design
No Phone

DOT now finalizing **Location and Design Manual.** Will be available for purchase by 12/1990. Send to:

Bureau of Contract Sales
Ohio Department of Transportation
25 South Front Street
P.O. Box 899
Columbus, OH 43216-0899

MINNESOTA

Donald J. Fleming
State Bridge Engineer
612-296-3172
Fax: 612-297-2070

1. **Section .200 of the Bridge Design Manual on Geometrics**
2. **MnDOT State Aid Operations Chapter 8820**
3. **11/89 Task Force Report on County State Aid and Trunk Highway Rural Design Standards**

Can order a complete copy of **State Aid Manual** by calling:

MnDOT Map and Manual Sales
612-296-2216

FLORIDA

Florida Department of Transportation
Map & Publication Sales
Mail Station 12
605 Suwannee Street
Tallahassee, FL 32339-0450
904-488-9220

Summary of Manuals, Plans, and Specs are available for purchase. Address for purchase orders is same as listed. List for order numbers can be found in file.

MAINE

James Chandler
Engineer of Design
No Phone
or
Peter M. Coughlan, P.E.
Co-director
Maine Local Roads Center
207-289-2151

1. Typical X-sections and Minimum Surface Dimensions for Local Roads
2. Rural Bridge Design Standards and Geometrics
3. Design of Integral Abutments for Low-Volume Roads Bridges
4. Wearing Surface Specifications for Bridge Decks
5. Thickness for Bridge Approaches
6. Standards used for State-Aid Work and Town and Road Improvement Projects (this phase of State-Aid was eliminated in 1982, so these standards are no longer used)
   a. State-Aid Force Account Standard Sections
   b. Maine DOT Standard Specifications, Regulations, and General Information for State, State-Aid, Special State-Aid, and Town Road Improvement Projects Performed as Force Account

APPENDIX B
COUNTY SURVEY UPDATE FORMS

Segment Identification Form

County _____ Page _____ of _____

SEGMENT	IDENTIFICATION							
County Route Number From–To	Length	Route Identification	Urban or Rural	FAS	Functional Class	Mail Route	School Route	Economic Generator
–								
–								
–								
–								
–								
–								
–								
–								
–								
–								

For more detail, see the *Instructions*. Short descriptions of each data item on this form are given below. *1-800-346-4146 "Local Roads Help" from 8am to 5pm CST.*

County Route Number: See the *Instructions*.

From: See the *Instructions*.

To: See the *Instructions*.

Length: The length of the segment to the nearest tenth of a mile.

Route Identification: See the *Instructions*.

Urban or Rural: Enter U for *Urban* or R for *Rural*.

FAS: Enter Y if this is on the designated FAS, and enter N it is not.

Functional Class: Enter A for *arterial*, C for *collector*, L for *local*, or O for *other*.

Mail Route: Enter Y if any portion of this segment lies on a mail route, and enter N otherwise.

School Route: Enter Y if any portion of this segment lies on a school bus route, and enter N otherwise.

Economic Generator: Enter Y if any portion of this segment is an economic generator, and enter N otherwise.

Miscellaneous Information Form

County _____ Page _____ of _____

SEGMENT		ROADWAY HISTORY						MINOR STRUCTURES		OPERATIONAL INFORMATION			
County Route Number	From–To	Graded Width	Surface Thickness	Base Thickness	Year of Last Improvement	Year Next Improvement Is Scheduled	Surface Condition	Number of Minor Structures	Number Needing Improvement	Load Restrictions	Regrade	Priority Route	OMAD Eligible
	–												
	–												
	–												
	–												
	–												
	–												
	–												
	–												
	–												
	–												

For more detail, see the *Instructions*. Short descriptions of each data item on this form are given below. *1-800-346-4146 "Local Roads Help" from 8am to 5pm CST.*

County Route Number: The county route number from the *Segement Identification Form.*

From: The *from* mile point from the *Segement Identification Form.*

To: The *to* mile point from the *Segement Identification Form.*

Graded Width: The top width of the finished dirt grade to the nearest foot.

Surface Thickness: See the *Instructions.*

Base Thickness: See the *Instructions.*

Last Year of Improvement: The last year that an improvement was made. If the road has never been improved, the year of construction.

Next Improvement Scheduled: The next year any significant work will be done which effects the roadway surface.

Surface Condition: 5=nearly perfect, 4=adequate with normal maintenance, 3=significant maintenance needed to prevent further failure, 2=degeneration beyond practical limits of normal maintenance efforts, 1=failure severely affects traffic.

The Number of Minor Structures: Total number of box culverts, culverts,and small bridges which are less than 20 feet in length.

The Number of Minor Structures in Need of Improvement: The number of minor structures which need replacement.

Load Restrictions: 5=none, 3=normal, 1=excessive

Regrade: Mark Y if this segment is a desirable candidate for regrading, otherwise mark N.

Priority Route: 5=high priority route, 3=medium priority, 1=low priority.

OMAD Eligible: Mark Y if the segment is eligible to receive funding from the OMAD program for missle access routes.

Roadway Information Form

County _____ Page _____ of _____

SEGMENT	ROADWAY INFORMATION															
County Route Number From–To	Top Width	Shoulder Width	Right of Way Width	Terrain Code	Assumed Design Speed	Roadway Inslope	Surface Type Code	Vertical Curvature Code	Number Per Mile	Minimum Sight Distance	Horizontal Curvature Code	Length per Mile (H)	Drainage and Snow Code	Length per Mile (D)	ADT	Percent Trucks
–																
–																
–																
–																
–																
–																
–																
–																
–																
–																

For more detail, see the *Instructions*. Short descriptions of each data item on this form are given below. *1-800-346-4146 "Local Roads Help" from 8am to 5pm CST.*

County Route Number: The county route number from the *Segement Identification Form.*

From: The *from* mile point from the *Segement Identification Form.*

To: The *to* mile point from the *Segement Identification Form.*

Top Width: The width of the driving lanes.

Shoulder Width: Shoulder width (one side only).

Right of Way Width: See the *Instructions.*

Terrain Code: F=Flat, R=Rolling, M=Mountainous.

Assumed Design Speed: See the *Instructions.*

Roadway Inslope: Slope from the edge of surface to the bottom of the ditch. Use one of the following: 2:1, 3:1, 4:1, 5:1, 6:1, 7:1, 8:1.

Surface Type Code: 5=Concrete, 4=Asphalt Mat, 3=Surface Seal, 2=Gravel, 1=Other.

Vertical Curvature Code: 5=OK, 3=Remedaible, 1=Intolerable. (See the *Instructions.*)

Number per Mile: The number of locations per mile where these vertical curvature conditions exist.

Minimum Sight Distance: Estimate the minimum sight distance at the most restrictive location.

Horizontal Curvature Code: 5=OK, 3=Remedaible, 1=Intolerable.

Length per Mile (H): Total length of locations per mile with these horizontal curvature conditions.

Drainage and Snow Code: 5=No problems, 4=Average, 3=Seasonal or isolated problems, 2=Above average problems, 1=Intolerable.

Length per Mile (D): Total length of locations per mile with these Drainage and Snow conditions.

Average Daily Traffic: Estimate the average annual daily total traffic.

Percent Trucks: Estimate what percent of the average annual daily total traffic is trucks.

APPENDIX C
DATA BASE SUMMARY INFORMATION

	Number Usable Segments	Total Usable Length	Regrade is yes miles	Percent Regrade is yes miles	Miles With No ADT response	Total Need on Usable Segments in $1000
aurora	113	453.4	191.8	42	3.0	38973
brookings	68	378.0	24.0	6		34105
brown	158	674.6	47.4	7		70571
brule	113	504.0	113.5	23		45209
buffalo	12	172.0	172.0	100		14655
clark	69	457.2	457.2	100		46591
clay	51	240.1	79.5	33		25190
codington	111	389.9	98.2	25		37598
corson	45	334.7	107.5	32		25911
davison	68	325.8	68.0	21		30187
day	101	539.7	207.5	38	44.0	70837
deuel	50	248.2	46.6	19		18678
douglas	68	233.5	104.7	45		28511
faulk	56	357.0	69.5	19		29559
grant	81	455.6	455.6	100		56287
gregory	69	398.6	248.1	62		55009
hamlin	52	263.0	263.0	100		42424
hand	54	399.2	114.2	29		31321
hutchinson	109	472.9	65.4	14		43972
hyde	38	210.2	30.0	14		17515
jerauld	48	257.3	134.3	52	7.0	22770
kingsbury	83	358.9	337.8	94	358.9	39997
lake	64	290.5	6.0	2		26184
lawrence	58	256.4	169.1	66		50869
lincoln	63	315.4	106.4	34		46053
lyman	27	342.0	107.5	31	342.0	56118
marshall	63	318.4	56.5	18		26590
mccook	50	293.3	86.3	29		32995
mcpherson	52	350.9	75.1	21		31546
miner	63	304.0	27.0	9		28103
minnehaha	80	341.7	341.7	100		53522
pennington	56	363.0	363.0	100	14.4	63374
perkins	52	548.0	113.3	21		37677
potter	34	245.0	74.0	30		19028
roberts	94	480.3	128.6	27		50352
sanborn	62	305.5	12.0	4		25678
spink	131	682.0	682.0	100	682.0	51262
sully	76	306.5	180.0	59		31129
todd	22	172.0	172.0	100		16838
turner	57	311.5	78.5	25		27703
union	56	219.2	219.2	100		24086
walworth	77	330.2	38.8	12		30220
yankton	68	306.8	125.0	41		46172
ziebach	59	370.2	370.2	100	348.2	48447
	2981	15576.6	6968	45	1799.5	1649816

	AA	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	
aurora		1.5			0.5	25.5		7.0	11.5		9.0	30.5					27.2	180.2		39.5	121.0		453.4
brookings	6.0	21.5	88.0		8.5	54.5					11.5	7.0					24.5	156.5					378.0
brown	27.6	81.3	10.0		51.6	44.3		74.5	26.0		43.8	6.0		5.4			149.9	37.5		75.8	40.9		674.6
brule						9.0			6.0						8.0		59.0	135.0	9.5	58.5	215.5	3.5	504.0
buffalo																				32.0	140.0		172.0
clark					14.0	25.0		31.0	17.0		0.3						137.3	70.6		95.0	66.5		456.7
clay		9.5	7.0		27.8	75.1		14.1	30.8					6.3	22.0		8.4	36.5		2.6			240.1
codington	12.0	11.5	16.5		5.6	23.9		20.8	29.5		9.8	17.4		3.5			60.4	169.2		5.0	4.8		389.9
corson																	8.0	121.5		8.5	191.7	5.0	334.7
davison		36.0	1.0		1.0			42.5				1.5		22.0			93.8	5.0		109.0	14.0		325.8
day		1.0	34.5			63.2			67.5			20.5			19.5		12.3	258.2		6.0	57.0		539.7
deuel		2.0			3.0	28.5			33.0			23.2		6.0	14.0		2.0	97.1		2.0	37.4		248.2
douglas	2.0	2.0			5.7	45.8			23.4		5.8	18.7			2.5		4.7	73.6	2.0	7.0	40.3		233.5
faulk								14.5	10.5					13.0	14.0		82.2	39.3		136.5	47.0		357.0
grant	8.0	10.0	16.0		12.5	10.8					17.6	10.3					83.3	177.6		47.0	62.5		455.6
gregory			19.2			2.0			30.2			6.8			44.6			149.5			146.3		398.6
hamlin		2.5			3.0	37.5		5.0	61.5					4.0	35.0		8.0	106.5					263.0
hand								8.0			21.0	11.0		10.0			133.6	155.1		29.0	31.5		399.2
hutchinson	0.3	12.7			28.2	5.8		31.7	29.8					30.0	14.5		121.8	45.2		97.9	55.0		472.9
hyde															18.0		44.5	44.2		19.5	84.0		210.2
jackson																		112.0					112.0
jerauld									7.0								4.0			5.0	129.3		145.3
kingsbury								44.2	314.7														358.9
lake		4.2	23.6			40.0		3.0	70.8			12.5					13.5	115.4			7.0		290.0
lawrence	6.8		37.6	53.3		17.7	10.7			1.5		34.9	5.1					61.3	15.6		3.2	8.7	256.4
lincoln	23.9	23.5	50.5		9.5	25.0		2.0	2.0		11.5	41.5					48.0	74.0		4.0			315.4
lyman								6.0	336.0														342.0
marshall		9.5			5.0	9.5		5.0			18.0	11.7					63.0	104.7		38.0	54.0		318.4
mccook		7.5	15.5		22.0	21.0					31.0	59.0					32.5	101.8		3.0			293.3
mcpherson								8.0	8.0			9.0					96.5	96.5		58.3	74.6		350.9
miner		5.0	9.0		8.0	18.5		2.0	29.0		3.0	11.0		1.0	3.0		14.0	98.5		21.0	81.0		304.0
minnehaha	31.0	22.0	132.9		3.0	33.5			14.5		18.0	16.0						63.8		2.0	5.0		341.7
pennington	33.4		6.4			37.4			69.0			0.8						184.3			31.7		363.0
perkins															30.6			79.8			437.6		548.0
potter						15.5						19.5					30.0	67.0		5.0	108.0		245.0
roberts	3.0	11.0	7.0		10.0	45.5		8.0	81.8		2.5	7.0		11.0	22.3		44.5	142.0		6.3	78.4		480.3
sanborn		15.0	12.5		8.0			3.0						35.0	49.0		41.5	15.0		75.0	51.5		305.5
spink									682.0														682.0
sully		7.0	12.0		1.0			12.0	10.0					51.5	116.5		15.5	12.5		31.5	37.0		306.5
todd															30.0			73.0		2.0	67.0		172.0
turner			42.0		18.0	53.5		15.0	18.0			7.0		5.5	7.0		40.5	36.5		20.5	48.0		311.5
union	12.9	33.7	15.8		16.7	42.1		4.8	27.5								6.1	50.8		3.2	5.6		219.2
walworth		3.8			6.0			13.4	1.0		6.0			8.0			65.8	35.5		110.9	79.8		330.2
yankton	4.0	16.0	12.0		4.6	50.0		4.0	5.0		6.0	22.0		5.0	3.5		50.5	110.7	2.5	1.0	10.0		306.8
ziebach									370.2														370.2
	170.9	349.7	569.0	53.3	273.2	860.1	10.7	379.5	2423.2	1.5	214.8	404.8	5.1	217.2	454.0	0.0	1626.8	3693.4	29.6	1157.5	2664.1	17.2	15575.6

APPENDIX D
YEARLY MAINTENANCE AND REHABILITATION PLAN BY COUNTY

AURORA

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	1992	370,000
		370,000

Asphalt Crack Sealing	Year	Need
	1996	6,750
	1997	2,500
	1998	5,000
	1999	15,000
	2000	5,000
	2001	2,500
	2002	23,751
	2003	20,001
	2004	5,000
	2005	2,500
	2006	1,750
	2007	38,751
	2008	15,000
	2009	2,500
	2011	15,000
		161,004

Asphalt Seal Coat	Year	Need
	1996	6,300
	1998	18,000
	1999	9,000
	2000	18,000
	2001	54,000
	2004	103,500
	2005	9,000
	2006	6,300
	2007	72,000
	2010	36,000
	2011	94,500
		426,602

Overlay Asphalt on Asphalt	Year	Need
	2001	52,500
	2011	52,500
		105,000

Overlay Asphalt on Blotter	Year	Need
	1995	420,000
	1997	712,500
	2004	140,000
		1,272,500

Overlay Asphalt on Gravel	Year	Need
	1993	210,000
		210,000

Reconstruct to Blotter

Year	Need
1992	362,500
1993	870,000
	1,232,500

Blotter Crack Sealing

Year	Need
1992	23,751
1993	23,751
1994	62,502
1995	1,750
1996	40,001
1997	38,251
1998	77,502
1999	25,001
2000	1,750
2002	57,001
2003	77,502
2004	45,001
2005	23,751
2006	3,750
2007	50,751
2008	75,002
2009	87,502
2010	1,750
	716,268

Blotter Seal Coat

Year	Need
1993	360,001
1994	90,000
1995	6,300
1996	139,500
1997	124,201
1998	261,001
1999	63,000
2000	24,300
2001	27,000
2002	182,700
2003	265,501
2005	85,500
2006	148,501
2007	182,700
2008	292,501
2009	139,501
2010	6,300
	2,398,508

Routine Blading of Gravel Roads

Year	Need
1992	297,693
1993	260,769
1994	260,769
1995	260,769
1996	260,769
1997	260,769
1998	260,769
1999	260,769
2000	260,769
2001	260,769
2002	260,769
2003	260,769
2004	260,769
2005	260,769

	2006	260,769
	2007	260,769
	2008	260,769
	2009	260,769
	2010	260,769
	2011	260,769
		5,252,303

Overlay Blotter on Blotter	Year	Need
	1993	14,583
	1994	93,750
	1997	484,374
	1998	15,625
	1999	450,000
	2000	46,875
	2001	281,249
	2004	190,625
	2005	17,500
	2011	14,583
		1,609,164

Overlay Blotter on Gravel	Year	Need
	1992	62,292
	1993	671,875
		734,167

Overlay Gravel on Gravel	Year	Need
	1994	1,022,499
	1995	776,665
	1996	5,204,160
	1999	75,833
	2000	711,665
	2001	946,666
	2002	65,000
	2003	5,204,160
	2004	75,833
	2005	711,665
	2008	946,666
	2009	140,833
	2010	5,915,825
		21,797,470

PCC	Year	Need
	1992	2,687,430
		2,687,430
		38,972,915

BROOKINGS

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Asphalt Crack Sealing

Year	Need
1992	35,001
1993	56,251
1994	143,753
1995	41,251
1996	42,501
1997	176,254
1998	153,754
1999	53,751
2000	16,250
2001	157,504
2002	27,501
2003	105,002
2004	36,251
2005	142,503
2006	158,754
2007	65,002
2008	45,001
2009	160,004
2010	108,753
2011	71,252
	1,796,293

Asphalt Seal Coat

Year	Need
1992	85,500
1994	459,002
1995	40,500
1996	54,000
1997	256,501
1998	36,000
1999	513,003
2000	414,002
2001	139,501
2003	76,500
2004	153,001
2005	513,003
2006	99,000
2007	180,001
2008	414,002
2009	18,000
2010	63,000
2011	531,003
	4,045,520

Overlay Asphalt on Asphalt

Year	Need
1992	720,000
1993	3,730,000
1995	930,000
2000	670,000
2001	1,080,000
2002	2,060,000
2004	440,000
2007	480,000
2009	817,500
2010	240,000

	2011	380,000
		11,547,500

Reconstruct to Blotter

Year	Need
2004	290,000
	290,000

Blotter Crack Sealing

Year	Need
1994	66,460
1995	28,751
1996	12,500
1997	50,626
1998	22,501
1999	4,583
2000	52,501
2001	5,000
2002	70,627
2003	10,000
2004	63,960
2005	5,000
2007	58,126
2008	46,251
2009	45,209
2010	28,751
	570,847

Blotter Seal Coat

Year	Need
1992	103,500
1993	177,751
1994	61,500
1996	45,000
1997	182,251
1998	36,000
1999	120,000
2000	130,501
2001	18,000
2002	209,251
2003	36,000
2004	85,500
2005	18,000
2006	144,751
2007	209,251
2008	121,500
2009	18,000
2010	45,000
	1,761,756

Routine Blading of Gravel Roads

Year	Need
1992	105,428
1993	101,541
1994	101,541
1995	101,541
1996	101,541
1997	101,541
1998	101,541
1999	105,104
2000	105,104
2001	105,104
2002	105,104
2003	105,104
2004	105,104

	2005	105,104
	2006	105,104
	2007	105,104
	2008	105,104
	2009	105,104
	2010	105,104
	2011	105,104
		2,081,034

Overlay Blotter on Asphalt	Year	Need
	1993	70,000
	1996	332,500
		402,500

Overlay Blotter on Blotter	Year	Need
	1997	125,000
	1999	412,499
	2004	125,000
	2005	287,499
	2009	50,000
		999,998

Overlay Blotter on Gravel	Year	Need
	1992	456,250
	1993	100,000
		556,250

Overlay Gravel on Blotter	Year	Need
	1999	55,000
		55,000

Overlay Gravel on Gravel	Year	Need
	1993	40,000
	1994	1,769,999
	1995	40,000
	1996	280,000
	1997	40,000
	1999	40,000
	2001	1,809,999
	2003	320,000
	2005	40,000
	2006	73,333
	2007	40,000
	2008	1,769,999
	2009	40,000
	2010	280,000
	2011	40,000
		6,623,328

PCC	Year	Need
	1992	3,374,910
		3,374,910
		34,104,936

BROWN

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Asphalt Crack Sealing	Year	Need
	1993	60,001
	1994	6,250
	1995	203,005
	1996	132,753
	1997	31,251
	1998	184,254
	1999	274,006
	2000	25,001
	2001	209,255
	2002	107,752
	2003	203,755
	2004	251,756
	2005	132,753
	2006	28,751
	2007	404,009
	2008	166,004
	2009	53,751
	2010	84,002
	2011	243,756
		2,802,066

Asphalt Seal Coat	Year	Need
	1992	90,000
	1993	72,000
	1994	22,500
	1995	67,500
	1996	239,401
	1998	603,902
	1999	387,902
	2000	149,401
	2001	688,503
	2003	99,000
	2004	753,303
	2005	387,902
	2006	103,500
	2007	864,003
	2009	166,501
	2010	209,701
	2011	329,401
		5,234,421

Overlay Asphalt on Asphalt	Year	Need
	1992	4,216,000
	1993	1,670,000
	1995	1,465,000
	1998	102,500
	1999	887,500
	2000	156,250
	2003	627,500
	2007	1,308,000
	2008	102,500
	2010	4,297,000
	2011	2,633,500

17,465,750

Overlay Asphalt on Blotter	Year	Need
	1992	1,439,000
	1993	1,338,500
	1995	3,655,000
	2000	830,000
	2001	1,395,000
	2003	880,000
	2004	972,500

10,510,000

Overlay Asphalt on Gravel	Year	Need
	1992	987,500
	1993	675,000

1,662,500

Blotter Crack Sealing	Year	Need
	1992	111,003
	1993	195,505
	1994	181,754
	1995	253,162
	1996	64,189
	1997	205,505
	1998	186,254
	1999	99,502
	2000	117,753
	2001	57,689
	2002	225,255
	2003	257,506
	2004	114,003
	2005	94,408
	2006	1,500
	2007	265,506
	2008	210,005
	2009	95,002
	2010	149,660
	2011	27,188

2,912,350

Blotter Seal Coat	Year	Need
	1992	61,200
	1993	1,239,080
	1994	650,365
	1995	535,502
	1996	171,001
	1997	581,402
	1998	433,802
	1999	315,002
	2000	483,077
	2001	108,000
	2002	491,402
	2003	1,040,404
	2004	280,801
	2005	144,001
	2006	198,001
	2007	955,466
	2008	673,202
	2009	147,601
	2010	319,501
	2011	117,000

8,945,810

Routine Blading of Gravel Roads	Year	Need
	1992	105,108
	1993	66,241
	1994	66,241
	1995	66,241
	1996	66,241
	1997	66,241
	1998	66,241
	1999	66,241
	2000	66,241
	2001	66,241
	2002	66,241
	2003	66,241
	2004	66,241
	2005	67,018
	2006	67,018
	2007	67,018
	2008	67,018
	2009	67,018
	2010	67,018
	2011	67,018

1,369,126

Overlay Blotter on Blotter	Year	Need
	1992	750,417
	1995	847,082
	1997	531,249
	1998	1,391,770
	1999	652,083
	2000	615,415
	2001	526,040
	2004	12,500
	2005	1,176,040
	2006	321,875
	2007	362,500
	2010	382,292
	2011	813,749

8,383,011

Overlay Blotter on Gravel	Year	Need
	1992	1,420,415
	1993	1,120,831

2,541,246

Overlay Gravel on Blotter	Year	Need
	2005	12,000

12,000

Overlay Gravel on Gravel	Year	Need
	1992	95,833
	1993	50,000
	1994	1,543,247
	1995	309,000
	1996	368,583
	1997	50,000
	1999	1,194,248
	2000	259,000
	2001	544,832
	2003	418,583

	2004	1,048,415
	2005	309,000
	2006	95,833
	2007	50,000
	2008	494,832
	2009	1,098,415
	2010	627,583
	2011	50,000
		8,607,403

PCC	Year	Need
	1992	124,997
		124,997
		70,570,680

BRULE

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Asphalt Crack Sealing	Year	Need
	1992	15,000
	1993	42,501
	1994	22,501
	1997	15,000
	1998	65,002
	2002	37,501
	2003	42,501
	2008	65,002
		305,007

Asphalt Seal Coat	Year	Need
	1994	81,000
	1996	54,000
	1997	153,001
	2000	81,000
	2003	54,000
	2004	153,001
	2010	81,000
		657,003

Overlay Asphalt on Asphalt	Year	Need
	2004	630,000
	2007	420,000
	2009	1,150,000
		2,200,000

Reconstruct to Blotter	Year	Need
	1993	1,691,670
		1,691,670

Blotter Crack Sealing	Year	Need
	1995	142,503
	1998	41,668
	2000	142,503
	2003	41,668
	2008	41,668
	2010	142,503
		552,514

Blotter Seal Coat	Year	Need
	1992	315,001
	1995	198,001
	1998	150,000
	1999	315,001
	2000	198,001
	2003	150,000
	2008	150,000
	2010	198,001
		1,674,005

Routine Blading of Gravel Roads	Year	Need
	1992	313,370
	1993	294,908
	1994	294,908
	1995	294,908
	1996	294,908
	1997	294,908
	1998	294,908
	1999	294,908
	2000	294,908
	2001	294,908
	2002	294,908
	2003	294,908
	2004	294,908
	2005	294,908
	2006	294,908
	2007	294,908
	2008	294,908
	2009	294,908
	2010	294,908
	2011	294,908
		5,916,618

Overlay Blotter on Blotter	Year	Need
	2005	1,693,747
		1,693,747

Overlay Blotter on Gravel	Year	Need
	1993	141,666
		141,666

Overlay Gravel on Gravel	Year	Need
	1993	389,999
	1995	1,685,830
	1996	7,097,488
	1997	389,999
	1999	389,999
	2000	1,295,831
	2001	389,999
	2002	284,166
	2003	7,203,321
	2005	1,685,830
	2007	389,999
	2008	284,166
	2009	389,999
	2010	8,109,152
	2011	389,999
		30,375,779
		45,208,009

BUFFALO

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Routine Blading of Gravel Roads	Year	Need
	1992	111,420
	1993	111,420
	1994	111,420
	1995	111,420
	1996	111,420
	1997	111,420
	1998	111,420
	1999	111,420
	2000	111,420
	2001	111,420
	2002	111,420
	2003	111,420
	2004	111,420
	2005	111,420
	2006	111,420
	2007	111,420
	2008	111,420
	2009	111,420
	2010	111,420
	2011	111,420
		2,228,408

Overlay Gravel on Gravel	Year	Need
	1995	766,666
	1996	3,119,995
	2000	766,666
	2003	3,119,995
	2005	766,666
	2010	3,886,661
		12,426,649
		14,655,057

CLARK

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	1992	3,145,000
	1993	1,110,000
	1995	1,665,000
	2003	2,590,000
	2007	1,110,000
		9,620,000

Asphalt Crack Sealing	Year	Need
	1992	15,000
	1996	77,502
	1997	22,501
	1999	57,501
	2000	42,501
	2002	57,501
	2003	22,501
	2004	42,501
	2005	35,001
	2007	65,001
	2008	118,753
	2011	57,501
		613,765

Asphalt Seal Coat	Year	Need
	1996	54,000
	1998	153,001
	1999	153,001
	2001	81,000
	2003	54,000
	2004	153,001
	2005	126,001
	2006	27,000
	2007	81,000
	2009	126,000
	2010	301,502
		1,309,506

Overlay Asphalt on Asphalt	Year	Need
	1992	240,000
	2011	1,000,000
		1,240,000

Overlay Asphalt on Blotter	Year	Need
	1993	640,000
	2004	1,320,000
	2007	640,000
		2,600,000

Reconstruct to Blotter	Year	Need
	1993	1,087,500
	2001	43,500

	2005	120,833
		1,251,833

Blotter Crack Sealing

Year	Need
1992	20,001
1993	28,251
1994	58,751
1995	137,503
1996	22,501
1997	85,752
1998	225,755
1999	40,001
2000	102,502
2001	22,501
2002	126,253
2003	189,504
2004	22,501
2005	750
2007	65,002
2008	189,504
2009	23,251
2010	102,086
2011	22,501
	1,484,868

Blotter Seal Coat

Year	Need
1992	63,000
1993	164,701
1994	148,501
1995	432,002
1996	72,000
1997	236,701
1998	664,203
1999	63,000
2000	535,503
2001	144,000
2002	234,001
2003	754,203
2005	2,700
2006	63,000
2007	234,001
2008	700,203
2009	2,700
2010	304,502
	4,818,921

Routine Blading of Gravel Roads

Year	Need
1992	225,659
1993	152,490
1994	152,490
1995	152,490
1996	152,490
1997	152,490
1998	152,490
1999	152,490
2000	152,490
2001	152,490
2002	152,490
2003	152,490
2004	152,490
2005	152,490
2006	152,490

	2007	152,490
	2008	152,490
	2009	152,490
	2010	152,490
	2011	152,490
		3,122,976

Overlay Blotter on Blotter

Year	Need
1994	66,667
1998	66,667
1999	233,333
2005	1,333,331
2006	262,499
	1,962,496

Overlay Blotter on Gravel

Year	Need
1992	716,666
1993	1,958,746
	2,675,412

Overlay Gravel on Gravel

Year	Need
1992	373,333
1994	519,999
1995	1,546,665
1996	2,043,329
1998	247,333
1999	773,333
2000	1,546,665
2001	120,000
2003	2,043,329
2004	400,000
2005	1,793,998
2006	373,333
2008	120,000
2009	400,000
2010	3,589,994
	15,891,309
	46,591,086

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Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	1992	3,630,630
	1993	814,000
	1995	1,535,500
	2010	3,353,130
		9,333,260

Asphalt Crack Sealing	Year	Need
	1992	15,886
	1993	72,345
	1995	43,751
	1996	36,928
	1997	15,730
	1998	43,751
	1999	126,274
	2000	3,750
	2001	59,481
	2002	49,064
	2003	93,096
	2004	47,501
	2005	48,907
	2007	152,733
	2008	36,928
	2009	15,730
	2011	93,096
		954,950

Asphalt Seal Coat	Year	Need
	1993	57,188
	1998	171,001
	1999	176,063
	2001	335,139
	2004	228,188
	2005	176,063
	2007	335,139
	2010	13,500
	2011	113,813
		1,606,094

Overlay Asphalt on Asphalt	Year	Need
	1993	909,750
	1995	1,736,250
	1997	381,250
	2011	796,250
		3,823,500

Reconstruct to Blotter	Year	Need
	1993	277,917
		277,917

Blotter Crack Sealing	Year	Need

	1992	34,855
	1993	131,753
	1994	40,157
	1996	8,125
	1997	29,480
	1998	6,750
	1999	118,315
	2001	4,792
	2002	73,085
	2003	156,379
	2004	25,574
	2005	12,917
	2006	14,584
	2007	165,150
	2008	49,730
	2009	34,949
	2010	10,000
	2011	110,190
		1,026,785

Blotter Seal Coat	Year	Need
	1992	89,250
	1993	403,089
	1994	16,500
	1997	12,375
	1998	41,550
	1999	89,250
	2001	396,677
	2002	12,375
	2003	113,775
	2004	125,476
	2005	118,501
	2006	168,563
	2007	409,052
	2008	113,775
	2011	125,476
		2,235,684

Routine Blading of Gravel Roads	Year	Need
	1992	40,016
	1993	34,785
	1994	34,785
	1995	34,785
	1996	35,190
	1997	35,190
	1998	35,190
	1999	35,190
	2000	35,190
	2001	35,190
	2002	35,190
	2003	35,190
	2004	35,190
	2005	35,190
	2006	35,190
	2007	35,190
	2008	35,190
	2009	35,190
	2010	35,190
	2011	35,190
		707,411

Overlay Blotter on Blotter	Year	Need

	1992	166,666
	1993	81,250
	1995	1,101,873
	1997	348,542
	1998	448,541
	1999	255,729
	2000	45,833
	2011	81,250
		2,529,684

Overlay Blotter on Gravel	Year	Need
	1992	34,375
	1993	67,500
		101,875

Reconstruct to Gravel	Year	Need
	1996	400,000
		400,000

Overlay Gravel on Gravel	Year	Need
	1993	55,000
	1994	166,666
	1995	171,458
	1996	217,916
	1998	55,000
	2000	171,458
	2001	166,666
	2003	339,582
	2005	171,458
	2008	221,666
	2010	456,041
		2,192,912
		25,190,071

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Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	1995	906,500
		906,500

Asphalt Crack Sealing	Year	Need
	1992	17,750
	1993	12,229
	1994	42,813
	1995	58,001
	1996	40,001
	1997	62,501
	1998	44,418
	1999	48,501
	2000	16,250
	2001	75,002
	2002	1,250
	2003	84,356
	2004	52,751
	2005	32,501
	2006	60,314
	2007	73,752
	2008	34,105
	2009	61,251
	2010	50,564
	2011	77,752
		946,064

Asphalt Seal Coat	Year	Need
	1992	50,400
	1993	42,750
	1994	140,626
	1995	28,800
	1996	157,501
	1997	82,275
	1998	99,000
	1999	108,000
	2000	145,126
	2001	102,600
	2003	100,801
	2004	158,776
	2005	162,001
	2006	117,000
	2007	135,001
	2008	37,125
	2009	130,501
	2010	117,001
	2011	231,301
		2,146,584

Overlay Asphalt on Asphalt	Year	Need
	1992	900,000
	1993	225,000
	1998	72,500
	1999	119,000

	2000	865,000
	2001	177,500
	2002	270,000
	2003	35,000
	2007	1,019,000
	2008	72,500
	2009	139,500
	2011	252,500
		4,147,500

Overlay Asphalt on Blotter	Year	Need
	1993	675,000
	1995	420,000
	2001	217,000
	2003	525,000
	2004	615,000
	2007	420,000
		2,872,000

Overlay Asphalt on Gravel	Year	Need
	1992	400,000
		400,000

Reconstruct to Blotter	Year	Need
	1992	362,500
	1997	870,000
		1,232,500

Blotter Crack Sealing	Year	Need
	1992	56,501
	1993	27,251
	1994	38,501
	1995	146,253
	1996	43,751
	1997	43,751
	1998	106,002
	1999	51,751
	2000	130,503
	2001	17,500
	2002	78,752
	2003	103,377
	2004	20,250
	2006	25,001
	2007	30,751
	2008	106,627
	2009	18,500
	2010	105,252
	2011	27,501
		1,177,778

Blotter Seal Coat	Year	Need
	1992	198,001
	1993	9,000
	1994	156,601
	1995	271,801
	1996	234,001
	1997	56,700
	1998	335,701
	1999	282,601

	2000	334,801
	2001	63,000
	2002	54,000
	2003	529,652
	2004	72,900
	2005	54,000
	2006	36,000
	2007	54,000
	2008	365,851
	2009	141,301
	2010	180,901
	2011	36,000
		3,466,813

Routine Blading of Gravel Roads

Year	Need
1992	180,640
1993	150,226
1994	149,578
1995	149,578
1996	147,214
1997	147,214
1998	147,214
1999	147,214
2000	147,214
2001	147,214
2002	147,214
2003	147,214
2004	147,214
2005	147,214
2006	147,214
2007	147,214
2008	147,214
2009	147,214
2010	147,214
2011	147,214
	2,985,439

Overlay Blotter on Asphalt

Year	Need
1996	228,667
1998	140,000
2001	151,667
	520,334

Overlay Blotter on Blotter

Year	Need
2004	289,583
2005	1,237,288
2006	29,167
2007	342,708
2008	62,500
2011	170,625
	2,131,870

Overlay Blotter on Gravel

Year	Need
1993	894,582
	894,582

Reconstruct to Gravel

Year	Need
1994	400,000
1996	1,660,000

	2003	400,000
	2010	400,000
		2,860,000

Overlay Gravel on Gravel

Year	Need
1993	73,333
1994	50,000
1995	149,166
1996	3,053,329
1997	73,333
1999	83,333
2000	75,833
2001	180,000
2003	3,336,662
2004	10,000
2005	149,166
2007	73,333
2008	106,666
2009	83,333
2010	3,339,162
2011	73,333
	10,909,983
	37,597,946

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Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Asphalt Crack Sealing	Year	Need
	1996	17,500
	2001	17,500
	2006	17,500
	2011	17,500
		70,002

Asphalt Seal Coat	Year	Need
	1998	63,000
	2005	63,000
		126,000

Blotter Crack Sealing	Year	Need
	1997	20,001
	2002	20,001
	2007	20,001
		60,002

Blotter Seal Coat	Year	Need
	1997	72,000
	2002	72,000
	2007	72,000
		216,001

Routine Blading of Gravel Roads	Year	Need
	1992	233,405
	1993	233,405
	1994	234,377
	1995	234,377
	1996	231,948
	1997	231,948
	1998	231,948
	1999	231,948
	2000	231,948
	2001	231,948
	2002	231,948
	2003	231,948
	2004	231,948
	2005	231,948
	2006	231,948
	2007	231,948
	2008	231,948
	2009	231,948
	2010	231,948
	2011	231,948
		4,646,724

Overlay Blotter on Gravel	Year	Need
	1992	233,333
		233,333

Reconstruct to Gravel

Year	Need
1994	540,000
1996	1,500,000
	2,040,000

Overlay Gravel on Gravel

Year	Need
1992	93,333
1994	989,998
1995	170,000
1996	4,446,161
1998	285,000
1999	93,333
2000	170,000
2001	1,079,998
2002	91,667
2003	4,604,495
2005	455,000
2006	93,333
2008	1,171,665
2010	4,774,495
	18,518,478
	25,910,539

DAVISON

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Asphalt Crack Sealing	Year	Need
	1992	35,001
	1994	72,502
	1995	12,500
	1996	40,001
	1997	72,502
	1999	20,000
	2000	5,000
	2002	35,001
	2003	80,002
	2004	7,500
	2006	107,503
	2007	95,002
	2008	5,000
	2009	72,502
	2010	2,500
	2011	92,502
		755,018

Asphalt Seal Coat	Year	Need
	1993	153,000
	1994	261,001
	1995	45,000
	1998	18,000
	2001	72,000
	2003	126,000
	2004	18,000
	2006	261,001
	2007	36,000
	2009	306,001
	2010	18,000
		1,314,005

Overlay Asphalt on Asphalt	Year	Need
	1995	210,000
	1998	980,000
	2000	2,030,000
	2003	350,000
	2008	980,000
		4,550,000

Overlay Asphalt on Blotter	Year	Need
	2001	70,000
	2003	2,030,000
		2,100,000

Overlay Asphalt on Gravel	Year	Need
	1992	140,000
		140,000

Blotter Crack Sealing	Year	Need

1992	12,500
1993	19,500
1994	7,500
1995	200,005
1996	26,251
1997	70,002
1998	67,502
1999	72,502
2000	122,503
2001	30,001
2002	68,752
2003	67,002
2004	30,001
2005	5,000
2007	86,252
2008	82,002
2009	12,500
2010	107,503
2011	7,500
	1,094,776

Blotter Seal Coat

Year	Need
1992	18,000
1993	124,201
1994	36,000
1995	639,002
1996	13,500
1997	252,001
1998	252,001
1999	54,000
2000	396,002
2001	261,000
2002	265,501
2003	259,201
2004	63,000
2006	27,000
2007	265,501
2008	259,201
2009	36,000
2010	369,002
	3,590,113

Routine Blading of Gravel Roads

Year	Need
1992	98,141
1993	77,087
1994	77,087
1995	77,087
1996	77,087
1997	77,087
1998	77,087
1999	77,087
2000	77,087
2001	77,087
2002	77,087
2003	77,087
2004	77,087
2005	77,087
2006	77,087
2007	77,087
2008	77,087
2009	77,087
2010	77,087
2011	77,087

1,562,801

Overlay Blotter on Blotter	Year	Need
	1992	612,500
	1997	43,750
	1998	227,500
	1999	87,500
	2004	116,666
	2005	1,254,163
	2006	87,500
	2010	204,167

2,633,744

Overlay Blotter on Gravel	Year	Need
	1992	408,332
	1993	612,498

1,020,831

Overlay Gravel on Gravel	Year	Need
	1994	466,666
	1995	1,936,663
	1996	373,333
	1999	466,666
	2000	1,936,663
	2001	46,667
	2003	326,666
	2004	466,666
	2005	1,936,663
	2006	46,667
	2009	466,666
	2010	2,263,329
	2011	46,667

10,779,980

PCC	Year	Need
	1992	645,816

645,816

30,187,084

DAY

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	1992	8,325,000
	2004	1,110,000
		9,435,000

Asphalt Crack Sealing	Year	Need
	1992	37,501
	1993	15,750
	1994	35,001
	1995	1,250
	1996	78,752
	1997	100,002
	1998	80,002
	1999	1,250
	2000	57,501
	2001	28,751
	2002	90,002
	2003	62,001
	2004	57,501
	2005	7,500
	2006	71,252
	2007	53,751
	2008	206,755
	2009	10,000
	2010	47,501
	2011	21,251
		1,063,276

Asphalt Seal Coat	Year	Need
	1993	38,700
	1994	126,000
	1996	135,001
	1997	22,500
	1998	283,501
	1999	216,001
	2000	270,001
	2003	178,201
	2004	225,001
	2005	103,500
	2006	198,001
	2007	153,001
	2008	171,000
	2009	4,500
	2010	573,301
	2011	27,000
		2,725,208

Overlay Asphalt on Asphalt	Year	Need
	1998	344,000
	2000	75,000
	2002	1,105,000
	2007	1,230,000
	2008	344,000
	2009	160,000

	2011	40,000
		3,298,000

Overlay Asphalt on Blotter	Year	Need
	2002	540,000
	2004	3,090,500
		3,630,500

Overlay Asphalt on Gravel	Year	Need
	1993	1,550,000
		1,550,000

Reconstruct to Blotter	Year	Need
	1992	1,160,000
		1,160,000

Blotter Crack Sealing	Year	Need
	1992	15,000
	1993	30,001
	1994	145,504
	1995	69,252
	1996	7,500
	1997	20,001
	1998	176,754
	2000	69,252
	2002	173,004
	2003	61,252
	2007	42,501
	2008	90,002
	2010	69,252
		969,274

Blotter Seal Coat	Year	Need
	1992	357,301
	1993	54,000
	1994	523,801
	1996	27,000
	1997	72,000
	1998	112,501
	1999	249,301
	2000	523,801
	2002	99,000
	2003	112,501
	2004	54,000
	2005	108,000
	2007	99,000
	2008	112,501
	2010	103,500
	2011	54,000
		2,662,207

Routine Blading of Gravel Roads	Year	Need
	1992	328,269
	1993	279,847
	1994	272,235
	1995	272,235
	1996	270,858
	1997	270,858

	1998	270,858
	1999	270,858
	2000	270,858
	2001	270,858
	2002	270,858
	2003	270,858
	2004	270,858
	2005	270,858
	2006	270,858
	2007	270,858
	2008	270,858
	2009	270,858
	2010	270,858
	2011	270,858
		5,486,318

Overlay Blotter on Blotter	Year	Need
	1997	262,500
	1998	449,999
	2004	431,249
	2005	999,165
		2,142,913

Overlay Blotter on Gravel	Year	Need
	1993	390,625
		390,625

Reconstruct to Gravel	Year	Need
	1992	500,000
	1994	4,700,000
	1996	850,000
	1999	500,000
	2001	4,700,000
	2003	500,000
	2006	500,000
	2008	4,700,000
	2010	500,000
		17,450,000

Overlay Gravel on Gravel	Year	Need
	1992	266,665
	1994	1,861,665
	1995	317,500
	1996	3,661,661
	1998	116,666
	1999	149,999
	2000	434,166
	2001	1,744,999
	2002	116,666
	2003	3,603,328
	2004	116,666
	2005	317,500
	2006	266,665
	2008	1,861,665
	2010	4,037,494
		18,873,305
		70,836,625

DEUEL

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Asphalt Crack Sealing	Year	Need
	1992	2,500
	1994	17,500
	1995	20,000
	1996	32,501
	1997	10,000
	1998	10,000
	1999	17,500
	2000	10,000
	2001	20,001
	2002	7,500
	2003	27,501
	2004	2,500
	2006	30,001
	2007	20,000
	2008	7,500
	2010	2,500
	2011	37,501
		275,007

Asphalt Seal Coat	Year	Need
	1994	27,000
	1995	9,000
	1996	45,000
	1997	99,000
	1998	72,000
	2000	27,000
	2003	99,000
	2005	72,000
	2007	9,000
	2009	63,000
	2010	27,000
		549,002

Overlay Asphalt on Asphalt	Year	Need
	2001	60,000
	2004	180,000
	2009	280,000
		520,000

Reconstruct to Blotter	Year	Need
	1993	241,667
		241,667

Blotter Crack Sealing	Year	Need
	1992	90,002
	1994	36,751
	1995	114,503
	1996	85,002
	1997	60,001
	1998	25,417
	1999	40,501
	2000	104,503

	2001	70,002
	2002	96,252
	2003	29,167
	2006	82,502
	2007	40,001
	2008	40,418
	2009	15,500
	2010	56,876
	2011	45,001
		1,032,401

Blotter Seal Coat	Year	Need
	1992	322,201
	1993	54,000
	1994	186,301
	1996	270,001
	1997	90,000
	1998	213,001
	1999	432,002
	2000	76,500
	2001	54,000
	2003	321,001
	2004	54,000
	2005	198,001
	2006	99,000
	2008	15,000
	2009	199,801
	2010	76,500
	2011	99,000
		2,760,310

Routine Blading of Gravel Roads	Year	Need
	1992	81,838
	1993	80,056
	1994	80,056
	1995	80,056
	1996	77,206
	1997	77,206
	1998	77,206
	1999	77,206
	2000	77,206
	2001	77,206
	2002	77,206
	2003	77,206
	2004	77,206
	2005	89,644
	2006	89,644
	2007	89,644
	2008	89,644
	2009	89,644
	2010	89,644
	2011	89,644
		1,644,368

Overlay Blotter on Asphalt	Year	Need
	2001	204,167
		204,167

Overlay Blotter on Blotter	Year	Need
	1997	162,500
	2004	542,916

	2005	606,250
	2007	649,999
	2011	664,583
		2,626,247

Reconstruct to Gravel	Year	Need
	1996	2,720,000
	2005	300,000
		3,020,000

Overlay Gravel on Blotter	Year	Need
	2005	159,875
		159,875

Overlay Gravel on Gravel	Year	Need
	1993	120,000
	1995	160,000
	1996	1,125,998
	1997	120,000
	1999	120,000
	2000	40,000
	2001	120,000
	2003	1,699,330
	2005	160,000
	2007	120,000
	2009	120,000
	2010	1,619,330
	2011	120,000
		5,644,657
		18,677,699

	2005	130,638
	2006	130,638
	2007	130,638
	2008	130,638
	2009	130,638
	2010	130,638
	2011	131,232
		2,658,022

Overlay Blotter on Blotter	Year	Need
	1992	312,499
	1997	306,249
	2005	204,166
	2011	2,516,870
		3,339,784

Overlay Blotter on Gravel	Year	Need
	1993	1,292,081
		1,292,081

Reconstruct to Gravel	Year	Need
	1994	500,000
		500,000

Overlay Gravel on Blotter	Year	Need
	2011	13,750
		13,750

Overlay Gravel on Gravel	Year	Need
	1992	235,000
	1994	130,000
	1995	1,436,662
	1996	1,954,998
	1997	175,000
	1998	539,999
	1999	60,000
	2000	1,436,662
	2001	1,661,665
	2002	175,000
	2003	506,666
	2005	1,976,661
	2006	1,508,332
	2007	175,000
	2008	213,333
	2010	1,943,328
	2011	1,448,332
		15,576,636
		29,559,244

GRANT

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt

Year	Need
1993	555,000
1999	1,603,330
2000	2,004,163
2002	3,206,664
2011	185,000
	7,554,157

Asphalt Crack Sealing

Year	Need
1992	56,501
1993	273,006
1994	112,003
1995	28,751
1996	22,501
1997	30,001
1998	268,506
1999	27,501
2000	25,251
2001	5,000
2002	44,501
2003	276,006
2004	53,751
2005	27,501
2006	65,002
2007	28,751
2008	247,506
2009	30,001
2010	68,752
2011	20,001
	1,710,790

Asphalt Seal Coat

Year	Need
1992	171,901
1993	270,901
1994	313,201
1995	103,500
1996	72,000
1997	639,902
1998	90,000
1999	27,000
2000	314,101
2003	335,701
2004	639,902
2005	117,000
2006	90,000
2007	175,501
2008	234,901
2010	79,200
2011	90,000
	3,764,714

Overlay Asphalt on Asphalt

Year	Need
1996	789,000
1998	2,232,000

	2001	912,500
	2004	1,361,000
	2008	2,232,000
	2009	5,836,500
		13,363,000

Reconstruct to Blotter	Year	Need
	1993	1,305,000
	1996	145,000
	1998	116,000
		1,566,000

Blotter Crack Sealing	Year	Need
	1997	16,250
	1998	158,754
	2000	2,500
	2001	16,250
	2003	160,754
	2004	2,500
	2005	16,250
	2008	163,254
		536,513

Blotter Seal Coat	Year	Need
	1997	58,500
	1998	571,502
	2000	9,000
	2001	58,500
	2003	578,702
	2004	9,000
	2005	58,500
	2008	587,702
		1,931,407

Routine Blading of Gravel Roads	Year	Need
	1992	247,619
	1993	167,940
	1994	167,940
	1995	166,968
	1996	164,458
	1997	164,458
	1998	164,458
	1999	164,458
	2000	164,458
	2001	164,458
	2002	164,458
	2003	164,458
	2004	164,458
	2005	164,458
	2006	164,458
	2007	164,458
	2008	164,458
	2009	164,458
	2010	164,458
	2011	164,458
		3,381,800

Overlay Blotter on Blotter	Year	Need
	2009	162,500

		162,500
Overlay Blotter on Gravel	Year	Need
	1993	1,793,747
		1,793,747
Reconstruct to Gravel	Year	Need
	1995	540,000
	1996	1,550,000
	2000	540,000
	2003	1,550,000
	2005	540,000
	2010	2,090,000
		6,810,000
Overlay Gravel on Gravel	Year	Need
	1995	664,999
	1996	3,684,160
	2000	664,999
	2003	3,684,160
	2005	664,999
	2010	4,349,159
		13,712,475
		56,287,104

GREGORY

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	1992	1,110,000
	1993	1,202,500
		2,312,500

Asphalt Crack Sealing	Year	Need
	1992	16,000
	1993	42,522
	1994	42,751
	1995	50,001
	1996	3,500
	1997	15,750
	1998	120,524
	1999	10,250
	2001	3,500
	2002	36,001
	2003	88,023
	2005	39,751
	2006	41,251
	2007	40,501
	2008	40,251
	2010	77,502
	2011	3,500
		671,578

Asphalt Seal Coat	Year	Need
	1993	54,900
	1994	153,901
	1996	145,801
	1997	189,976
	1998	12,600
	1999	54,000
	2000	280,802
	2003	39,600
	2004	207,976
	2005	12,600
	2006	54,000
	2007	270,002
	2008	135,901
	2009	36,900
	2010	18,000
	2011	54,900
		1,721,859

Overlay Asphalt on Asphalt	Year	Need
	1997	457,500
	2000	1,272,000
	2002	906,000
	2004	120,000
	2007	18,000
	2008	468,000
	2011	246,000
		3,487,500

Overlay Asphalt on Gravel	Year	Need
	1993	570,000
		570,000

Reconstruct to Blotter	Year	Need
	1993	986,000
		986,000

Blotter Crack Sealing	Year	Need
	1998	17,000
	2003	17,000
	2008	17,000
		51,001

Blotter Seal Coat	Year	Need
	1998	61,200
	2003	61,200
	2008	61,200
		183,601

Routine Blading of Gravel Roads	Year	Need
	1992	269,474
	1993	236,544
	1994	234,034
	1995	234,034
	1996	229,540
	1997	229,540
	1998	229,540
	1999	229,540
	2000	229,540
	2001	229,540
	2002	229,540
	2003	229,540
	2004	229,540
	2005	229,540
	2006	229,540
	2007	229,540
	2008	242,247
	2009	242,247
	2010	242,247
	2011	242,247
		4,697,554

Reconstruct to Gravel	Year	Need
	1994	3,800,000
	1996	5,340,000
	2001	3,800,000
	2003	5,340,000
	2008	3,800,000
	2010	5,340,000
		27,420,000

Overlay Gravel on Asphalt	Year	Need
	2008	196,166
		196,166

Overlay Gravel on Gravel

Year	Need
1993	294,000
1994	374,999
1995	60,000
1996	3,350,160
1997	60,000
1998	234,000
1999	60,000
2001	434,999
2003	3,644,160
2005	60,000
2007	60,000
2008	608,999
2009	60,000
2010	3,350,160
2011	60,000
	12,711,476
	55,009,235

HAMLIN

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt

Year	Need
1992	1,295,000
1993	555,000
1995	6,937,500
1997	10,082,500
2000	501,042
2004	925,000
2011	555,000
	20,851,042

Asphalt Crack Sealing

Year	Need
1993	7,500
1994	6,250
1996	7,500
1997	23,751
1999	101,252
2002	161,254
2003	100,002
2005	7,500
2006	6,250
2007	247,506
2008	20,000
2009	6,250
2011	93,752
	788,768

Asphalt Seal Coat

Year	Need
1994	22,500
1999	90,000
2001	337,501
2004	490,502
2005	27,000
2006	85,500
2007	337,501
2010	45,000
2011	490,502
	1,926,006

Blotter Crack Sealing

Year	Need
1992	136,253
1993	73,752
1994	72,502
1997	20,001
1998	12,500
2002	42,501
2004	50,001
2006	10,000
2007	20,001
2009	50,001
2010	10,000
	497,512

Blotter Seal Coat

Year	Need

	1993	751,502
	1994	45,000
	1997	72,000
	2000	45,000
	2002	72,000
	2003	36,000
	2006	180,000
	2007	72,000
	2008	36,000
		1,309,504

Routine Blading of Gravel Roads	Year	Need
	1992	129,397
	1993	129,397
	1994	125,105
	1995	125,105
	1996	125,105
	1997	125,105
	1998	125,105
	1999	125,105
	2000	125,105
	2001	125,105
	2002	125,105
	2003	125,105
	2004	125,105
	2005	125,105
	2006	125,105
	2007	125,105
	2008	125,105
	2009	125,105
	2010	125,105
	2011	125,105
		2,510,683

Overlay Blotter on Blotter	Year	Need
	1998	100,000
	1999	558,332
		658,332

Overlay Blotter on Gravel	Year	Need
	1992	225,000
		225,000

Reconstruct to Gravel	Year	Need
	1994	2,650,000
	2001	1,950,000
	2008	1,950,000
		6,550,000

Overlay Gravel on Gravel	Year	Need
	1993	763,332
	1994	1,273,332
	1998	763,332
	2001	1,389,998
	2003	763,332
	2008	2,153,330
		7,106,655

42,423,503

HAND

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Blotter	Year	Need
	1992	338,333
		338,333

Blotter Crack Sealing	Year	Need
	1993	120,003
	1994	181,754
	1995	82,502
	1996	65,002
	1997	206,588
	1999	72,502
	2000	95,002
	2001	17,500
	2002	259,089
	2003	172,504
	2004	141,753
	2005	7,500
	2006	42,501
	2007	286,590
	2008	140,003
	2009	121,753
	2010	72,502
		2,085,049

Blotter Seal Coat	Year	Need
	1992	270,001
	1993	897,304
	1994	216,000
	1996	99,000
	1997	743,702
	1998	135,001
	1999	459,001
	2001	72,000
	2002	842,702
	2003	711,002
	2004	72,000
	2005	63,000
	2006	366,302
	2007	1,058,702
	2008	594,002
	2010	72,000
		6,671,720

Routine Blading of Gravel Roads	Year	Need
	1992	108,732
	1993	108,732
	1994	107,485
	1995	107,485
	1996	107,485
	1997	107,485
	1998	107,485
	1999	108,295
	2000	108,295
	2001	108,295

	2002	108,295
	2003	108,295
	2004	108,295
	2005	119,631
	2006	119,631
	2007	119,631
	2008	119,631
	2009	119,631
	2010	119,631
	2011	119,631
		2,242,076

Overlay Blotter on Blotter	Year	Need
	1992	658,123
	1994	233,333
	1995	612,499
	1997	320,833
	1998	1,618,747
	1999	1,152,290
	2000	87,500
	2005	477,083
	2011	816,665
		5,977,073

Overlay Blotter on Gravel	Year	Need
	1992	1,729,163
		1,729,163

Reconstruct to Gravel	Year	Need
	1994	770,000
	1999	100,000
	2001	320,000
	2005	1,400,000
	2006	100,000
	2008	320,000
		3,010,000

Overlay Gravel on Gravel	Year	Need
	1992	282,500
	1994	2,175,495
	1996	217,500
	1997	210,000
	1998	54,167
	1999	634,999
	2000	54,167
	2001	1,789,663
	2002	54,167
	2003	163,333
	2004	670,832
	2006	282,500
	2008	1,843,829
	2009	406,666
	2010	217,500
	2011	210,000
		9,267,315
		31,320,730

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Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Asphalt Crack Sealing

Year	Need
1992	100,555
1993	63,481
1994	33,876
1995	132,847
1996	122,961
1997	61,501
1998	82,054
1999	175,379
2000	38,251
2001	72,710
2002	89,231
2003	132,795
2004	58,928
2005	75,106
2006	109,232
2007	136,805
2008	51,730
2009	55,960
2010	55,720
2011	145,170
	1,794,292

Asphalt Seal Coat

Year	Need
1992	2,475
1993	201,751
1994	102,450
1995	253,838
1996	301,726
1997	263,626
1998	287,401
1999	143,251
2000	194,251
2001	289,801
2003	305,776
2004	234,751
2005	339,901
2006	134,100
2007	253,763
2008	85,425
2009	193,201
2010	169,951
2011	61,875
	3,819,314

Overlay Asphalt on Asphalt

Year	Need
1992	765,000
1993	1,054,000
1995	2,283,250
1997	277,500
1998	950,000
1999	21,000
2000	477,000
2001	2,262,000
2003	1,591,000

	2005	1,416,250
	2007	1,092,000
	2008	1,558,000
	2009	1,223,000
	2010	765,000
	2011	2,179,500
		17,914,500

Overlay Asphalt on Gravel	Year	Need
	1993	448,000
		448,000

Reconstruct to Blotter	Year	Need
	1993	145,000
		145,000

Blotter Crack Sealing	Year	Need
	1992	7,500
	1994	7,500
	1995	29,751
	1996	25,001
	1997	24,792
	1998	198,171
	2000	37,251
	2001	24,584
	2002	17,709
	2003	198,171
	2004	7,500
	2005	7,084
	2007	17,709
	2008	205,672
	2009	14,584
	2010	29,751
	2011	17,500
		870,229

Blotter Seal Coat	Year	Need
	1992	45,000
	1993	90,000
	1994	27,000
	1995	62,100
	1997	63,750
	1998	738,903
	1999	72,000
	2000	125,100
	2002	63,750
	2003	738,903
	2006	27,000
	2007	63,750
	2008	738,903
	2009	27,000
	2010	62,100
		2,945,262

Routine Blading of Gravel Roads	Year	Need
	1992	189,458
	1993	99,436
	1994	99,436
	1995	99,436

	1996	99,436
	1997	99,436
	1998	99,436
	1999	99,436
	2000	99,436
	2001	99,436
	2002	99,436
	2003	99,436
	2004	99,436
	2005	99,436
	2006	99,436
	2007	99,436
	2008	99,436
	2009	99,436
	2010	99,436
	2011	99,436
		2,078,745

Overlay Blotter on Blotter	Year	Need
	1999	100,000
	2004	100,000
	2005	396,666
	2006	233,333
		829,998

Overlay Blotter on Gravel	Year	Need
	1992	197,916
	1993	2,154,996
		2,352,912

Overlay Gravel on Gravel	Year	Need
	1994	55,000
	1995	1,611,165
	1996	1,369,665
	1999	55,000
	2000	1,611,165
	2003	1,369,665
	2004	55,000
	2005	1,611,165
	2009	55,000
	2010	2,980,830
		10,773,654
		43,971,906

HYDE

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Blotter Crack Sealing	Year	Need
	1995	2,500
	1998	108,753
	2000	2,500
	2003	108,753
	2008	108,753
	2010	2,500
		333,758

Blotter Seal Coat	Year	Need
	1995	9,000
	1998	391,502
	2000	9,000
	2003	391,502
	2008	391,502
	2010	9,000
		1,201,506

Routine Blading of Gravel Roads	Year	Need
	1992	175,584
	1993	133,316
	1994	133,316
	1995	133,316
	1996	133,316
	1997	133,316
	1998	133,316
	1999	133,316
	2000	133,316
	2001	133,316
	2002	133,316
	2003	133,316
	2004	133,316
	2005	133,316
	2006	133,316
	2007	133,316
	2008	133,316
	2009	133,316
	2010	133,316
	2011	133,316
		2,708,583

Overlay Blotter on Blotter	Year	Need
	2005	29,167
		29,167

Overlay Blotter on Gravel	Year	Need
	1993	1,256,248
		1,256,248

Overlay Gravel on Gravel	Year	Need
	1993	258,333

1995	622,499
1996	2,649,662
1998	514,999
2000	622,499
2003	2,907,994
2005	879,165
2008	258,333
2010	3,272,161
	11,985,645
	17,514,906

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Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	1993	1,295,000
		1,295,000

Asphalt Crack Sealing	Year	Need
	1993	71,043
	1998	86,044
	2003	88,544
	2008	86,044
		331,674

Asphalt Seal Coat	Year	Need
	1993	9,000
	1997	246,751
	2000	63,000
	2003	9,000
	2004	246,751
	2007	63,000
		637,502

Overlay Asphalt on Asphalt	Year	Need
	1998	65,000
	2008	65,000
	2009	1,695,000
		1,825,000

Blotter Crack Sealing	Year	Need
	1998	7,500
	2003	7,500
	2008	7,500
		22,501

Blotter Seal Coat	Year	Need
	1998	27,000
	2003	27,000
	2008	27,000
		81,000

Routine Blading of Gravel Roads	Year	Need
	1992	181,090
	1993	167,311
	1994	165,530
	1995	165,530
	1996	163,587
	1997	163,587
	1998	163,587
	1999	163,587
	2000	163,587
	2001	163,587
	2002	163,587

	2003	163,587
	2004	163,587
	2005	163,587
	2006	163,587
	2007	163,587
	2008	163,587
	2009	163,587
	2010	163,587
	2011	163,587
		3,296,847

Overlay Blotter on Gravel	Year	Need
	1993	87,500
		87,500

Reconstruct to Gravel	Year	Need
	1994	1,100,000
	1996	1,200,000
		2,300,000

Overlay Gravel on Gravel	Year	Need
	1994	515,166
	1995	100,000
	1996	3,393,747
	2000	100,000
	2001	698,499
	2003	3,593,747
	2005	100,000
	2008	698,499
	2010	3,693,746
		12,893,404
		22,770,428

KINGSBURY

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	1993	3,700,000
	2003	166,500
	2007	832,500
		4,699,000

Asphalt Crack Sealing	Year	Need
	1992	153,754
	1995	1,250
	1997	201,255
	1998	314,924
	1999	1,250
	2001	47,501
	2002	153,754
	2003	314,924
	2005	47,501
	2007	59,751
	2008	314,924
	2009	47,501
	2011	59,751
		1,718,040

Asphalt Seal Coat	Year	Need
	1995	4,500
	1996	553,502
	1999	171,001
	2000	1,133,705
	2001	4,500
	2003	553,502
	2005	171,001
	2007	1,133,705
	2009	215,100
	2011	171,001
		4,111,517

Overlay Asphalt on Asphalt	Year	Need
	2003	40,000
	2007	4,704,750
		4,744,750

Overlay Asphalt on Blotter	Year	Need
	2003	1,685,000
	2007	9,307,500
		10,992,500

Overlay Asphalt on Gravel	Year	Need
	1993	9,678,000
		9,678,000

Blotter Crack Sealing	Year	Need

	1992	312,674
	1995	61,710
	1997	312,674
	1999	61,710
	2002	312,674
	2007	3,250
	2011	3,250
		1,067,941

Blotter Seal Coat	Year	Need
	1995	222,150
	1996	1,125,604
	2001	222,150
	2003	1,125,604
	2009	11,700
		2,707,209

Routine Blading of Gravel Roads	Year	Need
	1992	234,771
		234,771

Overlay Blotter on Blotter	Year	Need
	2003	43,333
		43,333

39,997,062

LAKE

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Asphalt Crack Sealing	Year	Need
	1992	82,502
	1993	76,252
	1994	81,502
	1997	98,002
	1998	128,503
	2001	5,000
	2002	128,003
	2003	78,002
	2005	5,000
	2006	47,001
	2007	7,500
	2008	152,504
	2009	15,500
	2010	36,501
	2011	7,500
		949,272

Asphalt Seal Coat	Year	Need
	1993	94,500
	1994	293,401
	1996	297,001
	1997	180,001
	1999	18,000
	2000	282,601
	2003	333,001
	2004	180,001
	2005	18,000
	2006	37,800
	2007	27,000
	2008	131,401
	2009	27,000
	2010	342,001
	2011	18,000
		2,279,708

Overlay Asphalt on Asphalt	Year	Need
	1998	260,000
	2000	399,000
	2002	663,000
	2004	1,191,500
	2007	2,265,000
	2008	260,000
	2009	1,352,500
		6,391,000

Overlay Asphalt on Blotter	Year	Need
	2002	308,000
	2003	210,000
	2004	1,361,000
	2007	1,810,000
		3,689,000

Overlay Asphalt on Gravel	Year	Need
	1993	365,000
		365,000

Blotter Crack Sealing	Year	Need
	1992	87,002
	1994	68,002
	1995	106,253
	1997	87,002
	1998	90,502
	1999	15,000
	2000	98,752
	2002	136,503
	2003	46,251
	2008	46,251
	2009	7,500
	2010	98,752
		887,771

Blotter Seal Coat	Year	Need
	1992	351,001
	1994	244,801
	1995	31,500
	1996	313,201
	1998	108,000
	1999	378,001
	2000	222,301
	2001	27,000
	2003	479,702
	2008	166,500
	2009	27,000
	2010	4,500
		2,353,507

Routine Blading of Gravel Roads	Year	Need
	1992	82,982
	1993	62,577
	1994	62,577
	1995	62,577
	1996	62,577
	1997	62,577
	1998	62,577
	1999	62,577
	2000	62,577
	2001	62,577
	2002	62,577
	2003	62,577
	2004	62,577
	2005	62,577
	2006	62,577
	2007	62,577
	2008	62,577
	2009	62,577
	2010	62,577
	2011	62,577
		1,271,942

Overlay Blotter on Asphalt	Year	Need
	1998	246,459

		246,459
Overlay Blotter on Blotter	Year	Need
	2004	87,500
	2005	1,120,831
	2007	256,666
		1,464,997
Overlay Blotter on Gravel	Year	Need
	1993	349,999
		349,999
Overlay Gravel on Gravel	Year	Need
	1993	32,500
	1995	43,333
	1996	1,584,998
	1997	32,500
	1999	32,500
	2000	10,833
	2001	32,500
	2003	1,617,498
	2005	43,333
	2007	32,500
	2009	32,500
	2010	1,595,831
	2011	32,500
		5,123,326
PCC	Year	Need
	1992	812,478
		812,478
		26,184,459

LAWRENCE

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt

Year	Need
1992	10,580,458
1995	92,500
2002	1,122,330
2007	280,583
	12,075,871

Asphalt Crack Sealing

Year	Need
1993	11,792
1994	51,085
1995	6,250
1996	154,754
1997	11,250
1998	47,334
1999	59,751
2000	130,753
2001	17,500
2002	10,750
2003	49,751
2004	147,003
2005	22,001
2006	55,501
2007	49,751
2008	141,503
2009	11,250
2010	48,501
2011	73,752
	1,100,234

Asphalt Seal Coat

Year	Need
1992	38,700
1993	174,601
1994	147,900
1996	61,200
1997	47,700
1998	506,703
1999	40,500
2000	170,400
2001	179,101
2003	38,700
2004	493,202
2005	76,500
2007	217,801
2008	199,800
2010	470,702
2011	101,700
	2,965,213

Overlay Asphalt on Asphalt

Year	Need
1992	66,000
1993	360,000
1995	1,552,000
1999	344,000
2001	503,500

	2002	904,000
	2007	66,000
	2009	360,000
		4,155,500

Reconstruct to Blotter

Year	Need
1992	1,812,500
1993	2,465,000
	4,277,500

Blotter Crack Sealing

Year	Need
1994	15,500
1995	17,500
1997	31,251
1998	58,001
1999	17,500
2002	31,251
2003	60,001
2006	15,500
2007	48,751
2008	42,501
2010	15,500
2011	17,500
	370,759

Blotter Seal Coat

Year	Need
1994	55,800
1997	175,501
1998	153,000
2000	55,800
2002	112,501
2003	216,000
2007	112,501
2008	208,800
2009	63,000
	1,152,903

Routine Blading of Gravel Roads

Year	Need
1992	135,575
1993	108,759
1994	106,292
1995	106,292
1996	104,187
1997	104,187
1998	103,506
1999	103,506
2000	103,506
2001	103,506
2002	103,506
2003	103,506
2004	103,506
2005	103,506
2006	103,506
2007	103,506
2008	103,506
2009	103,506
2010	103,506
2011	103,506
	2,114,381

Overlay Blotter on Blotter	Year	Need
	2002	155,000
		155,000

Reconstruct to Gravel	Year	Need
	1992	689,000
	1994	2,348,000
	1996	2,703,000
	1998	420,000
	1999	590,000
	2000	306,000
	2001	1,430,000
	2003	2,550,000
	2005	420,000
	2006	896,000
	2008	1,430,000
	2010	2,550,000
		16,332,000

Overlay Gravel on Gravel	Year	Need
	1992	313,333
	1993	191,000
	1994	437,666
	1995	191,000
	1996	463,000
	1997	191,000
	1998	329,833
	1999	191,000
	2000	443,666
	2001	286,999
	2002	418,833
	2003	260,666
	2004	329,833
	2005	191,000
	2006	443,666
	2007	191,000
	2008	514,833
	2009	191,000
	2010	399,500
	2011	191,000
		6,169,826
		50,869,187

LINCOLN

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt

Year	Need
1999	3,086,417
2000	1,903,960
2002	9,319,379
2003	370,000
	14,679,756

Asphalt Crack Sealing

Year	Need
1992	28,751
1993	163,504
1994	191,255
1995	41,251
1996	57,251
1997	45,001
1998	252,506
1999	12,500
2001	22,501
2002	124,753
2003	130,003
2004	36,251
2005	67,251
2006	162,504
2007	41,251
2008	174,754
2009	63,752
2010	140,003
2011	62,251
	1,817,292

Asphalt Seal Coat

Year	Need
1992	206,101
1993	184,501
1994	688,503
1995	103,501
1996	224,101
1997	198,001
1998	45,000
1999	63,000
2000	580,503
2001	18,000
2003	327,601
2004	243,001
2005	36,000
2006	166,501
2007	291,601
2008	418,502
2009	45,000
2010	225,001
2011	242,101
	4,306,519

Overlay Asphalt on Asphalt

Year	Need
1992	425,000
1994	210,000

	1998	1,107,500
	1999	750,000
	2000	790,000
	2001	837,500
	2004	2,335,000
	2007	180,000
	2008	1,107,500
	2009	1,440,000
	2010	425,000
		9,607,500

Overlay Asphalt on Blotter	Year	Need
	1993	340,000
		340,000

Reconstruct to Blotter	Year	Need
	2004	1,087,500
		1,087,500

Blotter Crack Sealing	Year	Need
	1993	28,751
	1994	82,502
	1995	55,001
	1997	45,001
	1998	80,002
	1999	33,751
	2000	55,001
	2003	85,002
	2004	15,000
	2005	28,751
	2008	85,002
	2009	77,502
	2010	55,001
		726,267

Blotter Seal Coat	Year	Need
	1992	49,500
	1993	157,501
	1994	243,001
	1995	148,501
	1997	103,500
	1998	225,001
	1999	171,001
	2000	211,501
	2003	306,001
	2005	103,500
	2006	54,000
	2008	306,001
	2009	225,001
	2010	148,501
		2,452,509

Routine Blading of Gravel Roads	Year	Need
	1992	62,350
	1993	38,058
	1994	38,058
	1995	38,058
	1996	37,329
	1997	37,329

	1998	37,329
	1999	37,329
	2000	37,329
	2001	37,329
	2002	37,329
	2003	37,329
	2004	37,329
	2005	37,329
	2006	37,329
	2007	37,329
	2008	37,329
	2009	41,216
	2010	41,216
	2011	41,216
		785,448

Overlay Blotter on Asphalt	Year	Need
	1998	437,501
		437,501

Overlay Blotter on Blotter	Year	Need
	1999	212,500
	2001	443,749
	2004	212,500
	2005	727,083
		1,595,832

Overlay Blotter on Gravel	Year	Need
	1993	833,332
		833,332

Reconstruct to Gravel	Year	Need
	1996	450,000
	2003	450,000
	2010	450,000
		1,350,000

Overlay Gravel on Asphalt	Year	Need
	2009	113,333
		113,333

Overlay Gravel on Gravel	Year	Need
	1993	133,333
	1995	239,999
	1996	720,000
	1997	133,333
	1999	133,333
	2000	106,666
	2001	133,333
	2003	853,333
	2005	239,999
	2007	133,333
	2009	133,333
	2010	826,666
	2011	133,333
		3,919,994

	Year	Need
PCC	1992	1,999,947
		1,999,947
		46,052,729

LYMAN

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	1992	1,110,000
	1993	9,065,000
		10,175,000

Asphalt Crack Sealing	Year	Need
	1997	78,752
	1998	508,762
	2002	78,752
	2003	508,762
	2007	78,752
	2008	508,762
		1,762,541

Asphalt Seal Coat	Year	Need
	1999	283,501
	2000	1,831,508
	2006	283,501
	2007	1,831,508
		4,230,019

Overlay Asphalt on Asphalt	Year	Need
	1992	390,000
		390,000

Overlay Asphalt on Gravel	Year	Need
	1992	1,520,000
	1993	10,845,000
		12,365,000

Routine Blading of Gravel Roads	Year	Need
	1992	502,849
	1993	173,284
	1994	173,284
	1995	173,284
	1996	173,284
	1997	173,284
	1998	173,284
	1999	173,284
	2000	173,284
	2001	173,284
	2002	173,284
	2003	173,284
	2004	173,284
	2005	173,284
	2006	173,284
	2007	173,284
	2008	173,284
	2009	173,284
	2010	173,284
	2011	173,284

		3,795,253
Overlay Gravel on Gravel	Year	Need
	1992	519,999
	1993	1,819,996
	1994	519,999
	1995	1,819,996
	1996	519,999
	1997	1,819,996
	1998	519,999
	1999	1,819,996
	2000	519,999
	2001	1,819,996
	2002	519,999
	2003	1,819,996
	2004	519,999
	2005	1,819,996
	2006	519,999
	2007	1,819,996
	2008	519,999
	2009	1,819,996
	2010	519,999
	2011	1,819,996
		23,399,952
		56,117,765

MARSHALL

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	2000	1,903,960
		1,903,960

Asphalt Crack Sealing	Year	Need
	1992	2,500
	1993	37,251
	1995	2,500
	1996	10,000
	1998	39,751
	2003	61,001
	2004	12,500
	2006	33,751
	2007	12,500
	2008	61,001
	2009	23,751
	2010	12,500
	2011	10,000
		319,007

Asphalt Seal Coat	Year	Need
	1995	9,000
	1997	170,101
	2004	134,101
	2006	85,500
	2007	45,000
	2008	36,000
	2010	85,500
		565,202

Overlay Asphalt on Asphalt	Year	Need
	2001	360,000
	2009	1,132,000
		1,492,000

Overlay Asphalt on Blotter	Year	Need
	2001	260,000
	2004	760,000
		1,020,000

Reconstruct to Blotter	Year	Need
	2001	145,000
		145,000

Blotter Crack Sealing	Year	Need
	1992	10,000
	1993	67,502
	1994	137,587
	1995	82,502
	1996	12,500

	1997	63,752
	1998	101,044
	1999	46,751
	2000	72,502
	2001	12,500
	2002	23,751
	2003	112,294
	2004	55,835
	2005	40,001
	2007	17,500
	2008	94,794
	2009	125,086
	2010	72,502
	2011	25,001
		1,173,403

Blotter Seal Coat

Year	Need
1992	36,000
1993	534,002
1994	294,301
1995	261,001
1997	144,001
1998	242,251
1999	159,301
2000	355,501
2001	45,000
2003	359,251
2005	144,001
2006	201,001
2007	63,000
2008	341,251
2009	249,301
2010	225,001
	3,654,165

Routine Blading of Gravel Roads

Year	Need
1992	138,244
1993	112,090
1994	112,090
1995	112,090
1996	112,090
1997	112,090
1998	112,090
1999	112,090
2000	112,090
2001	112,090
2002	112,090
2003	112,090
2004	112,090
2005	112,090
2006	112,090
2007	112,090
2008	112,090
2009	112,090
2010	112,090
2011	112,090
	2,267,950

Overlay Blotter on Blotter

Year	Need
1995	197,916
1998	320,833
1999	616,665

	2001	466,666
	2004	365,625
	2005	919,790
	2006	166,666
	2011	62,500
		3,116,661

Overlay Blotter on Gravel	Year	Need
	1993	803,124
		803,124

Overlay Gravel on Gravel	Year	Need
	1994	80,000
	1995	666,666
	1996	2,407,663
	2000	666,666
	2001	80,000
	2003	2,407,663
	2005	666,666
	2008	80,000
	2010	3,074,328
		10,129,651
		26,590,122

MCCOOK

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	1992	1,480,000
		1,480,000

Asphalt Crack Sealing	Year	Need
	1996	20,001
	2000	20,001
	2004	20,001
	2008	20,001
		80,002

Asphalt Seal Coat	Year	Need
	1998	72,000
	2004	72,000
	2010	72,000
		216,001

Reconstruct to Blotter	Year	Need
	1993	1,087,500
		1,087,500

Blotter Crack Sealing	Year	Need
	1993	35,001
	1994	72,502
	1995	18,750
	1996	185,004
	1997	70,002
	1998	72,502
	1999	85,002
	2000	27,501
	2001	47,501
	2002	171,254
	2003	141,253
	2004	38,751
	2005	76,252
	2006	10,000
	2007	225,005
	2008	103,752
	2009	78,752
	2010	10,000
	2011	15,000
		1,483,785

Blotter Seal Coat	Year	Need
	1992	36,000
	1993	117,000
	1994	216,001
	1996	531,002
	1997	76,500
	1998	324,001
	1999	427,501

	2001	54,000
	2002	544,502
	2003	418,502
	2004	94,500
	2005	274,501
	2006	81,000
	2007	778,503
	2008	238,501
	2009	63,000
	2010	63,000
	2011	139,500
		4,477,515

Routine Blading of Gravel Roads	Year	Need
	1992	154,952
	1993	128,716
	1994	128,716
	1995	128,716
	1996	123,404
	1997	123,404
	1998	123,404
	1999	123,404
	2000	123,404
	2001	123,404
	2002	123,404
	2003	123,404
	2004	123,404
	2005	123,404
	2006	123,404
	2007	123,404
	2008	123,404
	2009	123,404
	2010	123,404
	2011	123,404
		2,515,572

Overlay Blotter on Blotter	Year	Need
	1992	306,249
	1993	685,415
	1995	749,999
	1997	1,720,831
	1998	27,083
	1999	145,833
	2000	116,666
	2001	204,166
	2005	108,333
	2010	102,083
	2011	816,666
		4,983,324

Overlay Blotter on Gravel	Year	Need
	1992	43,750
	1993	483,332
		527,082

Reconstruct to Gravel	Year	Need
	1996	3,280,000
	2003	1,580,000
	2010	1,580,000

6,440,000

Overlay Gravel on Gravel

Year	Need
1992	163,333
1993	326,666
1994	245,000
1995	326,666
1996	1,474,163
1997	326,666
1998	163,333
1999	386,666
2000	163,333
2001	348,333
2002	163,333
2003	1,920,829
2004	223,333
2005	326,666
2006	163,333
2007	326,666
2008	185,000
2009	386,666
2010	1,757,496
2011	326,666

9,704,147

32,994,927

MCPHERSON

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	1992	1,480,000
		1,480,000

Asphalt Crack Sealing	Year	Need
	1992	100,877
	1993	40,001
	1994	69,377
	1996	20,001
	1997	100,877
	1998	77,502
	1999	69,377
	2000	97,502
	2002	20,001
	2003	112,503
	2004	89,377
	2005	50,001
	2007	120,878
	2008	97,502
	2010	77,502
		1,143,277

Asphalt Seal Coat	Year	Need
	1993	126,001
	1997	18,000
	1998	684,903
	2000	360,001
	2002	180,001
	2003	126,001
	2004	162,001
	2005	249,751
	2007	261,000
	2009	543,152
	2010	171,001
	2011	72,000
		2,953,810

Overlay Asphalt on Asphalt	Year	Need
	1993	2,450,000
	1995	2,405,000
	1998	1,095,000
	2002	3,017,000
	2005	880,000
	2008	1,095,000
	2009	2,305,000
		13,247,000

Overlay Asphalt on Blotter	Year	Need
	1997	720,000
		720,000

Blotter Crack Sealing

Year	Need
1992	20,001
1993	15,000
1994	111,253
1995	100,002
1996	15,750
1997	141,253
1998	30,001
1999	60,210
2000	67,502
2001	15,750
2002	141,253
2003	45,001
2004	171,462
2005	32,501
2007	141,253
2008	45,001
2009	171,462
2010	100,002
2011	15,750
	1,440,409

Blotter Seal Coat

Year	Need
1992	81,000
1993	583,203
1994	117,001
1995	162,001
1997	508,502
1999	81,000
2000	326,701
2001	216,751
2002	508,502
2003	54,000
2006	400,502
2007	733,503
2008	270,751
2010	162,001
	4,205,417

Overlay Blotter on Blotter

Year	Need
1992	1,863,537
1993	418,750
1994	714,583
1998	225,000
1999	1,583,331
2000	416,666
2005	918,747
2006	215,416
	6,356,030
	31,545,942

MINER

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Asphalt Crack Sealing	Year	Need
	1993	15,000
	1994	22,501
	1995	5,000
	1998	37,501
	1999	5,000
	2003	15,000
	2004	20,001
	2006	22,501
	2007	25,001
	2008	32,501
	2010	42,501
	2011	5,000
		247,506

Asphalt Seal Coat	Year	Need
	1994	81,000
	1995	18,000
	1997	54,000
	2000	81,000
	2001	18,000
	2004	54,000
	2007	72,000
	2008	81,000
	2009	18,000
	2010	63,000
		540,002

Overlay Asphalt on Asphalt	Year	Need
	2002	540,000
	2003	130,000
	2009	360,000
		1,030,000

Overlay Asphalt on Blotter	Year	Need
	2001	520,000
	2004	455,000
	2007	910,000
		1,885,000

Reconstruct to Blotter	Year	Need
	1992	435,000
		435,000

Blotter Crack Sealing	Year	Need
	1992	92,502
	1993	21,251
	1994	35,001
	1995	35,001
	1996	9,792
	1997	85,002

1998	47,501
1999	21,251
2000	24,792
2002	95,002
2003	38,751
2004	9,792
2006	12,500
2007	21,251
2008	12,292
2009	12,500
2010	15,000
2011	21,251
	610,431

Blotter Seal Coat

Year	Need
1992	54,000
1994	126,001
1995	72,000
1996	288,001
1997	8,250
1998	18,000
1999	54,000
2000	108,000
2001	76,500
2002	8,250
2003	279,001
2004	27,000
2006	45,000
2007	84,750
2008	18,000
2010	18,000
	1,284,755

Routine Blading of Gravel Roads

Year	Need
1992	184,702
1993	182,759
1994	181,625
1995	181,625
1996	181,625
1997	181,625
1998	181,625
1999	181,625
2000	181,625
2001	181,625
2002	181,625
2003	181,625
2004	181,625
2005	181,625
2006	181,625
2007	181,625
2008	181,625
2009	181,625
2010	181,625
2011	181,625
	3,636,711

Overlay Blotter on Blotter

Year	Need
1995	263,542
2000	135,416
2004	58,333
2005	156,250
2007	375,000

	2008	75,000
		1,063,540

Overlay Blotter on Gravel

Year	Need
1992	22,917
1993	58,333
	81,250

Reconstruct to Gravel

Year	Need
1994	700,000
	700,000

Overlay Gravel on Gravel

Year	Need
1992	1,713,332
1993	180,000
1994	2,584,998
1995	180,000
1996	308,333
1997	560,000
1998	308,333
1999	1,251,665
2000	308,333
2001	2,526,664
2002	688,333
2003	180,000
2004	355,000
2005	180,000
2006	1,333,332
2007	560,000
2008	2,654,997
2009	226,667
2010	308,333
2011	180,000
	16,588,319
	28,102,515

MINNEHAHA

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt

Year	Need
1992	2,312,500
1994	1,202,500
1999	801,667
2001	601,250
2003	3,106,460
2004	555,000
2005	3,407,083
2006	901,875
2007	2,004,170
2008	1,202,497
2009	3,206,672
2010	6,293,087
	25,594,761

Asphalt Crack Sealing

Year	Need
1992	125,628
1993	160,004
1994	180,921
1995	163,754
1996	196,255
1997	111,253
1998	218,422
1999	165,629
2000	162,504
2001	115,628
2002	242,797
2003	98,752
2004	174,379
2005	131,878
2006	162,795
2007	80,002
2008	181,254
2009	50,626
2010	116,253
2011	191,254
	3,029,988

Asphalt Seal Coat

Year	Need
1992	96,750
1993	198,000
1994	571,502
1995	515,252
1996	705,303
1997	171,001
1998	470,252
1999	198,000
2000	283,501
2001	544,502
2002	896,554
2003	150,751
2004	364,501
2005	231,750
2006	279,001
2007	189,001

	2008	631,052
	2009	463,502
	2010	326,251
	2011	243,001
		7,529,428

Overlay Asphalt on Asphalt

Year	Need
1992	480,000
1993	280,000
1996	750,000
1997	635,000
2000	990,000
2001	280,000
2002	480,000
2005	320,000
2006	870,000
2007	1,855,000
2008	1,630,000
2009	430,000
2010	1,672,500
2011	140,000
	10,812,500

Overlay Asphalt on Blotter

Year	Need
1992	162,500
2003	637,500
	800,000

Overlay Asphalt on Gravel

Year	Need
1992	455,000
	455,000

Reconstruct to Blotter

Year	Need
1992	145,000
2008	145,000
	290,000

Blotter Crack Sealing

Year	Need
1993	36,251
1994	15,625
1995	21,667
1996	2,500
1998	60,501
1999	8,875
2000	24,167
2002	24,251
2004	11,375
2005	17,500
2006	24,251
2008	15,000
2010	4,167
	266,131

Blotter Seal Coat

Year	Need
1992	91,500
1996	65,250
1997	117,001
1998	63,000

	1999	91,500
	2000	9,000
	2002	87,300
	2003	31,950
	2004	72,000
	2006	63,000
	2008	24,300
	2010	54,000
		769,803

Routine Blading of Gravel Roads

Year	Need
1992	14,575
1993	14,575
1994	14,575
1995	14,575
1996	14,575
1997	14,575
1998	14,575
1999	14,575
2000	14,575
2001	14,575
2002	14,575
2003	14,575
2004	14,575
2005	14,575
2006	14,575
2007	14,575
2008	14,575
2009	17,005
2010	17,005
2011	17,005
	298,794

Overlay Blotter on Blotter

Year	Need
1994	218,750
2003	162,500
2005	58,333
2009	40,625
2010	460,416
	940,624

Reconstruct to Gravel

Year	Need
1992	500,000
1999	500,000
2006	500,000
2009	300,000
	1,800,000

Overlay Gravel on Gravel

Year	Need
1992	116,666
1993	75,000
1996	120,000
1999	116,666
2000	75,000
2003	120,000
2006	116,666
2007	75,000
2010	120,000
	934,998

53,522,027

PENNINGTON

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	1992	26,505,880
	1995	814,000
		27,319,880

Asphalt Crack Sealing	Year	Need
	1995	83,502
	1996	94,002
	1997	172,504
	1998	83,502
	1999	11,000
	2000	110,044
	2001	83,502
	2002	172,504
	2003	11,000
	2004	177,504
	2005	16,042
	2007	183,504
	2008	94,002
	2010	99,544
	2011	11,000
		1,403,158

Asphalt Seal Coat	Year	Need
	1996	300,600
	1998	338,401
	1999	621,001
	2000	300,600
	2001	39,600
	2002	57,750
	2004	639,002
	2006	621,001
	2007	39,600
	2009	57,750
	2010	338,401
	2011	300,600
		3,654,309

Overlay Asphalt on Asphalt	Year	Need
	1995	420,000
	2007	2,171,000
		2,591,000

Reconstruct to Blotter	Year	Need
	1992	116,000
		116,000

Blotter Crack Sealing	Year	Need
	1993	9,688
	1995	2,708
	1997	7,959

	1999	2,708
	2002	7,959
	2003	2,708
	2007	10,667
	2011	2,708
		47,105

Blotter Seal Coat

Year	Need
1997	16,950
1999	21,450
2002	7,200
2003	9,750
2006	21,450
2007	7,200
2009	9,750
	93,750

Routine Blading of Gravel Roads

Year	Need
1992	152,177
1993	163,999
1994	163,465
1995	163,465
1996	163,465
1997	163,465
1998	163,465
1999	163,465
2000	163,465
2001	163,465
2002	163,465
2003	163,465
2004	163,465
2005	163,465
2006	163,465
2007	163,465
2008	163,465
2009	163,465
2010	163,465
2011	163,465
	3,258,546

Overlay Blotter on Blotter

Year	Need
1992	59,583
	59,583

Reconstruct to Gravel

Year	Need
1992	15,170,000
1993	1,460,000
1994	330,000
	16,960,000

Overlay Gravel on Gravel

Year	Need
1992	718,331
1999	3,246,660
2000	243,333
2001	55,000
2006	3,246,660
2007	243,333
2008	55,000

7,808,318

PCC	Year	Need
	1992	62,498
		62,498
		63,374,149

PERKINS

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Asphalt Crack Sealing	Year	Need
	1992	4,583
	1993	44,751
	1995	24,751
	1996	57,751
	1997	4,583
	1998	44,751
	2001	20,751
	2003	44,751
	2005	24,751
	2006	57,751
	2007	4,583
	2010	24,751
	2011	57,751
		416,260

Asphalt Seal Coat	Year	Need
	1996	89,100
	1997	294,302
	1998	91,200
	2004	161,101
	2005	74,700
	2007	89,100
	2008	133,201
	2009	16,500
		949,205

Overlay Asphalt on Asphalt	Year	Need
	2000	643,500
	2001	962,000
	2002	120,000
	2008	1,163,500
		2,889,000

Blotter Crack Sealing	Year	Need
	1995	26,751
	1996	23,834
	2000	26,751
	2001	23,834
	2010	26,751
	2011	23,834
		151,754

Blotter Seal Coat	Year	Need
	1992	96,300
	1993	85,800
	1999	96,300
	2000	85,800
		364,201

Routine Blading of Gravel Roads	Year	Need

	1992	278,556
	1993	278,556
	1994	278,556
	1995	278,556
	1996	278,556
	1997	278,556
	1998	278,556
	1999	278,556
	2000	278,556
	2001	278,556
	2002	278,556
	2003	278,556
	2004	278,556
	2005	278,556
	2006	278,556
	2007	278,556
	2008	278,556
	2009	278,556
	2010	278,556
	2011	278,556
		5,571,123

Overlay Blotter on Blotter

Year	Need
2005	289,791
2006	281,666
	571,457

Overlay Gravel on Gravel

Year	Need
1992	559,166
1994	2,703,329
1996	5,462,157
1998	295,167
1999	559,166
2001	2,703,329
2003	5,462,157
2005	295,167
2006	559,166
2008	2,703,329
2010	5,462,157
	26,764,288
	37,677,288

POTTER

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Asphalt Crack Sealing	Year	Need
	1994	10,000
	1998	10,000
	1999	28,751
	2002	10,000
	2003	28,751
	2007	28,751
	2008	10,000
	2011	28,751
		155,004

Asphalt Seal Coat	Year	Need
	1994	36,000
	2000	36,000
	2001	103,500
	2007	103,500
	2010	36,000
		315,000

Overlay Asphalt on Asphalt	Year	Need
	2004	280,000
		280,000

Overlay Asphalt on Blotter	Year	Need
	1995	1,035,000
		1,035,000

Blotter Crack Sealing	Year	Need
	1993	28,751
	1994	22,501
	1997	21,251
	1998	95,002
	1999	7,500
	2002	21,251
	2003	95,002
	2004	15,000
	2007	21,251
	2008	95,002
	2009	22,501
		445,011

Blotter Seal Coat	Year	Need
	1993	54,000
	1994	27,000
	1997	76,500
	1998	342,001
	1999	27,000
	2002	76,500
	2003	342,001
	2006	54,000
	2007	76,500

	2008	342,001
	2009	27,000
		1,444,504

Routine Blading of Gravel Roads

Year	Need
1992	167,508
1993	125,402
1994	125,402
1995	125,402
1996	125,402
1997	125,402
1998	125,402
1999	125,402
2000	125,402
2001	125,402
2002	125,402
2003	125,402
2004	125,402
2005	125,402
2006	125,402
2007	125,402
2008	125,402
2009	125,402
2010	125,402
2011	125,402
	2,550,144

Overlay Blotter on Blotter

Year	Need
1999	200,000
2004	100,000
	300,000

Overlay Blotter on Gravel

Year	Need
1992	283,333
1993	1,349,997
	1,633,330

Reconstruct to Gravel

Year	Need
1992	300,000
	300,000

Overlay Gravel on Gravel

Year	Need
1992	83,333
1994	756,665
1995	50,000
1996	2,369,996
1998	303,333
1999	166,666
2000	50,000
2001	723,331
2003	2,369,996
2004	33,333
2005	353,333
2006	133,333
2008	723,331
2009	33,333
2010	2,419,996
	10,569,980

19,027,973

ROBERTS

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt

Year	Need
1992	200,417
1993	740,000
1995	2,867,500
1997	3,700,000
2007	200,417
2011	740,000
	8,448,334

Asphalt Crack Sealing

Year	Need
1992	50,001
1993	45,001
1994	46,251
1995	51,251
1996	12,500
1997	92,002
1998	42,501
1999	85,002
2001	5,000
2002	155,754
2003	95,002
2004	15,000
2005	12,500
2006	31,251
2007	168,254
2008	32,501
2009	18,750
2010	27,501
2011	77,502
	1,063,525

Asphalt Seal Coat

Year	Need
1992	9,000
1993	108,000
1994	166,501
1995	76,500
1996	171,001
1997	90,000
1999	155,701
2000	117,000
2001	180,001
2003	288,002
2004	198,001
2005	36,000
2006	187,201
2007	184,501
2008	45,000
2009	130,501
2010	72,000
2011	207,001
	2,421,910

Overlay Asphalt on Asphalt

Year	Need
1992	70,000

	1998	350,000
	1999	70,000
	2000	615,000
	2001	300,000
	2002	225,000
	2003	300,000
	2004	560,000
	2007	1,270,000
	2008	350,000
		4,110,000

Overlay Asphalt on Blotter	Year	Need
	1992	989,000
	2002	140,000
		1,129,000

Reconstruct to Blotter	Year	Need
	1993	604,167
		604,167

Blotter Crack Sealing	Year	Need
	1992	131,253
	1993	137,003
	1994	70,002
	1995	68,752
	1996	25,001
	1997	16,250
	1998	100,419
	1999	48,751
	2000	60,002
	2001	33,751
	2002	113,753
	2003	228,672
	2004	31,251
	2005	10,000
	2006	27,501
	2007	122,503
	2008	189,921
	2009	27,501
	2010	87,502
	2011	57,501
		1,587,288

Blotter Seal Coat	Year	Need
	1992	317,702
	1993	832,504
	1994	40,500
	1995	99,000
	1996	40,500
	1998	190,501
	1999	175,501
	2000	342,001
	2001	135,000
	2003	474,002
	2004	283,502
	2005	236,701
	2006	81,000
	2007	310,501
	2008	411,001
	2010	99,000
	2011	270,002

4,338,917

Routine Blading of Gravel Roads	Year	Need
	1992	164,345
	1993	146,369
	1994	145,883
	1995	145,883
	1996	139,567
	1997	139,567
	1998	139,567
	1999	142,968
	2000	142,968
	2001	142,968
	2002	142,968
	2003	142,968
	2004	142,968
	2005	142,968
	2006	142,968
	2007	142,968
	2008	142,968
	2009	142,968
	2010	142,968
	2011	142,968

2,879,761

Overlay Blotter on Asphalt	Year	Need
	1998	306,251

306,251

Overlay Blotter on Blotter	Year	Need
	1992	94,792
	1993	643,748
	1995	502,603
	1997	812,499
	1998	1,262,914
	1999	243,749
	2005	708,332
	2006	233,333
	2007	131,250
	2010	94,792
	2011	121,354

4,849,365

Overlay Blotter on Gravel	Year	Need
	1993	427,083

427,083

Reconstruct to Gravel	Year	Need
	1994	300,000
	1996	3,900,000
	2001	300,000
	2003	1,300,000
	2008	300,000
	2010	1,300,000

7,400,000

Overlay Gravel on Blotter	Year	Need
	1999	61,250

		61,250
Overlay Gravel on Gravel	Year	Need
	1994	183,667
	1995	101,500
	1996	2,905,828
	1999	40,000
	2000	101,500
	2001	143,667
	2003	3,339,159
	2004	40,000
	2005	101,500
	2006	81,667
	2008	143,667
	2009	40,000
	2010	3,440,659
		10,662,812
PCC	Year	Need
	1992	62,498
		62,498
		50,352,161

SANBORN

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Asphalt Crack Sealing	Year	Need
	1994	1,250
	1995	30,001
	1997	7,500
	1998	1,250
	1999	30,001
	2001	7,500
	2003	30,001
	2004	7,500
	2005	7,500
	2006	1,250
	2007	37,501
	2009	7,500
	2010	8,750
		177,504

Asphalt Seal Coat	Year	Need
	1994	4,500
	1997	108,000
	1999	27,000
	2000	4,500
	2003	108,000
	2005	27,000
	2007	27,000
	2008	4,500
	2009	108,000
	2011	27,000
		445,500

Overlay Asphalt on Asphalt	Year	Need
	2002	30,000
	2011	720,000
		750,000

Overlay Asphalt on Blotter	Year	Need
	2001	195,000
	2009	325,000
		520,000

Overlay Asphalt on Gravel	Year	Need
	1993	225,000
		225,000

Blotter Crack Sealing	Year	Need
	1992	57,501
	1994	50,001
	1995	46,251
	1996	50,001
	1997	72,502
	1998	87,502
	1999	15,000

	2000	86,252
	2001	22,501
	2003	145,003
	2005	22,501
	2006	50,001
	2007	15,000
	2008	130,003
	2009	60,001
	2010	23,751
		933,772

Blotter Seal Coat	Year	Need
	1994	315,001
	1995	112,500
	1996	54,000
	1997	45,000
	1998	369,001
	1999	180,001
	2000	85,500
	2001	54,000
	2003	414,002
	2006	189,000
	2008	369,001
	2009	180,001
	2010	85,500
		2,452,508

Routine Blading of Gravel Roads	Year	Need
	1992	207,618
	1993	160,005
	1994	160,005
	1995	160,005
	1996	160,005
	1997	160,005
	1998	160,005
	1999	160,005
	2000	160,005
	2001	160,005
	2002	160,005
	2003	160,005
	2004	160,005
	2005	160,005
	2006	160,005
	2007	160,005
	2008	160,005
	2009	160,005
	2010	160,005
	2011	160,005
		3,247,712

Overlay Blotter on Blotter	Year	Need
	2000	374,999
	2004	516,666
	2005	257,291
	2011	150,000
		1,298,956

Overlay Blotter on Gravel	Year	Need
	1993	1,118,748

		1,118,748
Overlay Gravel on Gravel	Year	Need
	1995	2,331,664
	1996	1,559,998
	1998	110,000
	2000	2,331,664
	2001	281,666
	2003	1,278,332
	2005	2,441,664
	2006	281,666
	2010	3,609,997
	2011	281,666
		14,508,318
		25,678,019

SPINK

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	1992	0
		0

Asphalt Crack Sealing	Year	Need
	1997	1,247,532
	2002	1,247,532
	2007	1,247,532
		3,742,595

Asphalt Seal Coat	Year	Need
	1999	4,491,017
	2006	4,491,017
		8,982,033

Overlay Asphalt on Blotter	Year	Need
	2010	1,080,000
		1,080,000

Overlay Asphalt on Gravel	Year	Need
	1992	30,750,000
		30,750,000

Blotter Crack Sealing	Year	Need
	1992	15,000
	1993	58,752
	1994	337,509
	1995	45,001
	1997	15,000
	1998	58,752
	1999	337,509
	2000	45,001
	2002	15,000
	2003	58,752
	2004	337,509
	2005	45,001
	2007	15,000
	2008	58,752
	2009	337,509
		1,780,046

Blotter Seal Coat	Year	Need
	1992	162,001
	1994	54,000
	1995	211,501
	1996	1,215,005
	1999	162,001
	2001	54,000
	2002	211,501
	2003	1,215,005

2006	162,001
2008	54,000
2009	211,501
2010	1,215,005
	4,927,518
	51,262,193

SULLY

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	1992	740,000
		740,000

Asphalt Crack Sealing	Year	Need
	1994	47,501
	1996	5,000
	1997	32,501
	1998	30,001
	2000	7,500
	2001	5,000
	2002	25,001
	2003	17,500
	2004	5,000
	2005	5,000
	2006	47,501
	2007	45,001
	2008	5,000
	2009	20,001
	2010	30,001
	2011	20,001
		347,509

Asphalt Seal Coat	Year	Need
	1994	162,000
	1997	9,000
	1998	18,000
	1999	54,000
	2000	108,000
	2003	9,000
	2004	72,000
	2005	18,000
	2006	90,000
	2008	108,000
	2009	72,000
	2010	18,000
	2011	72,000
		810,002

Overlay Asphalt on Asphalt	Year	Need
	2000	510,000
	2002	930,000
	2009	200,000
		1,640,000

Overlay Asphalt on Blotter	Year	Need
	1997	450,000
	2003	600,000
		1,050,000

Overlay Asphalt on Gravel	Year	Need

	1992	160,000
	1993	150,000
		310,000

Blotter Crack Sealing

Year	Need
1992	17,500
1993	1,250
1994	6,250
1995	23,751
1996	87,502
1997	60,001
1998	20,000
1999	21,251
2000	87,502
2001	40,001
2002	20,001
2003	20,000
2004	96,252
2005	40,001
2007	23,751
2008	106,252
2009	46,251
2010	2,500
	720,017

Blotter Seal Coat

Year	Need
1993	81,000
1995	81,000
1996	4,500
1997	387,002
1998	207,001
2001	76,500
2002	387,002
2003	211,501
2006	27,000
2007	396,002
2008	211,501
	2,070,008

Routine Blading of Gravel Roads

Year	Need
1992	235,635
1993	204,865
1994	204,865
1995	203,137
1996	203,137
1997	203,137
1998	203,137
1999	203,137
2000	203,137
2001	203,137
2002	203,137
2003	203,137
2004	203,137
2005	203,137
2006	203,137
2007	203,137
2008	203,137
2009	203,137
2010	203,137
2011	203,137
	4,098,694

Overlay Blotter on Blotter	Year	Need
	1998	14,583
	1999	67,708
	2001	83,333
	2011	14,583
		180,208

Overlay Blotter on Gravel	Year	Need
	1992	1,302,080
	1993	704,165
		2,006,245

Reconstruct to Gravel	Year	Need
	1995	800,000
		800,000

Overlay Gravel on Gravel	Year	Need
	1992	886,664
	1993	698,332
	1994	390,833
	1995	1,508,330
	1996	767,915
	1997	886,664
	1998	698,332
	1999	106,667
	2000	1,641,663
	2001	284,166
	2002	886,664
	2003	1,466,247
	2004	106,667
	2005	1,641,663
	2007	886,664
	2008	982,498
	2009	106,667
	2010	2,409,578
		16,356,212
		31,128,895

TODD

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Asphalt Crack Sealing	Year	Need
	1993	16,042
	1995	18,750
	1998	16,042
	2003	16,042
	2008	16,042
		82,918

Asphalt Seal Coat	Year	Need
	1996	67,500
	1997	57,750
	2004	57,750
		183,001

Overlay Asphalt on Asphalt	Year	Need
	2009	385,000
		385,000

Routine Blading of Gravel Roads	Year	Need
	1992	112,986
	1993	112,986
	1994	112,986
	1995	113,094
	1996	115,037
	1997	115,037
	1998	115,037
	1999	115,037
	2000	124,754
	2001	124,754
	2002	124,754
	2003	124,754
	2004	124,754
	2005	124,754
	2006	124,754
	2007	124,754
	2008	124,754
	2009	124,754
	2010	124,754
	2011	124,754
		2,409,248

Reconstruct to Gravel	Year	Need
	1992	1,670,000
	1995	180,000
	1996	3,410,000
	2000	900,000
		6,160,000

Overlay Gravel on Gravel	Year	Need
	1992	279,999
	1993	384,999

1994	350,000
1996	701,666
1998	384,999
1999	558,332
2000	30,000
2001	350,000
2003	1,654,997
2005	180,000
2006	558,332
2008	734,999
2010	1,449,998
	7,618,321
	16,838,488

TURNER

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	2001	3,330,000
		3,330,000

Asphalt Crack Sealing	Year	Need
	1992	85,210
	1993	49,584
	1994	82,502
	1995	106,253
	1996	41,251
	1997	85,210
	1998	125,003
	1999	121,253
	2001	65,002
	2002	50,001
	2003	123,753
	2004	52,501
	2005	52,501
	2006	48,751
	2007	191,463
	2008	67,502
	2009	52,501
	2010	70,002
	2011	95,002
		1,565,246

Asphalt Seal Coat	Year	Need
	1993	61,500
	1994	270,001
	1995	162,001
	1996	90,000
	1997	225,001
	1998	243,751
	1999	162,001
	2000	270,001
	2001	189,001
	2003	238,501
	2004	18,000
	2005	261,001
	2006	27,000
	2007	351,001
	2008	103,500
	2009	338,251
	2010	225,000
	2011	162,001
		3,397,511

Overlay Asphalt on Asphalt	Year	Need
	1993	1,080,000
	1995	770,000
	1998	300,000
	2001	270,000
	2002	1,565,000
	2004	1,205,000

	2008	300,000
	2009	400,000
	2011	1,020,000
		6,910,000

Overlay Asphalt on Blotter	Year	Need
	1995	650,000
	2004	325,000
		975,000

Reconstruct to Blotter	Year	Need
	1998	241,667
		241,667

Blotter Crack Sealing	Year	Need
	1992	31,251
	1993	51,251
	1994	12,500
	1995	110,003
	1996	28,751
	1998	12,500
	1999	20,001
	2000	118,753
	2001	5,000
	2002	37,501
	2003	50,418
	2004	17,500
	2005	15,000
	2006	17,500
	2007	45,001
	2008	54,168
	2010	110,003
	2011	42,501
		779,602

Blotter Seal Coat	Year	Need
	1992	135,001
	1993	274,501
	1994	121,501
	1995	207,001
	1998	63,000
	1999	157,501
	2000	270,001
	2001	72,000
	2003	109,501
	2004	153,001
	2006	63,000
	2007	126,001
	2008	109,501
	2009	22,500
	2010	270,001
	2011	153,001
		2,307,009

Routine Blading of Gravel Roads	Year	Need
	1992	52,147
	1993	52,147
	1994	52,147
	1995	52,147

	1996	52,147
	1997	52,147
	1998	52,147
	1999	52,147
	2000	52,147
	2001	52,147
	2002	52,147
	2003	52,147
	2004	52,147
	2005	52,147
	2006	52,147
	2007	52,147
	2008	52,147
	2009	52,147
	2010	52,147
	2011	52,147
		1,042,946

Overlay Blotter on Asphalt	Year	Need
	2001	265,417
		265,417

Overlay Blotter on Blotter	Year	Need
	1992	204,166
	1995	216,666
	1997	291,666
	1998	280,208
	2000	162,500
	2004	72,917
	2005	1,041,666
	2006	50,000
		2,319,788

Overlay Gravel on Gravel	Year	Need
	1992	664,999
	1994	93,333
	1995	136,666
	1996	356,666
	1997	70,000
	1998	210,000
	1999	594,999
	2000	136,666
	2001	279,999
	2002	70,000
	2003	170,000
	2005	346,666
	2006	781,665
	2007	70,000
	2008	93,333
	2010	306,666
	2011	186,666
		4,568,324
		27,702,509

UNION

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	1992	2,625,459
	1993	280,583
	1999	400,833
	2006	400,833
	2007	1,665,000
	2009	1,122,333
		6,495,041

Asphalt Crack Sealing	Year	Need
	1992	31,751
	1993	31,501
	1994	65,189
	1995	116,753
	1996	62,751
	1997	68,939
	1998	76,002
	1999	115,503
	2000	38,688
	2001	53,751
	2002	63,001
	2003	150,691
	2004	49,251
	2005	28,251
	2006	69,189
	2007	129,253
	2008	55,001
	2009	26,001
	2010	24,751
	2011	114,753
		1,370,970

Asphalt Seal Coat	Year	Need
	1992	18,000
	1994	95,400
	1995	108,000
	1996	131,401
	1997	422,777
	1998	149,401
	1999	137,700
	2000	99,900
	2001	98,100
	2003	460,577
	2004	172,801
	2005	144,900
	2006	39,600
	2007	152,101
	2008	63,000
	2009	243,001
	2010	109,800
	2011	62,100
		2,708,561

Overlay Asphalt on Asphalt	Year	Need

	1992	104,000
	1993	243,750
	1995	366,000
	2000	286,000
	2001	762,500
	2003	62,500
	2004	403,000
	2006	325,000
	2007	830,500
	2009	549,500
	2010	637,000
	2011	1,170,750
		5,740,500

Overlay Asphalt on Blotter

Year	Need
1995	228,000
2007	240,000
2009	318,500
	786,500

Overlay Asphalt on Gravel

Year	Need
1993	360,000
	360,000

Blotter Crack Sealing

Year	Need
1992	30,626
1993	5,042
1994	27,751
1995	8,386
1996	8,709
1997	43,376
1998	12,500
2000	21,136
2001	8,709
2002	30,626
2003	30,292
2004	15,000
2006	21,459
2008	17,542
2009	15,000
2010	8,386
	304,539

Blotter Seal Coat

Year	Need
1992	30,188
1993	106,350
1996	141,601
1997	45,900
1999	30,188
2000	45,000
2001	31,350
2003	174,301
2006	85,350
2007	45,000
2008	18,150
	753,378

Routine Blading of Gravel Roads

Year	Need
1992	39,402

	1993	29,021
	1994	29,021
	1995	29,021
	1996	29,021
	1997	29,021
	1998	29,021
	1999	29,021
	2000	29,021
	2001	29,021
	2002	29,021
	2003	29,021
	2004	29,021
	2005	29,021
	2006	29,021
	2007	29,021
	2008	29,021
	2009	29,021
	2010	29,021
	2011	29,021
		590,803

Overlay Blotter on Blotter	Year	Need
	1993	125,000
	1998	50,417
	1999	156,250
	2005	83,854
	2011	87,083
		502,604

Overlay Gravel on Gravel	Year	Need
	1992	93,333
	1995	58,667
	1996	147,333
	1998	378,249
	1999	93,333
	2000	58,667
	2003	147,333
	2005	436,915
	2006	93,333
	2010	206,000
		1,713,163

PCC	Year	Need
	1992	2,760,346
		2,760,346
		24,086,403

WALWORTH

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Asphalt Crack Sealing	Year	Need
	1994	0
	1996	2,000
	1997	12,500
	1999	2,000
	2001	12,500
	2002	2,000
	2004	13,000
	2005	14,500
	2007	33,001
	2008	2,000
	2009	12,500
	2010	13,000
	2011	20,000
		139,003

Asphalt Seal Coat	Year	Need
	1998	0
	1999	52,200
	2005	52,200
	2007	46,800
	2009	72,000
	2011	45,000
		268,201

Overlay Asphalt on Asphalt	Year	Need
	2009	0
	2011	68,000
		68,000

Overlay Asphalt on Blotter	Year	Need
	2001	405,000
	2003	620,000
	2007	85,000
		1,110,000

Overlay Asphalt on Gravel	Year	Need
	1993	493,000
		493,000

Blotter Crack Sealing	Year	Need
	1992	35,501
	1993	21,250
	1994	9,500
	1995	42,001
	1996	35,001
	1997	37,001
	1998	152,254
	1999	20,000
	2000	29,001
	2001	15,000

	2002	12,500
	2003	155,004
	2005	15,000
	2006	24,501
	2007	10,000
	2008	165,504
	2009	24,501
	2010	9,000
		812,519

Blotter Seal Coat

Year	Need
1993	76,500
1994	106,200
1995	151,201
1996	9,000
1997	90,000
1998	555,302
1999	72,000
2000	32,400
2001	72,000
2002	36,000
2003	532,802
2005	108,000
2006	34,200
2007	36,000
2008	523,802
2009	126,001
2010	32,400
	2,593,809

Routine Blading of Gravel Roads

Year	Need
1992	218,133
1993	154,358
1994	154,358
1995	154,358
1996	154,358
1997	154,358
1998	154,358
1999	154,358
2000	154,358
2001	154,358
2002	154,358
2003	154,358
2004	154,358
2005	154,358
2006	154,358
2007	154,358
2008	154,358
2009	154,358
2010	154,358
2011	154,358
	3,150,940

Overlay Blotter on Blotter

Year	Need
1998	78,125
2000	126,666
2001	208,333
2004	299,999
2005	105,000
2011	212,500
	1,030,622

Yearly maintenance and reconstruction needs report 08/20/91

Overlay Blotter on Gravel

Year	Need
1992	125,000
1993	1,791,456
	1,916,456

Overlay Gravel on Gravel

Year	Need
1993	8,667
1994	515,332
1995	2,297,164
1996	2,536,829
1997	8,667
1999	249,000
2000	2,288,497
2001	283,666
2003	2,545,495
2004	240,333
2005	2,297,164
2007	8,667
2008	275,000
2009	249,000
2010	4,825,326
2011	8,667
	18,637,471
	30,220,021

YANKTON

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

Reconstruct to Asphalt	Year	Need
	1992	2,204,580
	1993	2,405,000
	2000	1,202,500
	2001	555,000
	2004	4,255,000
	2007	1,726,667
	2010	1,402,913
		13,751,660

Asphalt Crack Sealing	Year	Need
	1992	46,501
	1993	108,002
	1994	111,253
	1995	78,377
	1996	148,754
	1997	61,251
	1998	184,504
	1999	45,626
	2000	30,001
	2001	140,003
	2002	112,503
	2003	154,879
	2004	42,751
	2005	35,001
	2006	152,504
	2007	73,377
	2008	148,004
	2009	53,751
	2010	36,501
	2011	129,378
		1,892,920

Asphalt Seal Coat	Year	Need
	1992	54,000
	1993	238,501
	1994	400,501
	1995	41,400
	1996	288,001
	1997	323,551
	1998	360,002
	1999	108,000
	2000	477,001
	2001	36,000
	2003	348,751
	2004	289,801
	2005	391,501
	2006	220,501
	2007	77,400
	2008	90,000
	2009	110,250
	2010	387,001
	2011	144,000
		4,386,164

Overlay Asphalt on Asphalt	Year	Need
	1992	165,000
	1995	360,000
	1996	390,000
	1998	1,290,000
	2000	90,000
	2001	1,386,000
	2004	1,230,000
	2005	360,000
	2008	1,500,000
	2009	972,000
	2010	165,000
	2011	1,050,000
		8,958,000

Overlay Asphalt on Blotter	Year	Need
	1995	240,000
		240,000

Reconstruct to Blotter	Year	Need
	1994	435,000
		435,000

Blotter Crack Sealing	Year	Need
	1995	36,667
	1996	2,500
	1997	7,500
	1999	7,500
	2000	36,667
	2001	2,500
	2002	7,500
	2003	12,500
	2004	7,500
	2006	15,000
	2007	7,500
	2008	12,500
	2009	7,500
	2010	20,625
	2011	17,500
		201,463

Blotter Seal Coat	Year	Need
	1992	71,250
	1993	45,000
	1995	60,750
	1999	125,251
	2000	69,750
	2003	45,000
	2004	27,000
	2006	81,000
	2008	45,000
	2009	27,000
	2010	60,750
	2011	54,000
		711,753

Routine Blading of Gravel Roads	Year	Need
	1992	65,751

	1993	65,751
	1994	62,350
	1995	62,350
	1996	61,702
	1997	61,702
	1998	61,702
	1999	61,702
	2000	61,702
	2001	61,702
	2002	61,702
	2003	61,702
	2004	61,702
	2005	67,937
	2006	67,937
	2007	67,937
	2008	67,937
	2009	67,937
	2010	67,937
	2011	67,937
		1,287,084

Overlay Blotter on Asphalt	Year	Need
	1998	175,000
	2001	210,000
		385,000

Overlay Blotter on Blotter	Year	Need
	1992	75,000
	2005	206,250
	2006	25,000
		306,250

Reconstruct to Gravel	Year	Need
	1992	600,000
	1994	2,100,000
	1996	400,000
	1999	600,000
	2001	2,100,000
	2003	400,000
	2006	600,000
	2008	2,100,000
	2010	400,000
		9,300,000

Overlay Gravel on Blotter	Year	Need
	2005	96,250
		96,250

Overlay Gravel on Gravel	Year	Need
	1993	240,000
	1994	380,000
	1995	260,000
	1996	200,000
	1997	240,000
	1999	240,000
	2000	70,000
	2001	570,000
	2003	440,000
	2005	260,000

2006	50,000
2007	240,000
2008	330,000
2009	240,000
2010	220,000
2011	240,000
	4,219,999
	46,171,542

ZIEBACH

Yearly maintenance and reconstruction needs report
All figures in current dollars
08/20/91

	Year	Need
Reconstruct to Asphalt	1992	23,809,500
		23,809,500
Asphalt Crack Sealing	Year	Need
	1997	925,522
	2002	925,522
	2007	925,522
		2,776,566
Asphalt Seal Coat	Year	Need
	1999	3,331,813
	2006	3,331,813
		6,663,625
Overlay Asphalt on Gravel	Year	Need
	1992	15,197,500
		15,197,500
		48,447,191

20 yr state wide	1,649,814,574