TRANSPORTATION NEEDS ASSESSMENT STUDY (HCR 3069)

SUMMARY REPORT

by
Daniel L. Zink

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IN COOPERATION WITH THE

NORTH DAKOTA STATE HIGHWAY DEPARTMENT
WALTER R. HJELLE, COMMISSIONER
and
FEDERAL HIGHWAY ADMINISTRATION
U. S. DEPARTMENT OF TRANSPORTATION

UPPER GREAT PLAINS TRANSPORTATION INSTITUTE
NORTH DAKOTA STATE UNIVERSITY
P. O. BOX 5074
FARGO, NORTH DAKOTA 58105

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PREFACE

North Dakota's transportation system is critical to the economic and social health of our state. The highway network, railroad system, and collection of airports provide the personal mobility and commercial linkages necessary for prosperity in the region. A constant vigil must be maintained to insure the integrity of the state's transportation system and to protect it from degradation, neglect, and misuse.

To this end the 49th Legislative Assembly passed House Concurrent Resolution 3069, directing an assessment of the transportation system of North Dakota. The Interim Transportation Committee asked the State Highway Department to direct and assist in completion of the study. The Upper Great Plains Transportation Institute, NDSU, was also contracted to assist in completion of the assessment.

This summary report is a synopsis of several individual reports addressing county, township and city transportation issues. These reports include:

"County Road Management Problems in North Dakota"

"City Streets in North Dakota"

"Consolidation of Local Highway Departments: The Case of Adams County and the City of Hettinger"

"County Asphalt Plant Ownership: The LaMoure County Experience"

"State Tax Incentives for the North Dakota Ethanol Industry: Issues and Alternatives"

"Changing Demands on North Dakota's Road and Bridge Network"

Each of these reports can be obtained by contacting:

Upper Great Plains Transportation Institute
North Dakota State University
Fargo, North Dakota 58105

In addition to the above documents, information and reports were prepared regarding the state rail system, the state highway system, and the state airport/aviation network. These reports can also be obtained from the Upper Great Plains Transportation Institute, or can be requested directly from the Planning Division of the North Dakota State Highway Department, or the North Dakota Aeronautics Commission.

Funding for this project was provided by the North Dakota State Highway Department, Walter R. Hjelle, Commissioner, in cooperation with the Federal Highway Administration, U. S. Department of Transportation.

TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

North Dakotans are served by an extensive and diverse transportation system. The state's railroad network provides a high capacity commercial alternative for bulk agricultural products, coal, and other commodities. The system of highways and airports is utilized for movement of a variety of commercial shipments, as well as the means for social activities in a sparsely populated yet highly mobile society.

OVERVIEW OF NORTH DAKOTA'S TRANSPORTATION MODES

The rail network in North Dakota is characterized by a high proportion of low density branch lines, and an agriculturally dominated traffic base. Of the approximately 4,500 miles of rail lines in the state, 64 percent are classified as branch lines. The state is served by three railroads, the Burlington Northern, the Soo Line and the Dakota, Minnesota and Eastern, a newly formed regional railroad. Track miles by main and branch line classification are presented in Table 1.

TABLE 1. NORTH DAKOTA RAIL TRACKAGE, 1987

Railroad	Track Miles		
	Main	Branch	Total
Burlington Northern	1210[a]	1935	3145
Soo Line	353	922	1275
Dakota, Minnesota & Eastern	0	14	14
Total	**1563**	**2871**	**4434**

[a]Includes 103 miles of track in southwestern North Dakota owned by the State of South Dakota and operated by the Burlington Northern.

SOURCE: North Dakota State Highway Department.

The state of North Dakota plays less of a role in the rail industry due primarily to the ownership structure of the railroads and the roles of the Interstate Commerce Commission (ICC) and the North Dakota Public Service Commission. The ICC pre-empts states' regulatory rights over railroads on interstate traffic, therefore the state has little oversight of railroad activities. North Dakota has been active, however, in the rehabilitation of rail branch lines to preserve rail service in the state. Between 1981 and 1985, the state has assisted in rehabilitation of over 152 miles of rail lines, mostly through low interest loans, under the federally funded Local Rail Service Assistance program.[1]

Citizens of North Dakota are also served by a well developed system of airports and air transport in the state. Currently four North Dakota cities receive scheduled air service from as many as three trunk carriers, while an additional three cities receive service from commuter airlines. These cities constitute all of the commercial originating and terminating air passengers in the state. The state is also served by 580 local or private airports, utilized mostly by operators of private planes or agricultural spray planes.

Probably the most significant change in air transportation in North Dakota recently have been the effects of airline deregulation on air fares and service. In 1978, air passenger travel was deregulated, and North Dakota has seen effects of this change in the form of fares, available seats, number of cities receiving scheduled service, number of serving carriers, and routing. In general, a great deal of turbulence has occurred in each of these areas.[2]

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[1]For a more complete description of the Local Rail Assistance Program and the entire railroad transportation system in North Dakota, see "North Dakota Rail System," prepared by the Planning Division, North Dakota State Highway Department, 1986.

[2]A more complete discussion of air transportation in North Dakota can be obtained from one of several documents prepared by the North Dakota Aeronautics Commission.

The entire state of North Dakota is also served by a virtual maze of state, interstate and county highways, local roads, and city streets. Mileage of each of these is presented in Table 2. North Dakota has more miles of road than any other state, indicating the wide geographic dispersion of its residents.

TABLE 2. NORTH DAKOTA ROAD AND STREET MILEAGE, BY JURISDICTION, DECEMBER, 1984

Jurisdiction	Miles
State	7,287.3
County FAS	9,394.4
Incorporated City Streets	3,317.9
Other Rural Roads and Streets	86,381.6
Total	**106,381.2**

Each of the jurisdictions listed in Table 2 are faced with the enormous task of managing and financing its road or street network in order to meet the travel needs of its motoring constituents. The State Highway Department alone must maintain a network of over 7,000 miles of roadway. A variety of funding sources are available to each of these jurisdictions. The primary sources of funds for each are presented in Table 3.

TABLE 3. PRIMARY SOURCES OF FUNDS FOR NORTH DAKOTA ROAD AND STREET PROGRAMS BY JURISDICTION	
Jurisdiction	**Primary Funding Sources**
State	Federal Highway Trust Fund (federal fuel taxes) State Fuel Taxes Vehicle Registration Fees
Counties	State Fuel and Registration Fees Apportioned to Counties County Property Tax Levy
Cities	Property Taxes and Special Assessments Long Term Borrowing State Fuel Taxes and Registration Fees
Townships	State Fuel Taxes and Local Property Taxes

Each of these jurisdictions is responsible for managing and maintaining their roads or streets. The scale of this task varies tremendously. The State Highway Department is charged with the task of managing and maintaining over 7,000 miles of roads, while some of the individual smaller cities are faced with managing less than one or two miles of streets.

OBJECTIVES OF THIS PAPER

This report is a synopsis of several reports related to the funding and management of primarily the road and street system in North Dakota. Funding and management issues related to the airport/aviation and railroad systems in the state are detailed in separate documents as reported in the preface of this report. Information summarized in the following sections was taken from separate reports written on the county road system, city street network, gasohol taxation issues, changing demands on the roadways,

consolidation of local highway departments, and county asphalt plant ownership (see preface for exact titles and how to obtain these reports). Each of these reports will be referred to throughout the discussion.

The general objectives of this study were to:

1. Evaluate the status of intergovernmental communication, cooperation, and coordination among the state, counties, cities, and townships relative to road program management.

2. Examine the physical condition of North Dakota's road network to assess repair, reconstruction and maintenance needs and adequacy of funding.

3. Identify how and why the demand for transportation services is changing in North Dakota, and how these changes are affecting the quality of services in the state and ability to fund the network.

4. Assess the extent of diversion of highway funds to non-highway use, especially the impact of the tax exemption on alcohol-blended fuels.

COOPERATION AMONG JURISDICTIONS

The large number of individual jurisdictions in the state and the large number of network miles would suggest that some degree of coordination or cooperation among jurisdictions could and should occur. This cooperation may be in the form of coordinating locations of arterial routes at jurisdiction borders, or sharing crews and equipment. Cooperation among jurisdictions has the potential to enhance services to the public through synergistic agreements among parties and integration of the individual road networks into a unified system. In addition, individual budget constraints may be partially eased if equipment or personnel requirements can be reduced through these cooperative arrangements.

State

The North Dakota State Highway Department is involved on almost a daily basis with many jurisdictions in overall funding/management of North Dakota's roads. A large portion of this involvement is due to the fact that the state is charged, by federal and state law, with disbursing federal and state funds to the local jurisdictions according to standards set forth in the law. The State Highway Department must therefore deal regularly with counties and cities regarding actual disbursement of funds, planning and approval of projects, and prioritization of major projects statewide.

In addition to administering the flow of funds to the many local jurisdictions in North Dakota, the State Highway Department is also involved in a number of managerial activities with cities and counties. The eight district offices of the State Highway Department are responsible for the management of the State Highway System within their district. Each of these offices, however, are involved in smaller scale cooperative activities with the local jurisdictions within their district. For example, the normal maintenance/construction activities of the district can often have "spill over" effects for the local jurisdictions. The districts occasionally share equipment such as tar kettles, seal chip spreaders, traffic counting equipment, pavement stripping equipment and others. Possible one of the most important equipment-related activities that the districts perform for counties and cities is the use of equipment in emergencies, especially after winter storms.

The state district offices, however, are reluctant to share equipment on a routine basis because of budget considerations. Although the districts would certainly be willing to do more work for cities and counties, regular sharing would accelerate equipment deterioration and budgets simply do not permit more equipment purchases or more frequent replacement.

The districts provide several other types of assistance to the counties and cities, including:

1. Selling small quantities of materials such as sand, asphalt, etc. to local jurisdiction;
2. Providing technical assistance to cities;
3. Sharing some stockpiles of materials;
4. Performing occasional minor sanding or sealing;
5. Sharing tank facilities;
6. Snow plowing on major streets near interchanges and ramps;
7. Providing traffic engineering assistance on major arterial streets;
8. Sharing materials such as oil, sand, salt, etc. on a temporary basis when one jurisdiction encounters an unexpected shortage.

The district engineers also provide planning and engineering advice to all cities in their respective districts. A formal maintenance inspection of city streets is performed annually to suggest a maintenance program to be carried out for the year. The inspection and recommendations may include items such as drainage procedures, design standards, signalling, etc. This program may be particularly helpful in smaller cities that do not have the staff or expertise to perform such evaluations.

The Planning Division of the State Highway Department also provides a variety of types of assistance to local governments. This assistance is primarily given to the larger cities as a means to effectively plan urban growth and utilize federal funds on city projects. County governments, however, are able to request planning assistance for use in their local road management programs. The planning assistance provided may include inventorying road systems and condition, prioritizing vehicle routes, identifying traffic generators, and developing construction/maintenance strategies for the future. Counties may apply for 85/15

percent matching federal funds to initiate planning projects. A project of this type was recently undertaken in Richland County. This type of planning activity would be extremely helpful in all counties, but the resources at the state and county level simply are not available to undertake this scale of project.

Constraints to participation in cooperative projects by the State Highway Department are primarily budgetary. The district engineers expressed a desire to participate in more projects with counties and cities, but could not due to the necessity to preserve existing equipment and other budget items. Also, state auditing procedures require strict adherence to standards when inventorying materials. This restricts the districts abilities to participate in informal sharing agreements.

County

County road officials were also asked to identify their extent of participation in cooperative projects with other jurisdictions. A county or rural community may not be able to use its equipment or staff most efficiently because of the size and scale of their operation. Combining resources with a neighboring county may not only more effectively utilize resources, but also make more types of equipment and facilities available for each jurisdiction's use. Also, savings may be achieved through joint purchasing of materials to achieve volume discounts. Some of the particular cooperative projects that were mentioned by county road officials include:

1. Occasional joint construction projects between larger jurisdictions;
2. Joint equipment rental for testing;
3. Joint county line maintenance and construction;
4. Equipment loans to neighboring counties or cities;
5. Consideration of consolidating shops and communication facilities;

6. Joint materials purchasing and shared stock piling;

7. Emergency equipment sharing during floods, snow storms, etc.;

8. Purchase supplies under state bid;

9. Gravel crushing for cities;

10. Adams County/City of Hettinger road department consolidation.

Although the many cooperative projects noted above were mentioned by county road officials, few had actually aggressively pursued these activities or actively been involved in many cooperative projects. When asked what inhibited participation in these projects, several factors were cited. In general, these factors involved difficulties in coordinating the supervisory personnel and the necessary equipment involved. Specific problems with cooperative project participation mentioned by local road officials included;

1. Obtaining agreement among jurisdictional boards and managers;

2. Equipment needs are simultaneous;

3. Equipment types needed are different for cities and counties;

4. Timing and prioritizing of when and where work should be done;

5. Geography, distances involved;

6. Under sharing agreements, specific details on maintenance and other responsibilities often difficult to reach;

7. Some auditing, accounting restrictions;

8. Equipment often specialized;

9. Centralized management on cooperative projects lacking, supervisory role questionable.

One example of a cooperative activity which may serve as a model for other jurisdictions is the consolidation of Adams County and Hettinger highway departments. On November 1, 1984, Adams County and its county seat Hettinger finalized an agreement to

consolidate into one unit the road management/maintenance activities of each jurisdiction. Several advantages and benefits of the consolidation appear to have been realized:

1. A more centralized system with more clear lines of authority;
2. Duplication of shop facilities and some equipment was eliminated;
3. Joint purchasing of fuel and materials was accomplished;
4. A larger equipment pool was made possible.

Specific gains to the county included:

1. Some additional equipment available;
2. One additional employee available;
3. Significant expansion of shop space.

Specific gains to the city included:

1. Addition of a superintendent with substantial road management experience;
2. Additional personnel;
3. Additional shop space.

Some disadvantages or additional tasks were experienced due to the consolidation, however. Additional accounting and bookkeeping was necessary to allocate specific activities to the appropriate jurisdiction. According to the superintendent, it is difficult to precisely allocate fuel costs, equipment use and other costs when the county and city jointly benefit from activities. Administrative responsibilities also increased when city activities were placed under the authority of the county road superintendent.

The consolidation of the Hettinger and Adams County highway functions appears to have been an overall positive experience. The primary benefits appear to have been improved

service to the city and better utilization of shop facilities. Overall expenditures remained approximately the same. This type of cooperative project may be one that other local jurisdictions with similar characteristics may want to consider.

Cities

City officials were also asked to comment on the types of cooperative projects in which they had been involved on an inter-jurisdictional basis. Projects of this type have the potential to help cities utilize their resources more economically while maintaining essential services. Officials were asked to state whether or not they had been involved in equipment or crew sharing projects, joint materials purchasing, joint materials or stockpile utilization, shop facilities sharing and others (Table 4).

TABLE 4. FREQUENCY OF PARTICIPATION IN INTER-JURISDICTIONAL COOPERATIVE PROJECTS BY NORTH DAKOTA CITIES, 1986

Type of Cooperative Project	Yes	No
	(Percent)	
	Population 0-100	
Equipment sharing	7	93
Crew sharing	7	93
Materials purchased jointly	4	96
Materials/stockpiles shared	4	96
Shop sharing	15	85
Other	0	100
	Population 101-500	
Equipment sharing	17	84
Crew sharing	7	93
Materials purchased jointly	7	93
Materials/stockpiles shared	7	92
Shop sharing	6	94
Other	11	89
	Population 501-1000	
Equipment sharing	9	91
Crew sharing	4	96
Materials purchased jointly	9	91
Materials/stockpiles shared	9	91
Shop sharing	0	100
Other	0	100
	Population 1001-5000	
Equipment sharing	17	83
Crew sharing	4	96
Materials purchased jointly	24	76
Materials/stockpiles shared	28	72
Shop sharing	4	96
Other	0	100
	Population Over 5000	
Equipment sharing	55	46
Crew sharing	18	82
Materials purchased jointly	55	46
Materials/stockpiles shared	9	91
Shop sharing	0	100
Other	75	25

In general, cities in smaller size categories had participated in fewer cooperative projects than their larger counterparts. The only exception was in the area of shop facility sharing. Nine cities in the smaller three categories had been involved in some kind of shop-sharing agreement, while only one city in the larger two categories had shared shop facilities. The larger cities, however, had a much higher frequency of participation in both equipment sharing and joint materials purchasing. Six of the eleven responding largest cities had participated in both equipment sharing and joint materials purchasing. Crew sharing, joint stockpile utilization, and other cooperative projects were much less common than either equipment sharing or joint materials purchasing.

City officials were also asked to identify reasons why they were unable to participate in more cooperative projects. The primary reason given for not pursuing more joint projects was a lack of available funds. Also, the distance to other cities or county shops was stated as a prohibitive factor. Other reasons given include:

1. Each city had its own equipment;
2. Cooperative projects not necessary due to extremely small scale of city street programs;
3. Many cities have no equipment or crews to share;
4. Timing of projects prohibits more than one jurisdiction using equipment or crews;
5. Unable to get city councils and county commissioners to agree on terms;
6. Lack of information on types of projects in which to participate.

LEGAL AND REGULATORY PROBLEMS ENCOUNTERED BY NORTH DAKOTA ROAD OFFICIALS

During the process of surveying county and city road officials, and through contacts with state personnel, several legal and regulatory problems were mentioned as causing some type of problem in road program management. Each of them are discussed in the following paragraphs.

Farm-to-Market Program

One major management problem regarding county roads is the current law governing county farm-to-market road programs. Under this law, counties are bound to their priority listing of road construction projects as voted on many years ago. These priority listings may have reflected needs within the counties several years ago, but many factors have rendered these programs obsolete. These factors include:

1. Demographic shifts;
2. Inflation in road construction/maintenance costs;
3. Shifts in major arterial routes.

All of these factors have led to substantial dissatisfaction with the remaining projects on many counties' priority lists. However, due to the inflexibility in current law, counties cannot change or reprioritize their programs to make them fit their needs of today.

Bid Requirements

Counties are required to submit for bids any purchase over $15,000 in order to allow vendors to compete for equipment and other sales. Some county road officials expressed dissatisfaction with this restriction and stated that it did not allow them to make appropriate purchases in all cases. For example, if a county road official could purchase a piece of equipment at an auction, he may be able to obtain a substantial savings over buying a new

item. If the price of that piece of equipment is over $15,000, the official cannot buy it. An increase in the minimum bid level or a provision for special purchases may provide for better utilization of funds.

County FAS Highway Mill Levy

Counties are allowed by law to assess up to 15 mills on local property for the purpose of matching federal funds to maintain and construct their federal aid county road network. Several counties are currently at the maximum of 15 mills, and officials have expressed concern over the adequacy of this funding level. An increase in this maximum would seem to be easy to justify, given that voters in a county must approve the actual increase, and that funds from other sources such as federal revenue sharing have been diminished or eliminated.

Facility Siting

The rate at which traffic generating industrial facilities are being located on state, county, and other highway systems is accelerating. For example, several agricultural processing plants have been constructed in the past decade. Each of these facilities very likely has some level of inbound and/or outbound truck shipment associated with their operation.

The problem with current law is that there is a lack of oversight procedures regarding heavy industrial facility siting where road impacts may occur. This absence of oversight limits the amount of planning by state or county road officials that can be contributed to the effective location of the facility.

Low Volume Rural Roads

A high proportion of North Dakota's rural road system has very low traffic densities. The rural network serves fewer motorists as the rural to urban population shift continues and as farms are becoming fewer and larger. Many roads serve only the needs of a few residents or are used for field access only. Yet, these roads are still maintained in order to provide a minimum level of service and to avoid liability claims caused by inadequate maintenance or defects in the road or bridges. No provision exists in current law which specifically defines a level of responsibility for low volume roads relative to required surface condition and liability. A law exempting jurisdictions from these responsibilities, with proper warning to motorists, may be appropriate.[3]

County and Township System Condition

County road officials are continuously attempting to upgrade the overall quality of their roadway surface conditions. The challenge is to most effectively utilize available funds on portions of their system where the most benefit will be attained. Officials were asked to rate the condition of their county and township systems, both gravel and paved roads. Results of that rating are presented in Table 5.

[3]The state of Minnesota has a "minimum maintenance road law" in the affect which states that, upon designation and proper signing, a road can be maintained at an absolute minimum level, and motorists are warned to travel at their own risk.

TABLE 5. COUNTY AND TOWNSHIP ROAD CONDITION AS REPORTED BY COUNTY ROAD MANAGERS, 1986					
Condition Category	COUNTY		TOWNSHIP		All Miles
	Paved	Gravel	Paved	Gravel	
Needs major repair or reconstruction	12%	31%	-	6%	15%
Maintenance much higher than normal	48%	28%	-	28%	26%
Needs only regular maintenance	40%	41%	-	66%	59%

Condition of local roads varied by jurisdiction and by surface type. On the county system, 12 percent of paved roads and 31 percent of graveled roads were rated as needing major repair or construction. Forty percent of the paved county roads and 41 percent of the gravel roads were rated as needing regular maintenance only.

Condition rating of the township system revealed somewhat different results. Six percent of the township miles were rated as needing reconstruction, 28 percent needed higher than regular maintenance, and 66 percent needed only regular maintenance. Many county road officials felt that even though many township roads may not have been in good condition, the lower traffic density levels did not justify any significant investment. This may explain the small percent of township miles placed in the reconstruction category and the higher proportion noted in the regular maintenance only category.

In order to economize on road maintenance/construction expenditures, some county officials have chosen to reduce service levels on some low density or problem roads. Reducing service levels may include many activities such as:

1. Reducing or eliminating snow removal;

2. Reducing the frequency of re-graveling or blading;

3. Reverting a paved road back to gravel;

4. Replacing a bridge with culvert or other lower cost structure.

Many of these cost-reduction activities take place regularly in county road management such as replacing bridges with culverts. Also, the frequency of snow removal or re-graveling may be a function of available funds in any particular fiscal period. Some counties, however, have actually turned some paved roads back to gravel due to the high maintenance costs of paved roads, and due to the intolerable driving characteristics of a poorly surfaced, broken-up paved road. Officials from eleven counties stated they had actually reverted some portion of their system from pavement to gravel. The average length of road segment noted by these eleven officials was 11 miles, ranging from 0.5 to 40 miles. In addition, 10 officials stated that they planned to reduce services on more of their system in the next five years.

Condition of North Dakota's city streets was also rated by city officials and is presented in Table 6. City officials were asked to specify the proportions of their street network which were in good, fair or poor condition. In general, officials from smaller cities reported that a higher proportion of their network was in fair or poor condition, while the larger city officials reported a higher share in good condition. For example, officials from cities over 5,000 reported that 54% of their network was in good condition, while 17% was in poor condition. Officials from the smallest size category (0-100), on the other hand, reported that only 33% of their network was in good condition, while 22% was in poor condition. A large percentage of the smaller cities' streets were rated in fair condition.

TABLE 6. NORTH DAKOTA CITY STREET CONDITION BY CITY SIZE CATEGORY, 1986			
	Average Street Condition		
Population	Good	Fair	Poor
	(Percent)		
0-100	33.3	45.0	21.7
101-500	33.2	40.8	26.3
501-1000	56.6	32.5	10.9
1001-5000	39.6	43.9	16.5
Over 5000	54.4	28.9	16.6

CHANGING DEMANDS ON NORTH DAKOTA'S ROAD AND BRIDGE SYSTEM

Management and utilization of North Dakota's transportation network is extremely dynamic in nature. This has always been the case, but particularly so in the past five to ten years. Several factors have accelerated the changes in demands on the transportation system and its managers. Some of these factors include changes in agricultural marketing patterns, shifting demographics, concentration of tourist and recreational activities, urban sprawl and city fringe area development, industrial and commercial plant siting, and increasing maximum allowable vehicle weights.

Agricultural Production

Production of raw agricultural commodities has been increasing steadily since the development of farming in the state. Due to the relative lack of in-state processing and low population, a high proportion of the crop is exported from North Dakota. In the

1985-86 crop year, 87 percent of the wheat produced was shipped out of North Dakota. The remaining 13 percent was processed or stored in-state, with a large portion of the processed product also shipped out of state.

A period of rapidly expanding production can certainly be of concern to managers of public transportation facilities. In North Dakota, increased production most likely means more shipments of those agricultural commodities by farm truck, semi-truck and railroad. The level of each of these types of shipments has implications for North Dakota's rural and state roadways, as well as for the rail network.

Agricultural Marketing Patterns

The agricultural marketing system includes movement of products starting at the "farm gate" and extending to the actual end-user. A significant portion of this marketing chain takes place on North Dakota's road and bridge network, and is therefore of substantial concern to providers of highway services.

Farm truck transport of grains constitutes a substantial portion of vehicle miles and ton/miles on North Dakota's rural road network. Several changes in farm truck transport have put added pressure on rural roads. Between 1973 and 1980 the average payload of farm trucks increased from 248 bushels to 310 bushels. Also, the distance traveled by farm truck has increased. The average one-way distance traveled to country elevators increased from 9.6 to 12 miles, while the total vehicle miles increased from 2,510 to 5,162 miles per year over the same time period.

Over-the-road truck shipments of grain also constitute a significant share of total vehicle miles and ton-miles. Although the truck share of total grain shipments from

North Dakota has declined since 1978-79, the absolute volume carried by large trucks has remained relatively constant due to increasing volumes produced and marketed from North Dakota.

Methods of truck shipment and changes in the vehicle themselves have affected North Dakota's road system. Size of over-the-road trucks have generally increased since their introduction in the early 1900's and have been limited in their growth by federal and state regulations. It has been purported that the growth in size of trucks has out-stripped the road system's capability to accommodate the larger vehicles. This has been caused at least in part by increased pressures toward cost efficiencies in the trucking industry and discontinuity in road construction and upgrading. Cost reduction is achieved by increasing the maximum allowable weight of a truck. This weight increase does not necessarily coincide with a concurrent upgrading of roads sufficient to accommodate the heavier loads. A history of the maximum allowable truck weights and lengths in North Dakota of the maximum allowable truck weights and lengths in North Dakota is presented in a later section of this report.

Country Elevator Marketing

Country grain elevators have long served in their primary role of consolidating smaller grain shipments from farmers and merchandising them in larger consignments at major terminal markets.

The number of grain elevators in North Dakota has been decreasing since approximately the turn of the century when over 2,000 elevators were in operation. Due to pressures toward increased throughput and other reasons, the number is currently down to approximately 577. This reduction in elevator numbers may impact the state's road system as farmers haul grain longer distances to the nearest elevator outlet. Also, more loads will be funnelled over the roads leading to the remaining elevators.

While elevator numbers overall have been decreasing, a shift in the concentration of grain moving through the remaining stations has occurred. A larger share of the total grain handled is done through a smaller number of firms. For example, the five largest grain elevators in 1977-78 handled about 5 percent of all grains marketed from North Dakota. In 1985-86, the largest five firms handled almost 10 percent of all grains. This concentration of grain shipments may also cause increased rural road deterioration due to the larger number of truck shipments bringing grain into these higher volume elevators.

In the 1980's, North Dakota has witnessed significant changes in the traditional country grain gathering system. These changes have been precipitated largely by the introduction of "multi-car" or "unit train" railroad rates.

Changes brought about by the introduction of multi-car railroad rates have been numerous and far-reaching. The country elevator industry has been undergoing significant structural changes in an effort to adjust to and take advantage of the new rates. One major result has been the emergence of what has been termed the "subterminal" grain elevator. Subterminal elevators are simply those that have the physical capabilities to load grain onto 26 or 52 car trains and access the associated rate savings. Today, about 125 grain elevators in North Dakota have capabilities to load 26 or 52 car trains.

The advent of the subterminal elevator in North Dakota has had other consequences relative to North Dakota's road and bridge network. Very likely the most significant has been the development of "subterminal/satellite" cooperative elevator companies. This type of cooperative is formed by the merger or consolidation of several local elevators for the purpose of consolidating grain shipments through a single, central shipping point. The central shipping point is generally a newly constructed subterminal or an existing station upgraded to subterminal capabilities. Consolidation of shipments from substations and semi-

truck movement to the subterminal has led to a significant increase in local truck traffic in some areas of the state. Although the primary method of marketing is still the farm to country elevator to terminal market route, a significant number of bushels are trucked from one elevator to another for reshipment. In the crop years 1983-84 and 1984-85, an average of over 31 million bushels per year was shipped from one North Dakota elevator to another, presumably for reshipment by rail. The most critical consequence of this phenomenon is that a large proportion of these intra-state shipments take place on the rural road system. While inter-state truck shipments are generally routed to the nearest major arterial such as an Interstate highway, the intra-state shipments are made primarily over state or county roads.

One significant addition to North Dakota's agricultural marketing system was made in the 1970's and 1980's in the form of agricultural processing. Prior to the 1970's, agricultural processing was mostly limited to mixing and grinding at feed plants for local livestock consumption. Since then several plants of varying sizes have been constructed. These include three sunflower crushing plants, two barley malting plants (one in Moorhead, Minnesota), a pasta manufacturing plant, and two alcohol fuel plants.

The volume of commodity shipments into agricultural processing can be substantial. In the 1984-85 crop marketing year total shipments of grain and oilseeds to in-state processors amounted to approximately 70 million bushels of which over 50 million was shipped by truck.

One final factor which is affecting agricultural marketing patterns is the accelerated rate of rail line abandonment in North Dakota. The extent of rail line abandonment is important from a public transportation facilities perspective in that traffic may be diverted from railroads onto the local road system. Several factors will affect the extent to which road impacts are felt. If country grain elevators and other shippers relied heavily on rail transport

prior to abandonment, a significant amount of traffic could be diverted to trucks traveling over local roads. However, if shippers were not utilizing rail shipments extensively, abandonment may have little or no impact on the remaining transportation system. The organizational structure of firms after abandonment also will affect the road network. Some firms will attempt to merge or consolidate facilities to retain access to rail shipment. Road impacts will be felt if this reorganization involves substantial truck shipments to nearby rail loading points.

Demographic Patterns

North Dakota's rural road network is extensive by any measure. It has a total of over 104,000 miles for all roads in the state. On a per capita basis this is higher than any other state in the country. The need for an extensive road network like North Dakota's was very likely at its greatest several decades ago when the rural and agricultural population was a more dominant factor in the state. More recently, however, significant shifts have occurred in the demographic structure in North Dakota.

The number of farms in North Dakota has been declining steadily for several decades. In 1950, over 65,000 farms were operating in the state. That number has since declined to 34,000, about half of the 1950 level. The rural population base has also diminished along with the decline in farm numbers. In 1940, 327,000 people or over half the total state population lived on farms. An additional 83,000 people lived in rural non-farm communities. The urban population made up less than 35 percent of the total state population base. The rural/urban make-up of the state has since shifted toward the urban areas, with approximately 52 percent of the state's population living in cities with over 2,500 people. The rural farm population has decreased by over 68 percent in this time period. Rural non-farm population and urban population increased by 178 percent and 44 percent respectively.

The distribution of North Dakota cities among city size groupings also reflects the shift in population from rural to urban areas. In 1930, only 12 North Dakota cities had populations over 2,400, compared to 20 in 1980. In that same time period, number of cities under 1,000 grew slightly from 285 to 301. The number of cities with population 1,000-2,5000 grew from 29 to 46. Growth in the number of cities in these larger two categories further substantiates the rural to urban shift.

These data give insight into the changing rural population in North Dakota. This demographic shift has implications for performance of the local road system serving the public. Several decades ago when many farms occupied a smaller geographic area, many more users depended on local roads for personal and commercial transport. Today, fewer farm units and rural residents depend on basically the same size road network. However, the demand for local road miles does not decrease in proportion to the number of local residents or users. The essential skeleton network of roadways is still required to move agricultural commodities from the land as much or more than in the past. Also, the diminishing tax base in rural areas is creating a finance problem for local jurisdictions. Fewer users exist to pay for the local road system, yet the network is essential to support the economic and social structure of the entire region.

Utilization of Recreational Area Access Roads

Tourism is one industry in North Dakota whose growth has put increased demands on the state's road network. Utilization of recreational facilities in North Dakota has increased in recent history, as evidenced by indications such as hunting and fishing license sales. For example, resident fishing license sales increased over 60 percent between 1968 and 1983. During this same time period nonresident fishing license sales increased 149 percent. Similar trends are noted in hunting license sales.

In order to gain insight into the extent of need for improvements in recreational road condition in North Dakota, a survey was conducted whereby individual road segments were categorized as to condition and usage.[4] Surveys were sent to county road officials, district game wardens, and state park managers. The questionnaire was designed to obtain information on access road mileage, surface type, surface condition, utilization, and priority of the road segment. Segments were then prioritized based on these criteria, as well as the perceived utilization if access roads were upgraded. Some sites were considered to have a high potential for utilization if access roads are upgraded.

Using these criteria, 32 access road segments were identified as high priorities in a recreational roads improvements program. These segments included 44 paved miles, 163 gravel miles and 10 unimproved miles. Also, a list of secondary priorities was developed and included 47 access road segments. These segments included 17 paved miles, 206 gravel miles and 5 unimproved miles.

The number of road segments and extent of mileage in these two categories is indicative of the impact that higher utilization of recreational facilities has had on access road condition. To fully utilize and gain maximum utility from our state's outdoor activities, serious consideration must be given to upgrading access roads. Also, from an economic development standpoint, good quality recreational access roads are desirable in that out-of-state tourists may be more likely to utilize North Dakota facilities in their travel plans.

Vehicle Size and Weights

Very likely one of the most important issues affecting North Dakota's road and bridge network is the historical trend toward increasing the maximum allowable vehicle weights on

[4]See "An Assessment of Access Roads to Recreation Areas," prepared by the North Dakota Parks and Recreation Department.

the road systems. Pressure to increase the maximum allowable weights on the highways primarily comes from the motor carrier and shipping communities. Allowing higher weights for a vehicle contributes to the operating efficiencies of the firm and may provide lower transportation rates to the shipping public.

Increasing the maximum vehicle weights, however, is not without its associated costs. In general terms, higher axle-loadings cause increased stress on the road surface, although altering axle spacings and axle configurations can mitigate at least some of these effects. The problem of higher vehicle weights would not be severe if road surfaces were constructed or upgraded to accommodate the heavier loads when the increased maximums are allowed. Several factors prevent this from occurring. First, highways are generally constructed with an expected life of about 20 years. Climate, intensity of use, and other factors will influence the actual road life, but design standards and expected traffic levels (including lading weights) indicate an expected life of about 20 years. A change in the regulations after construction will therefore impact that road's actual life span. Second, funds are simply not available to adjust the entire road system to a change in allowable weights. A reconstruction project such as this scale is unimaginable in size and scope. Government jurisdictions are therefore faced with attempting to adjust to higher weights with existing resources. By many estimates, the result has been a deterioration in road surface quality with further damage expected.

Maximum vehicle weights have increased over the past 25 years, as indicated in Table 7. The maximum weight for single axle trucks has increased from 18,000 to 20,000 pounds, while the maximum tandem axle weight has increased from 32,000 to 34,000 pounds. The largest increase, however, has been on the gross vehicle weight of multi-axle vehicles and vehicle combinations. Between 1961 and 1979, the maximum gross vehicle weight was

increased from 73,280 pounds to 105,500 pounds, an increase of 44 percent. In 1983, the 105,500 pound limit was extended to include the entire state highway system, except for the interstate system.

TABLE 7. NORTH DAKOTA MAXIMUM ALLOWABLE WEIGHTS, 1961-1986

Year	Maximum Weight (pounds)		
1961	18,000	32,000	73,280
1973	20,000	34,000	82,000
1979	20,000	34,000	105,500 (designated routes only)
1983	20,000	34,000	105,500 (entire state system, excluding Interstate)

Along with increasing maximum allowable truck weights in North Dakota, size restrictions on the width and length of vehicles have increased. Changes in vehicle width and height have been small or nonexistent. However, the allowable maximum on vehicle length has changed considerably over time. Some vehicle combinations on designated routes can now legally reach lengths of up to 110 feet.

Diversion of Funds to Non-Highway Use

Construction and maintenance of the road and bridge network in North Dakota is financed from a number of sources. State highways are funded by federal programs, state vehicle registration fees, state fuel excise taxes (gasoline and diesel), special fuel taxes (agricultural, railroad, industrial and heating fuel), and several other miscellaneous sources.

local property tax levies, and other miscellaneous sources. Cities support their local street system with property taxes and special assessments, transfers from the State Highway Distribution Fund, long term borrowing, and other minor sources. Each of these jurisdictions relies heavily on this variety of funding sources to maintain the integrity of their respective systems.

Each of these jurisdictions are continually searching for new and additional funds to augment their existing resources. One phenomenon which has eroded the pool of funds available for road management programs is the diversion of highway funds to non-highway use. Two specific examples can be cited where funds collected under the user fee principal (intended to go to road use) were diverted to some other use. These examples include the diversion of highway funds to finance the operations of the State Highway Patrol and the Travel and Tourism Division of the Economic Development Commission (EDC). During the 1985-87 biennium, $12.4 million was diverted from state highway funds to finance these two agencies.

In addition to funds going to the Highway Patrol and Travel/Tourism Division of EDC, a substantial sum of gasoline taxes are being foregone due to the excise tax exemption on gasohol. Gasoline sales are taxed at a rate of 13 cents per gallon (state tax), with these funds pooled in the Highway Distribution Fund. Monies in this fund are allocated to the State Highway Department, counties, and cities for care of their respective roads and streets. Gasohol, however, is currently taxed at a rate of only 5 cents per gallon, or an exemption of 8 cents per gallon. Therefore, for each gallon of gasohol purchased in lieu of gasoline, 8 cents of revenue to maintain the state's road and street system is foregone.[5]

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[5] Under current law, on July 1, 1987, the gasohol tax exemption will change from 8 cents to 4 cents per gallon.

The fiscal impact of this exemption on State Highway Distribution Funds is substantial. The annual fiscal impact of the exemption is presented in Table 8. The proportional impact of the exemption on each jurisdiction is also presented.

TABLE 8. ANNUAL FISCAL IMPACT OF GASOHOL EXEMPTION

Fiscal Year	Total Impact	Jurisdictional Impact		
		State[a]	County[b]	City[c]
		(dollars)		
1985	449,484	283,175	104,730	61,579
1986	4,667,290	2,940,393	1,087,479	639,419
1987 (proj.)[d]	5,496,400	3,462,732	1,280,661	753,007
1988 (proj.)[d]	2,716,600	1,711,458	632,968	372,174

The combined effects of increased gasohol consumption and an increase in the level of the exemption led to a sharp increase in the fiscal impact in the 1986 fiscal year. Projected losses to the fund in fiscal years 1987 and 1988 are $5.5 million and $2.7 million, respectively.

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[a] Assumes 63% share of Highway Distribution Fund.

[b] Assumes 23.3% share of Highway Distribution Fund.

[c] Assumes 13.7% share of Highway Distribution Fund.

[d] Assumes 20% gasohol market share.

SUMMARY

The transportation system of North Dakota is vital to the economic health of the state. This highly bulk-product oriented economy relies on cost-efficient and capacity-effective transport in order to provide value to our commodities. The rural road network, rail system, arterial highway system, and collection of airports provide the commercial lanes and the personal mobility essential to the state.

It is essential to continually monitor the state's transportation network in order to ensure it is fulfilling the needs and wants of residents. This monitoring process should hopefully accomplish several goals:

1) Identify the appropriate role of government in providing transportation services;

2) Provide for adequate funding for public transportation services;

3) Provide an atmosphere for economic growth;

4) Fulfill the commercial and social needs of citizens.

Very likely one of the most critical of the above goals is to provide adequate funds to provide for the essential minimum of transportation services. A problem arises, however, in estimating both the "appropriate" level of funding and what "proper" or essential minimum level of services is actually required. Distinguishing between <u>needs</u> (minimum level of necessary services) and <u>wants</u> (budgetary desires of managing agencies and citizens regardless of costs) is a perennial problem. Implementation of an on going program which would assist in the determination of funding requirements at each jurisdictional level would be extremely helpful. A program such as this may provide information such as an inventory of system condition, funds necessary to bring roads up to a normal replacement/maintenance cycles, types of jurisdictional expenditures, and others. Also, such a program may prove to be invaluable to local jurisdictions in their management and planning efforts, particularly for

North Dakota's smaller to medium-sized cities. Many of these cities are unable to carry-out any long term planning or management activities due to their size. Also, benefits may be gained in counties where well-defined planning programs are not in place. These kinds of planning efforts could be invaluable in estimating the extent of funding needs for road maintenance and construction, as well as in maintaining the integrity of funding sources.

A series of surveys and interviews was conducted to assess the extent of cooperation and coordination among various jurisdictions in North Dakota. The goal of this cooperation is to reduce costs and/or improve levels of service in road and street management. In general, jurisdictions were involved in cooperative activities where geography or visible need permitted. The activities typically involved some equipment sharing or purchasing/sharing materials jointly. However, few cooperative projects were identified whereby regular equipment, crew or materials sharing was common. A particular absence of cooperative projects was noted at the smaller city level where street management programs were much smaller in scale.

Several problems were identified relating to inappropriate existing laws or the absence of a law that may help management of road and street systems. These generally centered around the rapidly changing transportation patterns and how the various jurisdictions could adjust to these changes. Some of these dynamic forces affecting the transportation network include:

1. Changing agricultural marketing patterns;
2. Rural to urban population shift;
3. Rail line abandonment; and,
4. Increase in truck sizes and weights.

Local jurisdictions were also asked to rate the condition of their respective road networks. In general, officials from larger cities rated their street systems in better condition than smaller cities. County officials reported a higher proportion of system miles in need of repair, while the township network was thought to need less attention due to lower traffic densities.

Finally, a general trend was noted whereby funds designated for highway use are being diverted to non-highway programs. These funds are being used for some highway-related activities (such as funding the Highway Patrol), but are also used for completely unrelated purposes such as economic development. Funding programs for highway finance are developed to provide stable budget necessary for proper long-term highway planning, maintenance, and construction. Any deviation from these long-term programs causes difficulty in maintaining the state's road systems at their expected quality levels.

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