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Alternative Solutions to Railroad Impacts on Communities

Phase I

Problem Identification

October 1981

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ALTERNATIVE SOLUTIONS TO RAILROAD IMPACTS ON COMMUNITIES

PROBLEM DEFINITION

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FOR

MINNESOTA DEPARTMENT OF TRANSPORTATION
NORTH DAKOTA STATE HIGHWAY DEPARTMENT

OCTOBER 1981

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PHASE I SUMMARY REPORT

INTRODUCTION

This report presents a summary of the first phase of a study to identify community problems resulting from railroad operations and community activity conflicts. The purpose of this study is also to develop low-cost ways to resolve these problems. The study area is shown in Exhibit 1. It is the Burlington Northern Railroad mainline corridor from Beach, North Dakota to Fargo/Moorhead, from there to Staples, Minnesota, and then branching to the vicinity of Minneapolis and Duluth/Superior. The study was initiated as a result of (1) the formation and activities of the Rail Traffic Task Force, and (2) the increasing significance of the coal train impact issue nationally.

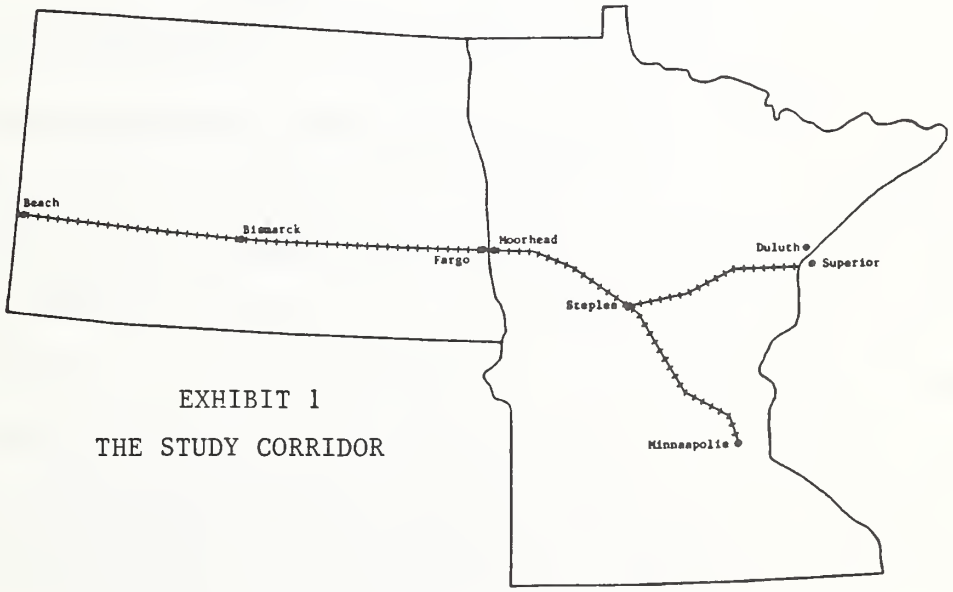

EXHIBIT 1
THE STUDY CORRIDOR

In 1976, a unique organization called the Rail Traffic Task Force was formed. The Task Force is a voluntary group of Minnesota and North Dakota communities organized to identify and resolve community problems resulting from railroad operations. The Task Force members recognize that the Burlington Northern Railroad has had a substantial positive affect on the approximately 80 communities located in the corridor, for many years serving as a major employer and providing essential freight transportation links to the rest of the country. It continues to play this vital role in the development and well-being of these communities.

On the other hand, the location of the railroad mainline within these communities and the local rail service provided to them has created conflicts with community activities. The Task Force has contended that the increase in coal traffic in the corridor has significantly increased the severity of these conflicts. Task Force members as well as other communities are also concerned that if projected increases in rail traffic occur, the conflicts will become even more serious. The concerns of the Task Force and the actions it has taken to express these concerns are largely responsible for the conduct of this study.

The efforts of the Task Force and the commitment of the States of Minnesota and North Dakota and the Burlington Northern Railroad to address the community problems attracted the attention of the U.S. Departments of Energy and Transportation. The Departments were attracted by the opportunity to conduct a prototype study of community impacts of railroad operations, particularly unit coal train operations. As coal has come to play a more significant role in meeting the nation's energy requirements, the community impacts of unit coal trains have become an increasing concern of the federal government. Consequently, the U.S. Departments of Energy

and Transportation have joined the Minnesota Department of Transportation, the North Dakota State Highway Department, the Burlington Northern Railroad and the Rail Traffic Task Force in jointly sponsoring this study.

STUDY OVERVIEW

To accomplish the objectives of the study, a three-phase work program is being conducted.

Phase I did the following:

- Identified the railroad operation/community problems (existing and perceived) in the corridor
- Determined in which communities problems occur
- Determined which communities have the most severe problems
- Chose six communities for more indepth case study.

Phase II will do the following:

- Define and describe impact problems in each selected community
- Identify alternative low cost solutions to resolve community impact problems in these communities
- Evaluate the alternatives and propose implementation of a minimum of ten as demonstration projects
- Identify funding sources for the demonstration projects.

Phase III will do the following:

- Implement the demonstration projects
- Determine the effectiveness of each project in resolving community problems
- Determine the applicability of the projects in other communities.

PHASE I APPROACH

This report summarizes the findings of the Phase I effort which was based on an extensive data collection program. The data collection components included:

- A mail survey of 12,000 randomly selected corridor residents (about 25% of the surveys were returned)
- Interviews and public meetings with corridor community officials and residents (over 30 communities were represented)
- Interviews with State and Burlington Northern Railroad officials
- Field observations of corridor communities.

Information on 47 of the 77 corridor communities was obtained from these sources.

The data obtained represent personal experience and opinions of those surveyed or interviewed during Phase I of the study. These data reveal problems which exist and provide insight into their relative magnitude. They do not fully establish the actual magnitude of the problems (e.g., number of fatal accidents per year). This will be done in Phase II.

PROBLEMS OCCURING IN CORRIDOR COMMUNITIES

The discussion in this section presents the highlights and results of the analysis of data obtained during Phase I. More detailed documentation of these findings is presented in the Phase I final report. The report is available upon request from the Minnesota Department of Transportation and the North Dakota State Highway Department.

A significant finding of Phase I is that the following basic types of problems were identified as existing or perceived to exist throughout the corridor:

- Pedestrian safety
- Vehicle safety
- Emergency vehicle delay
- Delays in traveling to and from work and school
- Delays in traveling to and from personal business and social activities
- Noise, air pollution, and other environmental disturbances
- Community development problems such as inhibition of economic or residential growth, distribution of economic activity away from preferred locations, and reduced community attractiveness.

All corridor communities for which information was obtained experience at least one of these seven basic problems. Of these problems, concern for delay to emergency vehicles was expressed most often by survey respondents. The relative extent and severity of this problem, as well as the other problems, varies considerably among communities.

For the purposes of this study, communities were ranked in terms of relative overall problem severity. This judgement was based on analysis of the survey responses from each community as well as the information provided in personal interviews with community officials and the public meetings held throughout the corridor.

- The sum of the percentage of respondents who perceive each problem to be severe or very severe in their community. (The justification for using this information is that communities with a larger percentage of their population experiencing a series of serious problems are more severely affected by railroad

operation/community activity conflicts than communities with less extensive problem incidence.)

- The percentage of respondents who perceive at least one problem to be severe or very severe in their community. (This is an indicator of the percentage of the population which experiences at least one serious problem. The justification for using this information is that a community with a larger percentage of population perceiving a serious problem is more severely affected by railroad operations/community activity conflicts than a community with a smaller percentage of its population perceiving a serious problem.)

- The frequency with which a community is one of the top ten most severely impacted communities by problem area. (The purpose of this information is to compensate those communities which are among the most severely affected communities in several problem areas but which do not rank well in terms of the other information noted above.)

Based on this information, the thirty communities represented in the survey were divided into three groups of ten--those with relatively high, medium and low overall problem severity.

Communities which were not represented in the survey were given a high, medium or low rank based on an understanding of their problems gained through interviews with community officials and residents, interviews with state government and railroad representatives, and field observations. These communities were ranked consistent with the rankings of the communities represented in the survey through comparative examination of problem descriptions. The communities designated as having the most serious overall problems are as follows:

Beach, ND	Hebron, ND	Perham, MN
Brainerd, MN	Jamestown, ND	Sauk Rapids, MN
Carlton, MN	Little Falls, MN	Staples, MN
Casselton, ND	Moorhead, MN	Wadena, MN
Elk River, MN	New Salem, ND	

Considerable caution is urged in using this list of communities to establish program priorities because one or more serious problems may exist in the lower ranked communities. In fact, of the thirty communities represented in the survey, 21 identified that they perceived at least one problem to be severe or very servere in their community.

EXAMPLES OF COMMUNITY PROBLEMS

A summary of the problems identified in the survey, interviews, and public meetings are listed below. The examples are organized by the seven basic problem types previously identified in this report.

- Pedestrian Safety

  -In several communities, a large portion of the elderly population resides on the side of the mainline opposite to the central business and commercial area. Often these people do not have access to automobiles or by preference travel by foot. As train traffic has increased in the corridor, there has been growing concern for the safety of elderly pedestrians who cross the mainline for personal business or social activities. In addition, some communities are concerned that the elderly population is becoming increasingly isolated from the rest of the community due to pedestrian safety fears and delays.

  -In one community, a new swimming pool is nearing completion. The pool is located on the south side of the mainline adjacent to the community golf course. Because two-thirds of the population resides on the north side of the mainline, the community is concerned about the potential safety hazard for children crossing the mainline to go swimming.

  -A problem occurring with increasing frequency is children crawling underneath standing trains to avoid being late for school or to avoid waiting for the train to move so that they might proceed to their destination.

- Vehicle Safety

  -In some communities, local switching operations often activate the gates at a crossing even though the train will not use the crossing. In other communities, the gates are activated by trains standing while the crew takes a break or a crew change occurs. These false warnings at crossings may last up to 20 minutes. Used to this experience, motorists have begun to ignore the warning signals with increasing frequency by weaving their vehicles through the gates. Several fatal accidents have resulted from this practice because the motorist failed to see a train coming from a direction opposite to the switch operation or standing train. In one community, trucks carrying combustible cargo frequently ignore the warning devices. A collision with a train and one of these trucks could produce a major disaster in the community.

  -In many communities, the vehicle safety problem results in part from visual obstructions created by sharp curves in the track, and grain elevators, lumber yards, and other rail user facilities located adjacent to the mainline crossings.

  -Steep approaches to grade crossings have caused accidents in some communities. The steep approach obstructs the motorist's view of trains. Also, to make it up and over the crossings, particularly in icy conditions, drivers will get up speed and are unable to stop if a train is coming.

- Environmental Problems

  -Some communities, where residential areas are located near the railroad, are annoyed by train whistles that are blown late at night.

  -As a result of lengthy vehicle delays at railroad crossings on major roadways, some communities report pollution problems. When the delays occur during peak time periods of the day, lengthy queues of idling vehicles are created.

  -In one community the natural buffer of trees between a residential development and the mainline and railroad yard was removed to provide space for yard expansion required to satisfy growing demand. With the removal of

this barrier, the community is no longer shielded from the yard operations. Property values are said to have declined as a result of the visual intrusion.

- Delays to Emergency Vehicles

-For many communities, a central cause of this problem is the existence of only one fire station, or one hospital, or one ambulance service which must serve population on both sides of the mainline. When the grade crossings are blocked, a more circuitous route to respond to emergencies is required. In emergency situations, a delay in reaching the emergency location could be critical. For example, a slaughter house, the major employer in one community, burned to the ground because the fire engine company was delayed in arriving at the scene by 20 minutes at a railroad grade crossing.

-Other communities' emergency vehicle access problems are complicated by community development patterns and geography. For example, in one community, the residential area is shaped like a triangle with the mainline bordering two sides and a river bordering the third side. Emergency services are provided from another part of the community making delays to emergency vehicles a potential problem. Geographic barriers, particularly lakes and rivers, occur frequently in corridor communities and complicate the vehicle delay problem.

-The anger caused by delay of emergency vehicles at rail crossings is as much a part of the problem as the actual losses resulting from these delays. Residents related emotional descriptions of the intense anxiety created when a relative accompanies a person in the ambulance and the ambulance is delayed at a crossing on the way to the hospital.

- Delays to Work and School

-In one community, children are bused across the mainline for a special lunch program. Often they are delayed at crossings going to and from their lunch location. The delays mean a particularly short time for lunch or shortened classroom time.

-Many community members express frustration in commuting to work because of blockage by trains. Sometimes they leave with time to spare but are blocked by a train for 20 minutes and reach work late. Other times they leave early and arrive at work extremely early. The unpredictability of delays is as frustrating as the length of delays.

- Delays to Shopping & Recreation

-Many of the communities are located near prime recreation areas. The population in these communities often doubles or triples during the summer. When trains block access to the recreation areas large congestion problems are created in the communities which disrupt community activities as well as delay vacationers.

-Most corridor communities are too small to support more than one shopping and business area. Further, the shopping and business area has developed along one side of the mainline while the residential areas are dispersed on both sides. Often the population split by the mainline is in a 35%/65% ratio. Consequently, a significant portion of most communities' residents are subject to delays traveling to/from shopping areas.

- Economic Development

-In several cases the community's growth is constricted by geographical limitations such as rivers and lakes. These communities have developed across the railroad track from the main part of the community where the only available land exists. In other communities existing infrastructure makes development on the "wrong side of the tracks" an economic necessity. These developments further split the communities and increase the incidence of conflicts.

-In some communities development decisions have been made with no regard for the community/railroad conflicts which will be created. An example is a community currently located predominantly on one side of the mainline which has planned a major residential development on the other side of the mainline.

-In some communities, the closeness of the mainline to the CBD or other economic centers has created the fear of derailment as train traffic has increased. While the problem in this case is more one of expectation than a history of accidents, there have been isolated cases where derailments have done substantial damage to adjacent properties.

FACTORS CONTRIBUTING TO COMMUNITY PROBLEMS

Exhibit 2 illustrates the factors contributing to community problems. The asterisks identify the factors cited most frequently by corridor residents and officials in the interviews, public meetings and surveys.

Exhibit 3 presents the dynamic relationship between community activities and railroad operations which gives rise to community problems. Basically, Exhibit 3 shows that the blocking of grade crossings within communities by railroad operation conflicts with community activities and development, thus creating the seven basic problems previously defined.*

Through analysis of railroad operations and community conflicts identified by communities throughout the study corridor, an understanding of the factors which create the problems and determine their severity has been developed. For example, it was learned that the perception, expressed by many at the outset of this study, that increased coal train traffic in the corridor is solely responsible for the problems being experienced by

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* Although some problems reported were not the result of grade crossing blockage, (e.g., disturbances to land uses adjacent to the mainline), most of the significant problems (i.e., those reported most frequently and those thought to be most serious by community officials and residents) are related to blocking of grade crossings. Thus, the discussion focuses on these problem types.

EXHIBIT 2

FACTORS CONTRIBUTING TO COMMUNITY PROBLEMS

Community Transportation System

No grade separated crossings*

At grade crossings close/blocked simultaneously*

Grade separation inadequate

Outdated, inadequate warning devices*

Visual obstruction near rail right-of-way*

Icy roads

Steep approaches to grade crossings

Poorly maintained grade crossings

Volume of vehicle traffic*

State Highways in Communities*

State highway traffic diverted through communities by blocked crossings

Number of crossings and their spacing*

Angle of Roadway approach to crossing

Location of warning signals

Lack of pedestrian crossings*

Community/Railroad Communication

Do not know who to contact concerning problems*

Receive incomplete or inconsistent data

Lack of railroad/emergency vehicle communication*

Railroad not responsive to requests or complaints

Behavior Patterns

Possible misperception of problem severity

Violation of crossing warning signals*

Large volume of pedestrian traffic*

Community Service Patterns, Equipment, and Facilities

One emergency station serving areas on both sides of the mainline*

School bus routes require crossing mainline*

Transit bus routes require crossing mainline

Location of community recreation facilities vis-a-vis mainline*

Community Activities and Development Patterns

Percentage of community split by the mainline*

Geographic barriers to development and access*

Significant seasonal variations in population/traffic*

Location of storage tank with combustible chemicals adjacent to mainline*

Location of new or planned development*

Location of available land for development

Infrastructure in place

Separation of commercial and business area from residential area by main line*

Separation of residential areas from school, shopping, work and recreation areas by the mainline*

Development on soft soil foundation

Railroad Operating Practices

Crew change location*

Local switching operations*

Train speed*

Train length*

Train volume*

Standing trains which block crossings*

Time of day switching operations occur*

Unpredictability of train movements*

Idling trains

Activation of warning signals when unnecessary*

Railroad Facilities

Inadequate spur or siding length*

Mechanical versus automatic switches

Locations of train verifiers

Number of mainlines

Location of switching operations*

Not well maintained right-of-way*

Location of yards*

Condition/age of tracks and structures

Track configuration

Location of maintenance facilities

Refueling location

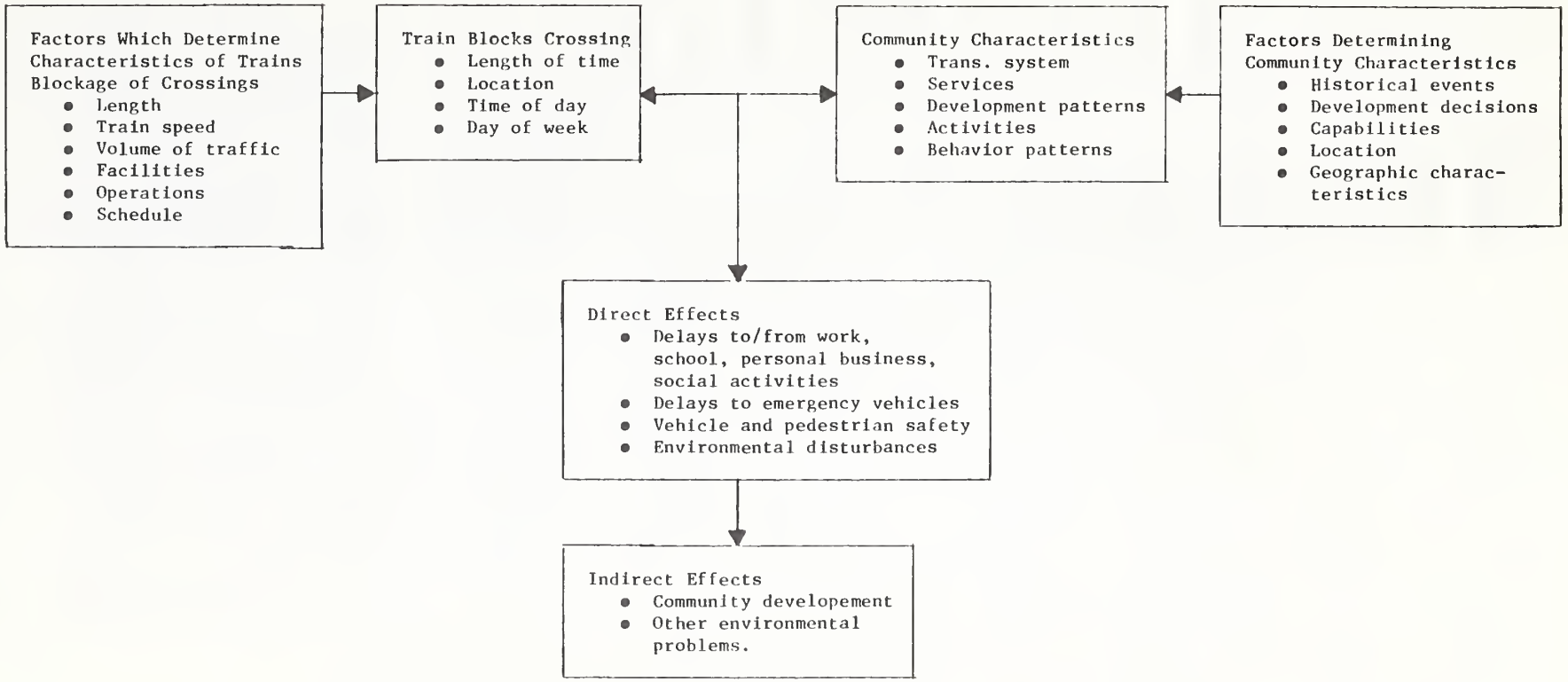
***Factors cited most frequently by community officials and residents.**

Source: Personal interviews, public meetings and survey research conducted by Ernst & Ernst, December 1978 - February 1979.

EXHIBIT 3

INTERRELATIONSHIP OF FACTORS CONTRIBUTING

TO COMMUNITY PROBLEMS



the communities is not correct. There are two reasons why coal trains may be readily perceived as problems by the communities. First, because of the sameness of equipment, unit coal trains are easily identified. Second, the major increase in total train traffic in the corridor since 1971 has been due to unit coal trains.

Although unit coal trains may be a significant factor in the development of community problems, based on the information collected in Phase I, they have not created any unique problems, nor are they the sole cause of any of the problems currently existing in the corridor. Rather, it is the cumulative effect of a mix of railroad operations in interaction with community characteristics that create the problems existing in corridor communities. Also, the relative contribution of unit coal trains to these problems differs among communities. The contribution is a function of traffic volume, train operations conducted, the characteristics of rail facilities, and the characteristics of the community.

Exhibit 4 compares unit coal trains, merchandise trains and local freight trains in terms of the factors presented in Exhibits 2 and 3. The final column of Exhibit 4 presents the implications of the differences among the train types. Based on this information, several observations concerning the relative role of unit coal trains in the development of community problems can be made.

- In most communities, the types of operations conducted by unit coal trains differ only marginally from those conducted by merchandise trains. Consequently, the types of problems to which these trains contribute are the same. This conclusion is substantiated by the fact that the types of problems existing in communities with predominantly coal train traffic differ only marginally from those in communities with predominantly non-coal train traffic. The magnitude of the coal trains'

UNITIES

CHARACTERISTICS		ION OF THOSE PROBLEMS
Average Train Speed Through Communities (mph)1/ Loaded - Empty Average Train Length (feet)2/		paaing for a longer period of time than the average merchandise train due to the its longer length. However, the difference is not large. The approximate time rom 1.5 to 3.4 minutes depending on the speed of the train. The range for the utes. (These calculations exclude consideration of operations which affect train rossings for the smallest amount of time. The speed of the local train may be is subatantially shorter.
Average Daily Volume (trains)		ssing blockage caused by through train movements varies among communities due to experienced by communities on the average day. Using the blockage time and the ntribution of coal unit trains is 62% west of Casselton, 27% between Casselton and om Staples to Carlton and 2% from Becker to Minneapolis. a through train movement, is negligible relative to coal unit trains and
Schadule (time of day, day of week, saason of year)		The volume of trains passing through a community can vary considerably in y of week and time of year. Thus, the nature and extent of railroad operation/ lay to day, etc.
Mainline Traffic Volumes	Operations mus with nther mai	he operation of all trains in similar ways. The specific effects will depend e trains converge. To interact with other traffic may reguire (1) use of sidings nts, (2) queuing as train operations preceeding the queuing train(s) are conducted ards) and similar operations. The deceleration, stopping and acceleration required f time a croasing is blocked. The blockage time can be as long as 45 minutes ts interviewed. nit trains may be affected differently than the merchandiae traina by these are not long enough to accommodate the 6,000' trains unless the traina extend nit trains also will block more crosaings simultaneoualy than other trains when nit trains makes deceleration and accelerstion a slower process relative to the ta of mainline traffic volume may be more significant for coal unit trains than e railroad operating practice is to give priority to coal unit trains in through
Entering and Exiting Yards	Required tn co tion (at Manda train maintena verification (bad car orders tions occur.) Are affected b i.e., can requ as preceeding	ation, stopping (if a mechanical switch must be thrown) and acceleration. Thus, amount of time adjacent grade crosaings are blocked. (Yard operations themselves turb adjacent land uses, e.g., in Mandan. However, this type of problem was in which yards are located.) Most yard operations involve pick-upa and set-outa ns. To a conaiderably lesser extent merchandise trains are involved in theae yard se trains use the yards only for the purposea of inspection, verification and y are similar to coal unit trains in this regard. ted by other trains entering and exiting yards. See comments under "Mainline teraction.
Crew Changes, Refueling, Track Changes and Similar Operatinns	These nperatio	celeration. As noted above, these movementa increase the amount of time crossings icsnt for coal unit trains. (See comments under "Mainline Traffic Volumes.") d set-out work they conduct in the communitiea, account for the largest share of fer little in the frequency with which these operationa are conducted or the locstion

1/ Variation in speeds is due to a variety of factnrs such as trns perform (e.g., entering and exiting a yard). The variations due to operstions conduct

2/ Merchandise trains may range in length from 3,300' to 7,150' t

3/ This is the average number nf trains per day nperating in coves in one direction or snother.

4/ Source nf train characteristics: Burlington Northern, Inc., M

[illegible] is not correct. There are two reasons why coal trains may

EXHIBIT 4

COMPARISON OF TRAIN TYPES IN TERMS OF CHARACTERISTICS WHICH DETERMINE RAILROAD OPERATION IMPACTS ON COMMUNITIES

CHARACTERISTICS	TYPE OF TRAIN			IMPLICATIONS FOR COMMUNITY PROBLEMS AND ATTRIBUTION OF THOSE PROBLEMS
	Coal Unit train	Merchandise Train	Local Freight Train	
Average Train Speed Through Communities (mph)[1/]				• The average unit coal train will block a crossing for a longer period of time than the average merchandise train due to the combination of its lower average speed and its longer length. However, the difference is not large. The approximate time a coal unit train blocks crossings ranges from 1.5 to 3.4 minutes depending on the speed of the train. The range for the average merchandise train is 1.3 to 3.0 minutes. (These calculations exclude consideration of operations which affect train speeds as indicated below.)
Loaded.	20 - 45	20 - 55	20-55	
Empty	20 - 55	20 - 60		
Average Train Length (feet)[2/]	5,900'	4,900'		• The local freight through movement blocks crossings for the smallest amount of time. The speed of the local train may be lower than the other trains but its length is substantially shorter.
Average Daily Volume (trains)	1/2 - 13	1 - 22	1[3/]	• The contribution of coal unit trains to crossing blockage caused by through train movements varies among communities due to the variation in train volume by train type experienced by communities on the average day. Using the blockage time and the train volume by train type, the relative contribution of coal unit trains is 62% west of Casselton, 27% between Casselton and Staples, 19% from Staples to Becker, 52% from Staples to Carlton and 2% from Becker to Minneapolis. • The contribution of local freight trains, as a through train movement, is negligible relative to coal unit trains and merchandise trains.
Schedule (time of day, day of week, season of year)	Not Predictable	Not Predictable	Not Predictable	• Through train movements are not predictable. The volume of trains passing through a community can vary considerably in terms of mix of train types, time of day, day of week and time of year. Thus, the nature and extent of railroad operation/community activity conflicts can vary from day to day, etc.
Mainline Traffic Volumes	Operations must be conducted to interact with other mainline trains.	Same as Coal Unit Trains	Same as Coal Unit Trains	• The volume of mainline traffic will affect the operation of all trains in similar ways. The specific effects will depend on the rail facilities at the locations where trains converge. To interact with other traffic may require (1) use of sidings to clear the mainline for other train movements, (2) queuing as train operations preceeding the queuing train(s) are conducted (e.g., track changes, entering and exiting yards) and similar operations. The deceleration, stopping and acceleration required by these operations can prolong the amount of time a crossing is blocked. The blockage time can be as long as 45 minutes according to community officials and residents interviewed. • The longer and heavier on the average coal unit trains may be affected differently than the merchandise trains by these operations. Many sidings along the corridor are not long enough to accommodate the 6,000' trains unless the trains extend into the grade crossings. The longer coal unit trains also will block more crossings simultaneously than other trains when standing in queue. The weight of the coal unit trains makes deceleration and acceleration a slower process relative to the lighter merchandise trains. Thus, the effects of mainline traffic volume may be more significant for coal unit trains than other trains. To minimize these effects, the railroad operating practice is to give priority to coal unit trains in through movements, insofar as possible.
Entering and Exiting Yards	Required to conduct 500 mile mandatory inspection (at Mandan and Northtown), unscheduled train maintenance (at major terminals), train verification (at Northtown), and correction of bad car orders (Mandan). (Few bad order operations occur.) Are affected by other trains' use of yards, i.e., can require speed reductions or queuing as preceeding trains enter or wait the yards.	Required to conduct 500 mile inspection, unscheduled maintenance, train verification and pick-up and set-out operations. These operations are conducted in same locations as for coal unit trains. Pick-up and set-outs are conducted only at the major mainline terminals. (e.g., Mandan, Dilworth, Northtown). Many merchandise trains do not conduct pick-up and set-out operations in the corridor. Few if any of these trains conduct pick-up and set-out operations in all major terminals. Are affected by other trains' use of yards, i.e., can require speed reductions or queuing as preceeding trains enter or exit the yards.	Required principally to Conduct pick-up and set-out operations.	• Entering and exiting yards requires deceleration, stopping (if a mechanical switch must be thrown) and acceleration. Thus, entering and exiting yards can increase the amount of time adjacent grade crossings are blocked. (Yard operations themselves can create community problems when they disturb adjacent land uses, e.g., in Mandan. However, this type of problem was infrequently cited by corridor communities in which yards are located.) Most yard operations involve pick-ups and set-outs and are conducted by the local freight trains. To a considerably lesser extent merchandise trains are involved in these yard operations. However, many of the merchandise trains use the yards only for the purposes of inspection, verification and unscheduled maintenance. Consequently, they are similar to coal unit trains in this regard. • All mainline train operations may be affected by other trains entering and exiting yards. See comments under "Mainline Traffic Volumes" for the effects of this interaction.
Crew Changes, Refueling, Track Changes and Similar Operations	These operations are conducted by coal unit trains and merchandise trains at similar locations.		Operations are conducted in the yards or in local communities in which local switching operations are conducted.	• Require train deceleration, stopping and acceleration. As noted above, these movements increase the amount of time crossings are blocked; the effects may be more significant for coal unit trains. (See comments under "Mainline Traffic Volumes.") • Local freight trains, through the pick-up and set-out work they conduct in the communities, account for the largest share of these types of operations. • Coal unit trains and merchandise trains differ little in the frequency with which these operations are conducted or the location in which they are conducted.

[1/] Variation in speeds is due to a variety of factors such as track configuration and condition and local speed ordinances. Thus, the speeds of the trains vary in the same direction at any given location. Speeds also vary as a function of the operations trains perform (e.g., entering and waiting a yard). The variations due to operations conducted are not included in the speed ranges. Rather, the implications of operations on community problems are treated separately.

[2/] Merchandise trains may range in length from 3,300' to 7,150' but are usually closer to the average 5,500'. Local freight trains cannot be accurately typified in terms of average length; the size varies considerably.

[3/] This is the average number of trains per day operating in communities. The number of movements conducted by this train vary tremendously among communities, e.g., from 1 to 25 per day on the average. Movements is defined as the number of times the train moves in one direction or another.

[4/] Source of train characteristics: Burlington Northern, Inc., May 1979.

contribution to problems in a given community, however, may differ significantly from merchandise trains for reasons stated below.

- For through train movements under free traffic flow conditions, coal trains will block more crossings simultaneously for a slightly longer period of time than other trains. The difference between the coal and merchandise trains in this regard, however, is insignificant.

- Where both coal trains and merchandise trains conduct yard operations, or other operations requiring deceleration, stopping and acceleration, unit coal trains will block more crossings simultaneously for a slightly longer period of time than the merchandise trains.

- In some communities, merchandise trains conduct set-out and pick-up operations in the yards. In these communities, the merchandise trains may block crossings for a longer period of time than coal trains if the latter do not conduct and are not affected by trains entering and exiting the yards.

- The relative volume of unit coal trains versus other trains varies among communities. West of Casselton, North Dakota, coal trains predominate. East of Casselton, merchandise trains predominate. This suggests that unit coal trains are a more significant contributing factor west of Casselton. The observation is consistent with comments made during the interviews and public meetings.

- There are definite operating differences between unit coal trains and local freight trains. Thus, the problems which each of these trains create may differ. Alternatively, they may contribute to the same problem in a community in different ways.

- Because most of the operating characteristics of unit coal trains and merchandise trains are similar, many, but not all, potential solutions used to address problems created by these trains are similar. Due to the large differences between unit coal trains and local freight trains, potential solutions for problems involving these train types differ more frequently.

During Phase II, a review of historical records and on-site observation of train operations in each case study community will provide

the quantitative data required to draw more precise conclusions concerning the contribution of coal unit trains to community problems.

FUTURE PROJECTIONS

The uncertainty of the nation's energy future and proposed environmental regulations makes it difficult to forecast what the magnitude of change in train traffic will be. Currently, projected levels of traffic on the mainline show increases in traffic volumns that range from 4 to 40 percent along corridor segments by 1983 (see Exhibit 5). Based on these projections, it appears that the extent and severity of the perceived problems will continue to increase.

SOLUTIONS TO CORRIDOR PROBLEMS

Based on the Phase I analysis, it is evident that low cost solutions are possible. Exhibit 6 presents a preliminary list of potential low-cost solutions. These possibilities will be further evaluated in the remainder of the study to determine how effective they may be and if they are indeed low in cost.

CASE STUDY COMMUNITIES

In Phase II, specific problems in six case study communities will be analyzed. A minimum of ten projects demonstrating solutions for problems will be recommended for implementation in these communities. The communities selected as case studies are listed below. The numbers in parentheses are the approximate populations of the respective communities.

- Beach, North Dakota (1,400)
- Casselton, North Dakota (1,500)

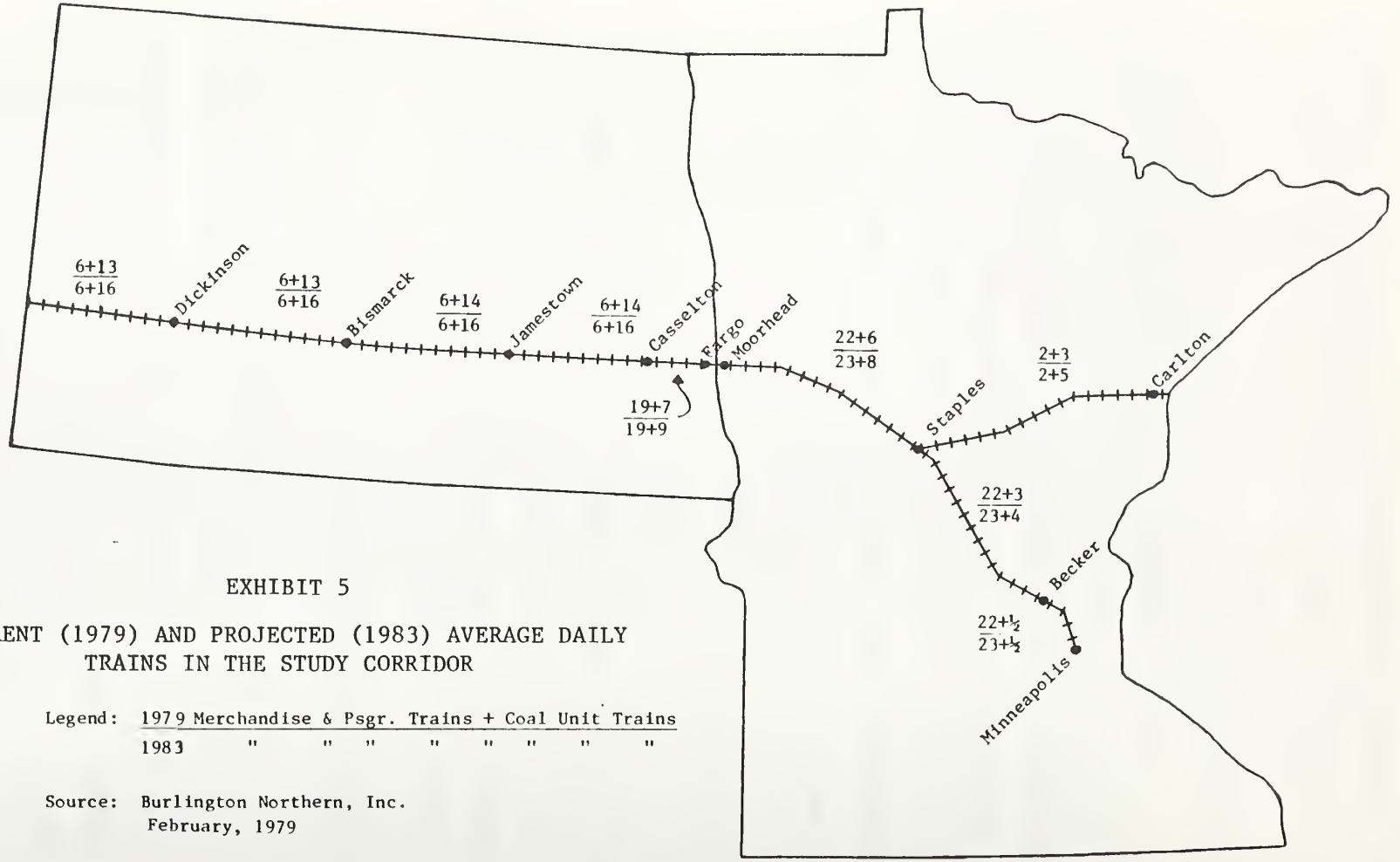


EXHIBIT 5

CURRENT (1979) AND PROJECTED (1983) AVERAGE DAILY TRAINS IN THE STUDY CORRIDOR

Legend: 1979 Merchandise & Psgr. Trains + Coal Unit Trains
1983 " " " " " " " "

Source: Burlington Northern, Inc.
February, 1979

EXHIBIT 6

PRELIMINARY LIST OF POTENTIAL LOW COST SOLUTIONS TO RAILROAD/COMMUNITY CONFLICTS

Railroad Operating Practices

Ensure standing and local switching trains do not activate warning devices unnecessarily

Ensure trains do not stand in crossings unless necessary

Do not idle engines while trains are standing for long periods of time

Control train speeds through communities

Consolidate traffic on a single line

Divert traffic to alternative routes

Change switching operations schedules

Establish procedures to break trains in emergency situations

Railroad Facilities

Change location of train verifiers

Change location of crew change points

Improve maintenance and appearance of track right-of-way

Extend sidings; construct additional sidings

Straighten track alignment

Upgrade warning device activators

Upgrade switches

Change location of switching operations

Decrease derailment possibilities

Change train refueling location

Change train maintenance location

Community Transportation Facilities

Widen street at grade crossing

Locate additional warning devices farther from crossing

Improve crossing maintenance

Improve crossing and crossing approach maintenance in winter

Improve or upgrade warning devices

Divert traffic to alternative routes

Designate emergency vehicle only routes

Extend gate arms

Modify approach gradients

Synchronize warning signals and traffic lights

Develop/improve pedestrian crossings

Construct new at grade crossings

Close at grade crossings

Railroad/Community Communication

Establish communications between emergency service providers and local train controller

Establish communication channels between railroad and community officials

Community Development Patterns

Remove visual obstructions adjacent to the main line

Conduct preventive planning and related actions such as zoning and infrastructure development

Relocate storage facilities containing combustible products away from the main line

Community Services

Outfit firefighters with personal emergency equipment

Acquire new fire equipment and construct new fire sheds

Reroute school buses

Reroute transit vehicles

Establish special emergency vehicle routes

Establish alternative emergency medical procedures

Establish coordination between jurisdiction fire services

Behavior Modification

Market to promote area development

Campaign to change people's perceptions of problems

Conduct safety education programs

Enforce laws against violating warning signals

Source: Personal interviews, public meetings and survey research conducted by Ernst & Ernst, December 1978 - February 1979.

- Elk River, Minnesota (7,000)
- Hebron, North Dakota (1,100)
- Moorhead, Minnesota (30,000)
- Sauk Rapids, Minnesota (5,000)

These communities are representative of other communities in the corridor in terms of community characteristics, problems experienced, causes of those problems, and potential solutions to those problems. Thus, by selecting these communities, information and procedures to identify the most cost-effective ways to resolve problems in the remaining communities can be developed.

FUNDING

Funding is another issue that will be addressed in Phase II. The basic question is who should fund implementation of solutions to railroad operation/community activity conflicts. According to respondents to the survey, a variety of parties should contribute to financing the solutions. These parties include state and federal governments, the railroad, local businesses, and the residents themselves. Significantly, in some communities 50% of the residents (as represented by survey respondents) indicated they would be willing to increase their taxes to help pay for solutions to their problems.

CONCLUSION

Phase I has provided important insight into the problems arising from railroad operation/community activity conflicts in the corridor. Communities throughout the corridor are experiencing seven basic types of problems: (1) pedestrian safety, (2) vehicle safety, (3) emergency vehicle

delays, (4) delays traveling to and from work and school, (5) delays traveling to and from business and social activities, (6) environmental disturbances, and (7) community development problems. All communities for which data were obtained experience at least one of the problems. Many of the communities experience several problems.

Corridor-wide, emergency vehicle delay and vehicle safety are perceived to be the most serious problems. The extent and severity of these problems from community to community vary considerably. Further, the relatively severe problems are not concentrated in a small group of communities. Rather, the list of most severly affected communities varies by problem type being considered.

A variety of factors contribute to problem extent and severity. The problems are not caused solely by increased coal train traffic. Rather, they are the result of the interaction of a variety of community characteristics, railroad operations and rail facility characteristics. Similarly, projected growth in both railroad operations and community size and development patterns suggest the problems will increase in severity in the future.

There appear to be low-cost solutions to some of the problems experienced by many of the communities. Consistent with the problems' causes, these solutions range from changing community activity patterns to changing railroad operating practices. Which of these potential solutions are the most cost-effective, remains a question.

Finally, it is apparent that, even if it were practical to divert railroad operations away from corridor communities, this would not be a favored strategy. The communities recognize that the railroad has played, and will continue to play, a vital role in their development and

well-being. Eighty percent of all respondents to the survey stated that their community benefits from railroad operations. Even in the most severely affected communities, the percent of respondents who stated that their community benefits from railroad operations is high (not less than 65%). While corridor residents want to resolve the problems created by railroad operations/community activity conflicts, they do not want to lose the benefits accruing to them as a result of rail service in their communities.

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