Final Report

Nebraska Transit Corridors Study

Prepared for
Nebraska Transit and Rail Advisory Council

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

HWS
Consulting Group Inc.

December 23, 2003

Nebraska Transit Corridors Study
Commuter Rail and Express Bus Options Evaluation

Final Report

Prepared for:

Nebraska Transit and Rail Advisory Council (NTRAC)
Assisted by the Nebraska Department of Roads (NDOR)

Prepared by:

Wilbur Smith Associates
and
HWS Consulting Group

December 23, 2003

Executive Summary
NEBRASKA TRANSIT CORRIDORS STUDY

PROJECT OVERVIEW

The increasing suburbanization of metropolitan areas across the United States has prompted a remarkable revival of regional transit. For the first time in decades, several new commuter railroads have been introduced. States also are continuing a trend in sponsoring new intercity rail passenger services. Where either commuter rail or intercity rail is not appropriate, public transportation authorities have begun initiating new commuter or express bus and even Bus Rapid Transit (BRT) solutions. All these modes are aimed at one goal – providing enhanced mobility by giving people meaningful choices of how to travel.

This goal is at the heart of the Nebraska Transit Corridor Study. The study was sponsored by the Nebraska Transit and Rail Advisory Council (NTRAC), which was created by the State Legislature in 1999 to assess the transportation demand and needs of current and future commuters. Driving the study is the growth in commuter and intercity trips. Along with this growth is the need for enhanced mobility beyond what can be provided by more lanes for congested roadways.

Accordingly, the purpose of this study has been to identify:

- New transit corridors between Nebraska cities; and
- The modal options appropriate for corridor conditions.

The study has also sought to identify the new steps toward implementation for feasible transit options.

HOW THE STUDY WAS DONE

To accomplish these objectives, the study team performed various essential analyses.

- ***Travel patterns between Nebraska cities.*** The team identified travel patterns between the major Nebraska cities. The Nebraska Department of Roads (NDOR) provided the year 2000 highway volumes for the major population centers in Nebraska. These indicated that the heaviest volumes were in three corridors. One was generally east-west: Kearney-Grand Island-Lincoln-Omaha. Another was generally northwest to southeast: Norfolk-Columbus-Fremont-Omaha. The third was generally north-south: Sioux City-Blair-Omaha-Nebraska City.
- ***Ridership forecasts.*** The team developed ridership for rail and bus intercity and commute services in the three corridors. As a result of this analysis, the corridors were shortened to Lincoln-Omaha, Fremont-Omaha, and Blair-Omaha, for these areas are where more trips were occurring. Further, NTRAC decided to focus on commuters, as commuters comprise the largest identifiable market. Commuter rail between Lincoln and Omaha could generate

between 141,000 and 199,000 riders in 2010. Express bus ridership in the same corridor would be less than half of rail, ranging from 56,000 to 81,000. Bus ridership between Fremont and Omaha would range from about 24,000 to 29,000, and between Blair and Fremont from about 28,000 to 32,000. Intercity rail and bus services would generate small fractions of commuter ridership[1].

- ***Commuter rail operating plan.*** Commuter trains would operate bi-directionally between Lincoln and Omaha during morning and evening peak commuter periods. There would be no weekend service, *per se*. However, trains could serve special events, primarily University of Nebraska Cornhusker football events in the fall. Rolling stock would consist of self-propelled rail cars, also known as Diesel Multiple Units (DMUs), which deliver operating cost savings versus conventional locomotive hauled equipment in light density corridors. Total capital costs for the track improvements, station improvements and rolling stock total $79.3 million. Operating subsidies could range from $3.9 million to $4.2 million in 2010.
- ***Express bus operating plans.*** Express bus services could operate in all three corridors. Buses would run bi-directionally between Lincoln and Omaha during morning and evening peak commuter periods. Buses would run to Omaha from Fremont and Blair in the morning peak and return in the evening peak. There would be no weekend service. Rolling stock would be suburban commuter buses, which have more comfortable seating as compared to urban transit buses. Total capital costs for new park-and-ride facilities and rolling stock, and other amenities total $3 million for Lincoln-Omaha, $2.1 million for Fremont-Omaha, and $2.1 million for Blair-Omaha. Operating subsidies could range from $198,000 to $270,000 in 2010 for Lincoln-Omaha, from $51,000 to $64,000 for Fremont-Omaha, and $18,000 to $24,000 for Blair-Omaha in 2010.
- ***Environmental and social impacts analysis.*** The study team looked at the rail and bus options in terms of their environmental and social impacts. The team considered impacts on land use, recreational areas, noise and vibration, biological resources, existing transportation systems, and on neighborhoods and smaller communities (i.e. environmental justice), among other things. Some potential impacts would be negative while others could be positive. For example, the commuter rail and bus options would increase noise and vibration in various places, but they could have positive impacts also by providing more transit alternatives to neighborhoods and smaller communities. Overall, the team found no environmental fatal flaws in the potential transit options.
- ***Financial and economic assessments.*** The study team analyzed the rail and bus options in terms of three scenarios. Scenario A included rail between Lincoln and Omaha, and express buses between Fremont and Omaha, and Blair and Omaha. Scenario B included express buses running in all three corridors. Scenario C included only express buses running between Lincoln and Omaha. For the financial evaluation, the team looked at performance over a 20-year period. For all three, ridership, revenue and fare box recovery improve over time. However, the financial performances of the bus-only Scenarios B and C are superior to Scenario A, the rail-bus combination option. Rail's comparatively high capital and operating costs push Scenario A's cost per new rider to $61.28 dollars,

[1] Commuter ridership represents daily home to work trips, most of which occur in morning and evening peak periods. Intercity ridership is from all other trips.

assuming a high-side 2010 ridership estimate. Shorn of accompanying bus services and their lower costs per new rider, rail by itself has a cost per new rider of $76.64 in 2010. These costs are well above what is considered good by federal funding authorities. Scenarios B and C have costs per new rider under $11, a level considered good.

On the other hand, the economic evaluation showed that rail generated greater benefits in terms of accident savings, traveler cost savings, and congestion-related time savings. The reason is that rail draws greater ridership than buses, and the economic benefits are driven by ridership. On this basis, more economic benefits accrued to Scenario A than to either Scenario B or C. Even so, the complexities of establishing a new rail passenger service, with its high capital costs and operating subsidies, suggests that the bus-only options would be better public investments – at least for now.

LESSONS LEARNED

The team's analysis supports various observations about commuter rail and express bus options in future Nebraska transit corridors.

- ***Rail's High Cost per New Rider Works against the Potential for Federal Funding –*** Commuter rail's cost per new rider, even when combined with express bus services, is higher than federal agencies such as the Federal Transit Administration consider as eligible for federal funding. Accordingly, it is unlikely that federal funds would be available for commuter rail, as currently envisioned.
- ***Local Funding Sources Need to be Found for Transit Options*** – Without the potential for federal funds, State and local funding sources would be needed for the implementation and ongoing operations of a commuter rail option. Express bus alternatives have more attractive costs per new rider, and may be eligible for federal funds. But the bus options would need a source for covering operating subsidies. A common mechanism for funding transit improvements are sales taxes levied at the State and local levels.
- ***Public Policy Decisions and Employer Action Can Spur Rail Ridership –*** Major public policy decisions, like establishing a mix of higher density residential and commercial uses around stations, can help lower operating subsidies by encouraging rail ridership. Large employers like the University of Nebraska could encourage ridership by subsidizing employees' fares. Such actions could lower a rail transit option's the cost per new rider to within sight of federal funding eligibility.
- ***Transit Integration –*** Both rail and bus options will depend on integration with existing transit operations in Omaha and Lincoln to carry commuters from their trains to their workplaces in the morning and back again in the evening. For both commuter rail and bus, local bus operators will need to modify existing routes. There likely will be revenue and cost impacts in doing so for the local operators. These were not calculated in this study.
- ***Overall Feasibility –*** There are no obvious environmental fatal flaws to any of the options. However, some are more practical and easier to implement than others. On balance, given the high start-up costs and operating subsidies for rail, the bus-only options appear easier and more practical to implement.

TABLE OF CONTENTS

Chapter 5 Commuter Rail Operating Plan

Chapter 6 Express Bus Plans

Chapter 7 Environmental and Social Implications

Chapter 8 Financial and Economic Analysis

Chapter 9 Summary Findings and Evaluation

Appendix A Ridership Comparisons

Appendix B Commuter Rail Costs

Appendix C Bus Park-and-Ride Lots

Appendix D NTRAC Members

List of Tables and Figures

Chapter 1
STUDY PURPOSE AND METHODOLOGY

INTRODUCTION

This chapter outlines the background, purpose, and methodology of the Nebraska Transit Corridors Study. This study began in the summer of 2002 and concluded in December 2003. The study sponsor was the Nebraska Transit and Rail Advisory Council (NTRAC), a State agency established by the Legislature. NTRAC retained consultants Wilbur Smith Associates (WSA), of Columbia, SC, and HWS Consulting, of Lincoln, NE, to study new rail and bus transit options in the Nebraska.

The study determined that there is potential demand for and no apparent fatal flaws with commuter rail and bus options in Eastern Nebraska. However, the lower capital costs for the bus options, a small fraction of what would be required for commuter rail, indicate that the bus options overall are easier to implement than commuter rail. The findings for the study are set forth through the following eight chapters. The study concludes with the next steps needed for implementation of the rail or bus options, or a combination of both.

STUDY BACKGROUND

NTRAC was created by the State Legislature On May 26, 1999. The original 11 members of the Council were appointed by Governor Mike Johanns on June 18, 1999. The diverse membership includes representatives of State and local governments, private railroads, and interested communities. The primary goal of the Council is to assess the transportation demand and needs of current and future commuters, initially between Lincoln and Omaha metropolitan areas, and later between other Nebraska communities. Through the Nebraska Department of Roads (NDOR), NTRAC obtained a federal grant to conduct a study of the feasibility and projected costs of new passenger rail and bus services for the State. In the spring of 2002, NTRAC retained the WSA and HWS study team to complete this study.

STUDY PURPOSE

The purpose of the Nebraska Transit Corridors Study was twofold. First was to identify corridors for new public transit options in Nebraska. This required an assessment of travel patterns between major population centers in the State. The list ultimately narrowed down to three, i.e. Omaha-Lincoln, Fremont-Omaha, and Blair-Omaha. The reason for this focus is that more intrastate travel occurs on these corridors than elsewhere. Table 1-1 below demonstrates this observation.

Table 1-1: Relative Trips between Nebraska Cities

	Omaha	Lincoln	Sioux City	Grand Island	Kearney	Norfolk	Fremont	North Platte	Columbus	Hastings	Lexington	Beatrice	Wahoo	Blair	Seward	Nebraska City	Totals
Lincoln	29,955																29,555
Sioux City	4,725	732															5,457
Grand Island	818	617	64														1,498
Kearney	395	225	34	502													1,156
Norfolk	1,597	315	98	67	28												2,106
Fremont	11,262	1,468	288	52	22	147											13,238
North Platte	135	68	13	32	50	8	6										313
Columbus	1,661	314	93	133	40	293	186	9									2,727
Hastings	476	309	40	1,517	128	28	22	14	45								2,578
Lexington	153	74	14	71	229	10	8	82	12	26							679
Beatrice	881	1,277	37	26	12	15	38	4	14	14	19						2,339
Wahoo	6,176	2,514	97	28	12	45	652	3	49	15	4	36					9,631
Blair	16,540	369	182	19	9	42	618	3	47	7	3	13	83				17,934
Seward	1,033	3,755	35	69	21	15	47	4	14	33	6	37	53	14			5,137
Nebraska City	3,309	153	40	9	4	12	36	2	12	5	2	7	20	28	7		3,644
York	486	593	22	173	33	10	21	5	14	74	8	15	19	7	122	4	1,607
Totals	79,603	12,781	1,058	2,699	589	624	1,633	127	207	173	44	108	174	50	129	4	100,000

Source: Wilbur Smith Associates, based on gravity model

Table 1-1 shows travel patterns suggested by a transportation modeling exercise. From observations of intercity travel, it is known that movements between communities increase both in relation to the size of the communities, and in relation to the distance between the communities. Table 1-1 represents the major travel patterns that might be expected per a base of 100,000 trips between the population centers of Eastern Nebraska, as determined by a gravity model[1] based on population and distance. The table reflects relative expected volumes, rather than precise travel numbers. The significance is that it basically illustrates the same travel patterns as the average highway traffic indicators (shown in Chapter 2), but in slightly different proportions because it does not include any travel generated outside Nebraska except for using the combined populations of Omaha and Council Bluffs, and the combined populations of Sioux City, IA, and South Sioux City, NE. Of the total trips shown above, more than half occur between Lincoln and Omaha, between Fremont and Omaha, and between Blair and Omaha – thus the reason for the focus on these three corridors.

The second purpose was to identify the appropriate modal options for those corridors. Here again the list narrowed to commuter rail between Lincoln and Omaha, and express bus between Lincoln and Omaha, Fremont and Omaha, and Blair and Omaha. Rail lines exist in two corridors, Lincoln-Omaha and Fremont-Omaha. However, only the Lincoln-Omaha corridor would have a ridership that might be considered sufficient to support a commuter rail option, as discussed in Chapter 3. Highways run through all three corridors, and sufficient demand for express bus exists in all three as well.

ANALYSIS METHODOLOGY

The study had four phases, which appear schematically in the Figure 1-1 flow chart.

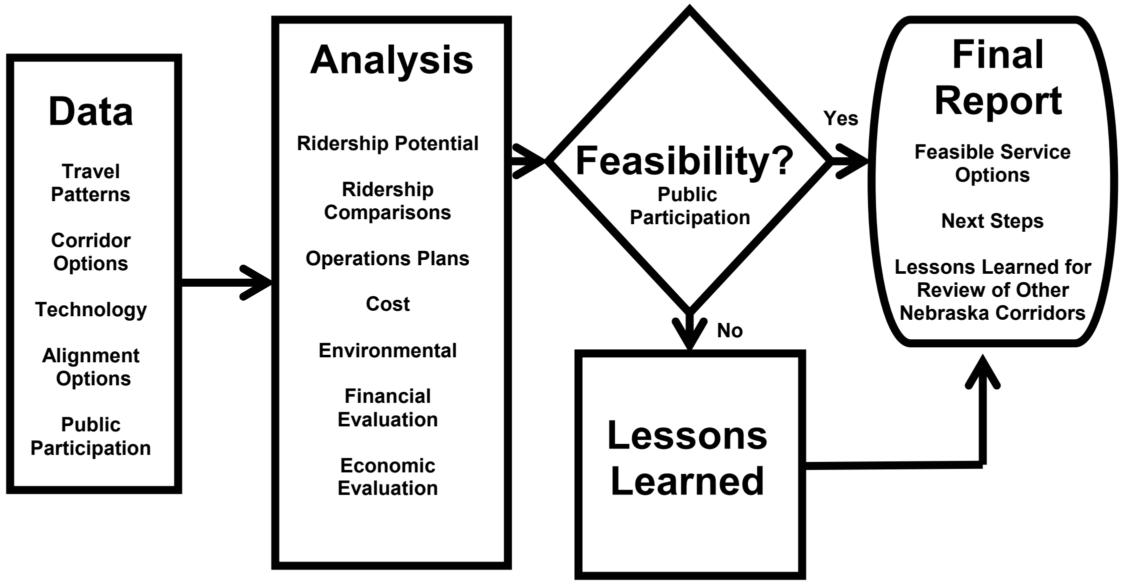
Phase One: Data Gathering

The first phase was for the gathering of data to perform the analysis. The study approach called for collecting specifics on travel patterns, corridor options, and alignment or route options. The data findings of existing conditions are summarized in Chapter 2. The team also gathered detail on specific modal options, i.e. commuter rail, intercity rail, light rail, commuter bus, and intercity bus, to understand the appropriate technologies for candidate corridors. The results of this investigation appear in Chapter 4.

Part of this phase also was the first series of public meetings. These meetings were held in January 2003 in cities which were then part of corridors under study. The cities were Norfolk, Grand Island, Omaha, and Lincoln. At those meetings, the team explained the study purpose and solicited the public's ideas on potential transit services.

[1] A transportation model may also incorporate other relationships, such as travel time or cost, socio-economic factors, and alternative transportation modes. The simplified exercise used for this purpose considered only population and distance.

Figure 1-1 **Analysis Process Flowchart**



Phase 2: The Analysis

The second phase also consisted of numerous elements. During this phase, the study team forecasted ridership for rail and bus options in the assumed service start-year of 2010. The team also collected comparable ridership data from existing rail and bus operations, with similar levels of service and operating conditions, to validate the forecasts. The ridership forecasts appear in Chapter 3.

The team developed modal operating plans, which detailed what commuter rail and bus services would look like and run like. Specifics included schedules, stations locations, rolling stock, and staffing requirements, among other things. From these operating plans and the ridership forecasts (Chapter 3), the team calculated revenue, capital and operating costs. The commuter rail operating plan appears as Chapters 5, and the express bus operating plans appear as Chapter 6.

Determining whether or not there were any fatal flaw environmental and social impacts to potential commuter rail and express bus options was a study goal. The study team evaluated the rail and bus options based on various criteria, such as impacts on wetlands, existing transportation systems, air quality, and noise, among others. No fatal flaw was obvious. More detail on the findings appears in Chapter 7.

The financial performance and economic impacts of the rail and bus options were the also investigated. The financial assessment included an assessment of the options potential for qualifying for federal funding. It also included survey of eligible funding sources to build the systems. The economic assessment calculated the broader benefits to society of these new services, i.e. highway accidents avoided, traveler cost savings, and congestion time savings that would occur with implementation of the potential transit options. The results of these investigations appear in Chapter 8.

Phase 3: Assessments of Feasibility

The third phase was an assessment of the feasibility of the rail and bus options. For the purpose of the feasibility assessment, the options were grouped in various scenarios. For example, Scenario A consisted of commuter rail between Lincoln and Omaha, and express bus between Fremont and Omaha and Blair and Omaha. Scenario B was an all express bus option for all three corridors. Scenario C was an express bus option only between Lincoln and Omaha. As noted before, none of the options appears infeasible. However, the bus-only options appeared more feasible, largely due to their lower capital requirements and superior financial performance. Details of the assessment appear in Chapter 8 as well. The results of the analysis were shared in a second series of public meetings in October. These were held in Fremont, Blair, Omaha, and Lincoln.

Phase 4: Final Report and Next Steps

The fourth and final phase of the effort was the development of the final report, including identification of next steps for the implementation of any of the transit options analyzed. The lessons learned from the analysis were also summarized. The next steps and lessons learned appear in Chapter 9.

Chapter 2
EXISTING CONDITIONS IN INTERCITY CORRIDORS

INTRODUCTION

This chapter outlines the existing conditions in three Nebraska corridors. It first identifies generally where people are traveling in Nebraska. It then illustrates traffic volumes in Eastern Nebraska, and discusses passenger rail, bus, and air service in the State. The chapter calculates Levels of Service (a measure of traffic volume to roadway capacity) on road systems in the three high volume transportation corridors, and cites improvements for the future. Rail traffic in those corridors is shown also. In sum, this chapter explains NTRAC's decision to focus this study on three corridors.

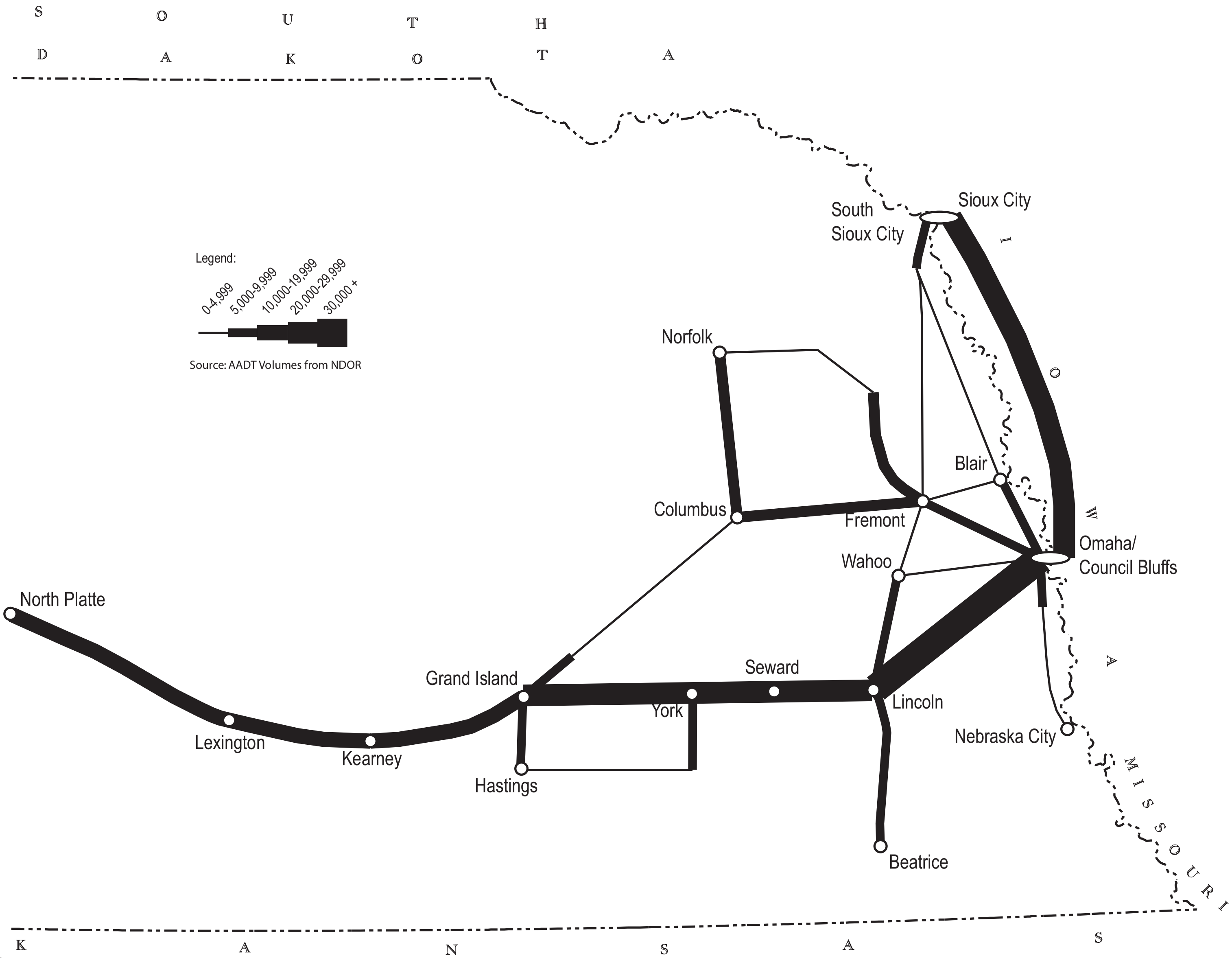
STATEWIDE TRAVEL PATTERNS

Major travel patterns in Nebraska can be determined directly by observation of vehicle movements. The primary indicator of travel patterns is the volume of highway traffic between communities. Other sources would be passenger movements by air, rail, and bus. The greatest insight regarding statewide travel patterns comes from the examination of highway travel patterns, since they carry by far the bulk of travel within the State. Rail and bus service is very limited, serving only a fraction of total travel. Similarly, air service within the State is limited since the nature of air travel favors long distance trips that would originate or terminate beyond the State.

Average Daily Traffic

The Nebraska Department of Roads (NDOR) conducts and updates traffic counts on local roads and on State and federal highway routes. The data are commonly presented in the form of average annual daily traffic passing specific locations along the highway routes. The counts for Nebraska are available on the NDOR Website. Figure 2-1 shows the highway volumes for the most recent year (2000) for the major population centers in Nebraska. Figure 2-1 extends west only to North Platte. The travel volumes west of North Platte decline. It does not appear that travel patterns west of North Platte would support extensive new investment in public transportation modes other than continued development of the highway system.

Figure 2-1 clearly indicates a primary corridor along I-80, from Omaha west to Lincoln and Grand Island. The corridor extends further west to North Platte, but with somewhat lower travel volumes. A second and significant travel corridor extends between Omaha/Council Bluffs and the Sioux City area. The bulk of the travel follows I-29 through Iowa. Additional travel corridors is evident between Omaha, Fremont, Columbus, and Norfolk (along US-275, 30, and 81) and between Omaha, Lincoln, and Beatrice (along I-80 and US-77).



SOURCE: Nebraska Department of Roads

Figure 2-1
INTERCITY TRAVEL HIGHWAY TRAFFIC VOLUMES - YEAR 2000 AADT

384180\2000 AADT - 11/4/03

Wilbur Smith Associates
ENGINEERS PLANNERS ECONOMISTS

The traffic volumes recorded by traffic counts include travel passing through the State as well as intrastate movements. It should be noted that some of the volume, particularly along the primary I-80 route, represents travel unrelated to Nebraska communities. Based on I-80 volumes west of North Platte, it would appear that about 6,000 vehicles per day are passing through the State along I-80.

NEBRASKA RAIL PASSENGER ROUTES

At one time, Nebraska was blessed with a plethora of rail passenger services. Figure 2-2 shows the extent of these services during the late 1940s and early 1950s. Five major railroads that were then offering passenger services included the Union Pacific Railroad (UP), the Chicago, Rock Island and Pacific Railroad, the Missouri Pacific Railroad, the Chicago, Burlington and Quincy Railroad, and the Chicago Northwestern Railroad. Except in one corridor, these services have long since faded into history.

That noted, passenger rail service continues one potential option for moving larger volumes between communities. Two typical types of service are found in other states:

- Commuter service, with trains predominately running in peak hours and usually only peak directions (i.e. trains into Omaha in the morning, and out of Omaha in the evening, running only on business work days).
- Intercity service, with several daily schedules serving travel in both directions, usually over longer distances than commuter service, and usually operating 7 days per week.

Figure 2-3 shows current rail routes connecting the population centers of Eastern Nebraska. In most cases, the routes generally parallel the highway routes, and could offer opportunities for development of passenger rail service where the overall travel volumes are sufficient to warrant such service.

The only passenger rail service currently provided in Nebraska is Amtrak's California Zephyr, which uses the Burlington Northern and Santa Fe Railway (BNSF) route between Omaha, Lincoln, and Hastings. This train runs daily between Chicago and California, making Nebraska stops during the night. Consequently, it is of limited value in meeting travel needs between Nebraska communities.

INTERCITY BUS SERVICE

Intercity bus services appear in Figure 2-4. The services to and from the major population centers of the State are discussed in below.

Greyhound Lines operates intercity bus service across the State, following the route of I-80. There are 6 to 7 schedules daily. Some operate as express service, while others make local stops in Lincoln, Grand Island, and other communities. This east-west service operates between Chicago, Denver, and California, but some schedules are convenient for travel within Nebraska. A single daily frequency is operated between Minneapolis and Kansas City, serving Omaha and Sioux City, IA.

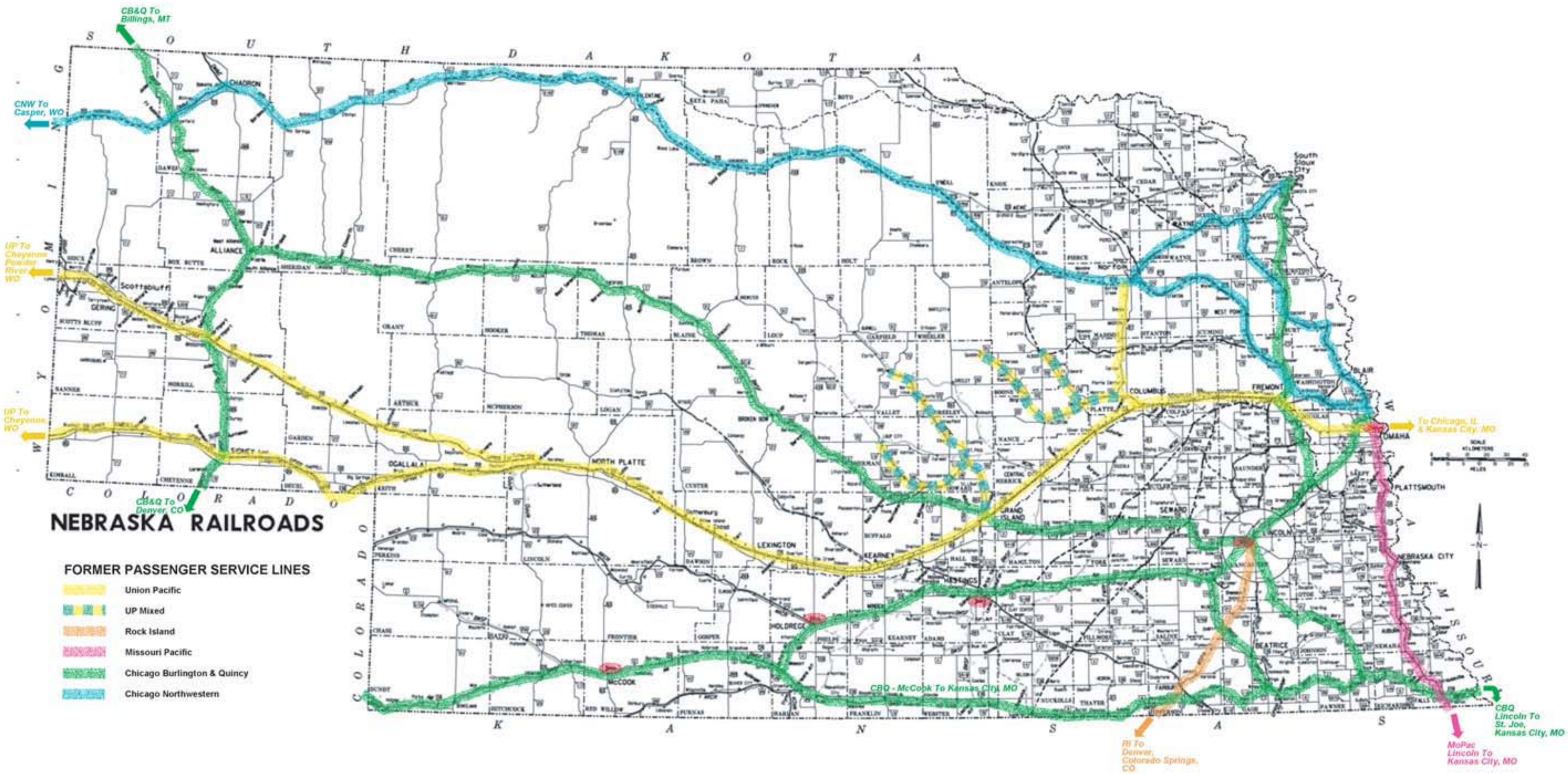


Figure 2-2
FORMER PASSENGER SERVICE LINES

384180\FIGURE2-2 - 12/22/03

Wilbur Smith Associates
ENGINEERS PLANNERS ECONOMISTS

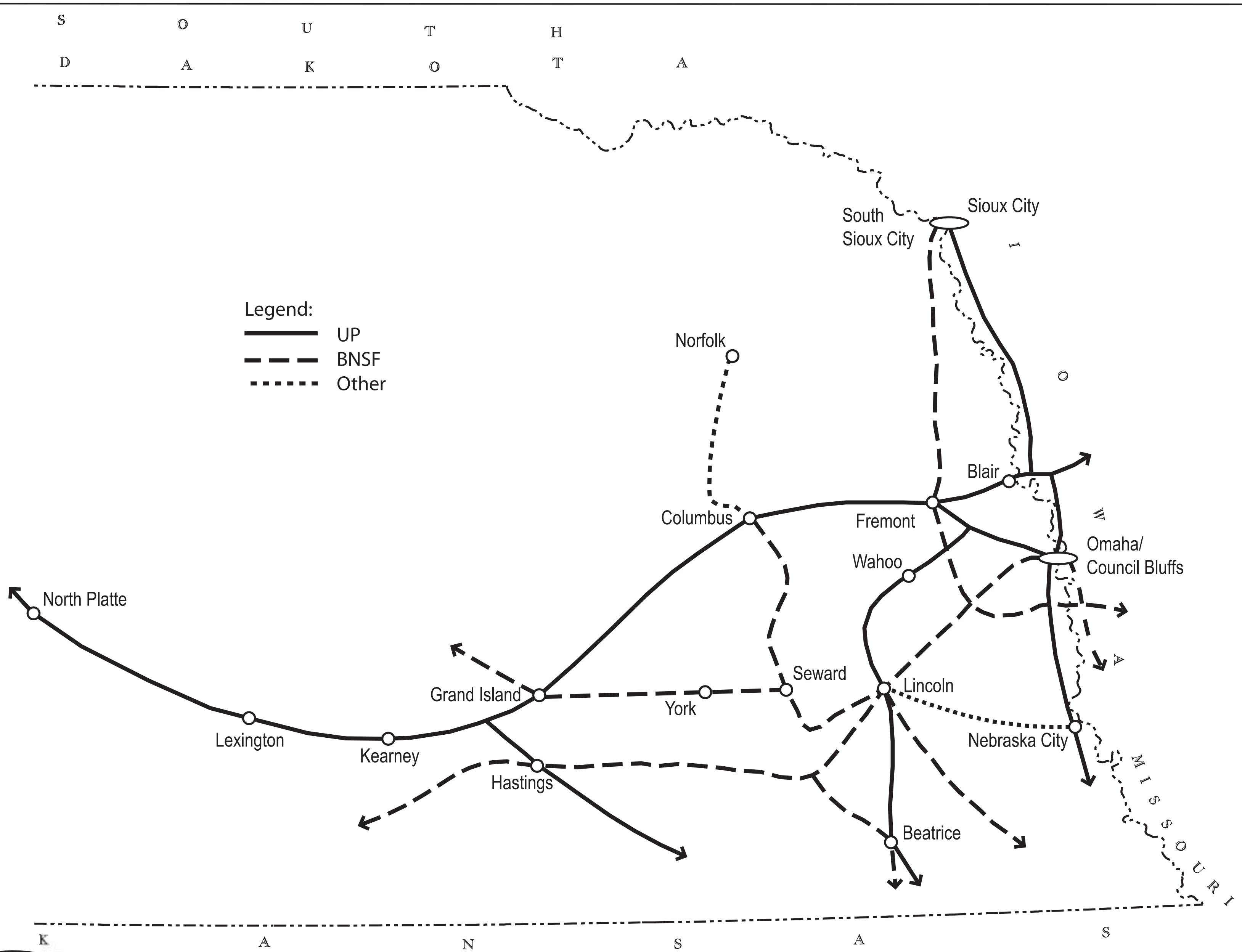
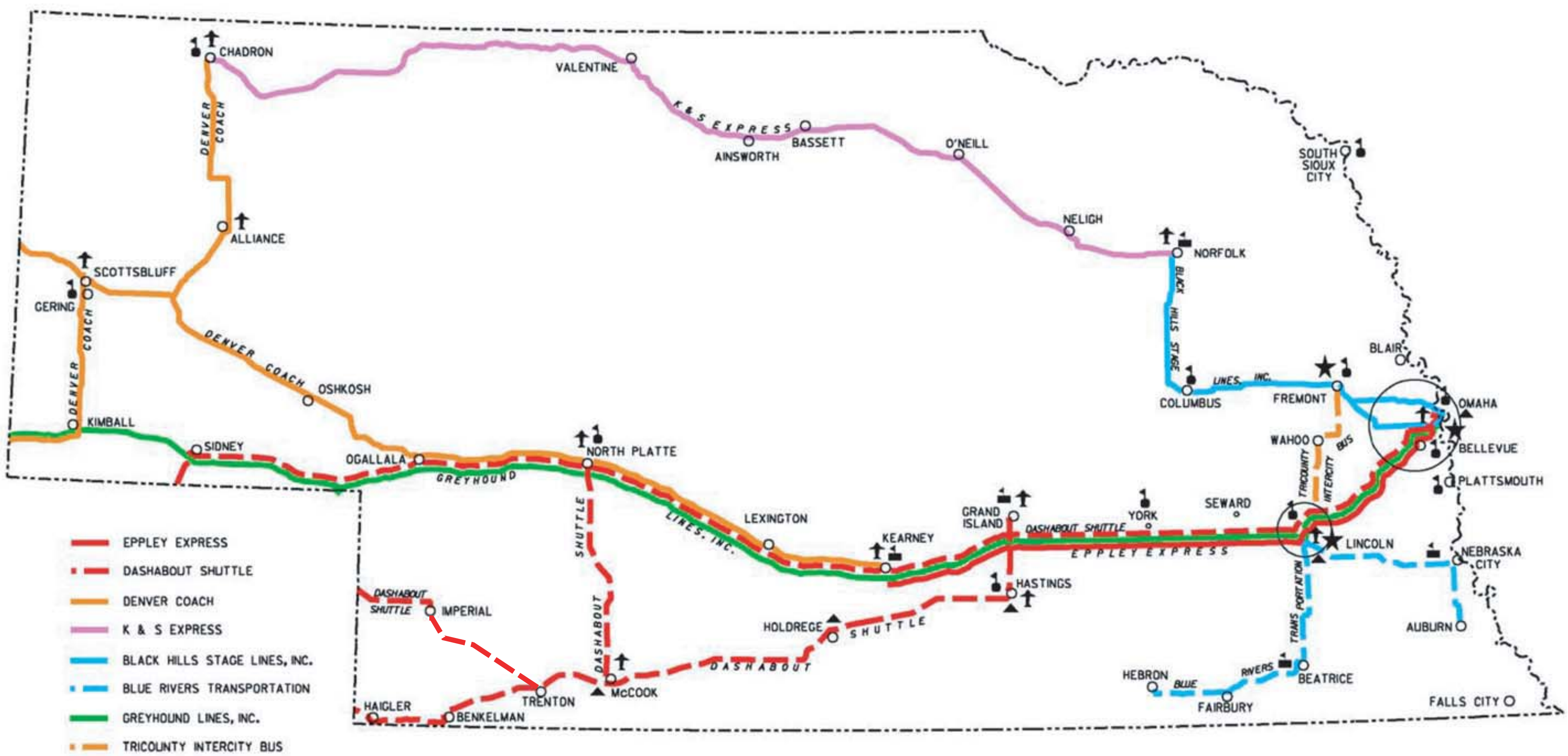


Figure 2-3
PRINCIPAL RAIL ROUTES SERVING EASTERN NEBRASKA POPULATION CENTERS

384180\RAIL LINES - 11/4/03



Wilbur Smith Associates
ENGINEERS
PLANNERS
ECONOMISTS

Figure 2-4
CURRENT INTERCITY TRANSIT SERVICES
384180\FIGURE2-4 - 12/22/03

Black Hills Stage Lines (the DBA entity of Arrow Stage Lines) operates a single round trip serving Omaha, Fremont, Columbus, and Norfolk Monday through Saturday, using Hwys 81, 30, and 275.

Eppley Express operates intercity bus service daily Kearney-Grand Island-York-Lincoln-Omaha on I-80. There are two roundtrips Mondays through Fridays; one roundtrip on Saturdays, and the same on Sundays.

Dashabout operates daily roundtrip intercity shuttle van service over six different routes in Nebraska. Confirmed with the operator on March 26, these are:

- North Platte-Ogallala-Big Springs-Chappell-Sidney along I-80, thence south on N-19 to Colorado
- McCook-Trenton-Benkleman-Haigler along US-34 thence to Colorado
- North Platte-Grand Island-Lincoln-Omaha along I-80
- North Platte-McCook along US-83, thence to Imperial and Colorado on US-6
- McCook-Hastings along US-6/34, thence to Grand Island along US-34/281, thence to Columbus along US-30

Bus stops include bus depots, train stations and airports.

Jefferson Lines operates daily intercity service between Omaha and Sioux City and also between Omaha and Kansas City along I-29.

AIR SERVICE IN NEBRASKA

A check of the April 2003 Official Airline Guide shows no commercial scheduled air service between Nebraska cities. Out-of-state service to and from Nebraska is limited to Omaha and Lincoln. Some of the major out-of-state markets appear below.

Omaha routes to nearby cities are:

- Chicago – multiple daily round trips
- Denver – 8 daily round trips
- Minneapolis – 6 daily round trips

Lincoln service consists of:

- Chicago – 3 daily round trips
- Denver – 3 daily round trips

Sioux City, IA shows 6 daily round trips to Minneapolis.

No service found to Kearney, Grand Island or Norfolk.

TRAVEL PATTERNS IN THREE INTERCITY CORRIDORS

On November, 2002, NTRAC decided to focus its analysis on three corridors. The decision was based primarily on the observation of the statewide travel patterns represented in Figure 2-1. These corridors are:

1. Omaha-Lincoln-York-Grand Island-Kearney
2. Norfolk-Fremont-Omaha (alternatives include a routing via Columbus and another direct between Fremont and Norfolk)
3. South Sioux City-Fremont-Omaha-Nebraska City

A discussion of intercity travel patterns along the corridors appears below. This chapter defines the patterns in terms of estimates of daily motor vehicle volume between the major city pairs in each corridor. The Planning and Project Development Division of the Nebraska Department of Roads prepared these estimates. The Year 2000 origin and destination (O&D) information was developed from the Nebraska Statewide Traffic Model 2000 trip matrix and the 2000 Statewide Traffic Assignment Network.

The statewide traffic model was developed in the early 1970s based on an intensive statewide O&D study. It has been updated with decennial Census data in 1980, 1990, and 2000. The model was designed to estimate traffic in the rural areas on the State highway system. The model does not include internal circulating traffic within the major metropolitan areas. For this reason, the sections of the State highway systems that fell within Lancaster, Douglas and Sarpy Counties were excluded from all calculations.

The 2000 O&D trip totals were adjusted to 2000 volumes applying an adjustment factor. This factor was calculated by dividing the 2000 Traffic Count Miles of Travel (CMT) by the 2000 traffic assignment Vehicle Miles of Travel (VMT) for each O&D path. The daily volume estimates in the three corridors were prepared using minimum time paths between the city pairs.

Corridor 1: Kearney-Grand Island-York-Lincoln-Omaha

As shown in Table 2-1, there are over 10,000 daily trips in this corridor. About two-thirds are between Lincoln and Omaha. Other origin and destination pairs are substantially smaller. Of these, three are noticeably larger than the rest. These are Grand Island-Omaha, Kearney-Grand Island, and York-Lincoln. All trips occur on Interstate 80 (I-80).

Table 2-1: Summary of Origin and Destination Trips in the Kearney-Omaha Corridor						
City-City	Path	Selected O&D Trips	Total 2000 County CMT	Total 2000 Assigned VMT	Adjustment Factor	Adjusted 2000 O&D Volume
Kearney-Grand Island	I-80	592	859,024	896,157	0.9586	565
Kearney-York	I-80	28	1,613,308	1,720,759	0.9376	25
Kearney-Lincoln	I-80	136	2,505,640	2,519,955	0.9943	135
Kearney-Omaha	I-80	132	2,886,284	2,791,794	1.0338	135
Grand Island-York	I-80	164	948,140	962,946	0.9846	160
Grand Island-Lincoln	I-80	304	1,840,472	1,762,142	1.0445	320
Grand Island-Omaha	I-80	728	2,974,316	2,744,801	1.0836	790
York-Lincoln	I-80	424	875,258	780,740	1.1211	475
York-Omaha	I-80	110	1,285,796	1,077,255	1.1936	130
Lincoln-Omaha	I-80	5,332	380,644	271,839	1.4003	7,465
Total						10,200

Source: NDOR

Corridor 2: Norfolk-Columbus-Fremont-Omaha

This corridor includes two routes. One is Norfolk-Fremont-Omaha, and the other is Norfolk-Columbus-Fremont-Omaha. These two routes are reflected in the traffic counts shown in Table 2-2. The corridor has over 5,300 intercity trips per day. The largest flow is between Fremont and Omaha. A distant second is between Columbus and Fremont. The Norfolk-Columbus-Fremont-Omaha corridor sees about 400 more intercity trips daily than does the Norfolk-Fremont-Omaha corridor.

Table 2-2: Summary of Origin and Destination Trips in the Norfolk-Omaha Corridor						
City-City	Path	Selected O&D Trips	Total 2000 County CMT	Total 2000 Assigned VMT	Adjustment Factor	Adjusted 2000 O&D Volume
Norfolk-Columbus	N-81	232	306,536	151,246	2.0267	470
Norfolk-Fremont	US-275	102	428,378	297,198	1.4414	145
Norfolk-Omaha	US-275	270	458,088	295,820	1.5485	420
Columbus-Fremont	US-30	164	357,589	175,638	2.0359	335
Columbus-Omaha	US-30 & US- 275	362	412,677	195,000	2.1163	765
Fremont-Omaha	US-275	2,840	28,232	24,860	1.1356	3,225
Total						5,360

Source: NDOR

Corridor 3: South Sioux City-Blair-Omaha-Nebraska City

This corridor has a total of 2,185 daily intercity trips. Three-quarters of the trips occur between Blair and Omaha. The second largest flow is between Omaha and Nebraska City. What is not shown in this table are trips made between Omaha and Sioux City on I-29 through Iowa.

Table 2-3: Summary of Origin and Destination Trips in the Sioux City-Nebraska City Corridor						
City-City	Path	Selected O&D Trips	Total 2000 County CMT	Total 2000 Assigned VMT	Adjustment Factor	Adjusted 2000 O&D Volume
S. Sioux City-Blair	US-75	2	239,872	183,996	1.3037	5
S. Sioux City-Omaha	US-75	33.5	324,222	243,440	1.3318	45
S. Sioux City-Nebraska City	US-75	0				0
Blair-Omaha	US-75, N-31& N-133	870	181,608	97,240	1.8676	1,630
Blair-Nebraska	US-75	4	201,774	168,444	1.1979	5
Omaha-Nebraska City	US-75	568	164,558	186,514	0.8823	500
Total						2,185

Source: NDOR

LEVELS OF SERVICE DEFINITION

2000 Highway Capacity Manual (HCM) defines Level of service (LOS) as a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience.

Six LOS are defined for each type of facility that has analysis procedures available. Letters designate each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each level of service represents a range of operating conditions and the driver's perception of those conditions. Safety is not included in the measures that establish service levels. Below are the descriptions of the six LOS as defined in the 2000 HCM for Highways and Freeways.

LOS Highways

LOS A describes completely free-flow conditions. The operation of vehicles is virtually unaffected by the presence of other vehicles, and operations are constrained only by the geometric features of the highway and by driver preferences. Maneuverability within the traffic stream is good. Minor disruptions to flow are easily absorbed without a change in travel speed.

LOS B also indicates free flow, although the presence of other vehicles becomes noticeable. Average travel speeds are the same as in LOS A, but drivers have slightly less freedom to maneuver. Minor disruptions are still easily absorbed, although local deterioration in LOS will be more obvious.

In LOS C, the influence of traffic density on operations becomes marked. The ability to maneuver within the traffic stream is clearly affected by other vehicles. On multilane highways with an FFS (free flow speed) above 50 mph, the travel speeds reduce somewhat. Minor disruptions can cause serious local deterioration in service, and queues will form behind any significant traffic disruption.

At LOS D, the ability to maneuver is severely restricted due to traffic congestion. Travel speed is reduced by the increasing volume. Only minor disruptions can be absorbed without extensive queues forming and the level of service deteriorating.

LOS E represents operations at or near capacity, an unstable level. The densities vary, depending on the FFS. Vehicles are operating with the minimum spacing for maintaining uniform flow. Disruptions cannot be dissipated readily, often causing queues to form and service to deteriorate to LOS F. For the majority of multilane highways with FFS between 45 and 60 mph, passenger-car mean speeds at capacity range from 42 to 55 mph but are highly variable and unpredictable.

LOS F represents forced or breakdown flow. It occurs either when vehicles arrive at a rate greater than the rate at which they are discharged or when the forecast demand exceeds the computed capacity of planned facility. Although operations at these points – and on sections immediately downstream – appear to be at capacity, queues form behind these breakdowns. Operations within queues are highly unstable, with vehicles experiencing brief periods of movement followed by stoppages. Travel speeds within queues are generally less than 30 mph. Note that the term LOS F may be used to characterize both the point of the breakdown and the operating condition within the queue.

LOS Freeways

LOS A describes free-flow operations. Free-flow speeds prevail. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream. The effects of incidents or point breakdowns are easily absorbed at this level.

LOS B represents reasonably free-flow, and free-flow speeds are maintained. The ability to maneuver within the traffic stream is only slightly restricted, and the general level of physical and psychological comfort provided to drivers is still high. The effects of minor incidents and point breakdowns are still easily absorbed.

LOS C provides for flow with speeds at or near the FFS of the freeway. Freedom to maneuver within the traffic stream is noticeably restricted, and lane changes require more care and vigilance on the part of the driver. Minor incidents may still be absorbed, but the local deterioration in service will be substantial. Queues may be expected to form behind any significant blockage.

LOS D is the level at which speeds begin to decline slightly with increasing flows and density begins to increase somewhat more quickly. Freedom to maneuver within the traffic stream is more noticeably limited, and the driver experiences reduced physical and psychological comfort levels. Even minor incidents can be expected to create queuing, because the traffic stream has little space to absorb disruptions.

At its highest density value, LOS E describes operation at capacity. Operations at this level are volatile, because there are virtually no usable gaps in the traffic stream. Vehicles are closely spaced, leaving little room to maneuver within the traffic stream at speeds that still exceed 49 mph. Any disruption of the traffic stream, such as vehicles entering from a ramp or a vehicle changing lanes, can establish a disruption wave that propagates throughout the upstream traffic flow. At capacity, the traffic stream has no ability to dissipate even the most minor disruption, and any incident can be expected to produce a serious breakdown with extensive queuing. Maneuverability within the traffic stream is extremely limited, and the level of physical and psychological comfort afforded the driver is poor.

LOS F describes breakdowns in vehicular flow. Such conditions generally exist within queues forming behind breakdown points. Breakdowns occur for a number of reasons:

- Traffic incidents can cause a temporary reduction in the capacity of a short segment, so that the number of vehicles arriving at the point is greater than the number of vehicles that can move through it.
- Points of recurring congestion, such as merge or weaving segments and lane drops, experience very high demand in which the number of vehicles arriving is greater than the number of vehicles discharged.
- In forecasting situations, the projected peak-hour (or other) flow rate can exceed the estimated capacity of the location.

Note that in all cases, breakdown occurs when the ratio of existing demand to actual capacity or of forecast demand to estimated capacity exceeds 1.00. Operations immediately downstream of such a point, however, are generally at or near capacity, and downstream operations improve (assuming that there are no additional downstream bottlenecks) as discharging vehicles move away from the bottleneck.

LOS F operations within a queue are the result of a breakdown or bottleneck at a downstream point. LOS F is also used to describe conditions at the point of the breakdown or bottleneck and the queue discharge flow that occurs at speeds lower than the lowest speed for LOS E, as well as the operations within the queue that forms upstream. Whenever LOS F conditions exist, they have the potential to extend upstream for significant distances.

Level of Service was calculated based on 2000 data provided by the Nebraska Department of Roads (NDOR) using the 2000 HCM. The following chapters from the 2000 HCM were used: Chapter 20 Two-Lane Highways Methodology, Chapter 21 Multilane Highway Methodology, and Chapter 23 Basic Freeway Segments Methodology.

LEVELS OF SERVICE IN THE NEBRASKA CORRIDORS

Data provided by NDOR included 2000 highway ADT, 2000 Truck ADT, speed limits, surface type, facility type, median type, National Function Classification, and number of lanes. K factor was determined from ATR data, 10 percent was used on two-lane and multi-lane highway and 11 percent used on Interstate facilities.

Analysis Assumptions

The following assumptions where made for rural two-lane highway: 12ft. lanes, 6 ft. or greater shoulders, 3 access point per mile, level grade except for US-75, US-77 and N-133 where rolling terrain was used, 20 percent no passing zones on level grades and 40 percent no passing zones on rolling terrain.

The following assumptions were made for rural multi-lane highways: 12 ft. lanes, 12 ft. or greater lateral clearance (include shoulder and median clearance), 0 access point per mile, level grade except for US-75, and US-77 where rolling terrain was used, and D factor equal to a 60-40 split. The following assumption where made for rural freeway facilities, 12 ft. lanes, 6 ft. or greater lateral clearance, level grade, 0.5 interchanges per mile, and D factor equal to a 60-40 split.

Using the supplied NDOR data and assumptions, LOS was calculated for rural highway segments. The LOS on the segments was averaged to obtain a LOS between cities as presented in the following tables. The results appear in Figure 2-5. The ordering of corridor cities in the narrative below differs slightly from that on page 2-8: it reflects how the analysis was performed.

Corridor 1: Omaha-Lincoln-Seward-Grand Island-Kearney

	Lincoln	Grand Island
Omaha	C	
Seward	B	B
Kearney		B

Omaha to Lincoln

The primary highways in the corridor between Omaha and Lincoln are US-6 and I-80. US-6 is primarily a two-lane highway in the corridor; I-80 is a four-lane Interstate facility between Omaha and Lincoln. I-680 and US-6 would provide the link to Downtown Omaha for a new bus service.

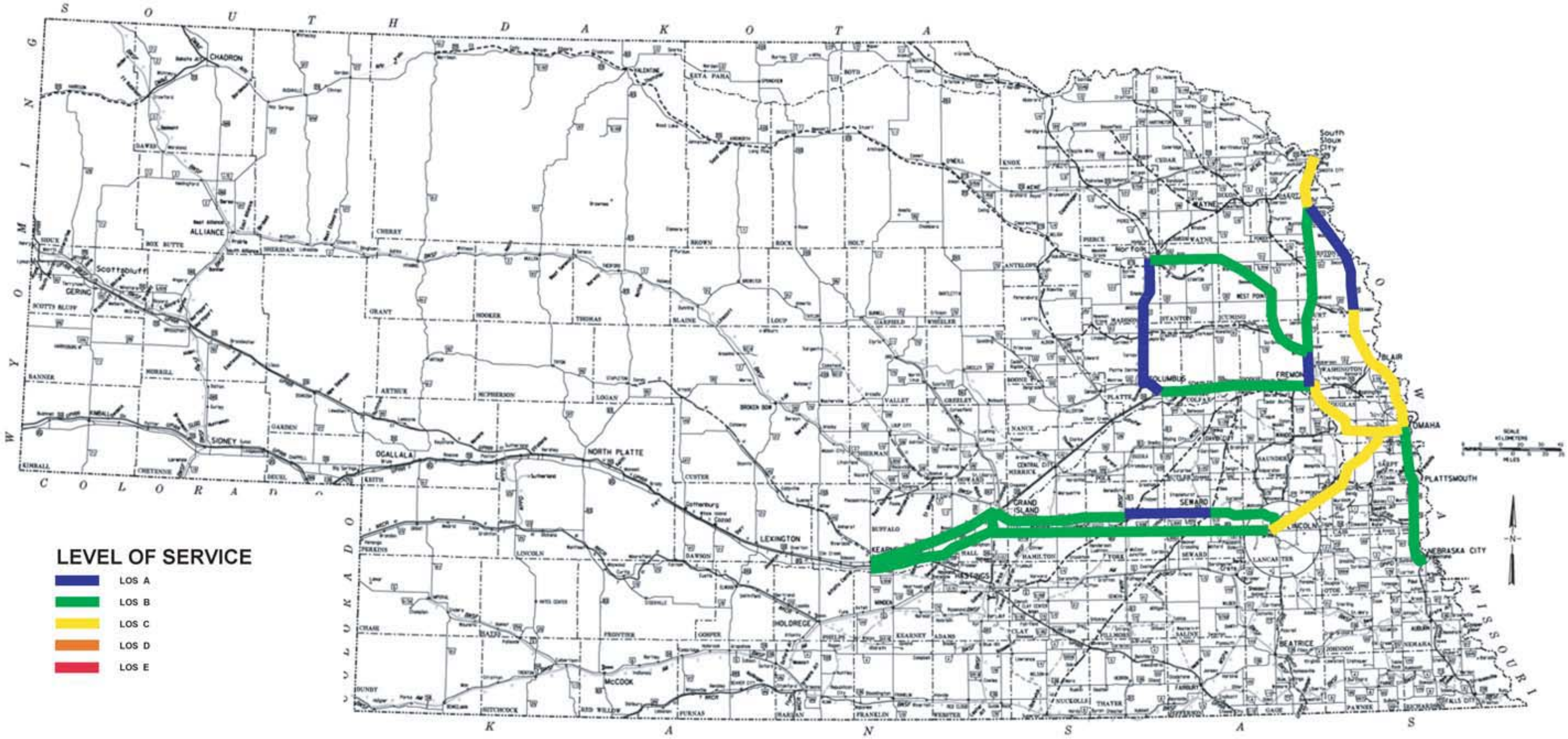
The two-lane section of US-6 was operating at a LOS B, and the four-lane section of I-80 was operating at a LOS C in the year 2000. An average LOS C was calculated for all the roadway sections between Omaha and Lincoln as shown in the table above.

The four-lane section of I-80 between Omaha and Lincoln is to be upgraded to a six-lane Interstate in the future. NDOR 2003-2008 Surface Transportation Program states that I-80 will upgraded in the five-year program (2004-2008). A new interchange for I-680 and US-6 is currently under construction. US-6 is being is being widened in the 2004-2008 timeframe to a four-lane expressway.

Lincoln to Seward

The primary highways in the corridor between Lincoln and Seward are US-34 and I-80. US-34 is a two-lane highway in the corridor; I-80 is a four-lane Interstate facility between Lincoln and Seward.

The two-lane section of US-34 was operating at a LOS B, and the four-lane section of I-80 was operating at a LOS B in the year 2000. An average LOS B was calculated for all the roadway sections between Lincoln and Seward as shown in the table above.



Wilbur Smith Associates
ENGINEERS PLANNERS ECONOMISTS

Figure 2-5
LEVEL OF SERVICE ON HIGHWAYS BETWEEN CITIES
384180\FIGURE2-5 - 12/22/03

The four-lane section of I-80 between Lincoln and Seward is to be upgraded to a six-lane Interstate in the future. NDOR 2000 Needs Assessment states that I-80 will upgraded in the next 20 years before 2020.

Seward to Grand Island

The primary highways in the corridor between Seward and Grand Island are US-34 and I-80. US-34 is a two-lane highway in the corridor; I-80 is a four-lane Interstate facility between Seward and Grand Island.

The two-lane section of US-34 was operating between a LOS B and LOS A, and the four-lane section of I-80 was operating at a LOS B in the year 2000. An average LOS B was calculated for all the roadway sections between Seward and Grand Island as shown in the table above.

The four-lane section of I-80 between Seward and Grand Island is to be upgraded to a six-lane Interstate in the future. NDOR 2000 Needs Assessment states that I-80 will upgraded in the next 20 years before 2020.

Grand Island to Kearney

The primary highways in the corridor between Grand Island and Kearney are US-34 and I-80. US-34 is a two-lane highway in the corridor; I-80 is a four-lane Interstate facility between Grand Island and Kearney.

The two-lane section of US-34 is operating at LOS B, and the four-lane section of I-80 is operating at a LOS B in the year 2000. An average LOS B was calculated for all the roadway sections between Grand Island and Kearney as shown in the table above.

None of the facilities between Grand Island and Kearney are to have capacity upgrades based on NDOR planning documents.

Corridor 2: Omaha-Fremont-Columbus-Norfolk

	Fremont	Norfolk
Omaha	C	
Winslow	A	B

Omaha to Fremont

The primary highway in the corridor between Omaha and Fremont is US-275. In 2000, US-275 was primarily a two-lane highway between Omaha and Fremont in the rural area. The two-lane section between Omaha and Fremont was operating at a LOS C in 2000. Later in 2002, the highway was opened as a four-lane expressway between N-64 (West Maple Road) to N-36. L-28B and US-6 would provide the link to Downtown Omaha for a new bus service.

Currently West Dodge Road (US-6, L-28B) from 168th Street to Skyline Drive is being upgraded to a 4-lane expressway. In the 2004 to 2009 time frame West Dodge Road (L-28B) from Skyline Drive to US-275 will be upgraded to a four-lane expressway, and US-275 from West Dodge Road (L-28B) to West Maple Road (N-64) will be upgraded to a four-lane expressway. Also US-6 is being widened in the 2004-2008 timeframe to a four-lane expressway. The upgrade information was obtained from the NDOR 2003-2008 Surface Transportation Program.

Fremont to Norfolk

The primary highway in the corridor between Fremont and Norfolk is US-275. US-275 currently is four-lane highway between Fremont and Winslow, and a two-lane highway between Winslow and Norfolk. The four-lane section between Fremont and Winslow was operating at a LOS A, and the two-lane section between Winslow and Norfolk was operating at a LOS B in the year 2000. The two-lane section is to be upgraded to a four-lane highway in the five-year program (2004-2008) or the year 2009 or beyond, as stated in NDOR 2003-2008 Surface Transportation Program. L-128B and US-6 would be part of the route as well. L-128B is being upgraded to a 4 lane expressway from Skyline Drive to US-275 in the 2004 to 2009 time frame.

	Fremont	Norfolk
Omaha	C	
Columbus	B	A

Fremont to Columbus

The primary highway in the corridor between Fremont and Columbus is US-30. US-30 is primarily a two-lane highway between Fremont and Columbus. The two-lane section between Fremont and Columbus was operating at a LOS B in the year 2000. The two-lane section is to be upgraded to a four-lane highway in the five-year program (2004-2008) or the year 2009 or beyond, as stated in NDOR 2003-2008 Surface Transportation Program.

Columbus to Norfolk

The primary highway in the corridor between Columbus and Norfolk is US-81. US-81 is a four-lane highway between Columbus and Norfolk. The four-lane section between Columbus and Norfolk was operating at a LOS A in the year 2000. This section was recently upgraded to a four-lane highway.

Corridor 3: Nebraska City-Omaha-Blair-Sioux City

	Nebraska City	Blair	Fremont	Winnebago
Omaha	B	C	C	
Tekamah		C		A
Winslow			A	B
Sioux City				C

Omaha to Nebraska City

The primary highway in the corridor between Omaha and Nebraska City is US-75. US-75 currently is a four-lane highway between Omaha and Plattsmouth, and a two-lane highway between Plattsmouth and Nebraska City. Since the four-lane section of highway is in the urban area, the LOS was calculated only on the two-lane section. The two-lane section between Plattsmouth and Nebraska City is operating at a LOS B in the year 2000. The two-lane section is to be upgraded to a four-lane highway in the year 2009 or beyond, as stated in NDOR 2003-2008 Surface Transportation Program.

Blair to Omaha

The primary highways in the corridor between Omaha and Blair are US-75 and N-133. US-75 currently is four-lane highway in Douglas County and a two-lane highway in Washington County. N-133 currently is a two-lane highway between Omaha and Blair. I-680 and US-6 would provide the link to Downtown Omaha for a new bus service.

The two-lane section of US-75 is operating at a LOS C in the year 2000. The four-lane section of US-75 is operating at a LOS B. N-133 is operating at LOS D close to Omaha and LOS C at Blair. An average LOS C was calculated for all the roadway sections between Omaha and Blair as shown in the table above.

The two-lane section of N-133 between Omaha and Blair and the two-lane section of US-75 between Douglas County and Fort Calhoun are to be upgraded to a four-lane highway in the future. NDOR 2003-2008 Surface Transportation Program states that N-133 will upgraded from I-680 to NE-36 in 2003 and from NE-36 to Blair in the year 2009 or beyond. US-75 from Douglas County to Fort Calhoun will be upgraded in the year 2009 or beyond. I-680 will be upgrade between Maple Street (N-64) and N-133. US-6 is being upgraded to a four-lane expressway.

Blair to Sioux City

The primary highway in the corridor between Blair and Sioux City is US-75. US-75 currently is two-lane highway between Blair and Sioux City.

US-75 is operating at a LOS C in the year 2000 between Blair and Tekamah, LOS A between Tekamah and Winnebago, and LOS C between Winnebago and Sioux City.

The two-lane section of US-75 between Winnebago and Sioux City is to be upgraded to a four-lane highway in the year 2009 and beyond as stated in the NDOR 2003-2008 Surface Transportation Program.

Winslow to Sioux City

An alternative route from Omaha to Sioux City is to go through Fremont and use US-77. US-77 is the primary highway in the corridor between Winslow and Sioux City. US-77 currently is two-lane highway between Winslow and Sioux City.

US-77 was operating at a LOS B in the year 2000 between Winslow and Sioux City.

US-77 between Winslow and Sioux City is not scheduled to have capacity upgrades based on NDOR planning documents.

CORRIDOR RAIL LINES

Corridor 1: Omaha-Lincoln-York-Grand Island-Kearney

Amtrak operates its California Zephyr intercity service daily through this corridor. Stops are at Omaha, Lincoln and Hastings.

The specifics of the rail lines in the corridor are as shown in Table 2-4. The rail route includes BNSF from Omaha to Grand Island, and UP from Grand Island to Kearney. BNSF reported that its traffic between Omaha and Lincoln will be significantly heavier in 2004. The railroad will run new empty coal trains on the line. These will push volume between Omaha and Ashland from 4 through trains to between 10 and 12 per day, and between Ashland and Lincoln from 40 through trains to between 55 and 60 trains per day.

Table 2-4: Corridor 1 Rail Specifics

	Length In miles	Owner-ship	Max mph Freight(F), Psgr (P)	Current Use in Trains/Day	Tracks and Signals	FRA Track Class	Passenger Service	Passenger Stations
Omaha-Ashland	30.3	BNSF	50F, 79P	4 through trains, 2 locals	STS, CTC	Class 4	California Zephyr	Omaha
Ashland-Lincoln	37.2	BNSF	60F, 79P	40 through trains, 2 locals	DT, CTC	Class 4	California Zephyr	Lincoln
Lincoln-York	54.0	BNSF	60F	60 through trains, 3 locals	DT/ST, CTC	Class 4	None	Lincoln
York-Grand Island	38.1	BNSF	60F	60 through trains, 3 locals	DT/ ST, CTC	Class 4	None	None
Grand Island-Kearney	42.7	UP	70F, 70P	68-131 through trains; 1 local	DT/TT, CTC	Class 4	None	None

Sources: BNSF timetables and track charts, UP track charts, and responses to inquiries
Notes: CTC is Central Traffic Control; ST is single track, STS is single track with sidings; DT is double track; TT is triple track. FRA Track Class 4 allows for maximum freight speeds of 60 mph and passenger of 80 mph.

Corridor 2: Norfolk-Columbus-Fremont-Omaha

There is no passenger rail service in this corridor. Specifics of the rail corridor appear below. The route consists of the Nebraska Central Rail Corporation (NCRC), a short line or small railroad, between Norfolk and Columbus, and the Union Pacific between Columbus, Fremont and Omaha.

(This space intentionally left blank.)

Table 2-5: Corridor 2 Rail Specifics								
	Length in miles	**Owner-ship**	**Max mph**	**Current Use in Trains/Day**	**Tracks and Signals**	**FRA Track Class**	**Passenger Service**	**Passenger Stations**
Norfolk-Columbus	40.0	NCRC	25F	4	STS, TWC	Class 3	None	None
Columbus-Fremont	45.3	UP	70F, 70P	68 through trains; 1 local	DT, CTC	4	None	None
Fremont-Omaha (Summit)	36.6	UP	70F, 70P	36 through trains; 6 locals	DT, CTC/ABS	4	None	Omaha (inactive)

Source: UP track charts, conversations with NCRC.
Note: TWC is track warrant control. ABS is automatic block signals. FRA track class 3 allows for maximum freight speeds of 40 mph.

Corridor 3: Sioux City-Fremont-Omaha-Nebraska City

There is no passenger rail service in this corridor. Specifics of the rail corridor appear below. The route consists of the BNSF between Sioux City and Fremont, and the UP between Fremont, Omaha and Nebraska City.

Table 2-6: Corridor 3 Rail Specifics								
	Length in miles	**Owner-ship**	**Max mph**	**Current Use in Trains/Day**	**Tracks and Signals**	**FRA Track Class**	**Passenger Service**	**Passenger Stations**
Sioux City-Fremont	193.0	BNSF	40F	12 through trains, 1 local	STS, TWC	Class 4	None	None
Fremont-Omaha	43.5	UP	70F, 70P	68 through trains; 1 local	DT, CTC/ABS	4	None	Omaha (inactive)
Omaha (Summit)-Nebraska City	45.0	UP	40F	6 through trains;1 local	STS/DT, CTC/ABS	3	None	Omaha (inactive)

Source: BNSF track charts and time tables, and UP track charts.

POTENTIAL FOR INTERMODAL CONNECTIONS

The major opportunities for intermodal connections can be attributed to the existence of intercity and local urban transit passenger services in the corridors. The following paragraphs describe the opportunities for intermodal connections in each of the corridors under study.

Corridor 1: Omaha-Lincoln-York-Grand Island-Kearney

Intercity bus service connections in Omaha can be made with Greyhound, Eppley Express, and Dashabout. Greyhound operates several schedules directly connecting Omaha with Lincoln and Grand Island. Greyhound also provides connecting bus service to Sioux City, IA and Kansas City from Omaha. Amtrak rail passenger service connects Omaha and Lincoln to Chicago and Denver and other cities in the national rail passenger network. Both Omaha and Lincoln have airports, which can be served directly or by connecting shuttle services depending on the final alignment and operating alternatives selected. The cities of Lincoln and Omaha provide extensive public transportation services in their respective urbanized area. Both local city transit systems could link directly to any of the express bus or commuter rail alternatives defined for analysis. Accordingly, there is potential for rail-bus-air connections in this corridor.

Corridor 2: Norfolk-Columbus-Fremont-Omaha

Arrow Stage Lines, DBA Black Hills Stage Lines, continues to provide one daily round trip between Norfolk, Fremont and Omaha except on Sundays and holidays. There is no rail passenger service either to or from Norfolk. Norfolk has a small city airport, which is part of the national air system. There is no scheduled service to Norfolk. Accordingly, there is potential for bus-air connections in this corridor.

Corridor 3: Sioux City-Fremont-Omaha-Nebraska City

Greyhound and Jefferson Lines provide intercity bus service between Omaha and Sioux City, IA and Kansas City, MO. There is no rail passenger service in this corridor. Scheduled air carrier service is available in Omaha and Sioux City, IA. Accordingly, there is potential for rail-bus-air connections in this corridor.

REVIEW OF CONDITIONS IN INTERCITY CORRIDORS

Travel Patterns along the Corridors

A review of statewide travel patterns presented in Figure 1-1 pointed to three candidate corridors for analysis. These candidate corridors are:

- ***Corridor 1:*** Omaha-Lincoln-York-Grand Island-Kearney
- ***Corridor 2:*** Norfolk-Fremont-Omaha (alternatives include a routing via Columbus and another direct between Fremont and Norfolk)
- ***Corridor 3:*** South Sioux City-Fremont-Omaha-Nebraska City

Levels of Service in Corridors and Planned Improvements

- ***Corridor 1:*** Conditions are generally good. The calculation of LOS C in the Lincoln-Omaha corridor indicates some recurring congestion.
- ***Corridor 2:*** Like Corridor 1, conditions are generally good. Between Fremont and Omaha, however, volumes are heavier and there is some congestion.
- ***Corridor 3:*** An LOS C rating for traffic conditions north of Omaha and south of Sioux City point to recurring congestion there. Otherwise, conditions are generally good.

To deal with congested conditions and to provide for future capacity, all three corridors are to have improvements in next few years. These improvements include another lane in each direction along I-80 between Omaha and Lincoln and widening of the remaining two-lane section of US-275 between Omaha and Fremont to four lanes. There are similar improvements plans for N-133 and US-75 between Omaha and Blair.

Rail Routes and Traffic Volumes

Rail capacity today is sufficient to handle BNSF's freight volumes between Omaha and Lincoln. However, starting next year, BNSF will route new empty coal trains westbound between Omaha and Lincoln. These will constrain capacity for any new commuter trains on that route.

Chapter 3
RIDERSHIP POTENTIAL

INTRODUCTION

This chapter presents estimates of rail and bus ridership in the three Nebraska Transit Corridors: Kearney to Omaha, Norfolk to Omaha, and South Sioux City to Nebraska City via Omaha. The analysis considers commuter, special event, and intercity opportunities for rail and bus modes. The general approach below is to first identify the target travel markets and then apply typical rail and bus mode splits to estimate the rail and bus market shares. The analysis concludes with the fundamental observations.

COMMUTER RAIL RIDERSHIP

Routes Analyzed

Commuter rail is characterized by peak period weekday service. If the demand exists, commuter trains operate during off-peak periods and on reduced schedules during the weekends. This analysis centers on the four commuter rail routes in the general Omaha/Lincoln area. The routes exist within two of the three Nebraska Transit Corridors. These corridors are:

- Lincoln to Omaha
- Omaha to Lincoln
- Fremont to Omaha
- Omaha to Fremont

Rail trips between Blair and Omaha were not analyzed, since there is no direct rail route between the cities. The analysis did consider Nebraska City-Omaha, but the low ridership potential there works against its consideration as a feasible commuter rail service.

Methodology

The first step in the analysis was to identify the total number of work trips that are occurring in the segments. These trips were adjusted to estimate work trips in 2010, the anticipated start-up year for the new transit services. From each of these projected market flows, the analysis determined a subset of trips that might be candidates for commuter rail service. Presented with a high-low range, each subset reflects the percentages of work trips that might reasonably be expected to use trains.

Sources

- Future work trips in the various flows were estimated from the county-to-county Journey to Work flows identified in the U.S. Census for 2000.

- Rail shares of total 2010 work trips were derived from commuter rail shares currently realized in comparable markets. Such shares are commonly referred to as rail and bus *capture rates*.
- The Metropolitan Area Planning Agency (MAPA) provided employment estimates by postal zip code in the Omaha area. Given assumptions about station stops, this information helped to estimate the percentage of work trips from Lincoln that might be served by rail.
- The City of Lincoln provided information on office and retail space concentrations. This information helped to estimate the percentage of work trips from Omaha that might be served by rail.

From Lincoln to Omaha

The most promising commuter rail potential is from Lincoln to Omaha. Running on the Burlington Northern and Santa Fe Railway (BNSF) main line, this service could generate a low of about 78,000 passenger trips per year and a high of about 116,000 annual passenger trips in 2010. Key assumptions include:

- Two peak period round trips each weekday; no weekend service.
- Termini of the Lincoln Depot and the Amtrak Omaha station.
- A Giles Road station, near I-80, serving work centers in southwestern Omaha; and a suburban station in northwest Lincoln.
- A capture rate of 6 percent applied to work trips, as shown in Table 2-1; 6 percent is consistent with rail shares experienced by Altamont Commuter Express (ACE) and Caltrain in Northern California[1]. ACE has a service level of three round trips operated during peak commute period – a service level that is comparable to that envisioned for Omaha-Lincoln commuter rail service.
- An additional 10 percent in weekday trips to account for casual or non-work trips.
- Growth rates for work trips to 2010 that reflect the growth that occurred in work trips between 1990 and 2000.
- Convenient transit connections in Omaha (either public or private) to move riders efficiently from trains to work centers within two to three miles of each station.
- Typical fares for commuter rail. Higher and lower fares would impact capture.

Table 3-1 shows the range in estimated rail work trips for 2010. City-to-city work trips were derived from the 2000 Census county-to-county calculations. The city-to-city trips were further refined into subsets representing trips terminating within a 2 to 3-mile radius of the station area(s); such a radius is the maximum that passengers are likely to ride a connecting shuttle from

[1] ACE operates three inbound trains on a 76-mile trip between Stockton and San Jose, California. The route is paralleled by Interstate highways, which suffer frequent congestion. Capture rates averaged about 4 percent for trips between 13 and 40 miles long. Longer trips tend to have higher capture rates. For a service running about 40 or more miles with two peak period round trips, a capture rate of 6 percent would appear reasonable. A review of Caltrain commute ridership on the San Francisco Peninsula also bears out the correlation of travel distances and capture rates and validates a 6 percent capture rate for a 40+ mile trip. Capture rate analyses for both ACE and Caltrain appear in Appendix Tables A-1 and A-2.

the station to their work places. The 6 percent rail capture rate is applied to produce the estimate of rail work trips. Ridership totals are increased 10 percent to reflect non-work trips.

Table 3-1: 2010 Morning Rail Work Trips

		Morning work trips	Trips near stations	Morning rail trips
Lincoln to Omaha	Low	5,700	2,331	154
Omaha to Lincoln	Low	3,254	1,532	101
Lincoln to Omaha	High	8,455	3,457	228
Omaha to Lincoln	High	4,351	2,049	135
Fremont to Omaha	Low	3,854	1,740	115
Omaha to Fremont	Low	1,119	1,007	66
Fremont to Omaha	High	4,673	2,110	139
Omaha to Fremont	High	1,558	1,403	93

Source: Wilbur Smith Associates; a.m. work trip data derived from U.S. Census county-county Journey to Work figurers

Table 3-2 presents the calculation of annual passenger trips. As noted, this calculation assumes only weekday service, with 254 weekdays per year. The total annual trips per option appear graphically in Figure 3-1.

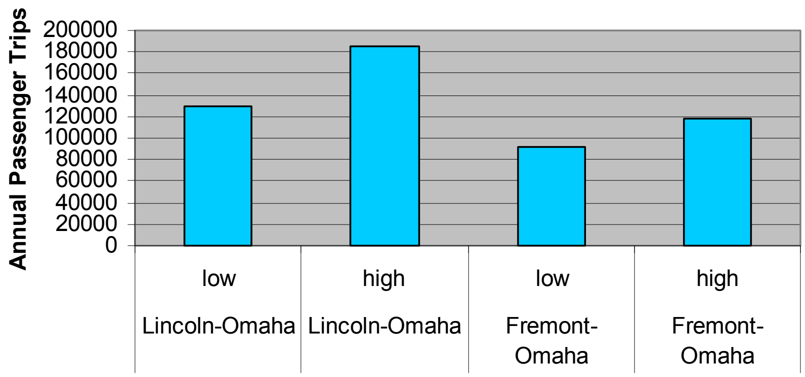
Table 3-2: 2010 Commuter Rail Ridership on Nebraska Corridors

		Morning rail trips	Daily one-way trips	Weekdays per year	Annual trips
Lincoln to Omaha	Low	154	308	254	78,146
Omaha to Lincoln	Low	101	202	254	51,373
Total		255	510	254	129,520
Lincoln to Omaha	High	228	456	254	115,918
Omaha to Lincoln	High	135	270	254	68,699
Total		363	727	254	184,617
Fremont to Omaha	Low	115	230	254	58,349
Omaha to Fremont	Low	66	132	254	33,779
Total		181	363	254	92,128
Fremont to Omaha	High	139	279	254	70,751
Omaha to Fremont	High	93	185	254	47,026
Total		232	464	254	117,777

Source: Wilbur Smith Associates

Note: Morning rail trips are shown as rounded whole numbers; calculations are based on actual numbers.

Figure 3-1: 2010 Commuter Rail Ridership



From Omaha to Lincoln

Lincoln-to-Omaha service would run in concert with an Omaha-to-Lincoln service. Given the same sort of assumptions, the two services together could generate a low of 129,000 annual passenger trips in 2010, and a high of 185,000 passenger trips. These figures are lower than other comparable commuter rail services. For example, in 2000 Short Line East (SLE) in southern Connecticut had about 285,000 passenger trips. SLE has three eastbound morning trips between 6 a.m. and 7:30 a.m., with two running through from New Haven to the major job center of Stamford, and the third connecting with Metro North at New Haven for a run to New York City. With its three morning peak period trains, ACE had about 804,000 annual passenger trips for Fiscal Year 2001-02. Sounder in Seattle-Tacoma, Washington, has three peak period round trips, which generated 672,000 passenger trips in Fiscal Year 2001-02.

From Fremont to Omaha

Running on the Union Pacific Railroad (UP) main line, this service is projected to generate between 58,000 and 71,000 passenger trips in 2010. The service assumes two stations in Omaha: one at 108th Street near the I-80/I-680 Interchange and the other downtown. It also assumes two peak period round trips.

From Omaha to Fremont

Fremont-to-Omaha service would run in concert with an Omaha-to-Fremont service. Given the same sort of assumptions, the two services together are projected to generate between 92,000 and 118,000 passenger trips. As with the ridership range for service between Lincoln and Omaha, this is at the lower end of the commuter rail ridership spectrum.

Other Segments

This analysis also looked at commuter rail service between Nebraska City and Omaha on the Union Pacific. However, services on this line would generate a high of about 18,000 passenger trips in 2010. This figure would be insufficient to support commuter rail.

Gretna Rail ridership

The commuter rail forecast in Table 3-2 is exclusive of ridership generated by a mid-route stop at Gretna and special event traffic. Gretna would generate comparatively light ridership, estimated at a low of 1,829 passenger trips in 2010 to Omaha. This is an equivalent of 4 percent of weekday work trips (180[2]) between Gretna and Omaha work centers that can be served by rail. A high-side estimate assumes a capture rate of 5 percent of work trips, resulting in a forecast of 2,286 riders in 2010. Gretna-Lincoln trips are counted as part of the commuter rail ridership from Omaha to Lincoln[3].

Other mid-route stations could be added (e.g. Ashland) as demand merits, but there will be a consequent elongation of travel time and increase in capital costs.

Special Event Rail Ridership

According to the University of Nebraska in Lincoln (UNL), the main special event that attracts Omaha residents is the fall football season. While specific numbers were not available, it is safe to assume that thousands of Cornhusker fans living in Omaha make the autumnal trek on about seven Saturdays to Lincoln and back by car. Attendance at Memorial Stadium can top 77,000 (seated capacity is 73,918). This rail patronage analysis assumes that three train sets, each consisting of a three-car self-propelled Diesel Multiple Unit (DMU) with 278 seats, would be filled to between 80- and 100-percent of capacity on game days. The football traffic would thus generate between 9,300 and 11,700 additional passenger trips in 2010. Facilitating this flow is the location of Memorial Stadium within walking distance from Lincoln Station.

The university also reported minor Omaha resident attendance at basketball and baseball games, amounting to a few hundred per game. The potential for rail ridership relative to these events was not analyzed as a result. That noted, given a convenient service, some fans in Omaha may opt for rail to UNL. While Hawks Field (baseball) is within walking distance of the Lincoln Station, Bob Devaney Sports Center (basketball) is further afield; a shuttle would have to be provided.

Other Potential Ridership

Large employers, like the University of Nebraska, could encourage employees to ride trains by subsidizing their fares, at least to some degree. Furthermore, the University could subsidize student fares. But such actions are within the purview of these institutions, and are outside of a commuter rail implementation *per se*. Accordingly, ridership that could result from these actions is not part of the forecast.

[2] Derived from Metropolitan Area Planning Agency (MAPA) travel demand model. 2010 work trips between Gretna and Downtown Omaha centers interpolated between 2000 and 2025 summed volumes.

[3] These were based on estimates of inter-county ridership in 2010; a specific estimate of Gretna-Lincoln riders was not performed. Any difference in revenue due to a small number of riders actually boarding in Gretna rather than in Omaha is small and not material to the analysis.

EXPRESS BUS RIDERSHIP

Peak period, limited stop service typifies commuter or express bus service. Presently, there is no commuter transit between Lincoln and Omaha, and other markets, *per se*. To understand what the ridership potential for a commuter bus service might be like, this analysis considered the shares currently realized by a comparable commuter bus operation. Golden Gate Transit (GGT) in Sonoma and Marin Counties, just north of San Francisco, carries about 2 percent of the work trip market[4]. The service moves commuters between semi-rural, suburban, and urban centers linked by a major highway.

Omaha/Lincoln Commuter Bus Ridership Potential

Commuter bus operations in the Omaha and Lincoln areas would occur on less congested corridors (compared with the U.S. Highway 101 through Sonoma and Marin Counties) with limited pay parking (likely less than at Marin County destinations). As highway congestion and pay parking tend to drive ridership, it would be reasonable to assume a capture rate of about 1 percent for work trips (less than for GGT). This percentage is applied to low-high range of county-to-county work trips for 2010 to estimate commute bus ridership in Table 3-3. Derived from 2000 Census figures, the 2010 county-to-county journey to work totals serve the base target market, as commute buses can gather and distribute riders in a wider spectrum versus rail, which is more limited in these respects due to its station locations and fixed guideway. Ridership totals are increased by 10 percent to reflect non-work trips. Estimates are for weekday service only.

As with rail ridership, the largest market is between the Lincoln and Omaha areas. The smallest market is between Otoe County and the Omaha area.

Gretna Bus Ridership

The commuter bus forecast in Table 3-3 is exclusive of ridership generated by a mid-route stop at Gretna and special event traffic. The estimate of Gretna riders bound for Omaha is about 45 percent of what are estimated for rail, i.e. 800 riders on the high side and 1,000 riders on the low side in 2010. Forty-five percent was used because estimated bus ridership Lincoln to Omaha is about 45 percent of the estimated rail ridership. As with commuter rail ridership, Gretna-Lincoln ridership is part of Omaha-Lincoln ridership.

Special Event bus ridership

As with DMUs, express buses could be deployed for special events which would add ridership. However, if federal funds were used to purchase these buses, the funding may constrain the use of the buses for special event runs, assuming that there is a commercial bus service providing the same service. This is because the provision may be perceived as unfair competition for a charter bus service. Should there be no such commercial service, there would be no such conflict. Still, since federal funding could be an eligible source for implementing express buses (see Chapter 8), this analysis assumes no special events ridership for the express buses.

[4] In 2000, GGT carried 1,250 of the 62,000 south bound work trips (the traditional flow), per "Marin / Sonoma Express Bus Study, Metropolitan Transportation Commission", January 2002.

Table 3-3: 2010 Commuter Bus Ridership in the Omaha/Lincoln Areas						
	Range	Morning work trips	Morning bus trips	Daily one-way trips	Weekdays per year	Annual trips
Douglas/Sarpy to Lancaster	Low	3,615	40	80	254	20,202
Lancaster to Douglas/Sarpy	Low	6,333	70	139	254	35,389
Total		9,948	109	219	254	55,591
Douglas/Sarpy to Lancaster	High	4,835	53	106	254	27,015
Lancaster to Douglas/Sarpy	High	9,394	103	207	254	52,495
Total		14,229	157	313	254	79,510
Dodge to Douglas/Sarpy	Low	4,282	47	94	254	23,929
Douglas/Sarpy to Dodge	Low	1,244	14	27	254	6,950
Total		5,526	61	122	254	30,879
Dodge to Douglas/Sarpy	High	5,192	57	114	254	29,015
Douglas/Sarpy to Dodge	High	1,732	19	38	254	9,676
Total		6,924	76	152	254	38,691
Washington to Douglas/Sarpy	Low	5,001	55	110	254	27,946
Douglas/Sarpy to Washington	Low	1,399	15	31	254	7,818
Total		6,400	70	141	254	35,763
Washington to Douglas/Sarpy	High	5,689	63	125	254	31,790
Douglas/Sarpy to Washington	High	1,512	17	33	254	8,449
Total		7,201	79	158	254	40,239
Otoe to Douglas/Sarpy	Low	739	8	16	254	4,132
Douglas/Sarpy to Otoe	Low	240	3	5	254	1,341
Total		979	11	22	254	5,473
Otoe to Douglas/Sarpy	High	1,079	12	24	254	6,028
Douglas/Sarpy to Otoe	High	297	3	7	254	1,660
Total		1,376	15	30	254	7,688

Source: Wilbur Smith Associates; a.m. work trip numbers derived from Journey to Work figures.
Note: Morning rail trips are shown as rounded whole numbers; calculations are based on actual numbers.

INTERCITY RAIL AND BUS RIDERSHIP

Intercity rail and bus services operations are characterized by daily schedules, though weekend options would be reduced. There are typically multiple round trips per day, which are not confined to peak periods. Only one corridor today has intercity rail service – Amtrak's California Zephyr operates one round trip per day between Lincoln and Omaha. There are more intercity bus services in the corridors. For example, there are several bus rounds trips between Lincoln and Omaha daily. For both rail and bus, the existing intercity services between Lincoln and Omaha are really parts of much longer services, with endpoints in other states.

Methodology

To understand the ridership potential for new transit services in the three Nebraska corridors, the analysis first tabulated existing daily trips between each city in its respective corridor. The analysis then applied intercity rail and bus intercity capture rates. These capture rates were derived from a review of similar service levels in similar rail and bus intercity markets.

Sources

- The Nebraska Department of Roads calculated the daily intercity motor vehicle volumes for each city pair in its respective corridors for the year 2000.
- Total intercity travel in comparable corridors was taken from the American Travel Survey (ATS), conducted for the year 1995 by the Bureau of Transportation Statistics of the U.S. Department of Transportation.
- The intercity rail ridership in those corridors was provided by Amtrak, the operator.
- Representative rail and bus shares of intercity rail travel were identified from the "Southeast High Speed Rail Market and Demand Study", North Carolina Department of Transportation et al., 1997.
- County population projections were obtained from the Bureau of Business Research, University of Nebraska in Lincoln.

Rail Ridership

Table 3-4 shows the rail ridership achieved in a set of 11 O-D pairs comparable with distances to the Nebraska transit corridor O-D pairs. This particular calculation has Amtrak trips as a percent of estimated intercity trips per the American Travel Survey. The average for all shares is about 0.05 percent.

Table 3-4: Current Intercity Rail Capture Rates in Selected Corridors

A	B	2001 Corridor Population	Corridor Length in miles	Current Annual Amtrak Ridership One-Way	Total Daily Intercity Trips	Amtrak Daily Psgr Trips	Amtrak Daily Psgr Trips/ Total Daily Intercity Trips
Buffalo	Rochester	1,678,000	67	2,300	160,000	6	0.004%
Detroit	Kalamazoo	2,422,000	143	9,700	739,400	27	0.004%
Fresno	Bakersfield	1,492,100	111	13,800	189,300	38	0.020%
Charlotte	Greensboro	1,141,800	89	5,500	320,000	15	0.005%
Modesto	Fresno	1,284,303	94	6,600	241,800	18	0.007%
Omaha	Lincoln	843,600	55	100	7,500	0.27	0.004%
Raleigh	Greensboro	1,427,900	84	13,800	682,000	38	0.006%
Rochester	Syracuse	1,191,500	79	2,800	71,700	8	0.011%
Springfield	Windsor/Hartford	1,317,000	26	1,500	104,700	4	0.004%
St. Louis/Kirkwood	Kansas City	2,197,300	283	60,300	920,000	165	0.018%
Windsor/Hartford	New Haven	1,687,500	32	36,500	136,000	100	0.074%

Source: Wilbur Smith Associates and others as noted below.
Notes:
1. Population estimates from 2000 U.S. Census Data.

2. Intercity trips per 1995 American Travel Survey (ATS), unless otherwise specified. Trips are between cities.
3. Fresno-Bakersfield has 69,198 Amtrak riders. An estimated 20 percent have origins and destinations in Bakersfield and Fresno. An estimated 80 percent are transferring to connecting buses to the Los Angeles area.
4. Omaha-Lincoln total trips provided by NDOR.
5. Springfield-Windsor-Hartford total intercity trips estimated from Connecticut Department of Transportation Average Daily Traffic figures, plus 1 percent for bus, and Amtrak figures.
6. St. Louis-Kansas City figures from unpublished ATS data.

The "Southeast High Speed Rail Market and Demand Study" also measured rail shares, plus bus shares (please see the calculations in the Appendix Table A-3). Its conclusion is that the average rail share is just under 1.81 percent in the various markets. The chief difference in the two data sets is that the O/D pairs in the high speed corridors tend to have longer distances that those shown in Table 3-4. It would appear that the longer the distance, the higher the rail capture rate. For the purposes of this analysis, a middle range, optimistic rail capture of 1 percent is assumed. The high speed study showed an average bus share of 0.11 percent, including many of the same markets counted for rail. This study assumes an optimistic bus capture rate of half that for rail, i.e. 0.5 percent: this rate is reasonably close to the bus capture rate achieved in some markets counted in the high speed rail study.

In Table 3-5, these rail and bus capture rates are applied to the estimated 2010 motor vehicle volume between various cities in a corridor. The 2010 O-D volume was updated from the 2000 O-D volume provided by NDOR and shown in Chapter 2. Updates were based on the average of the projected increase in total population of the counties in which the O-D cities are located (per the Bureau of Business Research, UNL). The update approach differs from that used to estimate 2010 work trips in previous tables, in that the growth in work trips between 2000 and 2010 was a direct function of the growth in work trips during the preceding decade. While Table 3-5 is not directly comparable to the previous tables, it does provide a logical basis for analysis to total intercity trips in the corridor.

That said, clearly, the corridor with the largest intercity rail and bus potential is between Kearney and Omaha (both directions represented). This is because it incorporates Lincoln-Omaha travel, of which part is commuting between the two cities. The volume for the South Sioux City to Nebraska City corridor does not include travel between Sioux City, Iowa and Nebraska cities in the corridor. Presumably, the majority of travel between Sioux City, IA and Omaha, the largest Nebraska population center, goes by I-29 through Iowa.

It must be noted that the estimated rail and bus shares for 2010 may be somewhat more or less than those experienced today. For example, the most recent Amtrak data showed 100 annual riders between Lincoln and Omaha, a number higher than the total estimated in Table 3-5 below. Still, the 87 trips shown is representative of the scale of annual ridership that could be expected. The same would hold true for bus.

Table 3-5: 2010 Intercity Rail and Bus Trips

Kearney to Omaha Corridor O-D Pairs	Adjusted 2000 Daily O-D volume	Growth	Projected 2010 daily O-D volume	Daily rail volume	Daily bus volume
Kearney-Grand Island	565	12.35%	634	6	3
Kearney-York	25	7.75%	27	0	0
Kearney-Lincoln	135	15.45%	156	2	1
Kearney-Omaha	135	14.50%	155	2	1
Grand Island-York	160	7.00%	171	2	1
Grand Island-Lincoln	320	14.70%	367	4	2
Grand Island-Omaha	790	13.75%	899	9	4
York-Lincoln	475	10.30%	524	5	3
York-Omaha	130	9.35%	142	1	1
Lincoln-Omaha	7,465	17.05%	8,738	87	44
Total				118	59
Norfolk to Omaha Corridor O-D Pairs	Adjusted 2000 O-D volume	Growth	2010 O-D Volume	Rail Volume	Bus volume
Norfolk-Columbus	470	7.95%	507	5	3
Norfolk-Fremont	145	8.75%	158	2	1
Norfolk-Omaha	420	12.50%	473	5	2
Columbus-Fremont	335	7.80%	361	4	2
Columbus-Omaha	765	11.55%	853	9	4
Fremont-Omaha	3,225	12.35%	3,623	36	18
Total				60	30
S. Sioux City to Nebraska City O-D Pairs	Adjusted 2000 O-D volume	Growth	2010 O-D Volume	Rail Volume	Bus volume
S. Sioux City-Blair	5	17.50%	6	0	0
S. Sioux City-Omaha	45	17.95%	53	1	0
S. Sioux City-Nebraska City	0	14.90%	0	0	0
Blair-Omaha	1,630	15.65%	1,885	19	9
Blair-Nebraska City	5	12.60%	6	0	0
Omaha-Nebraska City	500	13.05%	565	6	3
Total				25	13

Source: Wilbur Smith Associates; intercity trips for 2000 provided by NDOR.

From this analysis, none of these Nebraska corridors appears to hold promise for intercity rail options. However, with a total of about 60 daily bus riders, the Kearney to Omaha corridor would appear to justify intercity bus service. Indeed, Greyhound today runs several trips a day on this corridor.

SUMMARY

From the preceding preliminary analysis of potential ridership in 2010, various points seem clear.

- The best opportunity for commuter rail appears to be between Omaha and Lincoln. Even so, ridership will be on the low side of commuter rail ridership experienced nationally.
- Potential demand for express bus services appears to exist in all commute corridors reviewed in the Omaha-Lincoln area, with the exception of Otoe County to Omaha.
- Potential demand appears to exist to merit transit service (either bus or rail) for special events related to UNL sports events.
- Demand is insufficient to support new intercity rail services.
- The market with the best potential for intercity bus, i.e. between Omaha and Lincoln, is already served well by existing intercity bus services.

Before federal funding for any alternative can be obtained, a regional travel demand model needs to be developed so that more accurate ridership can be predicted.

COMBINATIONS OF SERVICE

In March of 2003, NTRAC decided to concentrate the analysis on three commute-length corridors focused on Lincoln and Omaha, i.e. Lincoln-Omaha, Fremont-Omaha, and Blair-Omaha. None of these is more than 60 miles long, and each has a definable commuter population. The rationale for the focus was simply that the greater Lincoln-Omaha area is where the most potential ridership would be for rail and/or bus commute options, and that the larger market potential would provide the stronger justification for implementing transit services.

NTRAC further identified alternative scenarios for transit services in these corridors. These were:

- ***Scenario A:*** commuter rail between Lincoln and Omaha, express bus between Omaha and Fremont and between Omaha and Blair. This option would have a total rail/bus ridership of between 193,000 and 259,000 (rounded to the nearest 1,000) in year 2010, as shown in Table 3-6 below.
- ***Scenario B:*** express bus between Lincoln and Omaha, between Omaha and Fremont, and between Omaha and Blair. This option would have a total bus ridership 108,000 and 141,000 in 2010.
- ***Scenario C:*** express bus between Lincoln and Omaha. This option would have a total bus ridership of between 56,000 and 81,000 in 2010.

Table 3-6: Ridership Summary for 2010 for the Alternative Operating Scenarios				
Scenario	Mode	Market	Low	High
A	Commuter Rail	Omaha-Lincoln	51,373	68,699
		Lincoln-Omaha	78,146	115,918
		Gretna-Omaha	1,829	2,286
		Special Events	9,341	11,676
		Subtotal	*140,690*	*198,579*
	Express Bus	Fremont-Omaha	23,929	29,015
		Blair-Omaha	27,946	31,790
		Subtotal	*51,875*	*60,805*
		Total	***192,565***	***259,384***
B	Express Bus	Omaha-Lincoln	20,202	27,015
		Lincoln-Omaha	35,389	52,495
		Gretna-Omaha	800	1,000
		Fremont-Omaha	23,929	29,015
		Blair-Omaha	27,946	31,790
		Total	***108,266***	***141,315***
C	Express Bus	Omaha-Lincoln	20,202	27,015
		Lincoln-Omaha	35,389	52,495
		Gretna-Omaha	800	1,000
		Total	***56,391***	***80,510***

Source: Wilbur Smith Associates

Chapter 4
TECHNOLOGY OPTIONS

INTRODUCTION

As Nebraska continues to grow, traffic on the interregional highway network will become worse. Increased traffic congestion in once rural areas is caused in part by urban sprawl. A growing inter-dependency of the two largest cities in Nebraska has led to increased traffic in the Lincoln-Omaha corridor. The increased use of automobiles for regional travel continues our dependence on foreign sources of oil to fuel our mobility. Increasing recognition of the need for high-quality transit service to alleviate these conditions has fueled growing demand for new or improved transit services. Improved transit systems have in fact played an essential role in providing an attractive and effective alternative to automobiles, by reaching into central cities, local neighborhoods, and rural areas to meet the mobility needs of millions of people in other parts of the country and throughout the world.

This chapter describes the family of high-capacity transit technology options or modes available to meet estimated future demand for intercity public transportation services in Nebraska. The chapter discusses the process of identifying and assessing appropriate groups of transit technologies along with the evaluation criteria used to analyze them. It then discusses and illustrates the candidate transit technologies' site-specific requirements. The chapter concludes with a summary of candidate mode characteristics. As an alternative, van-pools are briefly discussed.

IDENTIFICATION OF HIGH CAPACITY MASS TRANSIT TECHNOLOGIES

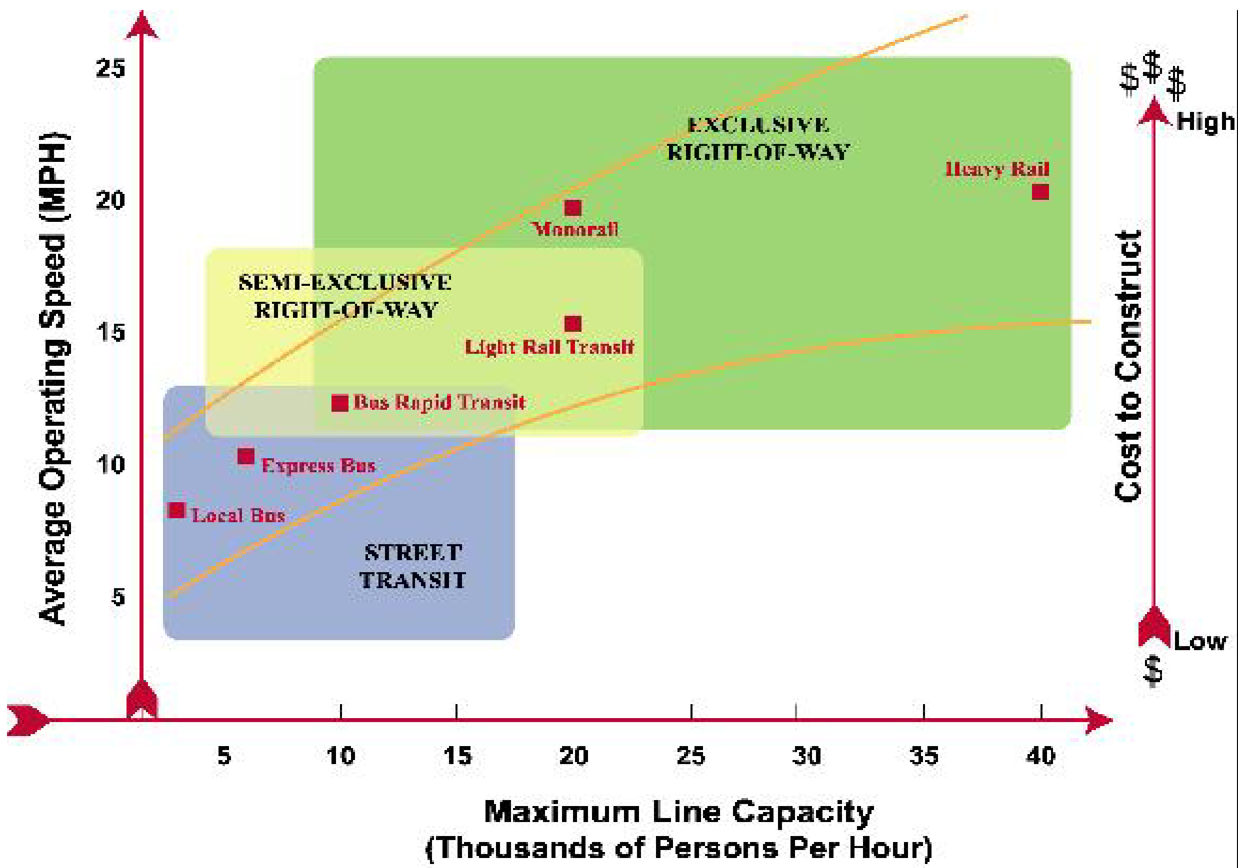
A family of public transportation technologies has been designed to supply a range of public transport system capacities that satisfy system demand. These technologies range from small buses in rural areas to heavy rail rapid transit systems in very large cities. Each group of technologies is designed to operate within a certain environment achieving capacities limited by vehicle size, right-of-way requirements and scheduled speed. Each technology option satisfies a particular level of travel market demand. The transit technology selected for a corridor therefore is largely dependent on the capacities of the technology under investigation.

CAPACITY OF TRANSIT TECHNOLOGIES

The capacity of a transit line is measured by calculating the number of persons per hour per direction (PHPD). This is achieved by simply multiplying vehicle capacity times the number of buses or trains operating per hour passing a given station. For example, assuming buses seat 40 people and the public transport system maximum load factor is 125 percent of seated capacity, the peak capacity of the bus is 50 passengers. With this load factor, a busway could theoretically serve up to 12,000 PHPD. This would be the equivalent of operating 4 buses per minute during the peak hour passing a station stop. Although buses passing a given point on a busway can achieve this throughput, not all buses can stop unless fairly elaborate stations with multiple bus bays are provided. At such levels of development, the bus system is likely to exhibit capital and operating costs comparable or higher than rail transit.

The number of trains per hour or minimum headway for trains is limited by several factors including train length, train control system (signaling), station platform design, method of fare collection and numbers of doors per train, which affects station dwell time. Generally, the signaling system is the most critical design element affecting capacity. Most signal systems are designed for 90-second intervals between trains. Using this 90-second headway and assuming train lengths of eight cars each carrying about 120-150 passengers, the maximum line capacity is between 38,400 and 48,000 PHPD. Figure 4-1 graphically presents comparisons among transit technologies, practical capacities and average operating speed.

Figure 4-1 **Spectrum of Transit Technologies**



EVALUATION CRITERIA

The specification of system concepts and a list of technology groups were identified and analyzed based on the following criteria:

- ***Site Specific Requirements*** **–** Site specific requirements refer to the ability of the technology to handle the geometric constraints, general system parameters and preliminary ridership requirements of this study area and the corridors selected for detailed study. Geometric (physical) constraints required of the technology include estimated turning radius, space/right-of-way availability, profile grade, guideway length, and station spacing. In addition, the technology must be safe.
- ***Technical Maturity*** **–** Technical maturity refers to the level of development of the technology group, or subgroup, including the overall maturity of the technology indicated by development status, operating applications, current market activity, manufacturer experience, and participation in the global market.
- ***Service Performance*** **–** Service performance refers to the ability of the technology to provide transit service adequate to accommodate initial peak hour peak direction passenger loads and to be increased over time to accommodate future year demand on the proposed transit lines.
- ***Capital and Operating Costs*** **–** Every project presents a unique set of costs including initial capital investments to build and equip the system, periodic capital expenditures during its life to renew certain project elements, and ongoing costs to operate the service and maintain all of the system elements in good working order.

CANDIDATE TRANSIT TECHNOLOGIES

The technology candidates are: intercity bus, express bus, bus rapid transit (BRT), light rail transit (LRT), commuter rail and intercity rail. Each is to be considered in a form or forms applicable to the needs of the corridors. The technology must function as high quality, "line-haul" transit routes with stations spaced appropriately to serve the market. Finally, operating examples from several cities are described to highlight the pros and cons of the several candidate technologies.

Intercity Bus and BRT

The bus is ubiquitous and is found to be in most urbanized areas in the country. Lincoln and Omaha have a highly developed local network of bus routes that provide urban dwellers with mobility choices. Bus systems are very flexible and the route design can incorporate elements of rapid transit, such as stations spaced further apart than local bus stops. Given the rural character of most of Nebraska, motor coach technology is a viable candidate technology in all of the corridors under investigation for interregional express bus services.

Express bus is a bus operation that operates a portion of the route without stops or with a limited number of stops. The express bus service is scheduled to operate faster than local service by limiting the number of stops the bus will make along the route. ***Intercity bus*** services connect cities. ***Regional express buses*** are generally characterized by use of motor coach equipment connecting major residential communities with central business districts in distant cities.

Bus rapid transit (BRT) generally operates on exclusive or reserved rights-of-way (busways) that permit higher speeds and avoidance of delays from general traffic flows. May include reverse lane operation on limited access roadways, and/or prioritization of at-grade bus movements through signalized intersections.

A busway is a roadway for the exclusive use of transit buses. The typical configuration is two lanes (one for each direction), with pull-out lanes at stations so express buses can pass locals, and ramps as required to/from other highways and streets.

"Guided busways" relieve drivers of steering responsibility while they are operating on the facility, but require specially-equipped buses. Examples are located in Essen, Germany and Adelaide, Australia.

The "pure" busway is relatively rare. Currently, installations exist only in Ottawa, Canada and Pittsburgh, Pennsylvania. The I-10 El Monte Busway in Los Angeles initially had improvement of bus service as its primary purpose. However, buses now share the facility with vanpools and carpools. Outside North America, busways serve the "new towns" of Runcorn and Milton Keynes in England. In South America busways have been built or proposed in Quito, Ecuador; and Sao Paolo and Rio de Janeiro in Brazil.

In Brazil, the city of Curitiba has developed an extensive system of expedited bus routes running on surface bus lanes designated on a number of city streets. Mostly curb lanes, they are furnished with a unique design of "tube" bus stop that facilitates off-vehicle fare collection and passenger boarding and alighting to/from high floor buses.

Capacity can be increased by using articulated, and even (in Curitiba) double-articulated buses. However, a limitation of buses compared to all other options, is that they cannot be coupled into trains. Buses must be run more frequently than fixed guideway systems to achieve high PHPD capacity.

Key points regarding the BRT option are:

- Site-specific requirements: Both grade-separated and at-grade location of lines, as well as exclusive and surface operation are feasible; however, reserved lanes and pre-emption/prioritization of traffic lights are necessary to ensure high levels of service reliability when operating within street rights-of-way. Low level platforms compatible with sidewalks and streetscapes are feasible.
- Technical maturity: Modern bus rapid transit is an outgrowth of decades of continuous development.
- Ubiquitous and interchangeable: Vehicles and support systems are competitively available from numerous suppliers.
- Buses are typically articulated, about 18 m long by 2.6 m wide, with about 70 seats and a total seated and standing capacity of about 110 (64 percent seated).
- Initially, a system running an articulated bus every 3 minutes would offer 1,400 PHPD seats, with a comfortable seated and standing PHPD load on the order of 1,800 passengers (90/bus). Reserve capacity to accommodate a PHPD load of up to 2,200 riders (110/bus) at the peak load point could be achieved before adding buses and shortening the headway.
- On a busway with one- or two-bus pullouts at stations, practical operating headways can be as short as one minute, yielding an "ultimate" capacity of about 6,000 PHPD riders. If more elaborate multiple-bay stations are provided, and/or if some or all buses run non-stop, a busway can accommodate up to 20,000 PHPD passengers.

Light Rail Transit

Light rail transit (LRT) is a rail transit technology capable of providing a broad range of passenger capacities. Modern electric rail vehicles operate singly or in short trains. Taking power from an overhead wire, they can run on either exclusive or shared rights-of-way with or without grade crossings, or occasionally in mixed traffic lanes on city streets. LRT could be considered the modern day equivalent of the former interurban railways that operated between Lincoln and Omaha over 60-years ago.

Locational flexibility is the primary defining attribute separating LRT from other rail *modes* (synonym for "technology"). Tracks can be laid in any of three generic right-of-way (R/W) categories:

- ***Category A* - Fully controlled R/W:** grade separated (aerial, fill, cut, tunnel) or at grade with no crossings, or widely-spaced crossings with signal override and gate protection. Light rail vehicles (LRV's) operate as rapid transit trains.
- ***Category B* - Separate R/W:** longitudinally separated (curbs, barriers, grade separation) from other traffic, but with vehicle and pedestrian grade crossings, e.g. curbed medians, side-of-street reservations, and private R/W with few-to-frequent grade crossings. LRV's receive priority over motor traffic.
- ***Category C* - Shared R/W:** surface streets with tracks in lane(s) reserved for transit by paint striping and/or signals, or lanes that are shared with other traffic.

LRT systems have been built in seven North American cities since Edmonton opened in 1978, and several older systems have been rebuilt and otherwise modernized. Scopes for projects completed during the 1980's ranged from modest systems costing less than $10 million/mile (San Diego and Sacramento) to lines with extensive subways approaching heavy rail standards and costs of $50 million/mile and more (Pittsburgh and Buffalo). In every instance, these LRT system are primarily used as urban area transit systems and do not have lengths greater than 30-miles.

Most of the new LRT systems use large, high capacity, high performance 50 to 65 mph (80-105 km/h) cars capable of operation in trains of up to four cars. Four double-width doors on each side of each car promote fast loading/unloading and, as a result, short station stopping (dwell) times.

Key points regarding the LRT option are:

- Site-specific requirements: Both grade-separated and at-grade location of lines, as well as exclusive and surface operation are feasible; however, reserved lanes and pre-emption/prioritization of traffic lights are necessary to ensure high levels of service reliability when operating within street rights-of-way. Low level platforms compatible with sidewalks and streetscapes are feasible.
- Technical maturity: Modern light rail transit is the outcome of over 100 years of continuous development.
- Ubiquitous and interchangeable: Vehicles and support systems are competitively available from numerous suppliers.
- Cars are typically articulated, triple-bogie units about 28 m long by 2.65 m wide, with about 75 seats and a total seated and standing capacity of approaching 190.
- Trains can vary from 2-4 cars, with a 4-car train capable of carrying about 300 seated passengers, and a total of up to 750 passengers (40% seated).
- Initially, a system running a 3-car train every 6 minutes would offer 2,250 PHPD seats, and a comfortable seated and standing PHPD load on the order of 4,000 passengers (135/car), with reserve capacity to accommodate a PHPD load of up to 5,700 riders (190/car) at the peak load point.
- Practical operating headways can be as short as three minutes, yielding an "ultimate" capacity with 4-car trains of up to 15,000 PHPD passengers.

Commuter Rail

Commuter rail is a mode of transportation that is based on operating passenger trains on the tracks of the general railroad system, which is shared with freight trains. Historically, commuter rail systems have been the local services of intercity rail passenger carriers that linked distant suburbs and rural areas with the Central Business District in major metropolitan areas such as New York, Chicago or Boston. The distances covered and markets served fall between urban transit and intercity rail passenger service. Commuter rail systems utilize the existing general railroad system infrastructure including tracks, signals and other facilities. Depending on location and the system operator commuter rail may share tracks with freight railroad users or operate on dedicated tracks.

Service is typically provided in the peak direction during the peak commuter travel periods. Service may operate all day to provide more balanced scheduling of trains and more travel choices to people. Trains may consist of single level or bi-level coaches and can be pulled or pushed by diesel electric locomotives. Commuter trains can also consist of electric (EMU) or diesel (DMU) multiple unit cars, self-propelled rail cars as shown below.

Regional rail systems can be considerably different in character from the typical commuter rail operation. Regional rail systems are operated by mainline railroad operators on the tracks of the general railway system in Berlin, Copenhagen, Tokyo, Frankfurt, and Vienna. These regional rail systems are differentiated from commuter rail by many stations in the city and adjacent communities and higher service frequencies that approach urban rail transit systems. Passenger volumes are less peaked since they are generally non-CBD (central business district) and non-commuter oriented. The Triangle Transit Authority (TTA) is contemplating developing a regional rail system in the Raleigh-Durham area.

What distinguishes commuter and regional rail from other modes of rail transit is it ability to provide fast, region-wide travel access by utilizing the existing infrastructure and rights-of-way of the general railroad system. By utilizing the general railroad system, commuter and regional rail trains are subject to regulation by the Federal Railroad Administration (FRA). Commuter train rolling stock must conform to the crashworthiness standards of the FRA.

Key points regarding the commuter and regional rail option are:

- Site-specific requirements: The rail lines utilize the general railroad system in the local area.
- Technical maturity: Modern commuter and regional rail transportation is the outcome of over 150 years of continuous development.
- Ubiquitous and interchangeable: Vehicles and support systems are competitively available from numerous suppliers.
- Trains are typically made up of single level or bi-level passenger coaches pulled or pushed by diesel-electric locomotives, or are made up of DMU or EMU cars. Seating capacity ranges from about 85 seats for a DMU/EMU or 100-150 seats for a standard passenger coach or bi-level coach. Trains can carry as many 600 seated passengers or more.

- Practical operating capacity can be up to 6,000 PHPD passengers.

Intercity Rail Passenger Service

Intercity rail passenger service connects rural communities and major cities that are separated by greater distances than a commuter train. Intercity passenger trains generally operate daily services with station stops of distances of about 100-miles between cities. Today, Amtrak provides rail service between McCook, Holdrege, Hastings, Lincoln and Omaha along the BNSF line. Various states are sponsoring intercity rail services. Examples include California's Capitol Corridor (San Jose-Sacramento), San Joaquin (Oakland/Sacramento-Bakersfield), and Surfliner (San Luis Obispo-San Diego) services. Texas, Oklahoma, New York, Oregon, Washington, Illinois, etc., also sponsor intercity rail services (by covering operating subsidies), using Amtrak crews and freight railroad tracks.

COMPARISONS OF TECHNOLOGIES

Based on the foregoing information and other characteristics of operating systems around the world, the several candidate technologies can be evaluated for their potential applicability for a regional transit system in the Nebraska study area. Comparisons are grouped under the categories established at the start of this chapter, Site Specific Requirements, Technical Maturity, and Service Performance.

Site Specific Requirements

Physical characteristics - minima and maxima - determine the relative ease or difficulty of inserting a particular technology into the pre-existing urban fabric of a built-up cityscape. The following Table 4-1 summarizes some of the key requirements of the candidate technologies.

(This space intentionally left blank.)

Table 4-1: Site Specific Requirements of Candidate Technologies				
Item	**Commuter Rail**	**Intercity Rail**	**LRT**	**Intercity and Express Bus**
Locational Flexibility [(a)] -A, Exclusive R/W -B, Semi-Exclusive R/W -C, Shared R/W	 Required No No	 Required No No	 Feasible Feasible Feasible	 Feasible Feasible Feasible
Curves and Grades: -Minimum Curve Radius[(b)] -Maximum Grade	 50m 2%	 40 m 2%	 25 m 7%	 13 m 12%
Stations: -Grade-Separated -Surface Platforms	 Not required Feasible	 Not required Feasible	 Not required Feasible	 Not required Feasible

Notes:
(a) See LRT paragraphs for definitions of Category A, B and C rights-of-way.
(b) Minimum-radius curves must be traversed at restricted speeds; for rail systems, need 350 m radius with 15 centimeters super-elevation to sustain 80 km/h speed through curve; similar for rubber tire systems.

To reach maximum levels of operating reliability and performance, LRT and BRT also are most desirably located in exclusive (R/W); but they can be accommodated in semi-exclusive R/W (Category B) when full grade separation is precluded by costs or other impacts. A semi-exclusive R/W, such as a boulevard or freeway median or reserved curb street lane, separates transit vehicles from parallel traffic flows. Special prioritization is needed at traffic signals, however, to expedite transit vehicle movements through at-grade intersections. If no other option is feasible, LRT and BRT vehicles even can be operated in shared R/W (Category C). Such segments should be kept as short as possible, because operating speeds will inevitably be relatively low, and schedule reliability will suffer from the effects of transit vehicles stuck in the general traffic flow.

Grades and, especially, curves affect the ability to locate a transit guideway within the confines of a city street R/W. LRT and BRT vehicles are capable of making much sharper turns than regional and intercity rail passenger trains. Sharp turns limit speeds; but in some places this is a necessary trade-off to enable location of a guideway within the limits of an urban street.

Technical Maturity

All of the technologies described are in daily revenue service. However, the number of operating systems varies significantly among alternatives. Buses, light rail vehicles (and their ancestor, the electric interurban) and commuter and intercity rail passenger trains are ubiquitous. Examples of such systems may be found in numerous cities around the world:

- Express buses: Virtually every city with transit
- Light rail (including Streetcars): 350 systems worldwide
- Commuter rail: over 15 cities in North America

- Intercity rail: Amtrak

What are not so numerous are examples of BRT. However, enough urban places have implemented some form of enhanced bus operations to establish a menu of available technologies ranging from traffic light priority hardware and software, through various types of surface street lane reservations (curb and median bus lanes, transit malls), up to exclusive busways. In Los Angeles, all three may be found:

- Expedited surface bus operations on Ventura and Wilshire Boulevards
- Highway lanes limited to buses and car pools on the San Bernardino Freeway
- Exclusive busway on the Harbor Freeway

Service Performance

The system built must accommodate initial forecast passenger loads and be expandable to handle future growth. These are both important capabilities. The forecast passenger volumes for the corridors under discussion are likely to be in the lower range of passenger capacity requirements. However, during some special events, such as for university of Nebraska football games, demand for travel between Omaha and Lincoln will be higher than normal and very peaked.

The capacities of the candidate technologies are presented in Table 4-2 and include a range of capacities for rail technologies for commuter rail and LRT. The values in Table 4-2 can then be correlated to the passenger demand forecasts being prepared as part of the present study when they become available.

Table 4-2: Peak Load Point Capacities of Candidate Technologies

Candidate Technology	Number of Seats Per Vehicle	Initially		Ultimately
		Comfortable PHPD* Load	Using Reserve PHPD* Capacity	Using Ultimate PHPD* Capacity
Commuter/Intercity rail	80-400 (a)	1,200	1,420	6,000
Light Rail Transit - Line Haul Service	80-240 (a)	9,600	14,400	20,000
Bus Transit:				
- Local bus	35	4,200	5,040	6,300
- Express Bus	50	6,000	7,200	9,000
- Bus Rapid Transit	65	7,800	9,360	20,000

Notes:
* PHPD: Peak hour in the peak direction at the peak load point on a line.
(a) Seats per single unit and for a train

The assumption used for the commuter rail alternative was four trains per hour per peak direction. This provides 15-minute service during the peak periods with a maximum train consist of 5 car lengths of single deck coaches. The commuter/intercity rail capacity can be increased by utilizing double-deck coaches or lengthening the train. However, it is anticipated that neither double-deck nor long trains will be required for any of the corridors under investigation.

Trains could also consist of diesel powered self-propelled railcars (also known as diesel multiple units or DMUs), which can operate more efficiently than locomotive hauled rains in light traffic volume corridors as contemplated in several of the corridors under investigation.

The LRT alternative assumed a maximum train length of 3-LRV and a maximum service frequency of 40-trains per hour (a train every 1.5-minutes).

Buses are a crucial element of any future multi-modal transit system. They will provide feeder service to and from rail stations on the "primary trunk" rail lines; and they will continue to serve the "secondary trunk" routes where volumes do not require the capacity of rail. Bus rapid transit could be developed in such a way as to operate in a high occupancy vehicle (HOV) lane of a regional freeway system or be combined with high occupancy toll (HOT) lanes in urbanized areas.

(This space intentionally left blank.)

SUMMARY OF COMPARISONS

Table 4-3: Characteristics of Transit Modes

Transit Mode	Commuter Rail	Intercity Rail	Express Bus	LRT	BRT
					
ROW options	Exclusive ROW General railroad Mixed traffic	Exclusive ROW General railroad Mixed traffic	Mixed traffic	Exclusive ROW Semi-exclusive Mixed traffic lanes	Exclusive ROW Semi-exclusive Mixed traffic lanes
Station spacing	5 to 10 miles	100 miles	1 to 5 miles	½ to 1 mile	¼ to 1 mile
Vehicles	Locomotive with train of sets of passenger coaches either single level or bi-level; or self-propelled multiple units, either diesel (DMU) or electric (EMU).	Locomotive with passenger coaches, café car.	Motor coach, high platform, diesel, CNG	Articulated and double articulated low floor, can operate in multiple unit train sets, overhead electric power; diesel/hybrid DMU.	Standard, articulated or double articulated buses, low floor or high platform, diesel, diesel/hybrid propulsion or ETB.
Seated Capacity	85 -150 per car	60-80 per car	45 to 55 per vehicle	65-85 per car	40 standard 65 articulated 85 double articulated
Average speed	25 to 45 mph	65 mph	25 to 45 mph	15 to 30 mph	15 to 30 mph
Passenger throughput	Up to 6,000 pphpd	Up to 6,000 pphpd	Up to 7,200 pphpd	Up to 20,000 pphpd	Up to 20,000 pphpd
Capital ROW Cost per mile	$2 to 10 million	$2 to 10 million	$350 k to $25 million	$20 to 55 million	$250 k to $25 million
Cost per vehicle	Locomotive $3.0 million; bi-level coach $1.5 million; DMU $6.8 million for a 3-car unit, Colorado Railcar	Locomotive $3.0 million; passenger coaches $1.5 to $2.0 million	$350,000 to $450,000	$1.8 to $3.0 million	$350,000 to $1.8 million
O&M Cost Per service hour	$300 to $400	$175 to $250	$75 to $100	$150 to $200	$65 to $100

Source: Vukan R. Vuchic; *Urban Public Transportation; Systems and Technology*; Prentice-Hall, Englewood Cliffs New Jersey, 1981 and Wilbur Smith Associates.

FINDINGS AND CONCLUSIONS

Its use of the infrastructure and facilities of the general railroad system makes ***commuter rail*** an attractive option for achieving regional mobility improvements at a fraction of the cost of a light rail transit (LRT) system. Intercity rail is also a viable technology alternative and could be a considered option, if merited by travel demand. The DMU is an appropriate and cost-effective technology for the Lincoln-Omaha corridor under study. Locomotive-hauled intercity trains are best utilized for longer distance and higher density corridors than any of those identified by this study.

Express bus and bus rapid transit (BRT) are viable technology alternatives and could be a considered option. However, with the anticipated widening of I-80, US-275, US-6, and N-133 – all routes which express bus services would utilize – there appears no need of a exclusive or semi-exclusive mixed traffic lanes, which denote BRT. Thus, ***express bus*** appears the more appropriate option for a bus technology in the three service scenarios under study.

The cost of the propulsion system infrastructure precludes LRT from being a cost-effective technology in long distance corridors with light travel volumes. Therefore, this technology is not recommended for any of the service scenarios being examined.

It is recommended that study effort not be expended on any monorail (MRL) or other automated guideway transit (AGT) or personal rapid transit (PRT) alternatives. These technologies do not serve long distance corridors appropriately. Some PRT or AGT technologies could be applied to localized circulation systems in certain station catchment areas, primarily in large hospital, university or commercial campuses or central business districts. However, such systems are very expensive to design, construct, operate and maintain.

An Alternative Technology – Van-pools

Though strictly not a high capacity urban technology (and therefore not analyzed here), van-pools hold the potential for efficient public-sponsored transportation in light density corridors. Reportedly, Metro Area Transit (MAT) in Omaha is investigating implementation of a van-pool program, similar to a Des Moines, IA program that started about eight years ago with four vans. According to the Omaha World Herald (July 26, 2003), that program now moves 550 commuters in 63 vans.

Conceivably, MAT would supply leased vans, and riders would pay a monthly fee that would cover maintenance, insurance, and fuel. Each van's passengers would pick a driver from among themselves, and they would determine the van's route. The program could be self-supporting and implemented in all three commute corridors under study.

Chapter 5
COMMUTER RAIL OPERATING PLAN

INTRODUCTION

Ridership forecasts in Chapter 3 indicated a potential travel demand for morning and afternoon service to both Omaha and Lincoln. The purpose of this chapter is to provide an operating plan for such a service. Presented here are the schedules, operating costs, revenues, and capital costs of this service for the start-up year of 2010. Other prerequisites for the service are also discussed, including operating agreements, an institutional structure, and transit integration. A discussion of the potential for a rail link to Eppley Airfield concludes the chapter.

SERVICE CONCEPT

Route

The service is assumed to operate on the BNSF trackage between Omaha (the current Amtrak stop) and Lincoln (Union Station, the current Amtrak stop). This route is the only direct route available, and is used once daily by Amtrak's California Zephyr. The California Zephyr's schedule allows approximately 1 hour and 10 minutes between Omaha and Lincoln, but the actual operating time necessary is only 1 hour.

Rolling Stock, Stations, and Run Time

A contemporary self-propelled Diesel Multiple Unit (DMU) train set with ample acceleration and deceleration rates should be able to complete the trip in about 55 minutes. Intermediate stops would add approximately 3 minutes each to the trip time. Assuming a suburban stop in southwestern Omaha, a mid-point stop at Gretna, and a suburban stop on the eastern periphery of Lincoln, a DMU schedule of 1 hour 5 minutes should be attainable.

Service Levels and Connections to Transit

Service will be bi-directional during the morning and evening peak commute periods. Four different service levels are discussed in the following section. There will be no weekend service, but trains will carry special event traffic, i.e. Cornhusker football fans between Omaha and Lincoln. Transit operations in Lincoln and Omaha would work with the commuter rail service for an integrated transit solution moving riders beyond stations to work centers and back again.

Management and Maintenance

The service will be sponsored by a public agency created for this purpose. Alternatively, it could be sponsored by the Nebraska Department of Roads. The agency will contract for the operations and maintenance of the trains and other essential services. The train sets will be maintained in a new shop in Lincoln.

MINIMUM SERVICE OPTIONS

The simplest operating plan would provide a single trip in each direction during morning and evening peak travel periods. Arrivals at Lincoln and Omaha should be timed to best serve the typical work day. The schedules could be covered by 2 DMU train sets. An example of this minimum option is shown in Table 5-1 below.

Table 5-1: Minimum Service Option, 2 Train Sets				
Eastbound (Read Down)			*Westbound (Read Up)*	
#1	#3	Location	#2	#4
6:40a	5:20p	Lincoln	7:45a	6:25p
7:45a	6:25p	Omaha	6:40a	5:20p

One DMU would be stored overnight in Omaha, while the second would be stored in Lincoln. Since both sets would need to be maintained at a single shop location on weekends, 2 additional trips would be required to position the train sets. Assuming the maintenance facility is in Lincoln, there would be an additional early morning trip from Lincoln to Omaha on Monday morning, and an additional late evening trip from Omaha to Lincoln on Friday evening.

Operation of this single morning and evening trip in each direction would not effectively serve the passenger demands in the corridor. Experience at other commuter rail start-ups suggests that at least two travel alternatives be provided to allow passengers a choice of travel times, and to capture a reasonable share of the travel demand.

The addition of a third train set would permit 2 morning and evening in each direction. The 2 trips would attract more riders by providing alternate travel times. Additional trips on Monday morning and Friday evening would be needed to move the equipment to and from the shop. Illustrative schedules for this level of service are shown in Table 5-2 below.

Table 5-2: Minimum Service Option, 3 Train Sets								
Eastbound (Read Down)								*Westbound (Read Up)*
#1	#3	#5	#7	Location	#2	#4	#6	#8
6:00a	6:45a	5:00p	5:45p	Lincoln	7:35a	8:20	6:35p	7:20p
7:05a	7:50a	6:05p	6:50p	Omaha	6:30a	7:15a	5:30p	6:15p

Note: Train #1 turns to #4; Train #5 turns to #8

This three train set option, with 2 morning and evening trips in each direction, is recommended as a start-up level of service. The projections of start-up costs, revenue, and subsidy requirements developed later in this chapter are based on this option. This service option assumes that local transit – StarTran in Lincoln and Metro Area Transit (MAT) in Omaha – will coordinate with the commuter rail service to carry riders between homes, stations, and work centers. Also assumed is the likelihood of privately sponsored employer shuttles.

POTENTIAL SERVICE ENHANCEMENTS

With no additional train sets, there is a potential to provide more service than shown in Table 5-2 by using the train sets for additional trips. Table 5-3 below illustrates a simple enhancement, with an added later morning trip from Lincoln to Omaha, and an added earlier afternoon trip from Omaha to Lincoln. This schedule could be implemented following start-up if there is sufficient demand demonstrated by the start-up service. The Monday and Friday equipment move would be needed, as in all options.

Table 5-3: Enhanced Service Option, 3 Train Sets

Eastbound (Read Down)										*Westbound (Read Up)*
#1	#3	#5	#7	#9	Location	#2	#4	#6	#8	#10
6:00a	6:45a	7:45a	5:00p	5:45p	Lincoln	7:35a	8:20a	5:35p	6:35p	7:20p
7:05a	7:50a	8:50a	6:05p	6:50p	Omaha	6:30a	7:15a	4:50p	5:30p	6:15p

Note: Train #1 turns to #4; Train #2 turns to #5; Train #6 turns to #9; Train #7 turns to #10.

Again, with only 3 train sets, mid-day service could be provided without added equipment if there is sufficient demand. Such mid-day service could be as simple as a single trip in each direction about 12:30 pm, or additional trips spread through the day. The primary advantage of mid-day trips is to make it possible for commuters to depart for home early or arrive at work late on days when medical appointments or other activities disrupt the normal full work day. Mid-day trips also increase ridership by making the service more attractive for non-work trips, such as a half day of shopping, medical or professional appointments, or even a half day of government-related business at the State Capitol. The incremental cost of running mid-day trips usually is lower than the initial cost of the morning and afternoon service, but at the same time the average ridership is lower. Mid-day service often is added to newer commuter operations after the initial peak period service is established, and after a base level of regular daily riders has been reached. One example of a mid-day service option, with late morning and early afternoon trips added, is illustrated in Table 5-4 parts a and b below.

Table 5-4a: Mid-day Service Option, 3 Train Sets

Eastbound (Read Down)							
#1	#3	#5	#7	#9	#11	#13	Location
6:00a	6:45a	7:45a	10:45a	2:45p	5:00p	5:45p	Lincoln
7:05a	7:50a	8:50a	11:50a	3:50p	6:05p	6:50p	Omaha

Table 5-4b: Mid-day Service Option, 3 Train Sets

							Westbound (Read Up)
Location	#2	#4	#6	#8	#10	#12	#14
Lincoln	7:35a	8:20a	11:20a	3:20p	5:35p	6:35p	7:20p
Omaha	6:30a	7:15a	10:15a	2:15p	4:50p	5:30p	6:15p

Train set A: #1, 4, 7, 8, 11, 14
Train set B: #2, 5, 12
Train set C: #3, 6, 9, 10, 13

OPERATING COSTS

The operating costs discussed here are based on Minimum Service Option with three train sets. This provides for 45-minute headways (frequencies) between peak period trains, and two trains in each direction during peak periods – a level of service sufficient to capture the work trips forecast in Chapter 3. Annual operating costs sum to just over $5 million and include the costs for special event trains. Components of these costs appear in table 5-5 below. Costs are rounded to the nearest $1,000. The detailed cost estimates appear in Appendix Table B-1.

Table 5-5: Summary of Operating Costs

	Estimate	Percent
Transportation and Maintenance	$1,170,000	24%
Payments to BNSF	675,000	14%
Fuel	187,000	4%
Service Facility Expenses	121,000	2%
Station Services	400,000	8%
Insurance	2,050,000	41%
General and Administrative	356,000	7%
Total	**$4,958,000**	**100%**

Source: Wilbur Smith Associates

Given 123,041 estimated train miles (weekdays plus special events), the cost per train mile is $40.30 per train mile.

Transportation

These are costs for train crews, supervision of the crews, maintenance of equipment, and overall management of the forces required to provide train service. The analysis assumes that these costs will be provided by under contract by Amtrak or another entity currently involved in the commuter rail market, e.g. Herzog Transit Services. Alternatively, the DMU manufacturer, e.g. Colorado Rail Car, could provide the maintenance services. Trains will be operated by one-person crews. Fare inspection will be handled through a separate contract with law enforcement agencies, obviating this traditional role of a conductor.

Payments to BNSF

These include payments to the railroad for dispatching services and for access. BNSF will dispatch the commuter trains through its Centralized Traffic Control (CTC) system, by which trains are directed across the line by a dispatcher in a remote location. The greater part of the payments to the railroad is for running passenger trains on the freight railroad's track. Access charges typically represent what the railroad feels is proper compensation for providing its track to a passenger rail agency; it also reflects the incremental cost of maintaining the track for the agency's use.

This analysis assumes a charge of $5 per train mile, which is about two-thirds of what the Metrolink commuter rail service in Los Angeles is paying BNSF today. However, compared to Metrolink, this service would run fewer, shorter, and lighter trains over just the peak period, so it is reasonable to expect that access charges would be less.

Fuel

Diesel fuel typically is a minor fraction of a commuter rail service's operating costs. With the Diesel Multiple Units assumed here, as opposed to conventional diesel locomotive hauled train sets, the fuel share of total costs is even smaller. Fuel purchases are assumed to be tax exempt.

Service Facility Expenses

These pertain to expense incurred at the two service facilities, i.e. the maintenance facility in Lincoln and the layover facility in Omaha; these facilities are discussed in detail a subsequent section of this chapter. These costs are unrelated to the maintenance of equipment performed in Lincoln by the operating contractor. The largest cost item here is the routine cleaning of the one train set that overnights in Omaha. The other train sets are washed in Lincoln overnight.

Station Services

These include contracted custodial services, revenue collection from Ticket Vending Machines (TVMs) at the five system stations, and fare inspection. Tickets will be sold by mail, on-line, or through TVMs located at all stations. The service will contract with local law enforcement agencies for inspection of tickets. Fare inspectors will not check all tickets, for fare inspectors will not ride all trains. Rather, inspections will be randomized. Under this proof of payment system, those riders not holding valid tickets will be cited. The analysis assumes that the inspection effort itself will require the equivalent of two full time persons, plus expenses.

Insurance

This will be the single largest expense of the commuter rail service. The Year 1 insurance premiums of $1.8 million are based on the amounts charged to similar commuter rail operations. In addition, the service will maintain a reserve of about $200,000 for payments to claimants; these funds are a guarantee that the deductible or underlying self-insured retention (SIR) has sufficient cash reserves to pay small claims. In Year 2, the service would pay the same sort of premiums, plus the required replenishment of the reserve fund – that is, whatever of the $200,000 that was not paid out in small claims. This level of insurance premiums will provide for a combined single limit (CSL) of $250 million, which means each accident occurrence is limited to $250 million total payout for all claimants combined.

General and Administrative Costs

These are costs related to the management of the commuter rail service. These include the costs of the general manager, the controller, and clerical assistants. The agency staff will be limited to four persons, who are all that are required, as the operations of the system will be the purview of the contract operator. The role of the agency staff will in large part be the management of the agency's various contracts. Also included here are the costs for accounting, marketing, and various consulting service, as well as for maintaining a small agency office.

Impacts to Local Transit

Integration of commuter rail service with local transit in Lincoln and Omaha may trigger cost impacts for StarTran and MAT. Calculating these impacts is beyond the scope of this effort, yet it is work that needs to be done prior to initiation of rail service. The issue should be addressed in any future effort to define an integrated transit solution, combining rail with the existing transit operations and delivering superior transit options for Lincoln and Omaha residents.

REVENUE

Chapter 3 contained forecasts for ridership for the commuter rail option in 2010. Ridership appeared in a range of between 129,500 passenger trips (rounded to the nearest 100) and 184,600 passenger trips in that year. These figures were based on the percentage of work trips between Lancaster and Douglas/Sarpy Counties (Lincoln-Omaha riders) that a commuter rail service with roughly 45-minute frequencies could capture. To these totals, the Gretna-Omaha work trip capture (as a Gretna station is assumed) and special event traffic need to be added; Gretna-Lincoln riders are included in the Lancaster-Douglas/Sarpy totals. This analysis applied fares common to commuter rail agencies today to estimate revenue. The resulting revenue numbers appear in Table 5-6 below. Fares are rounded to the nearest tenth of a dollar, riders to the nearest 100, and revenue to the nearest $1,000.

Table 5-6: Revenue for Lincoln-Omaha Commuter Rail Service in 2010

	Markets	Fares	Riders	Revenue
Revenue Low-side	Lancaster-Douglas/Sarpy Riders	$5.50	129,500	$715,000
	Special Event Riders	7.10	9,300	66,000
	Gretna-Omaha Riders	2.50	1,800	5,000
	Total		140,700	786,000
Revenue High-side	Lancaster-Douglas/Sarpy Riders	$5.50	184,600	$1,019,000
	Special Event Riders	7.10	11,700	82,000
	Gretna-Omaha Riders	2.50	2,300	6,000
	Total		198,600	1,107,000

Source: Wilbur Smith Associates

Given 123,041 annual train miles (weekdays plus special events), revenue per train mile ranges from a low of $6.38 to a high of $9 per train mile.

The fare charged to the Lancaster-Douglas/Sarpy riders is a blend of cash, 10-ride and monthly pass fares. The latter two are discounted tickets popular with commuters. At 10 cents per train mile, the blend is weighted heavily toward the discounted fares. Special event riders (Cornhusker football fans riding between Omaha and Lincoln) will pay full cash fares of almost 13 cents per train mile. Gretna-Omaha commuters pay a proportionally higher fare per train mile than the inter-county riders do. This is because shorter trips typically have higher per mile fares.

There are Transportation Demand Management (TDM) tools to be explored that could strengthen ridership and revenue. These include free or subsidized fares (by either the State or the University of Nebraska) that would encourage use of alternative travel modes, including commuter rail. For example, the Maryland Transit Administration offers the College 33 Pass, which provides college students lower fares on local and express/commuter buses. Metrochecks and Commuter Choice Maryland Vouchers result in lower fares to business employees on the Maryland Rail Commuter Service (MARC).

FARE BOX RECOVERY AND REQUIRED SUBSIDY

The calculations of operating costs and revenue allow for the calculation of fare box recovery, which is the proportion of operating costs covered by fare revenue. The fare box recovery ratio is a common measure of transit operations to judge the relative "profitability" of services. (Transit services rarely are profitable *per se*; the question posed by this measure is really, how close to profitable are they? As the measure can be changed one way or another by changes in fares, fare box recovery is not a measure of efficiency.) These ratios vary widely. For example, in the initial years of The Coaster commute rail service in San Diego County, fare box recovery was about 20 percent of operating costs; this ratio increased to about 30 percent in 2001. In 2001, Metra in Chicago generated a 46 percent fare box recovery, and New Jersey Transit enjoyed a fare box recovery ratio of 56 percent. On the other hand, Shore Line East in southern Connecticut has a 14 percent fare box recovery. The ratios for 14 commuter rail operations in the United States for 2001 appear in Table 5-7 below. These systems produced an average fare box recovery ratio of 44 percent.

Table 5-7: 2001 Financial Performance of Various U.S. Commuter Rail Services

Service	Service Area	Fare Box Recovery	Operating Cost per Train Mile	Revenue per Train Mile	Subsidy per Train Mile
Caltrain	Bay Area	54%	$48.62	$26.25	$22.37
Long Island Railroad	New York	47%	103.95	48.86	55.09
MARC	Baltimore	42%	54.67	22.96	31.71
MBTA	Boston	49%	47.53	23.29	24.24
Metra	Chicago	46%	64.98	29.89	35.09
Metrolink	Los Angeles	48%	40.41	19.40	21.01
Metro North	NY-CT	59%	79.28	46.78	32.50
New Jersey Transit	Northern NJ	56%	53.42	29.92	23.50
The Coaster	San Diego	30%	56.90	17.07	39.83
SEPTA	Philadelphia	41%	30.52	12.51	18.01
Shore Line East	Southern CT	14%	37.94	5.31	32.63
Trinity Rail Express	Dallas-Fort Worth	47%	42.80	20.12	22.68
Tri-Rail	Miami	27%	36.14	9.76	26.38
Virginia Rail Express	Washington DC	49%	59.28	29.05	30.23
Average		**44%**	**$54.03**	**$24.37**	**$29.66**

Source: Wilbur Smith Associates

On the high side, a commuter rail service operating between Lincoln and Omaha should generate a fare box recovery ratio of about 22 percent, which is about what The Coaster did in 1996. In the same way also, this figure can be expected to grow over time as riders are attracted to the train. The low side fare box recovery ratio is about 16 percent, but this should grow as well.

While fare box recovery for the Lincoln-Omaha service is on the lower side of the range experienced nationally, another key measure shows the service near the average experienced by the 14 other services. This measure is the subsidy per train mile, i.e. operating costs less fare revenue stated on a train mile basis. Per Table 5-8, the average for the 14 systems is about $30. In 2010, assuming high side ridership and revenue, the Lincoln-Omaha service will be close to that, as shown in Table 5-8 below. The reasons seem to be 1) passengers riding comparatively longer distances (and consequently paying higher fares), 2) the use of economical DMU technology, and 3) one-main crews, among other things.

Table 5-8: 2010 Financial Performance for Lincoln-Omaha Commuter Rail Service					
Service	Ridership Forecast	Fare Box Recovery	Operating Cost per Train Mile	Revenue per Train Mile	Subsidy per Train Mile
Lincoln-Omaha	Low	16%	$40.30	$6.38	$33.91
	High	22%	40.30	9.00	31.30

Source: Wilbur Smith Associates

In total terms, the required operating subsidy for the commuter rail service in 2010 could total between $3.9 million and $4.2 million. This subsidy will decrease over time with growth in ridership.

REQUIRED FACILITIES FOR RAIL SERVICE

A rail service between Omaha and Lincoln will require station facilities (including parking), a storage and service facility, and probably selected track capacity additions such as new or extended sidings. A preliminary listing of these needs is provided below. The analysis endeavored to keep the total number of stations to five, in order to minimize running time. Each station stop typically adds about 3 minutes of run time. While this analysis assumed a mid-route stop at Gretna, it could just have easily been Ashland. Indeed, if merited, an Ashland stop could be added in a service expansion.

Station Facilities

- ***Omaha***: Use of the current Amtrak station, adjacent to the historic Burlington Station, is assumed. Some off-street parking would be desirable, but most Omaha originating passengers may find the suburban station equally convenient for auto access. Also desirable would be bus stalls for shuttles to pick up arriving passengers for furtherance to downtown work centers, as well as delivering originating passengers for their trips to Lincoln. Two TVMs would be located here. The estimated cost is $872,000.
- ***Omaha Suburban***: The station will require a boarding platform, a passenger shelter for inclement weather, two TVMs, lighting, bus stalls, and parking. A location at Giles Road would provide convenient access for most Omaha area riders choosing to drive and park. Cost: $1,137,000.
- ***Gretna:*** The station will require a boarding platform, a passenger shelter for inclement weather, a TVM, lighting, and parking. A potential location would be ½ mile north of 204th Street and Highway 370. Cost: $763,000. An alternative station site could be in Ashland.
- ***Lincoln Suburban:*** The station will require a boarding platform, a passenger shelter for inclement weather, two TVMs, bus stalls, lighting, and parking. A location in the general vicinity of northwest Lincoln is assumed. For costing purposes only, a site near Cornhusker Highway and 48th Street was utilized. Cost: $1,306,000.

- ***Lincoln:*** Use of the current Amtrak station (Union Station) is assumed. The station will require a platform with lighting, a shelter for weather protection, two TVMs, and bus stalls. Some off-street parking would be desirable, but most originating passengers from Lincoln could use the suburban stop to access the service by auto. Cost: $504,000.

The total preliminary cost estimate for station improvements is $5 million, inclusive of contingencies. Details on these costs appear in Appendix Table B-2.

Lincoln Maintenance and Omaha Service Yards

Each train set, at the end of the last evening run, will pull into a facility where crews will clean and service the equipment. It is assumed that a maintenance facility or car shop will be in Lincoln. The Lincoln shop facility is intended to perform all maintenance except periodic or emergency heavy maintenance that can best be done by a full-scale railroad car shop. It is anticipated that UP or BNSF would be contracted to carry out heavy maintenance at either one's nearest car shop. The Lincoln shop would be operated by a contractor, which might be Amtrak, Herzog Transit Services, Colorado Rail Car (if it builds the DMUs), or any other qualified bidder.

Lincoln Maintenance Facility

The Lincoln facility requirements and cost estimates are described below. A schematic of the facility appears as Figure 5-1. The basic elements of the car shop include:

- A 1,700-foot siding off of the mainline track where the rail service equipment will be stored mid-day and overnight. This includes two switches in the main line. The facility itself will have three tracks: a 1,200-foot run through track linking with the siding and two stub-end tracks, totaling 1,500 track feet. This track arrangement will permit two train sets to be maintained without one blocking the other, and will also provide room for fleet expansion. Facility track feet will total 4,400 feet.
- The facility will include a 250-foot by 500-foot insulated prefabricated metal shop building with a cast in-place concrete floor, work bench/shop area, small office area and utility / restroom area. The building is of sufficient size to allow for a fleet expansion supporting enhanced services requiring more than four train sets.
- The area around the building will be paved. There will be a paved access road to the facility tracks. The areas on each side of, and between, the rails will be paved to facilitate all weather vehicular access to the rail equipment.
- The site improvements around the facility – including the building and surrounding yard area, access roads, and rail equipment tracks – will be illuminated.
- The maintenance facility will be furnished with the appropriate maintenance tools and necessary supplies and equipment for routine servicing and cleaning of the rail equipment including four 100-ton screw jacks, crane or hoist, and welding, grinding, bending and machining equipment, and including head-end power (HEP), the electrical "hook-up" required to provide electricity to the equipment's systems and prevent freeze-up. The facility will have its own electrical generator in case of a local power failure.

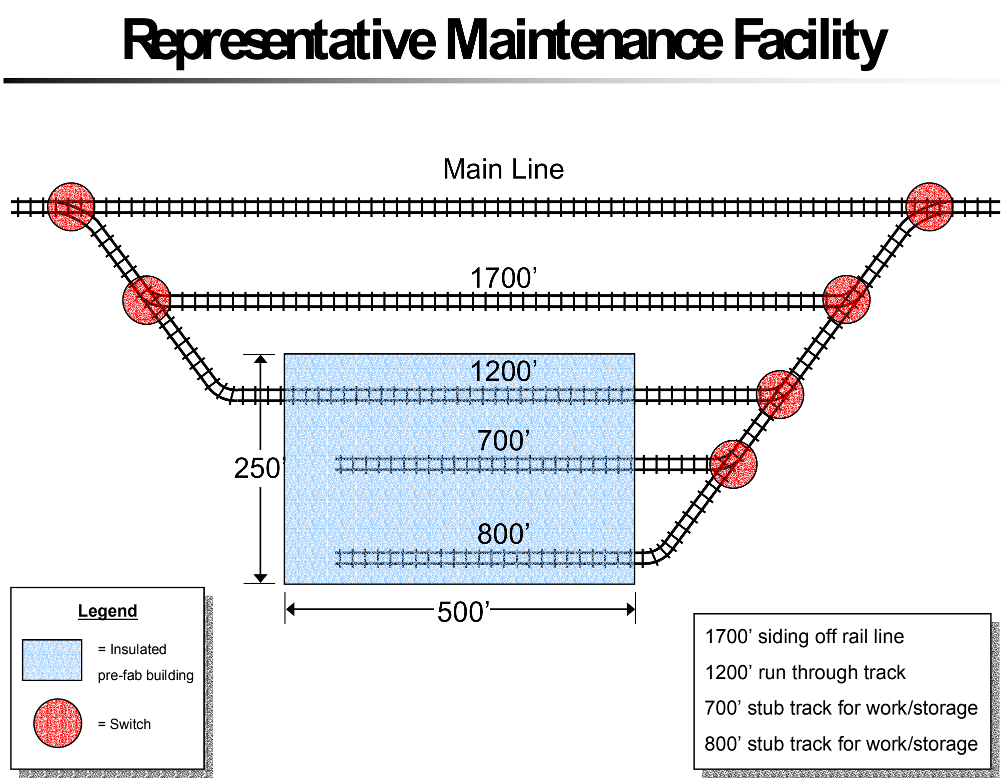
- The maintenance facility will be furnished with a 4x4 pickup (leased) equipped with a snowplow for maintaining the parking areas and maintenance access areas.

Omaha Layover Facility

As the near-term operating plan assumes the mid-day layover or overnighting of one train set in Omaha, the requirements of an overnighting facility appear below as well. At Omaha, the equipment would be cleaned and made secure in preparation for the next morning's commuter runs. The rolling stock would be maintained in Lincoln. This would require that units be "swapped" in Omaha, so that those units that overnight in Omaha could return to Lincoln regularly for maintenance and washing. The enhanced serve scenario assumes two three-car DMUs laying over during the day at Omaha. The basic elements of the overnighting facility include:

- A siding off of the mainline track where the rail service equipment will be stored overnight. This includes a switch in the main line and a stub track. The Omaha facility will include a single spur track of approximately 700 feet – a length sufficient for two three-car DMUs.

Figure 5-1



- The facility will include a 24-foot by 24-foot insulated prefabricated metal shop building with a cast in place concrete floor, work bench/shop area, small office area and utility/restroom area. The DMU will be stored uncovered in a fenced area.
- The area around the building will be paved. There will be a paved access road to the facility track. The areas on each side of, and between, the rails will be paved to facilitate all weather vehicular access to the rail equipment.
- The site improvements around the facility – including the building and surrounding yard area, access roads, and rail equipment tracks – will be illuminated.
- The facility will be furnished with the appropriate maintenance tools and necessary supplies and equipment for routine cleaning of the rail equipment, including head-end power. The facility will have its own electrical generator in case of a local power failure.
- The facility will be furnished with a 4x4 pickup equipped with a snowplow for maintaining the parking areas and maintenance access areas.

The following summarizes the preliminary cost estimates for each site. Costs are stated in year 2003 dollars; inflation over time will cause these costs to increase. Spreadsheets showing the preliminary cost estimates are included in Appendix Table B-3. These facilities total to $16 million.

- ***Lincoln:*** The car shop for the western end of the commuter rail system will be located in the vicinity of the Lincoln Depot. Approximate cost: $14,371,000, including the trackwork, building, equipment, land acquisition, and contingencies.
- ***Omaha:*** The overnighting facility for the eastern end of the commuter rail system will be located adjacent to the Omaha Station. Approximate cost: $1,611,000.

TRACK FACILITIES AND RAILROAD CAPACITY

Access to the BNSF tracks for operation of the Omaha-Lincoln service will require negotiation between the sponsoring agency and the railroad. Typically, BNSF will require construction of any necessary trackage to maintain its current and projected level of freight service without degradation of the level of freight service. As noted previously, BNSF also will require some form of access fee, or incremental track maintenance fee. The fee might be annual, or negotiated as a lump sum payment covering a given number of years of service. The fee may be based on the number of train miles operated over the BNSF system, as is assumed for the operating cost calculation.

BNSF moves the bulk of its east-west freight over the direct main line between Plattsmouth (Oreapolis) and Ashland. The secondary route from Oreapolis north to Omaha and then west to Ashland is used by Amtrak's California Zephyr to reach Omaha, and by local freight service to serve Omaha industrial customers. The line from Omaha west to Ashland is single track, with three intermediate passing locations (Ralston, Chalco, and Melia sidings). West of Ashland, the route is double track into Lincoln. The operation of passenger service in both directions between Omaha and Lincoln will require that some trains pass on the single track segment. A preliminary string line analysis[1] of the Table 5-2 schedules shows that meets between the passenger trains will occur east of Ashland (on a double track segment), and at Chalco siding. At a minimum, upgrading Chalco siding to mainline operating speed and extending the length of the siding (to permit running meets and minimize delays) will be necessary to accommodate the passenger service. Improvements to Melia and Ralston sidings will facilitate meets between the passenger trains and any freight service operating during the same morning and evening time periods, and will provide alternate passing locations for the passenger meets in the event one or both trains are operating off-schedule. Among other improvements are 2.6 miles of new track, including 8,500 feet of a third track leading into Lincoln yard (important to avoid back-ups on the main line in case of congested yard conditions).

Track improvements, excluding siding improvements, total $13.3 million. Siding improvements sum to another $12.8 million. Siding improvements were developed following a conversation with BNSF personnel pertaining to future freight train volumes[2]. Detail of these siding cost calculations appear as Appendix Table B-4.

ROLLING STOCK

This service concept assumes use of the Colorado Rail Car Diesel Multiple Units (DMUs). DMUs are more cost effective on lines with lighter passenger densities than are traditional locomotive-hauled equipment. Colorado Rail Car (seen at right) is the only manufacturer of DMUs that are compliant with safety requirements of the Federal Railroad Administration (FRA) for operation on track shared with freight and conventional passenger rail equipment. The BNSF main line between Lincoln and Omaha is such an environment. Accordingly, a DMU operating on the line would have to be an "FRA compliant" DMU.

Diesel Multiple Unit Commuter Train
Photo by Bill Farquhar

The service concept shown in Table 5-2 requires three train sets for daily operation[3]. A fourth is needed as a spare. Each train set will consist of one motorized unit, a trailing coach, and a cab-coach. This combination will allow the set to operate in a push-pull mode, obviating the need to turn the set for the return trip. A three-car DMU combination is a *de facto* requirement of BNSF, as a train combination of less than 12 axles does not register an electronic signal on the CTC system; this is to say, dispatchers in remote locations are not able to notice and direct trains

---

1 A string line is a chart with distance on the vertical scale and time of day on the horizontal scale. Moving trains are indicated by sloping lines on the chart that show the location of each train as it moves along the track. Where the lines intersect, the chart shows the need for a passing location.

2 The July 31, 2003, telephone conversation included Boyd Andrew and Bob Munguia, of BNSF.

3 Only one train set makes a round trip out of the four one-way trips during the morning peak period. Thus 3 sets are needed.

of less than 12 axles, and this inability is results in a serious safety issue. The safety implications are obvious, requiring at least three cars in the train set. Each train set costs $6.8 million, FOB plant (Fort Lupton, Colorado). The purchase of DMUs is assumed to be tax exempt. The total for all four, accordingly, is $27.2 million. A schematic of the three-car train set appears below.

SUMMARY OF CAPITAL COSTS

Total capital costs, inclusive of track work, stations, sidings, design and contingencies, are $79 million. The costs appear in Table 5-9 below.

Table 5-9: Estimated Capital Costs

Description	Unit	Unit Price	Quantity	Amount
136# Rail, Ties, Ballast & OTM	Track Mile	$740,000	2.6	$1,924,000
6" Sub-ballast	SY	6	31,200	187,200
Earthwork/Grading	CY	10	65,000	650,000
At-Grade Crossings	Each	230,000	0	$0
Centralized Traffic Control	Track Mile	100,000	0	$0
#24 Power Operated Switches w/ Signals	Each	750,000	14	10,500,000
Railroad Culvert Pipe	Each	7,500	0	$0
Railroad Bridges	LF	6,500	0	$0
Grade Separations Bridges	SF	100	0	$0
Seeding	Acre	1,500	21	31,500
Roadway Culvert Pipe	Each	2,000	0	$0
Right of Way	Acre	3,000	0	$0
Wetland Mitigation	Acre	15,000	0	$0
Subtotal				13,292,700
Passenger Facilities/Station Improvements				4,581,200
Maintenance and Layover Facilities				15,981,300
Siding Tracks				12,840,650
Misc. Realignments			10%	1,329,270
Misc. Construction & Contingency			20%	2,658,540
Subtotal				50,683,660
Est. Main Line Engineering			8%	1,382,441
Subtotal				52,066,101
Train Sets - 4 @ $6.8 Million Each (no tax)				27,200,000
Total				**$79,266,101**

Source: HWS Consulting

OPERATING AGREEMENTS

The commuter rail service will need at least two agreements with the BNSF. One is an access agreement, whereby BNSF allows the commuter trains to run on its line for a fee. The other is an operating agreement, which specifies the terms and conditions under which the trains will operate on the BNSF. BNSF currently hosts commuter rail operations, and the agreements signed with the commute rail operators can serve as models for commuter rail service on BNSF in Nebraska.

Access Agreement

This analysis has assumed an access agreement along the lines that Metrolink in Los Angeles has with BNSF today. That agreement grants Metrolink commuter trains access to the BNSF main line between San Bernardino and Los Angeles for about $7.67 per train mile, of which 66 cents is for dispatching and $7.01 is for access and maintenance of way. The dispatching charge would likely remain constant, but the access and maintenance fee could be lower, as the Lincoln-Omaha service would operate far fewer and far lighter trains than Metrolink does (thus, the incremental cost for maintenance of way as compared to Metrolink would be less). This analysis assumes a combined charge of $5 per train mile for access, subject to negotiation with the railroad.

The Metrolink/BNSF agreement also links increases in commuter trains to the capacity of the line. That is, more trains may trigger capacity improvements that would be the responsibility of the commuter agency. This could be a feature of the Lincoln-Omaha service as well.

Operating Agreement

Such an agreement specifies at a minimum such things as the hours of operations for commuter trains, dispatching rules, and safety requirements for passenger trains operating on BNSF lines. There could be various other items also, ranging from training of crews to insurance specifications, depending on the preferences of the railroad.

INSTITUTIONAL STRUCTURE

To negotiate these and several other agreements (i.e. for contract operator, fare inspection, custodial services, etc.) and carry on the running commuter trains, the service will require an institutional structure. One model is a Joint Powers Authority (JPA), composed of the jurisdictions served by the commuter operation. These could include the Cities of Lincoln, Omaha and Gretna, and Lancaster, Douglas, and Sarpy Counties. State agencies may even be part of the JPA. The primary responsibility of the JPA will be to sponsor the service – that is, sharing the costs of implementing and maintaining the commuter service. This will involve applying for any federal or State funds for which the service is eligible, raising the local match, and then securing local funding sources for covering the ongoing operating subsidies. A common vehicle for the subsidies is a local sales tax. Formation of JPAs may not require enabling legislation.

Other models include Special Districts (e.g. Bay Area Rapid Transit District) and a Regional Transportation Agency (e.g. RTA in Chicago), which may require special enabling legislation.

Whatever the specific form that the agency takes, it will comprise two elements – a policy making body, or a board, and a small staff to execute the policy that the board directs. This analysis assumes a small staff of four.

COMPREHENSIVE TRANSIT INTEGRATION

The implementation a commuter rail option will trigger a reshaping of existing transit services. These operators, StarTran and MAT, will be called upon to carry morning riders 1) from home to stations, 2) from stations to work centers, and 3) and the reverse in the evening. In doing so, there will be revenue and cost effects to existing operators for this integration. Calculating these effects is beyond the scope of this effort, yet it is work that needs to be done prior to initiation of rail service. The first step for the new commuter rail sponsoring agency is to engage StarTran in Lincoln and MAT in Omaha in planning for comprehensive transit integration.

This engagement is fundamental. Its purpose is to make the integrated system (rail and bus) as seamless and friendly an experience as possible for the system user. Ideally, this means common fare instruments (a ticket that works on rail and on bus), shared facilities (rail stations with bus shelters and bays), timed transfers (bus schedules designed to meet train arrivals and departures), and coordinated information distribution (bus schedules appear on the commuter rail Web site, and vice versa). The assumed implementation of commuter rail service is at least seven years away. Concepts for integration of commuter rail with local transit could include the following.

StarTran

StarTran related that it is in the process of reviewing their transit operations downtown. A morning connection with four commuter trains (two inbound and two outbound) on weekdays. Presently, the Star Shuttle operates between 9:30 a.m. and 4:45 p.m., so its service would need to be expanded if it were to meet the peak hour trains. Also, the route would need to extend further west to the Depot. In any case, management indicated that if commuter rail service between Lincoln and Omaha were initiated, StarTran would endeavor to accommodate it.

Metro Area Transit

MAT is planning to implement a hub and spoke system, with a 24th Street and Farnam Street facility serving as the hub. Buses will run on 10th and 13th Streets through the Downtown area to Farnam and thence to the hub. Buses on 10th Street could serve the Burlington Station, the commuter rail terminus in Omaha, with schedules that coincide with train arrivals and departures. To reach work centers beyond these routes, riders could transfer to the Downtown Weekday Circulator. Alternatively, the Circulator's service area could be expanded to include the Burlington Station. The Circulators (Green, Red and Blue Routes) operate during peak periods with five minute frequencies; these features mesh well with a peak period commuter rail service. Rail/bus commuters could purchase multi-ride fare instruments that would include a transfer to MAT.

There is no service today at the proposed Giles Road suburban Omaha station site. MAT's Route 96 could be extended from 108th Street to the Giles Road site to provide transit connections to the east and north. Route 96 buses now depart eastbound from 108th and L

Streets before the Omaha bound morning trains would arrive, assuming the schedule shown in Table 5-2. Furthermore, there are only 2 eastbound buses in the morning 20 minutes apart, and 2 westbound buses in the evening from Downtown 30 minutes apart. Schedules would have to be reconfigured to meet the trains operating on 45 minute headways. A new route would be needed to serve morning transit riders bound for Giles Road for furtherance by rail to Lincoln.

Other Alternatives

Besides transit, employer sponsored bus shuttles could move riders from stations to work places. This happens today at Santa Clara and San Jose in Northern California's high tech center of Silicon Valley. Employer shuttles meet ACE and Caltrain commuter trains (Northern California) and Amtrak Capitol Corridor intercity trains (sponsored by the California Department of Transportation) in the morning, picking up riders for furtherance to work centers in the area; the reverse happens at the end of the work day. Riders typically have no fares to pay; the costs are covered by their employers. It is reasonable to assume that larger employers in Omaha and Lincoln could band together to sponsor shuttle services for their train riding workers as well.

RAIL LINK TO OMAHA AIRPORT

A growing number of large metropolitan airports enjoy rail service. These include Baltimore and Portland, OR, both of which have light rail service, and Newark, NJ, which has an Amtrak Northeast Corridor station stop. Chicago's O'Hare and Midway airports both have urban heavy rail service. San Francisco International Airport is now served by BART. So this study looked at the potentiality of commuter rail service to Eppley Airfield.

A preliminary review reveals that the route to the airport would be circuitous, lengthy, and costly. First, trains would head east from the Omaha station and then immediately south along the west side of the Missouri River to a BNSF yard along Gibson Road. There the engineer would have to shift control from the front end the rear end of the train. This would require a brake test, adding about 10 minutes to the trip. The train would then head north on BNSF and UP track toward the airport. Near the intersection of Nicholas and 16th Streets, the train would veer to the east on a Canadian National Railway (former Illinois Central) branch line crossing Abbott Drive. Just north of Freedom Park and west of the line's bridge across the Missouri River, the train would proceed north on about two miles of new track to reach the airport terminal. The journey from Omaha station to the airport would cover about 11 miles and take an estimated 30 minutes. By contrast, a shuttle from the station to the airport could make the trip in about 10 minutes. The preliminary cost estimate for the airport extension would be $19.8 million, as itemized in Table 5-10. A connection from the Omaha station north to the BNSF main line is impractical due to the existence of the ConAgra Food Campus Headquarters that blocks the path.

Table 5-10: Preliminary Capital Costs for Airport Rail Service	
Station	$2,000,000
2 miles of Track	5,000,000
Land Acquisition	8,000,000
Contingency (30%)	2,100,000
Engineering (15%)	1,365,000
Construction (15%)	1,365,000
Total	$19,830,000

Source: HWS Consulting

According to the Omaha Airport Authority, about 60 percent of the airport users come from north of Omaha, and 40 percent from the Omaha, Lincoln, and the other parts of the State. The airport generates 1.8 million enplanements (boardings) a year. That noted, a commuter rail service's share of these airport users likely would be negligible. Assuming the schedule in Table 5-2, the eastbound trains would arrive at the airport on weekdays well after 7 a.m., by which time the majority of the primary outbound flow or "bank" of planes (the morning bank consists of 25 flights, or 31 percent of their airport's 81 flights) will have left Eppley. The remaining flights occur around noon, between 3:30 and 7 p.m., and between 8 and 11 p.m. Only the afternoon bank meshes with commuter rail schedules.

Chapter 6
EXPRESS BUS PLANS

INTRODUCTION

This chapter outlines three scenarios for the provision of express bus service in the Fremont to Omaha corridor; the Blair to Omaha corridor; and the Lincoln to Omaha corridor. The basic elements of these scenarios, some order of magnitude costs, and ridership expectations are discussed in this chapter. These express bus scenarios are a component of the larger effort to examine the feasibility of transit alternatives for the region as a part of the Nebraska Transit Corridors Study.

EXPRESS BUS SCENARIOS

The three proposed express bus scenarios will include more frequent, express bus service focusing on linking Fremont and Omaha, Blair and Omaha, and Lincoln and Omaha. These express bus service options will be examined in combination with and as an alternative to commuter rail service as viable options for travel in the region. The three express bus service options are proposed:

- ***Scenario A:*** along with commuter rail between Lincoln and Omaha, express bus between Omaha and Fremont and between Omaha and Blair;
- ***Scenario B:*** express bus between Lincoln and Omaha, between Omaha and Fremont, and between Omaha and Blair; and
- ***Scenario C:*** express bus between Lincoln and Omaha.

In particular, express bus service between Omaha and Lincoln could be used to test the market strength for enhanced public transit service in advance of committing to heavy investment associated with commuter rail implementation.

A map of these scenarios appears as Figure 6-1 below. The express scenarios are designed to primarily serve the home-to-work trip by focusing on service in the morning and evening peak. A guaranteed ride home service is also recommended to provide riders with a level of comfort, allowing for a way to get back home in the event of a day time emergency. These and other specific assumptions for the express bus service are cited below.

Figure 6-1

Express Bus Service Scenarios

Express Bus Service Assumptions

The following assumptions and general policy parameters apply to the operation of the proposed express bus service scenarios.

- Equipment to be used will be suburban commuter buses with overhead storage racks and bigger, more comfortable seats than urban transit bus seats. The assumed cost per coach is $450,000.
- Thirty-minute headways for the morning and evening peak trips.
- Initial service will include morning and evening peak periods. A mid-day trip could be added after the first year of operation based upon ridership levels and customer demand. Mid-day service provides travel time flexibility when a rider's normal schedule is disrupted, and offers the potential to increase ridership levels by making the service more attractive for non-work trips. An express bus rider survey is suggested after Year 1 of operation to determine the need for a mid-day bus. During Year 1, riders will be asked to register for the guaranteed-ride-home program. These trips are anticipated to be low in number and provided by other fleet vehicles of the contract operator.
- Fremont and Blair are bedroom communities of Omaha, and thus are home-based origin points. The demand for service is inbound to Omaha in the AM and outbound from Omaha in the PM. New park-and-ride facilities are provided in Fremont and Blair. Each of these facilities would include an automatic ticket vending machine (TVM) and a layover area for buses.
- Peak work travel demand between Lincoln and Omaha is bi-directional.
- There will be no weekend or holiday service, resulting in a total of 254 annual service days.
- The service will be competitively bid to a contractor to operate. A cost of $2 per mile (including insurance, general agency administration and marketing) is based on prices paid today for similar services[1]. The cost of the lease of a layover facility in Lincoln (assumed at $1,000 per month) is additive to the $2-per-mile operating and maintenance cost and is included in the *total* operating cost estimate.
- The contract operator will provide a centrally located maintenance facility in the Omaha area. Buses will layover overnight at new park-and-ride facilities in Fremont and Blair. In Lincoln, buses will layover mid-day and overnight at a facility leased for the service.
- Rolling stock (buses) will be provided by the State to the contractor. The contractor will operate and maintain the equipment and be responsible for providing a maintenance facility. Thus no costs for an Omaha bus maintenance facility are included in the capital cost estimate for any of the three scenarios.

[1] The California Department of Transportation's Rail Division today pays its contractor $1.50 per mile for its connecting intercity bus services. The Dallas Area Rapid Transit (DART) reportedly pays about $1.75 per mile. The $2-per-mile assumption, though higher, is a reasonable estimate of the likely cost for this service, which will include administrative costs borne either the Department of Roads or another agency sponsoring the service.

- Estimates of rolling stock requirements (number of buses) are based upon trip cycle times for the service provided.
- Routes would travel along major Interstate and State routes. There will be intermediate stops in Omaha and Lincoln. The Omaha-Lincoln service will have a mid-route stop at Gretna. Capacity improvements in bus routes will mitigate congestion and provide for future run times that equal achievable times today. The improvements per route are identified in Chapter 2.
- Express bus services will be integrated with MAT and StarTran transit services in Omaha and Lincoln, facilitating rider's journeys to and from work.
- The one-way trip full fare is $5 for express bus between Lincoln and Omaha; $4.25 between Fremont and Omaha; and $3.50 between Blair and Omaha and between Gretna and Omaha. Average fares (a mix of discounted fares and cash fares, less a transfer to local buses) are 60 percent of full fares. Fare collection is assumed to be on board the bus, with passengers able to purchase prepaid fares via mail, on-line, via TVMs at transfer points and park-and-ride lots, or through employer subsidized / distributed "Eco Pass" sales.

A more detailed description of each scenario follows, and a summary of all the proposed express bus service scenarios appears in Table 6-1.

SCENARIO A: COMMUTER RAIL AND EXPRESS BUS

Scenario A would provide commuter rail service between Lincoln and Omaha and commuter express bus service between Fremont and Omaha and between Blair and Omaha. The commuter rail service is explained in Chapter 5 and is not described here. Details of the express bus components of Scenario A are discussed below and summarized in Table 6-2.

Express Bus Service Components

Scenario A would also include express bus service between Omaha and Fremont (Route A1) and between Omaha and Blair (Route A2). Commuter quality bus service levels will be provided with 30-minute headways during the AM and PM peak periods. The service is designed for the morning peak trip to work and the evening peak return trip home. Both Fremont and Blair are bedroom communities to Omaha; thus the dominant trip desire lines would be inbound to Omaha in the morning and outbound from Omaha in the PM. A summary of Scenario A costs and revenues in 2010 appears in Table 6-2.

Table 6-1: Summary of 2010 Commuter Express Bus Scenarios (Bus Components Only)

Route	Between	And	Via	Notes	Headway		Total Weekday Bus Trips	# of Buses	Vehicle Miles	
					Peak	Rev. Peak			Daily	Annual
Scenario A: Fremont-Blair-Omaha										
A1	Fremont	Omaha	US-30 to US-275 to L28B to US-6	6 one-way trips	30 minutes	None	6	3	246	62,484
A2	Blair	Omaha	US-30 to N-133 to I-680 to US-6	6 one-way trips	30 minutes	None	6	3	168	42,672
Scenario B: Lincoln- Fremont-Blair-Omaha										
B1	Lincoln	Omaha	I-80 to I-680 to US-6	14 one-way trips	30 minutes	30 minutes	14	5	840	213,360
B2	Fremont	Omaha	US-30 to US 275 to L128B to US-6	6 one-way trips	30 minutes	None	6	3	246	62,484
B3	Blair	Omaha	US-30 to N-133 to I-680 to US-6	6 one-way trips	30 minutes	None	6	3	168	42,672
Scenario C: Lincoln-Omaha										
C	Lincoln	Omaha	I-80/680 to US-6	14 one-way trips	30 minutes	30 minutes	14	5	840	213,360

Source: Wilbur Smith Associates, July 2003.

Table 6-2: Summary of Scenario A - Bus Components			
Element	Route A1-Fremont to Omaha	Route A2- Blair to Omaha	Totals
Annual O&M Costs	$125,000	$85,000	$210,000
Capital Costs	$764,000	$789,000	$1.55 million
Rolling Stock	$1.35 million	$1.35 million	$2.7 million
Annual Ridership	24,000 to 29,000	28,000 to 32,000	52,000 to 61,000
Annual Revenue	$61,000-$74,000	$59,000-$67,000	$120,000-$141,000

Source: Wilbur Smith Associates, July 2003.
Note: Costs are rounded and in 2003 dollars. Ridership numbers are approximate estimates; all numbers are rounded to the nearest 1,000.

Bus Route A1: Fremont-Omaha

Trips from Fremont to Omaha would collect passengers at a new park-and-ride lot located near the interchange of US-275 and US-30 in Fremont. Buses would travel via US-30 to US-275, thence southbound to L28B (W. Dodge Road), thence eastbound to US-6, thence eastbound to MAT's new Downtown Omaha hub to be built at 24th and Farnam Streets. Intermediate stops would be at the existing transit centers at the Westroads Mall, the Crossroads Shopping Center, and the Nebraska Medical Center. Passengers would continue to their final destinations via local buses, with a free transfer. The return trip would follow the same route. Some modification of the local bus service schedules may be desirable in order to support the express bus service. One-way travel time is estimated at approximately 60 minutes. There will be six one-way trips on weekdays – three morning inbound to Omaha and three afternoon outbound trips from Omaha. The buses would layover overnight in Fremont at the park-and-ride facility for deployment in the AM peak. Buses in Omaha will be serviced mid-day at the maintenance facility, thence to be deployed for PM trips.

Three buses are needed to provide the service for Route A1 at a cost of $1.35 million. Route A1 capital costs for a new Fremont area park-and-ride lot are estimated at $348,000 (see Appendix Table C-1), inclusive of a bus layover area and an automatic TVM. Other capital costs include TVMs at stops in Omaha, totaling $416,000[2]. Annual operating and maintenance (O&M) costs for Route A1 are estimated at $125,000[3]. According to Chapter 3, an estimated 24,000 to 29,000 passenger trips will occur in 2010 for Route A1 between Fremont and Omaha. Annual revenues from fares ($4.25 each way X 60 percent = $2.55 average fare) are estimated at $61,000 to $74,000. The proposed service schedule for Route A1 is provided in Table 6-3.

[2] A TVM costs $65,000. Site preparation and installation plus contingencies are estimated at an additional 60 percent. Thus a total TVM cost sums to $104,000. The Westroads Mall transit center, the Crossroads Shopping Center transit center, the Nebraska Medical Center transit center, and the new MAT hub will each have one TVM, with a total estimated cost of $416,000.

[3] 41 mile between Fremont and Downtown Omaha X 6 trips X 254 weekdays X $2 per mile O&M costs = $124,986.

Table 6-3: Route A1 Timetable – Fremont-Omaha				
Trip	**From**	**To**	**Leave**	**Arrive**
Trip 1	Fremont	Omaha	6:10a	7:10a
Trip 2	Fremont	Omaha	6:40a	7:40a
Trip 3	Fremont	Omaha	7:10a	8:10a
Trip 4	Omaha	Fremont	4:45p	5:45p
Trip 5	Omaha	Fremont	5:15p	6:15p
Trip 6	Omaha	Fremont	5:45p	6:45p

Source: Wilbur Smith Associates, July 2003.

Bus Route A2: Blair-Omaha

Trips from Blair to Omaha would collect passengers at a new park-and-ride lot located near the interchange of US-75 and US-30 in Blair. Buses would travel via US-30 westbound to N-133, thence southbound to I-680, thence southbound to US-6, thence eastbound to MAT's Downtown hub. Intermediate stops in Omaha would be the same as those mentioned for Route A1. Passengers would continue to their final destinations via local buses, with a free transfer. The return trip would follow the same route. Some modification of the local bus service schedules may be desirable in order to support the express bus service. One-way travel time is estimated at approximately 45 minutes. There will be six one-way trips on weekdays – three morning inbound to Omaha and three afternoon outbound trips from Omaha. The buses would layover overnight in Blair at the park-and-ride facility for deployment in the AM peak. Buses in Omaha will be serviced mid-day at the maintenance facility, thence to be deployed for PM trips.

Three buses are needed to provide the service for Route A2 at a cost of $1.35 million. The estimated capital cost of the new Blair park-and-ride lot is $373,000 (see Appendix Table C-2), inclusive of a bus layover area and a TVM. Other capital costs include TVMs at stops in Omaha, totaling $416,000. Annual operating and maintenance costs for Route A1 are estimated at $85,000[4]. An estimated 28,000 to 32,000 annual passenger trips will occur in 2010 on Route A2 between Blair and Omaha. Annual revenues from fares ($3.50 each way X 60 percent = $2.10 average fare) are estimated at $59,000 to $67,000. The service time table for Route A2 is provided below.

Table 6-4: Route A2 Timetable – Blair-Omaha				
Trip	**From**	**To**	**Leave**	**Arrive**
Trip 1	Blair	Omaha	6:30a	7:15a
Trip 2	Blair	Omaha	7:00a	7:45a
Trip 3	Blair	Omaha	7:30a	8:15a
Trip 4	Omaha	Blair	4:50p	5:35p
Trip 5	Omaha	Blair	5:20p	5:05p
Trip 6	Omaha	Blair	5:50p	6:35p

Source: Wilbur Smith Associates, July 2003.

[4] 28 miles between Blair and Omaha X 6 trips X 254 weekdays X $2 per mile O&M costs = $85,344.

SCENARIO B: ALL EXPRESS BUS

Scenario B would provide express bus service between Lincoln and Omaha (Route B1); between Fremont and Omaha (Route B2); and between Blair and Omaha (Route B3). A summary of Scenario B costs and revenues appears in Table 6-5 below.

Table 6-5: Summary of Scenario B, Costs and Ridership

Elements	Components			
	Route B1 Between Lincoln and Omaha	Route B2 Between Omaha and Fremont	Route B3 Between Blair and Omaha	Totals
Annual O&M Costs	$439,000	$125,000	$85,000	$649,000
Capital Costs	$728,000	$764,000	$789,000	$2.3 million
Rolling Stock	$2.25 million	$1.35 million	$1.35 million	$4.95 million
Annual Ridership	56,000 to 81,000	24,000 to 29,000	28,000 to 32,000	108,000 to 141,000
Annual Revenue	$168,000 to $242,000	$61,000 to $74,000	$59,000 to $67,000	$288,000 to $381,000

Note: Costs in 2003 dollars. All numbers have been rounded to the nearest thousand. Source: Wilbur Smith Associates, July 2003.

Bus Route B1: Lincoln-Omaha

Express bus service would be provided between Lincoln and Omaha on 30-minute headways in the AM and PM peak periods. Market analysis shows that the ridership demand is bi-directional. There would be a total of 14 weekday trips – four from Lincoln to Omaha and three from Omaha to Lincoln in the morning, and the reciprocal flows in the afternoon. (Because the heavier forecasted morning flow will be toward Omaha, there are more morning Omaha-bound buses scheduled.) Buses in Lincoln will layover mid-day and overnight at a leased facility ($1000 per month), thence to deploy for PM trips. Buses in Omaha will be serviced mid-day at the maintenance facility, thence to be deployed for PM trips.

Buses from Lincoln would begin their trips to Omaha from the State Office Building (14th and M Streets)[5]. They would proceed northbound by city streets to the State Fairgrounds, where riders will have access to ample parking space. Buses would then proceed westbound via the Cornhusker Highway (US-6) to I-180, thence northbound to I-80, thence eastbound to US 6, thence to the new MAT hub in Downtown Omaha. Intermediate stops would include the Omaha stops mentioned for Route A1. Passengers would continue to their final destinations via local buses, with a free transfer. The return trip (and morning trips from Omaha to Lincoln) would follow the same route. Some modification of the local bus service schedules may be desirable in order to support the express bus service. One-way travel time is estimated at approximately 75 minutes.

Like the commuter rail plan (Chapter 5), this analysis assumes a Gretna stop. Owing to Gretna's three-mile distance from I-80 and the attendant run time impact), the stop will be off I-80 at the Gretna outlets.

[5] Alternatively, a Lincoln terminus could be the University of Nebraska.

Five buses are needed to provide the service for Route B1 at a cost of $2.25 million. A capital cost of $728,000 is estimated for TVMs along the route[6]. Annual operating and maintenance costs are estimated at $439,000[7], including the lease cost for layover facility in Lincoln. An estimated 56,000 to 80,000 annual passenger trips would occur in 2010 on Route B1 between Lincoln and Omaha, plus an additional 800-1,000 Gretna-Omaha riders. Estimated annual revenues from fares ($5 each way X 60 percent = $3 average fare) would range from $168,000 to $240,000 for Lincoln-Omaha trips, and additional revenue of around $2,000 from Gretna-Omaha trips ($3.50 each way X 60 percent = $2.10 average fare). The service time table for Route B1 is provided below.

Table 6-6: Route B1 Timetable – Lincoln-Omaha

Trip	From	To	Leave	Arrive
Trip 1	Lincoln	Omaha	6:15a	7:30a
Trip 2	Omaha	Lincoln	5:50a	7:05a
Trip 3	Lincoln	Omaha	6:45a	8:00a
Trip 4	Omaha	Lincoln	6:20a	7:35a
Trip 5	Lincoln	Omaha	7:15a	8:30a
Trip 6	Omaha	Lincoln	6:50a	8:05a
Trip 7	Lincoln	Omaha	7:45a	9:00a
Trip 8	Omaha	Lincoln	4:45p	6:00p
Trip 9	Lincoln	Omaha	4:20p	5:35p
Trip 10	Omaha	Lincoln	5:15p	6:30p
Trip 11	Lincoln	Omaha	4:50p	6:05p
Trip 12	Omaha	Lincoln	5:45p	7:00p
Trip 13	Lincoln	Omaha	5:20p	6:35p
Trip 14	Omaha	Lincoln	6:15p	7:30p

Source: Wilbur Smith Associates, July 2003.

Bus Route B2 Fremont-Omaha

This service will be the same as Route A1.

Bus Route B3: Blair-Omaha

This service will be the same as Route A2.

SCENARIO C: EXPRESS BUS LINCOLN-OMAHA

This service will be the same as Route B1.

[6] TVMs will be located at the State Office Building, the State Fairgrounds, the Gretna Outlets, the Westroads Mall, the Crossroads Shopping Center, the Nebraska Medical Center, and the new MAT hub in Downtown Omaha.

[7] 60 miles between Lincoln and Omaha X 14 trips X 254 weekdays X $2 per mile O&M cost + $12,000 for the Lincoln layover facility = $438,720.

ROLLING STOCK

Suburban commuter buses (shown below are proposed for use for the express bus service. These buses are similar to the coaches used to provide intercity service. They provide a larger, more comfortable seat (usually upholstered) than the standard city bus and also include over head storage racks. Many of the larger North American transit agencies, such as Houston METRO and DART, have had great success with this equipment and a high degree of rider satisfaction.

COMPARATIVE SUMMARY OF COMMUTER EXPRESS BUS SCENARIOS

A comparative summary of the three operating scenarios appear in Table 6-7. It should be remembered that Scenario A assumes commuter rail service between Lincoln and Omaha, and only the potential performance of the bus component of that scenario appears in the table below.

Table 6-7: Comparative Summary of Express Bus Scenarios

Elements	Scenario A – Commuter Rail/Express Bus (Bus Component Only)	Scenario B – Express Bus in All Corridors	Scenario C – Express Bus Lincoln-Omaha
Annual O&M Costs	$210,000	$649,000	$439,000
Capital Costs	$1.55 million	$2.3 million	$728,000
Rolling Stock	$2.7 million	$4.95 million	$2.25 million
Annual Ridership	52,000 to 61,000	108,000 to 141,000	56,000 to 81,000
Annual Revenue	$120,000 to $141,000	$290,000 to $383,000	$168,000 to $241,000

Source: Wilbur Smith Associates-, July 2003.
Note: Costs in 2003 dollars

FAREBOX RECOVERY AND OPERATING SUBSIDIES

Overall, Scenario A (bus component only) generates the best financial performance of the three bus scenarios. Assuming a high-side ridership estimate in 2010, Scenario A revenues would appear to be able to cover 70 percent of its operating costs.

Table 6-8: Operating Subsidies and Fare Box Recovery in 2010				
Service	Revenue	O&M Cost	Subsidy Requirement	Fare Box Recovery
Scenario A	$120,000 to $141,000	$210,000	$70,000 to $91,000	57%-67%
Scenario B	$288,000 to $381,000	$649,000	$268,000 to $361,000	44%-59%
Scenario C	$168,000 to $241,000	$439,000	$198,000 to $270,000	38%-55%

Source: Wilbur Smith Associates, July 2003
Subsidy calculation differentials: account rounding

Scenarios A and B combine revenues and costs for multiple bus services, whereas Scenario C served just Lincoln-Omaha, albeit a bidirectional market. Breaking out Scenarios A and B into individual bus markets shows that Fremont-Omaha service has an operating subsidy requirement of between $51,000 and $64,000 in 2010, and Blair-Omaha service has an operating subsidy requirement of between $18,000 and $24,000 in 2010.

SPECIAL EVENT SERVICE

If the buses procured for commuter service were deployed for special event traffic (e.g. Cornhusker fall football games and winter basketball games), there would be both additional revenues and costs. Given the financial performance analyzed above, it seems reasonable that the special events runs could cover their costs of operations, especially if higher slightly higher fares were to apply. However, there is a caveat. If federal funds were used to purchase these buses, the funding may constrain the use of the buses for special event runs, assuming that there is a commercial bus service providing the same service. This is because the provision may be perceived as unfair competition for a charter bus service. Should there be no such commercial service, there would be no such conflict. The University of Nebraska does not offer a charter bus service for special events at this time.

INSTITUTIONAL STRUCTURE

As noted for the rail operating plan, the commuter bus service will require an institutional structure to conduct its business. There must be a sponsoring agency to procure rolling stock, contract the operator, and secure the funding to cover any required subsidy. This agency could also sponsor the commuter rail operation, if implemented per Scenario B.

Potential institutional structures were discussed in Chapter 5, and that discussion is not repeated here other than to note the most likely candidate types:

- A Joint Powers Authority (JPA), composed of the jurisdictions served by the commuter operation. These could include the Cities of Fremont, Blair, Lincoln, Gretna and Omaha, and also include Dodge, Washington, Douglas and Sarpy Counties. State agencies may even be part of the JPA.
- Special Districts (e.g. Bay Area Rapid Transit District).
- A Regional Transportation Agency (e.g. RTA in Chicago).

The latter two may require special enabling legislation. Whatever the specific form that the agency takes, it will comprise two elements – a policy making body, or a board, and a small staff to execute the policy that the board directs. It will also need a funding basis to cover the required subsidies and capital improvements.

COMPREHENSIVE TRANSIT INTEGRATION

Like the commuter rail plan, the express bus plans assume the integration of express bus service with MAT and StarTran transit operations. Operationally, the integration appears straightforward. In Omaha, the buses would stop at three existing transit centers plus MAT's new Downtown hub. Express bus riders could easily transfer to MAT lines and the Downtown shuttles. In Downtown Lincoln, the buses would stop at the State Office Building, just one block from the route of the Star Shuttle. Similarly, commuters would have an easy transfer in Lincoln.

As with a commuter rail trains, the express buses are likely to trigger some reshaping of existing transit services. There will be revenue and cost impacts of doing so. In any case, effective transit integration will require agreements between the express bus sponsoring agency and the two transit operators. Agreements that are likely needed include:

- A revenue sharing agreement to account for transfers; and
- A facilities use agreement, enabling the express buses to stop at existing and future MAT and StarTran facilities.

Chapter 7
ENVIRONMENTAL AND SOCIAL IMPLICATIONS

INTRODUCTION

The purpose of this chapter is to identify the possible environmental and social issues associated with the commuter rail alternative and the express bus alternatives, and to determine if any of these are fatal flaws. These alternatives are outlined in Chapters 5 and 6. They are the transportation options that comprise Scenarios A, B, and C.

The commuter rail alternative is focused on the Omaha-Lincoln weekday peak period work trip market. The express bus alternatives also are focused on the weekday peak work trip market; they could operate in three corridors: Omaha-Lincoln, Omaha-Fremont, and Omaha-Blair. These alternatives could have environmental and social implications for these corridors. The implications could include impacts on land use, biological resources, and air quality, among other things.

The possible implications are noted in Table 7-1 below.

Table 7-1: Environmental and Social Impact Matrix

	Omaha-Lincoln		Omaha-Fremont		Omaha-Blair	
	Rail	**Bus**	**Rail**	**Bus**	**Rail**	**Bus**
Land Use	Possible	Not Expected	na	Possible	na	Possible
Recreation	Possible	Possible	na	Possible	na	Possible
Noise and Vibration	Possible	Possible	na	Possible	na	Possible
Biological	Possible	Not Expected	na	Possible	na	Possible
Stream / Drainage	Possible	Not Expected	na	Possible	na	Possible
Transportation	Possible	Possible	na	Possible	na	Possible
Cultural	Possible	Not Expected	na	Possible	na	Possible
Environmental Justice	Possible	Possible	na	Possible	na	Possible
Air Quality	Not Expected	Not Expected	na	Not Expected	na	Not Expected
Environmental Risk Sites	Possible	Not Expected	na	Possible	na	Possible
Economic and Social Impacts	Possible	Possible	na	Possible	na	Possible

The following text discusses the possible environmental and social impacts that have been identified in the table above for the commuter rail and express bus alternatives. This list is a preliminary analysis and is not exhaustive. A more detailed Environmental Analysis likely would be needed to quantify the significance of any impacts, should any of these alternatives progress toward implementation.

LAND USE

The commuter rail alternative utilizes the existing BNSF railroad line between Lincoln and Omaha. This reduces the amount of new facilities that must be constructed and/or upgraded. Siting of rail stations and a maintenance facility must be consistent with current zoning. That noted, there may be land acquisitions and possible displacements triggered by these new stations and the maintenance facility. Because many of the towns in the corridor grew up around the railroad, the potential for the project to disrupt adjacent communities is reduced. Any land use changes would be studied in depth and documented during a detailed environmental study.

The express bus alternatives utilize existing Interstate and State highways. Siting of park-and-ride facilities in Fremont and Blair must be consistent with current zoning. That noted, there may be land acquisitions and possible displacements triggered by these new facilities. Any land use changes would be studied in-depth and documented during a detailed environmental study.

RECREATION

The commuter rail alternative could impact recreation facilities adjacent to the BNSF line in and around the Platte River (i.e. Eugene T. Mahoney State Park and the State-run Catfish Run Wildlife Management Area) by increasing noise and traffic on the rail line, but these likely would be minimal as additional trains would be short, few, and limited to peak periods. There are no apparent safety issues at these facilities related to new commuter trains and pedestrians crossing the BNSF track. That noted, the commuter rail alternative could benefit established recreation activities in Lincoln and Omaha by providing an additional transportation option.

The express bus alternatives could impact recreation facilities adjacent to the proposed routes, including those in and around the Platte River and Interstate Park and Oak Lake Park along I-180 in Lincoln, by increasing noise and traffic on the highways. However, since the buses would not contribute much additional traffic on the existing corridors, impacts to recreation areas as a result of the increase in express buses along the routes are anticipated to be minimal. That noted, the express bus alternatives could benefit established recreation activities in Lincoln and Omaha by providing an additional means of transportation.

NOISE AND VIBRATION

The BNSF main line runs through residential areas in Lincoln, Waverly, Greenwood, Ashland, Gretna, and Metropolitan Omaha. The commuter rail alternative could result in increased noise and vibration impacts to property adjacent to the BNSF line. That noted, the additional trains would be short commuter trains operating at peak periods only. Thus, any impact due to running trains likely would be minimal. Depending on the siting of a maintenance facility, however, there may be significant impacts due to train movements, idling, and repairs. Noise impacts would be studied further in a detailed environmental study.

The express bus alternatives may result in increased noise impacts to property adjacent to the proposed routes. Since the buses would not contribute much additional traffic on the existing corridors, noise impacts as a result of increased traffic along the routes are anticipated to be minimal. Depending on the siting of a maintenance facility, however, there may be significant impacts due to bus movements, idling, and repairs. Noise impacts would be studied further in a detailed environmental study.

BIOLOGICAL RESOURCES

The addition of peak period commuter trains to existing traffic on the BNSF Lincoln-Omaha line is not expected to increase noise levels significantly. That noted, there may be runoff impacts due to construction supporting commuter trains, i.e. siding improvements and new stations. Furthermore, poor maintenance by the railroad along the new sidings could result in the unintentional development of wetland habitat (a result of poor drainage). During detailed environmental analysis, the US Fish and Wildlife Service and the Nebraska Game and Parks Commission would be consulted to determine the existence and/or extent of impacts to threatened or endangered species. The existing rail corridor crosses the Platte River, as well as a number of streams and tributaries. Any proposed construction sites would be surveyed for possible wetlands and habitat impacts.

The addition of buses to existing traffic on the existing corridors is not anticipated to increase existing noise levels significantly. That noted, there could be runoff impacts due to construction supporting express buses, i.e. park-and-ride facilities in Blair and Fremont. During detailed environmental analysis, the US Fish and Wildlife Service and the Nebraska Game and Parks Commission would be consulted to determine the existence and/or extent of impacts to threatened or endangered species.

STREAMS AND DRAINAGE

The commuter rail alternative would be located in existing rail right of way. The existing BNSF railroad corridor crosses the Platte River along with a number of streams and tributaries. Any crossing upgrades or siding construction could have an impact on streams and drainage. With increased traffic on the rail lines, maintenance of bridges could be more frequent. Water quality could be impacted by runoff from construction activities for siding and station improvements. Any proposed construction would be evaluated during a detailed environmental analysis.

The express bus alternatives would be located in existing road right of way. The existing Interstate and State highway corridors cross the Platte River along with a number of streams and tributaries. Since the buses would not contribute much additional traffic on the existing corridors, impacts to streams and drainage as a result of the increase in traffic along the routes are anticipated to be minimal. That noted, surface water quality could be impacted by storm water runoff from construction activities for park-and-ride lots in Fremont and Blair. Any proposed construction sites would be evaluated during a detailed environmental analysis.

TRANSPORTATION

The commuter rail alternative would impact the existing transportation network in Omaha and Lincoln: transit operators MAT in Omaha and StarTran in Lincoln would meet the new trains. The alternative may impact the existing public conveyance systems between Lincoln and Omaha – such entities as Greyhound, Dashabout, and Eppley Express: there may be competitive issues with those carriers. And it would impact the transportation facilities along the BNSF line between Omaha and Lincoln: there likely would be capacity issues, particularly if BNSF were to increase volumes on the line. The commuter trains could decrease motor car traffic on I-80. The increased rail traffic between Omaha and Lincoln would also affect the local motor car and pedestrian traffic at rail crossings, potentially triggering delay and safety issues. Traffic within the cities of Omaha and Lincoln would also be impacted by an increase in motor car traffic on the local street network to and from the rail stations.

The express bus alternatives would impact the existing transportation network in Omaha and Lincoln: MAT and StarTran buses would meet the commuter buses. There may be an impact to the existing public transportation provider between Fremont and Omaha, Black Hills Stage Lines: there may be a competitive issue with that carrier. The addition of express bus service along I-80 and the State highway corridors between Omaha, Lincoln, Blair and Fremont would impact existing highway traffic, but the impacts would be minimal. The express buses could decrease the amount of motor car traffic on these roadways. The addition of an express bus network would also increase motor car traffic on the local street network to and from the transit centers in Omaha, Lincoln, Fremont, and Blair.

CULTURAL

The commuter rail alternative would utilize existing railroad right of way. Most of the modern railroad right of way has been impacted to some degree by railroad activity, construction, and flood control activities. These impacts have affected to varying degrees the integrity of any archeological materials located within the right of way. Since many communities in Nebraska developed along railroad lines, there could be cultural or historical materials in the area of any proposed railroad construction, and thus any new construction supporting commuter trains could impact them. A survey of possible archaeological resources and historically significant sites would be performed during a detailed environmental analysis.

The express bus alternatives would be located on existing road right of way. Most of the modern road right of way has been impacted to some degree by road activity, construction, and flood control activities. These impacts have affected to varying degrees the integrity of any archeological materials located within the right of way. New park-and-ride construction in Fremont and Blair could impact existing archaeological and cultural resources. A survey of possible archaeological resources and historically significant sites would be performed during a detailed environmental analysis.

ENVIRONMENTAL JUSTICE

The commuter rail alternative utilizes existing railroad right of way that runs adjacent to neighborhoods in Omaha, Lincoln and a number of smaller communities along the corridor. An in-depth study of the social and economical variables (e.g. race, income, ethnicity, etc.) of the neighborhoods, using current Census data, would need to be performed to determine if there are any disadvantaged neighborhoods along the proposed corridor. The commuter rail service could have a positive impact by providing more transit alternatives to the neighborhoods and smaller communities.

The express bus alternatives utilize existing Interstate and State highways that run adjacent to neighborhoods in Omaha, Lincoln, Blair, Fremont and a number of smaller communities along the corridors. An in-depth study of the social and economical variables (e.g. race, income, ethnicity, etc) of the neighborhoods, using current Census data, would need to be performed to determine if there are any disadvantaged neighborhoods along the proposed corridors. The express bus service could have a positive impact by providing more transit alternatives to the neighborhoods and smaller communities.

AIR QUALITY

Currently, the entire State of Nebraska is in Attainment for Air Quality. The commuter rail alternative could positively impact air quality by reducing the number of motor cars traveling between Omaha and Lincoln. Most likely, however, implementation of commuter rail would have a minimal beneficial impact on air quality. During the detailed environmental analysis, an air-quality analysis would be conducted to determine if any significant impacts exist.

The express bus alternatives also could impact air quality by reducing the number of motor cars traveling between Omaha, Lincoln, Blair and Fremont. Most likely, however, implementation of the express buses would have a minimal beneficial impact on air quality. During the detailed environmental analysis, an air quality analysis would be conducted to determine if any significant impacts exist.

ENVIRONMENTAL RISK SITES

The commuter rail alternative could impact environmental risk sites during construction of sidings, new stations, and a maintenance facility. Environmental risk sites, which are areas of suspected hazardous material contamination, are often found near rail facilities and could be located in areas of proposed railroad construction. If an environmental risk site were located in an area where construction occurred, there could be direct contact with contamination that is present in soil, subsurface sediments or groundwater. A survey of environmental risk sites and a study of the potential impacts would be conducted as part of the detailed environmental impact study to determine if any significant impacts exist.

The express bus alternatives could impact environmental risk sites during construction of park-and-ride lots in Blair and Fremont. If an environmental risk site were located in an area where construction occurred, there could be direct contact with contamination that is present in soil, sediments or groundwater. A survey of environmental risk sites and a study of the potential impacts would be conducted as part of the detailed environmental impact study to determine if any significant impacts exist.

Databases which an environmental review would consult include: the National Priority List (NPL), Comprehensive Environmental Response Compensation and Liability Information System (CERLA), CERLA-Superfund Consent Decrees, Resource Conservation and Recovery Information System (RCRIS), and the Hazardous Materials Information Reporting System (HMIRS).

ECONOMIC AND SOCIAL IMPACTS

The commuter rail alternative would generate jobs related to improvements in the track, construction of stations and a maintenance facility, and ongoing operations.

The express bus alternatives would generate jobs related to construction of new park-and-ride in facilities in Blair and Fremont and ongoing operations.

SUMMARY

This analysis has not identified a fatal flaw pertaining to the development of the commuter rail and express bus alternatives. That noted, some form of environmental documentation will be required prior to the selection and implementation of the alternatives. The extent to which environmental documentation is performed is dependent on the anticipated impacts.

There are three levels of environmental documentation: Categorical Exclusion, Environmental Assessment, and Environmental Impact Statement.

A Categorical Exclusion (CE) is appropriate if the proposed actions are not anticipated to individually or cumulatively have a significant effect on the human environment. Specific items that are eligible for categorical exclusion are listed under 23 CFR 771.117. It should be noted that CE documentation satisfy NEPA requirements only and does not provide exemptions and exclusions from the requirements of other environmental laws such as historical and cultural resources, wetlands impacts, channel impacts, Clean Water Act, Clean Air Act, endangered species, etc. Separate documentation may be required from the governing agencies to document absence of impacts.

Preparation of an Environmental Assessment (EA) is needed for an action where the significance of the social, economic and environmental impact is not clearly established. The EA analyzes the impact of the alternatives on various social, environmental and economic factors within the study area. If the conclusions of the EA identify significant impacts to the environment, then preparation of an Environmental Impact Statement would be necessary.

An Environmental Impact Statement (EIS) is a document that evaluates the significance of the impacts of the alternatives upon environmental, social and economic factors and includes proposed mitigation to avoid, minimize or compensate for project impacts to the extent possible. The EIS contains in-depth studies of the areas where impacts are anticipated and ranks the alternatives according to the environmental impacts and benefits.

Given the potentiality of various kinds of impacts identified in this analysis, the commuter rail and express bus alternatives would most likely require an Environmental Assessment. (Rail right of way improvements may be exempt from environmental review, but new station development outside the existing right of way would not be.) Many of the activities proposed under the alternatives are described in the 23 CFR 771.117(c) and (d) lists of projects already approved for CE status. Consultation with the governing agencies would be conducted to determine which level of documentation would be most appropriate.

Chapter 8
FINANCIAL AND ECONOMIC ANALYSIS

INTRODUCTION

The purpose of this chapter is to present a financial and economic evaluation of the three potential transit service scenarios for Nebraska.

- ***Scenario A:*** DMU commuter rail service between Lincoln and Omaha; express bus service (commuter buses) between Fremont and Omaha and between Blair and Omaha.
- ***Scenario B:*** Express bus service between Omaha and Lincoln, between Fremont and Omaha, and between Blair and Omaha.
- ***Scenario C:*** Express bus service between Lincoln and Omaha.

The financial evaluation has three parts. First is a *pro forma* evaluation of the scenarios over a 20-year period. Second is a review of funding sources for which the commuter rail and bus scenarios could qualify. Third is an assessment of the scenarios using criteria established by the Federal Transit Administration (FTA) for New Starts transit projects. The economic valuation looks at direct and indirect traveler benefits of diverting commuters from their cars to transit. The paper concludes with a qualitative comparative evaluation of the three scenarios and identification of next steps for implementation.

FINANCIAL EVALUATION

The purpose of this evaluation is to extrapolate the ridership, revenue and costs for each of the three service scenarios over 20 years. The 20-year *pro forma* financial evaluation is a conventional tool to assess the feasibility of capital projects. It documents projected costs and revenues, and demonstrates the reasonableness of key assumptions underlying a project. Also, it is a key input to the cost effectiveness evaluation that follows in this chapter.

Recognizing the importance of sound financial planning to the successful implementation of transit capital investments, Section 3(a)(2)(a) of the Federal Transit Act states "No grant or loan shall be provided under this section unless the Secretary determines that the applicant has or will have the legal, financial, and technical capacity to carry out the proposed project." It is to demonstrate the financial implications of the scenarios over time and thus to help identify a preferred alternative for Nebraska – one that will be able to qualify for FTA funds – that this *pro forma* evaluation has been undertaken.

Scenario A

Financial Performance

This scenario has rail and bus components, as showing in Table 8-1 below. Ridership for each is forecast in a range from low to high. The forecasts in the first and last revenue years are summed and then compared to determine the difference and the percent change over the 20 years. In both the low and high ridership cases, commuter ridership and revenue grow at 1.5 percent per year (based on an average of the growth rates in population and employment in Lincoln, Douglas and Sarpy Counties). However, special event ridership is held to 2010 levels: the assumption is that they almost fill the trains as is, and thus do not grow as commuters do. A 1.5 percent annual increase in commuters over 20 years results in almost a 35 percent total increase in the period. But the 1.5 percent annual increase in commuters coupled with the flat special event ridership results in total ridership and revenue increases of less the 35 percent over the 20-year period.

Operating costs remain constant, as the growth is not sufficient to trigger any increases in service levels. The result is improvement financial performance, as seen in improved fare box recovery rates in the table below. With increasing revenues and constant costs, the operating subsidies required to cover operating costs over the period decrease, depending on the ridership assumption. The numbers in the table below are in 2003 dollars. Throughout this paper, the dollars figures are shown in constant dollars, excluding inflation.

Table 8-1: Scenario A 20-year Financial Summary

	2010			2030			Difference	Change
Low Ridership	*Rail*	*Bus*	*Total*	*Rail*	*Bus*	*Total*		
Ridership	140,690	51,875	192,565	186,249	69,868	256,117	63,552	33%
Revenue	785,527	119,706	905,233	1,035,085	161,226	1,196,311	291,078	32%
Operating Cost	4,958,424	210,330	5,168,754	4,958,424	210,330	5,168,754	0	0%
Subsidy	4,172,897	90,624	4,263,521	3,923,339	49,104	3,972,443	-291,078	-7%
Fare Box Recovery	16%	57%	18%	21%	77%	23%		
High Ridership								
Ridership	198,579	60,805	259,384	263,407	81,896	345,303	85,919	33%
Revenue	1,107,304	140,747	1,248,052	1,462,746	189,566	1,652,312	404,260	32%
Operating Cost	4,958,424	210,330	5,168,754	4,958,424	210,330	5,168,754	0	0%
Subsidy	3,851,120	69,583	3,920,702	3,495,678	20,764	3,516,442	-404,260	-10%
Fare Box Recovery	22%	67%	24%	30%	90%	32%		

Source: Wilbur Smith Associates

To be sure, forecasting is not so precise a science that ridership can be estimated to the last rider, or revenues and costs estimated to the dollar. Accordingly, the summary observations below are stated with rounded numbers. In sum, given a high-side ridership by 2030:

- Ridership should reach about 345,000 annual trips, from 260,000 in 2010.
- Revenue should reach $1.7 million, from $1.2 million in 2010.
- Operating subsidies should decrease $404,000 per year.
- Fare box recovery should reach 32 percent.

As will be shown later, Scenario A generates a cost per new rider figure that renders it unlikely to qualify for federal funding. In this case, all capital funding would have to be generated either at the State or local level, or both. Assuming financing (bonding) of these costs, another $9.3

million in principal and interest payments would need to be added for annual subsidy for the first 12 years (term of financing). Of this amount, $8.9 million would be due to financing rail related costs.

Capital Investments

Capital investments required for Scenario A appear in Table 8-2. Rail rolling stock will be delivered and paid for in 2009, prior to start-up of service in 2010. Similarly, rail line capacity improvements, stations, and support facilities will be completed and paid for in that year. Thus, 2009 will see about $79 million dollars in capital costs. In 2020, the DMU's will undergo a major refurbishment, estimated at half their purchase price. At the end of 20 service years, they will be sold for a residual value of 5 percent of their purchase price, and will be replaced with brand new DMUs.

Bus capital costs will total $4.2 million in 2009, inclusive of buses and new park and ride lots. The buses will be refurbished after 8 service years for 10 percent of their purchase price. New buses will be purchased in 2021, and the old buses will be sold off for their residual value the following year. The buses purchased in 2021 will be due for refurbishment in 2030.

Table 8-2: Scenario A 20-year Capital Improvements Summary

	2009	2018	2020	2021	2022	2029	2030
Rail							
Rolling Stock	27,200,000		13,600,000			27,200,000	-1,360,000
Facilities	52,066,101						
Subtotal	79,266,101		13,600,000			27,200,000	-1,360,000
Bus							
Rolling Stock	2,700,000	270,000		2,700,000	-135,000		270,000
Facilities	1,550,000						
Subtotal	4,250,000	270,000		2,700,000	-135,000		270,000
Total	83,516,101	270,000	13,600,000	2,700,000	-135,000	27,200,000	1,090,000

Source: Wilbur Smith Associates

Scenario B

Financial Performance

For this all express bus option, ridership growth was assumed at 1.5 per year. Operating costs would stay constant. No special events ridership was assumed. As seen in Table 8-3, the result on the high side is 35 percent growth in ridership and revenues, a $132,000 drop in annual operating subsidies, and a fare box recovery jump from 59 percent to 79 percent.

Table 8-3: Scenario B 20-year Financial Summary				
	2010	**2030**	**Difference**	**Change**
Low Ridership	*Bus*	*Bus*		
Ridership	108,266	145,819	37,553	35%
Revenue	288,159	388,108	99,949	35%
Operating Cost	649,050	649,050	0	0%
Subsidy	360,891	260,942	-99,949	-28%
Fare Box Recovery	44%	60%		
High Ridership				
Ridership	141,315	190,331	49,016	35%
Revenue	381,377	513,660	132,283	35%
Operating Cost	649,050	649,050	0	0%
Subsidy	267,673	135,390	-132,283	-49%
Fare Box Recovery	59%	79%		

Source: Wilbur Smith Associates

Capital Investments

As seen in Table 8-4, bus capital costs will total $7.3 million in 2009, inclusive of buses and new park and ride lots. The buses will be refurbished after 8 service years for 10 percent of their purchase price. New buses will be purchased in 2021, and the old buses will be sold off for their residual value the following year. The buses purchased in 2021 will be due for refurbishment in 2030.

Table 8-4: Scenario B 20-year Capital Improvements Summary						
Bus	**2009**	**2018**	**2021**	**2022**	**2029**	**2030**
Rolling Stock	4,950,000	495,000	4,950,000	-247,500		495,000
Facilities	2,300,000					
Total	7,250,000	495,000	4,950,000	-247,500		495,000

Source: Wilbur Smith Associates

Scenario C

Financial Performance

For this all express bus option for service only between Omaha and Lincoln, ridership growth was assumed at 1.5 per year. Operating costs would stay constant. No special events ridership was assumed. As seen in Table 8-5, the result on the high side is a 35 percent growth in ridership and revenues, a $83,000 drop in annual operating subsidies, and a fare box recovery jump from 55 percent to 74 percent.

Table 8-5: Scenario C 20-year Financial Summary				
	2010	**2030**	**Difference**	**Change**
Low Ridership	*Bus*	*Bus*		
Ridership	56,391	75,951	19,560	35%
Revenue	168,453	226,882	58,429	35%
Operating Cost	438,720	438,720	0	0%
Subsidy	270,267	211,838	-58,429	-22%
Fare Box Recovery	38%	52%		
High Ridership				
Ridership	80,510	108,435	27,925	35%
Revenue	240,630	324,094	83,464	35%
Operating Cost	438,720	438,720	0	0%
Subsidy	198,090	114,626	-83,464	-42%
Fare Box Recovery	55%	74%		

Source: Wilbur Smith Associates

Capital Investments

As seen in Table 8-6, bus capital costs will total $3 million in 2009, inclusive of buses and new park and ride lots. The buses will be refurbished after 8 service years for 10 percent of their purchase price. New buses will be purchased in 2021, and the old buses will be sold off for their residual value the following year. The buses purchased in 2021 will be due for refurbishment in 2030.

Table 8-6: Scenario C 20-year Capital Improvements Summary					
Bus	**2009**	**2018**	**2021**	**2022**	**2030**
Rolling Stock	2,250,000	225,000	2,250,000	-112,500	225,000
Facilities	728,000				
Total	2,978,000	225,000	2,250,000	-112,500	225,000

Source: Wilbur Smith Associates

Eligible Funding Sources

It is very useful to understand the difference between "funding and "financing." Funding is the primary stream of revenue used to offset cost or to support various leveraging options. Finance is the means by which the primary revenue streams are manipulated to make funds available when needed or to reduce the costs of borrowing. By way of illustration, in the case of bonds issued against revenues from a tax dedicated to transit use, the revenue stream from the tax pledged as security for the bonds would be the "funding." The bond proceeds, which concentrate the long-term tax revenues into several years to meet construction expense, would be the "financing." This paper will examine the funding sources.

Generalized Sources of Funds

Potential funding sources are expected to come from both the public and private sectors. Funding could include some combination of the following sources of funds:

- Federal:
  - Federal Transit Administration (FTA) Section 5307 (urban formula funding)
  - FTA Section 5309 (New Starts funding)
  - Federal Transit Administration (FTA) Section 5311 (non-urban formula funding)
  - Flexible Federal Highway Funds (FHWA / FTA)
  - Federal Congestion Mitigation and Air Quality Improvement (CMAQ) funds
  - Federal Surface Transportation Program (STP) funds
- State:
  - Nebraska Transit Assistance Program
  - General Fund and Trust Fund
- Local:
  - Sales tax
  - General property tax

The largest source of funding for any commuter rail transit improvement would be the FTA Section 5309 New Starts program. While certainly not impossible, securing significant federal capital support could be very difficult. The competition for New Starts funding is intense with the political support for a project often being more important than its technical merit. Current FTA guidance requires that the federal share from Section 5309 New Starts funding be limited to 50-percent of the total project budget. The current Administration has proposed codifying the 50/50 share in law.

Nebraska has a very limited statewide transit assistance program. This program provides a pass through of federal funds for elderly and disabled, rural transportation assistance transportation programs, and planning and discretionary capital projects. The Nebraska Transit Assistance Program also provides operating assistance to public and private transit service providers.

On the local side, early discussions with decision-makers will provide an indication of the possible sources of local funding packages that may be viable as well as the degree of commitment to project implementation. After tentative conclusions are drawn from discussions on funding, it may be necessary to return to preliminary decisions reached regarding agency roles and project implementation phasing.

Ultimately, the critical financial issue at the local level is the annual requirement for local funds to meet capital, operating and maintenance costs. The actual annual local share for capital costs, of course, depends on several important assumptions, none of which can be assumed at this stage of the implementation process. However, it is important for decision makers to have an estimate of potential costs in order to develop implementation plans.

Federal Funding Options

The Transportation Equity Act for the 21st Century (TEA-21) authorized federal transportation funding levels over a six-year period beginning in federal fiscal year 1998. Funds included both formula and grant funding to be used at the discretion of States and Metropolitan Planning Organizations (MPO).

Beyond earmarked funds, there are formula funds for highways, transit, and "flexible funds" which can be spent on a variety of transportation-related projects, including public roads and sidewalks, transit capital projects, and transportation enhancements, which encompass a broad range of environmentally related activities. Much of this funding is anticipated by State and local transportation departments and is likely to be committed to other projects.

Since the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, the US Department of Transportation has permitted States wide discretion in assigning portions of "conventional" highway funds to the flexible funding pool, thus widening the funds potentially available for transit projects. Legislation currently pending in Congress would continue these provisions of ISTEA and TEA-21. The following paragraphs describe the current federal funding programs available for transit projects.

- ***Section 5307 Urbanized Area Formula Program*** – Formerly known as the Section 9 program, the urbanized area formula program provides funding to all areas with populations of over 50,000 to be used for locally determined capital projects and transportation-related planning. The amount made available to the Urbanized Area Formula Program (49 U.S.C. 5307) by the FY 2003 DOT Appropriations Act is $3.4 billion. In addition, $5,479,136 in prior year funds became available for reapportionment under the Urbanized Area Formula Program as provided by 49 U.S.C. 5336(i).

  The Metropolitan Planning Organization (MPO) in each area annually approves a program of projects that plans for the distribution of Section 5307 funds for various capital projects. Funds are not necessarily distributed to transit agencies on the basis of their service data and the amount of funds brought to the area by that service data. Each grantee must submit a grant application for those projects included in the Program of Projects. Commuter rail capital costs are eligible for these funds. Section 5307 funds used for operating assistance is now restricted to urbanized areas of under 200,000.

- ***Section 5309 New Start Program*** **–** The term "New Start" is used to mean a project that involves building a new fixed guideway system, or extending an existing fixed guideway. The new start can be a vintage streetcar, light rail line, heavy rail rapid transit, commuter rail, people-mover, or busway. Also, new start projects can involve the development of transit corridors and markets to support the eventual construction of fixed guideway systems, including the construction of park-and-ride lots and the purchase of land to protect future rights-of-way. The amount made available for New Starts projects in the FY 2003 DOT Appropriations Act is $1.2 billion. Projects can receive up to 80 percent of eligible project costs from the FTA. However, current guidance and practice limits this funding to about 50 percent federal share. Legislation pending in Congress would codify this practice.

  In order to receive new start funds, projects should be authorized by TEA-21 or any subsequent authorizing act. Annual appropriations legislation then allocates available funding in specific amounts to specific projects. In order to receive new start funds, projects must first be rated by the FTA in accordance with criteria for ranking and evaluating new start projects. Such recommendations are included in the Annual Report on New Starts submitted to Congress in the spring of each year along with the President's budget request. FTA manages new start projects in four recognized phases: 1) Systems Planning 2) Preliminary Engineering 3) Final Design 4) Construction. FTA has extensive guidance regarding the requirements of each phase.

- ***Section 5311 Non-Urbanized Area Formula Program*** – The Non-urbanized Area Formula Program provides capital, operating and administrative assistance for areas under 50,000 in population. Each State must spend no less than 15 percent of its FY 2002 Non-Urbanized Area Formula apportionment for the development and support of intercity bus transportation, unless the Governor certifies to the U.S. Secretary of Transportation that the intercity bus service needs of the State are being adequately met.

Flexible Federal Highway Funding

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) created opportunities for certain categories of funds to be transferred between highway and transit projects according to State, regional / local discretion and priorities. This flexibility was enhanced further through TEA-21. Highway funds transferred to transit have been used to fund a variety of improvements such as construction and rehabilitation of rail stations, maintenance facility renovations, rolling stock procurements, and development of multi-modal transportation centers. Since 1991, nearly $5 billion in flexible funds have been transferred. Over the life of TEA-21, over $100 billion of highway funds could potentially have been used to finance qualifying transit projects.

FHWA funds designated for use in transit capital projects must be derived from the metropolitan and statewide planning and programming process, and must be included in an approved Statewide Transportation Improvement Program (STIP) before the funds can be transferred. The State DOT requests, by letter, the transfer of highway funds for a transit project to the FHWA Division Office. The letter should specify the project, amount to be transferred, apportionment year, State, federal aid apportionment category (i.e. Surface Transportation Program (STP), Congestion Mitigation and Air Quality (CMAQ), or congressional earmark), and a description of the project as contained in the STIP.

Transferred funds are treated as FTA formula funds, but are assigned a distinct identifying code for tracking purposes. The funds may be used for any capital purpose eligible under the FTA formula program to which they are transferred and in the case of CMAQ for certain operating costs. FTA and FHWA have issued guidance on project eligibility under the CMAQ program in a Notice at 65 FR 9040 et seq. (February 23, 2000). In accordance with 23 U.S.C. 104(k), all FTA requirements are applicable to transferred funds except local share – FHWA local share requirements apply. Transferred funds should be combined with regular FTA funds in a single annual grant application.

Other FHWA programs are flexible as well. Under certain circumstances, National Highway System (NHS) funds may be used to fund transit improvements in NHS corridors. Interstate Substitute Funds continue to be eligible for transit use. And in the case of commuter rail in the Lincoln to Omaha corridor, commuter rail could be funded as a "maintenance of traffic" project during reconstruction and widening of I-80. This is how the Tri-County Commuter Rail (Tri-Rail) program was started in South Florida.

- ***Surface Transportation Program (STP)*** – STP is the largest Federal Highway Administration (FHWA) flexible funding program. Funds may be used for all projects eligible for funding under current FTA programs, excluding Sections 5307 and 5311 operating assistance. A portion of STP funds available to each State is sub-allocated to urbanized areas that are programmed at the regional level. States use the balance of STP funds on a statewide level. Each State must use 10 percent of their STP funds for transportation enhancements such as bike and pedestrian facilities, scenic easements, and historic preservation projects. Certain rail projects are eligible to be funded as enhancements, such as rehabilitation and operation of historic transportation buildings and facilities.
- ***Congestion Mitigation and Air Quality Improvement Program (CMAQ)*** – Funds available through the CMAQ program are used to support transportation projects in air quality non-attainment areas. A CMAQ project must contribute to the national ambient air quality standards by reducing pollutant emissions from transportation sources.

Other Federal Funding Options

- Railroad Rehabilitation and Improvement Financing (RRIF) Program – The Railroad Rehabilitation and Improvement Financing (RRIF) Program enables the Federal Railroad Administration (FRA) to provide loans and loan guarantees for railroad capital projects, including freight railroads, State and local passenger and commuter railroads, and Amtrak. RRIF authorizes $3.5 billion, on a revolving basis, in direct federal loans and /or loan guarantees. Loans can have a term of 25 years with an interest rate that is essentially the cost of money to the federal government. RRIF loans are for railroad purposes only, but can be used for almost any rail purpose. There are no specific dollar thresholds. RRIF loans must be accompanied by a "credit risk premium", i.e. a premium payment that insures the Government against default. Pursuant to TEA 21, Congress can appropriate funds to cover this credit risk premium, or the applicant or a private or governmental partner may provide such funds.

  As Congress has not appropriated funds to cover the credit risk premium, it is up to each applicant to provide or obtain such funds. Obviously, the size of the premiums will be critical to the workability of the program. The Secretary of Transportation, in consultation with the Congressional Budget Office and the White House Office of Management and Budget (OMB), will determine the amount required for the premium. Many factors will be taken into consideration including credit worthiness of the applicant, collateral offered, or experience of other borrowers. It is expected that a credit risk of about 5 percent will be required.
- ***Section 130 Grade Crossing Program*** – TEA 21 requires each State to use 10 percent of the funds apportioned each year under the Surface Transportation Program (STP) to be used for carrying out rail-highway crossing and hazard elimination activities. Under the Section 130 grade crossing program, each State is required to identify crossing needs within the State and establish and implement a schedule of projects to meet those needs. This is the primary source of funding for crossing improvements. The 10 percent set aside represents the minimum amount of federal funding available for highway safety. Other federal highway programs may also be used for grade crossing projects, including

additional amounts of STP funds. Private grade crossings currently are not eligible for Section 130 funds. Although the Section 130 program is set at a 90 percent federal share, States have the discretion to waive the non-federal match for most Section 130 projects. Because motorists are the primary beneficiaries of grade crossing projects, federal regulations prohibit States from requiring a railroad contribution toward the cost of Section 130 projects. However, railroads often will make voluntary contributions.

- ***Job Access and Reverse Commute Grants*** – A new federal funding source was created to increase access to jobs for low-income workers. This program is authorized to receive up to $150 million per year in FY 1999-2003, with 20 percent of the grant going to urbanized areas with less than one million people. Up to $10 million per year can go to reverse commute projects, defined as transportation to suburban job opportunities. Funds from non-DOT Federal programs can be used to pay for the local match, which is 50 percent. The program offers discretionary grants for transportation to qualified low-income individuals. Funds can be provided for capital, operating and maintenance expenses, for promoting transit use by workers with non-traditional work hours, for promoting the use of transit vouchers by appropriate agencies, and for promoting the use of employer-provided transportation and transit pass benefits.

Sources of State Funding

A public transportation assistance program was established under Section 13-1209 of the Nebraska Code. The purpose of the Nebraska Transit Assistance Program is to provide State assistance for the operation of public transportation systems. A municipality, county, transit authority, or qualified public-purpose organization is eligible to receive financial assistance for eligible operating costs whether the applicant directly operates such system or contracts for its operation. A qualified public-purpose organization is not eligible for financial assistance under the Nebraska Public Transportation Act if such organization is currently receiving State funds for a program which includes transportation services and such funding and services would be duplicated by the act. Eligible operating costs shall include those expenses incurred in the operation of a public transportation system that exceed the amount of operating revenue and that are not otherwise eligible for reimbursement from any available federal programs other than those administered by the United States Department of the Treasury. The State grant to an applicant shall not exceed 50 percent of the eligible operating costs of the public transportation system. The amount of State funds shall be matched by an equal amount of local funds in support of operating costs. Currently, this program provides approximately $1 million annually to assist public transportation providers in the State. Funding for this program comes from the State Highway Trust Fund. Additional funds are appropriated from the State General Fund by the Legislature annually.

Local Sources of Transportation Funding

In Nebraska, most transit systems have been funded locally through special appropriations of city councils and other local legislative bodies. Metro Area Transit (MAT) in Omaha receives dedicated local funding from a property tax. Typically, commuter rail systems rely on local communities to fund the local share of acquisition, design and construction of stations in the city.

FTA New Starts Criteria Evaluation

Section (§)5309(e) requires FTA to evaluate each proposed New Starts project according to a series of criteria for project justification and local financial commitment. As proposed projects proceed through the stages of the planning and project development process, they are evaluated against the full range of statutory criteria. Based on the results of this evaluation and consistent with §5309(e)(6), summary ratings of "highly recommended," "recommended," or "not recommended" are assigned to each proposed project. The results of these evaluations are used as the basis for decisions regarding approval for entry into preliminary engineering and final design and to make annual funding recommendations to Congress. FTA relies on a multiple-measure approach to assign these ratings, which are updated throughout the preliminary engineering and final design processes as information concerning costs, benefits, and impacts is refined. The New Starts project evaluation criteria are in addition to the general grant eligibility requirements that apply to all FTA funding programs.

The criteria under which proposed New Starts projects must be evaluated are established by statute and contained in §5309(e). The criteria for evaluating project justification are largely unchanged from past FTA policy and prior authorizing legislation. As in the past, projects are evaluated according to the following criteria:

- Cost effectiveness
- Transit-supportive existing land use, policies and future patterns
- Mobility improvements
- Environmental benefits
- Operating efficiencies
- Other factors

Proposed projects also must be supported by an acceptable degree of local financial commitment, including evidence of stable and dependable financing sources to construct, maintain and operate the system or extension.

In evaluating the project justification criteria, FTA gives primary consideration to the measures for cost effectiveness, transit supportive land use, and mobility improvements, though all criteria are an integral part of the process. FTA attempts to reflect the unique characteristics and objectives of each New Starts project in consideration of the project justification criteria and other factors.

Cost Effectiveness

Congress places a high degree of emphasis on "cost effectiveness" and recently instructed FTA to once again develop "cost-per-new-rider" indices for this measure. This is a simple ratio between incremental costs and incremental benefits where benefits are not valued in monetary terms but in the number of new riders attracted to the commuter rail system. New riders attracted to the system are a proxy for direct and indirect economic benefits.

The cost effectiveness measure is based on the annualized total capital investment added to the annual operating costs divided by the forecast change in annual transit system ridership. Annualizing the capital costs recognizes the economic value of assets with differing useful lives.

This simple measure avoids the complex and often controversial determination of a monetary value for direct and indirect benefits. Calculations on the benefit side of the analysis are made quite difficult by the wide range of benefits associated with transit projects – congestion relief, improved travel times, energy conservation, pollution reductions, economic development and community amenities. The attraction of new riders to the transit network is a proxy for benefit measurement. In this case, the new riders are those who are attracted to the commuter rail system from automobiles and induced trips. Usually, the riders attracted from competing transit modes are not counted. However, given that there are no existing competing commuter bus services in the corridors under review, all riders are treated as new riders.

Table 8-7 tabulates and presents the cost per new rider index for the Rail Build alternatives and highlights the total annualized costs for the various rail rapid transit options under consideration.

Table 8-7: Cost Effectiveness Index (Cost Per New Rider)

Measures	Alternatives				
	No Build	Rail Only	Scenario A	Scenario B	Scenario C
Annual New Riders (midpoint)	0	169,634	225,974	124,790	68,450
Total Capital Costs	0	79,266,101	83,516,101	7,250,000	2,978,000
Annualized Capital Costs	0	10,261,164	1,0,726,914	807,750	342,468
Annualized O&M Costs	0	4,958,424	5,168,754	649,050	438,720
Total Annualized Costs	0	15,219,588	15,895,668	1,456,800	781,188
Cost per New Rider (US$)	N/a	89.72	70.34	11.67	11.41

Source: Wilbur Smith Associates

The annualized cost per new rider index for the alternatives with commuter rail options ranges between $70.32 and $89.72, which is considered poor and would receive a “not recommended” rating from the Federal Transit Administration. The bus only alternatives, Scenarios B and C, have significantly better indices of cost effectiveness. The bus only alternatives are not eligible for Section 5309 New Starts funding. The bus only alternatives are eligible for Sections 5307 and 5311 funding, which are 80 percent federal share.

As noted, the table above assumes a midpoint of the ridership range. Assuming the high end of the ridership range, the costs for new rider would be lower. They become $76.64 for rail between Lincoln and Omaha, $61.28 for Scenario A, $10.30 for Scenario B, and $9.70 for Scenario C. These lower figures are used for the evaluation of the scenarios in the final section of this chapter.

Transit Supportive Land-Use

To evaluate this criterion properly, summary information, supporting documentation, and quantitative data prepared by local agencies to assess the existing land use, transit supportive land use policies, and future patterns associated with the proposed commuter rail project must be gathered and analyzed. FTA uses three primary rating categories in its evaluation of proposed New Starts projects. These rating categories reflect the desire to clearly distinguish among three primary aspects of land use, i.e. existing land use patterns, plans and policies, and expected impacts.

- Existing Land Use
- Transit Supportive Plans and Policies:
    - "Growth Management"
    - Transit supportive corridor policies
    - Supportive zoning regulations near transit stations; and
    - Tools to implement land use policies.
- Performance and Expected Impacts of Policies:
    - Performance of land use policies; and
    - Potential impact of transit project on regional land use.

Due to the limited resources available for this study, this analysis cannot be carried out and would best be deferred to later stages of project development and analysis.

Mobility Improvements

The measures used to evaluate this criterion include travel times savings, number of low-income households within a ½-mile of station boarding areas, and the number of jobs within walk access of destination stations. Travel time savings are calculated by examining regional travel demand model output. Because a regional model was not used for this feasibility study, these data are not available for comparison. Similarly, the number of low-income households within a ½-mile of station boarding areas was not determined due to limited resources for this study. The commuter rail and express bus options with terminals in the central business districts of Lincoln and Omaha have excellent walk access and with connecting transit services excellent transit access to nearly all the major employers in each city. The added choice of a reliable transit option for travel between the two cities is a significant benefit.

ECONOMIC EVALUATION

The purpose the economic evaluation is to describe the potential traveler safety, traveler cost, and congestion cost impacts of diverting passenger car traffic from Nebraska highways to commuter rail and bus alternatives in three corridors.

In Chapter 2, the potential ridership was identified for the rail and bus options. These estimates were key inputs for Chapter 5, the commuter rail operating plan, and Chapter 6, the express bus plans. Ridership for the planned start year of 2010 was expressed in terms of a range. For the purpose of this evaluation, the ridership which Scenarios A, B, and C would generate represent trips that would otherwise be taken by car. Thus, ridership is reflective of passenger car traffic that the transit options would divert to rail and/or express bus. If these passengers do not travel by train or bus, they will travel by automobile.

A reasonable estimate of the average commuter vehicle occupancy rate is 1.1 persons per vehicle. Thus, for example, a high-side annual ridership of 187,000 train riders in the Lincoln-Omaha corridor (exclusive of special event riders) would divert about 670 cars per day off I-80 in 2010.

Benefits of Potential Traffic Diversions

The diversions of traffic from I-80 and other State highways would generate a wide range of benefits, including:

- Direct traveler benefits
- Indirect traveler benefits
- Societal benefits

Direct Traveler Benefits

Direct traveler benefits accrue passengers because trips are taken by train or bus instead of by highway vehicle. Direct traveler benefits may include: out-of-pocket cost savings, reductions in travel time, improvements in travel-time reliability, and enhanced safety or lower accident risks. Time and cost-related benefits depend upon the relative rates, travel times, and travel-time variances of rail and bus modes in 2010. For example, if train fares are lower than the cost of automobile travel (including parking costs) in 2010, rail passengers will experience direct benefits from traveling by rail instead of by highway. Direct traveler safety benefits are quantified by comparing current vehicle and rail accident rates and assuming that the relative risks of travel remain unchanged for the analysis period.

Indirect Traveler Benefits

The removal of automobiles from Nebraska highways will free-up scarce highway capacity for other users. Thus, benefits will accrue to highway travelers who are not directly involved in the traffic diversions. Higher average travel speeds and fewer delays will result in travel-time savings for all highway travelers. Moreover, fewer accidents and accident-related delays will result in lower crash costs.

Societal Benefits

Car traffic diversions may benefit all members of society, even those persons who do not travel in the I-80 and other corridors considered in this analysis, because of reductions in energy consumption, air pollution, and noise. Rail and bus passenger travel is more energy-efficient than automobile travel.

It is not practical to analyze societal costs in this study. Reductions in fuel consumption may lower railroad, bus and automobile operating costs. The magnitude of these cost savings will vary with the market price of fuel. However, the market price of fuel may not reflect its true long-run cost if the value of "energy security" could be quantified.

Noise impacts are localized phenomena that depend upon existing noise levels, the location of highway and railroad facilities in relation to residential land uses and sensitive noise receptors, the presence of noise barriers or rows of buildings that act as acoustical shields, and the distribution of traffic among daytime and nighttime hours. A very detailed study of individual highway and railroad segments would be necessary before inferences could be drawn about potential noise impacts.

Overview of Analytical Framework and Data

Framework for Comparison

In order to estimate the benefits of highway-to-rail/bus traffic diversions, it is necessary to compare conditions for two scenarios. In the null case, no traffic is diverted from Nebraska highways to trains and buses. Both passenger travelers drive I-80, US 275, NE 133, etc. The null case is the benchmark against which all traffic diversion scenarios are analyzed.

In a diversion scenario, a portion of the projected 2010 highway traffic is shifted to railroad and bus modes. Train and bus riders are compared to drivers in the null case. Benefits are estimated from changes in accidents, traveler costs, and congestion.

Comparisons between modes are made using average or marginal costs. Marginal cost is the change in cost associated with a small change in travel activity. Marginal costs are typically measured on a vehicle-mile of travel (VMT) basis. For some impacts, marginal cost estimates are not available for various modes, i.e. car, bus, commuter train, and intercity train. In these cases, the average cost of each mode is used in the comparison.

To both simplify the presentation and show the savings in the best possible light, total savings are calculated using the assumption of the high end of the ridership range. Economic savings generated by the low end of the ridership range would naturally be less. While the calculations are shown to the dollar, allowing the reader to "do the math", realistically, the figures should be considered approximate.

Primary Data Sources

The primary sources of data used in the impact analysis are:

- Nebraska Department of Roads statewide accident rates per section for Interstate, four-lane, and two-lane highways
- Comparative statistics from Iowa
- Accident statistics from Highway Statistics 1994, Federal Highway Administration (FHWA)
- The Economic Cost of Motor Vehicle Crashes - 1994, National Highway Traffic Safety Administration
- The Economic Impact of Motor Vehicle Crashes - 2002, National Highway Traffic Safety Administration
- Marginal unit costs of highway travel from the 1997 Federal Highway Cost Allocation Study: Final Report of the Federal Highway Administration
- Rail passenger safety data from Amtrak as reported by the Federal Railroad Administration
- Vehicle operating cost data from the American Automobile Association

Magnitude of Potential Impacts

As described in seen in 8-8, the diversion of vehicular traffic from I-80 and other Nebraska highways per the three scenarios would result in significant benefits in 2010. Rail by itself would generate total benefits of about $1 million in accident, traveler cost, and congestion savings in 2010. The specific types of savings and their calculation are discussed below. There will be higher savings for each of the scenarios in future years, for the savings will grow with ridership.

Table 8-8: Scenario Total Savings in 2010	
Scenario A	
Accident cost savings	$565,673
Traveler cost savings	390,814
Congestion savings	300,183
Total	1,256,670
Scenario B	
Accident cost savings	$299,755
Traveler cost savings	457,340
Congestion savings	148,013
Total	905,108
Scenario C	
Accident cost savings	$210,241
Traveler cost savings	352,363
Congestion savings	100,271
Total	662,875
Rail Alone	
Accident cost savings	$476,159
Traveler cost savings	285,837
Congestion savings	253,066
	1,015,062

Source: Wilbur Smith Associates

Accident Savings

These are savings resulting from accidents that would be avoided with driving commuters switching to commutes by rail and/or bus. To calculate these savings, estimate rail and bus ridership was converted to the equivalent of vehicle-miles of travel. This required an assumption of a load factor for a commute car. This analysis assumed a typical load factor of 1.1 persons per commuter car. The calculation also required two other factors: an accident cost per vehicle-mile, and an accident cost per rail passenger mile.

This analysis assumed a cost per vehicle-mile of $0.05, based on a review of national accident costs and accident rate in Nebraska and Iowa. The national statistics pointed to an overall accident cost per vehicle-mile of $0.16 (an average cost of property damage, injuries and fatalities) for all types of vehicles and all types of roads. As seen in Table 8-9, the Nebraska data showed accident rates for Interstate and rural highways of about one-third of urban road systems. Noting that trips in the three transit corridors would take place predominantly on either Interstate or rural highways, it is reasonable to expect accident costs would be conservatively about one-third of the national average, or about $0.05.

Table 8-9: Nebraska Statewide Accident Rates per Vehicle Miles of Travel (VMT)		
Highway Type	**Surrounding Environment**	**Accident Rate per Million VMT**
Interstate highway	Urban	1.357
	Rural	0.557
Four lane highway	Urban	4.386
	Rural	1.291
Two lane highway	Urban	3.904
	Rural	1.163

Source: Nebraska Department of Roads

For example, accident cost saving for rail diversion of car traffic between Lincoln and Omaha in 2010 was calculated by:

- Dividing rail ridership by the 1.1 load factor to identify the cars diverted from the highways.
- Multiplying the diverted cars by the point-to-point highway route miles to calculate a VMT equivalent of the rail ridership (i.e. 10,082,363[1]).
- Multiplying this VMT equivalent by $0.05 per vehicle-mile accident cost.

The result is an approximate accident cost avoided of $504,116. To calculate net savings, however, rail accidents cost must be subtracted from this figure.

The safety costs associated with rail passenger diversion include rail accident costs resulting from the projected increase in passengers and the resulting passenger-miles. These costs are estimated using data from Amtrak's accident/incident overview and accident table as reported by the Federal Railroad Administration. The rail accident cost per passenger-mile is illustrated in Table 8-10. As shown in the table, the four-year weighted average of reportable rail accident damage per passenger-mile used in the analysis is $0.00275.

Table 8-10: Amtrak Reportable Damage per Passenger-mile				
Year	**Accident Count**	**Reportable Damage**	**Passenger-miles**	**Reportable Damage per Passenger-mile**
1998	122	$8,771,465	5,324,191,727	$0.00165
1999	116	$20,816,334	5,288,677,392	$0.00394
2000	187	$11,277,149	5,573,991,695	$0.00202
2001	192	$19,036,559	5,570,567,754	$0.00342
Total/Weighted Average	617	$59,901,507	21,757,428,568	$0.00275

[1] (184,000 annual Lincoln-Omaha riders / 1.1 load factor times 60 bus route miles) + (2,300 Greta-Omaha riders / 1.1 load factor time 22 bus route miles) = 10,082,322.

Rail accident costs are calculated by multiply passenger-miles by the accident cost per passenger-mile. Train service between Lincoln and Omaha would generate a total of 10,166,000 passenger miles and a cost of $27,957. According, net accident costs avoided in 2010 would total approximately $476,159 ($504,116 less $27,957).

Accidents costs for the other scenarios are calculated in the same way, with the variation that accidents costs avoided by diverting car riders to buses must be reduced by accidents costs arising from the new buses. Accident Cost Savings per each scenario appear in Table 8-11.

Table 8-11: Accident Cost Savings

Scenario A	***Savings***
Rail Lincoln-Omaha	$476,159
Bus Fremont-Omaha	50,921
Bus Blair-Omaha	38,594
Total	565,674
Scenario B	
Bus Lincoln-Omaha	$210,241
Bus Fremont-Omaha	50,921
Bus Blair-Omaha	38,594
Total	299,756
Scenario C	
Bus Lincoln-Omaha	$210,241
Rail Alone	
Lincoln-Omaha	$476,159

Source: Wilbur Smith Associates

Traveler Cost Savings

These are savings that a driving commuter experiences in switching from car travel to train travel. If the cost of a train ticket is less than the operating costs of the vehicle, the former driver realizes a savings. The traveler cost savings are not set against the recurring subsidies for the rail and bus services. The savings are simply what the traveler will experience when riding the transit options as opposed to driving.

For example, travel cost saving for rail diversion of car traffic between Lincoln and Omaha in 2010 was calculated by:

- Multiplying the VMT equivalent of the estimated rail ridership (10,082,363) by an automobile operating cost (gas, oil, maintenance and tires exclusively) of $0.13 per mile; this equals $1,310,832.
- Subtracting fare revenue of $1,025,000.

The result is a savings of $285,837. The savings would be diminished by any costs for transfer to and from local transit and enhanced by any parking costs that the commuters would have to pay if they drove their cars. Assuming that the transit transfers and the parking costs effectively cancel each other out, the figure about is reflective of the approximate savings in travel costs that train riders could expect vis a vis driving.

Traveler cost savings thus calculated for all scenarios appear in Table 8-12. It is worth noting that traveler cost savings for Scenario B, the all bus option, is greater than the savings for the Scenario A, the rail/bus option, even though the latter has higher ridership. The reason is that the traveler cost for rail ($0.10) twice as much higher than for bus between Lincoln and Omaha. Bus traveler costs between Fremont and Omaha and between Blair and Omaha also are lower.

Table 8-12: Traveler Cost Savings

Scenario A	***Savings***
Rail Lincoln-Omaha	$285,837
Bus Fremont-Omaha	64,850
Bus Blair-Omaha	40,127
Total	390,814
Scenario B	
Bus Lincoln-Omaha	$352,363
Bus Fremont-Omaha	64,850
Bus Blair-Omaha	40,127
Total	457,340
Scenario C	
Bus Lincoln-Omaha	$352,363
Rail Alone	
Lincoln-Omaha	$285,837

Source: Wilbur Smith Associates

Congestion Savings

Marginal Highway Congestion Cost

In the 1997 federal highway cost allocation study, FHWA estimated marginal congestion costs per vehicle-mile of travel. These congestion costs were estimated for a range of traffic levels and mixes of vehicles. They reflect both peak period and non-peak period traffic conditions. In essence, the congestion costs are weighted averages, based on estimated percentages of peak and off-peak travel for different vehicle classes.

Table 8-13 shows FHWA's high, middle, and low estimates of marginal external congestion costs in cents per vehicle-mile. These costs represent the additional delay to motorists already using a highway segment as a result of one additional vehicle in the traffic stream.

Table 8-13: 2000 Marginal External Congestion Cost (Cents per Vehicle-Mile)

	Rural Highways			Urban Highways		
	High	**Middle**	**Low**	**High**	**Middle**	**Low**
Automobiles	3.76	1.28	0.34	18.27	6.21	1.64
Pickups and Vans	3.80	1.29	0.34	17.78	6.04	1.60
Buses	6.96	2.37	0.63	37.59	12.78	3.38
Single Unit Trucks	7.43	2.53	0.67	42.65	14.50	3.84

Combination Trucks	10.87	3.70	0.98	49.34	16.78	4.44
All Vehicles	4.40	1.50	0.40	19.72	6.71	1.78

Source: Federal Highway Administration, *1997 Federal Highway Cost Allocation Study*.

The costs shown in Table 8-13 are additive to normal travel time and vehicle operating costs. Congestion costs are *external* to the trip maker in the sense that they represent the delay cost imposed on other motorists by the additional trip.

The relevant congestion costs for this analysis are the ones shown for automobiles and buses. Congestion cost savings result from diverting drivers to buses, thus removing cars from the highways. However, these savings must be matched against whatever congestion that results from more buses on the highways now carrying the former drivers to produce a net savings.

Using the factors, a weighed average congestion cost per transit corridor and per vehicle type can be computed, as shown in Table 8-14. The table indicates both the relevant congestion costs per vehicle type (middle range costs for cars and buses) from Table 8-13 and the approximate proportion of rural and urban highway miles of total route miles in the three transit corridors.

Table 8-14: Congestion Costs for Cars and Buses in the Three Nebraska Transit Corridors

Corridor	Vehicle Type	Highway Type	Percent of Route	Congestion Cost in Cents per VMT	Weighted Cost in Cents per VMT
Fremont-Omaha	Car	Rural	78%	1.28	1.00
		Urban	22%	6.21	1.37
					2.37
	Bus	Rural	78%	2.37	1.85
		Urban	22%	12.78	2.81
					4.66
Blair-Omaha	Car	Rural	58%	1.28	0.74
		Urban	42%	6.21	2.61
					3.35
	Bus	Rural	58%	2.37	1.37
		Urban	42%	12.78	5.37
					6.74
Lincoln-Omaha	Car	Rural	75%	1.28	0.96
		Urban	25%	6.21	1.55
					2.51
	Bus	Rural	75%	2.37	1.78
		Urban	25%	12.78	3.20
					4.98

Source: Wilbur Smith Associates

As seen above, a weighted-average congestion cost of 2.37 cents per VMT is computed for automobile travel in the Fremont-Omaha corridor, and a congestion cost of 4.66 cents per VMT is computed for bus travel in that corridor.

Congestion Costs Avoided

An express bus option in the Fremont-Omaha corridor will generate the equivalent of 1,080,909 vehicle-miles of travel (29,000 riders divided by a commuter car load factor of 1.1 car riders per car times 41 miles between Fremont and Omaha). These VMT times a car congestion cost $0.0237 equals a cost avoided (savings) of $25,618. These savings are reduced by new bus congestion costs, i.e. 62,484 bus miles of travel (6 buses times 41 miles times 254 service days a year) times $0.0466, or $2,912. Thus net savings would equal approximately $25,618 less $2,912, or $22,706. The net congestion costs for all corridors are calculated in the same way, resulting in the savings shown in Table 8-15 below.

Table 8-15: Congestion Cost Savings

Scenario A	***Savings***
Rail Lincoln-Omaha	$253,066
Bus Fremont-Omaha	22,706
Bus Blair-Omaha	24,411
Total	300,183
Scenario B	
Bus Lincoln-Omaha	$100,896
Bus Fremont-Omaha	22,706
Bus Blair-Omaha	24,411
Total	148,013
Scenario C	
Bus Lincoln-Omaha	$100,271
Rail Alone	
Lincoln-Omaha	$253,066

Source: Wilbur Smith Associates

As seen in the table, congestion cost savings due to rail alone are far greater than savings generated by the bus options. This is because rail diverts more drivers than express bus does.

SUMMARY FINDINGS AND EVALUATIONS

Summary Findings

The three scenarios are summarized in Table 8-16. The table assumes the high end of the ridership range. This assumption portrays the financial and economic performance of the scenarios in the best possible light. Importantly, the assumption is grounded in reality. That is, ridership is derived in part by the number of home-based work trips forecast in 2010, and that forecast is based on the growth in such work trips between 1990 and 2000.

Table 8-16: Summary of Findings for Scenarios A, B and C			
	Scenario A	**Scenario B**	**Scenario C**
Capital Cost at Start-up	$83.5 million	$7.3 million	$3.0 million
Ridership in 2010	259,000	141,000	81,000
Fare Box Recovery in 2010	24 percent	59 percent	55 percent
Cost per New Rider	$61.28	$10.30	$9.70
Economic Savings in 2010	$1.3 million	$0.9 million	$0.7 million

Source: Wilbur Smith Associates

Scenarios A and B are really service combinations of modes and corridors. That is, Scenario A includes commuter rail trains operating between Lincoln and Omaha, and express buses operating between Fremont and Omaha and between Blair and Omaha. Scenario B includes express buses operating in all three corridors. Only Scenario C includes just one mode (buses), operating in one corridor (Lincoln-Omaha).

Table 8-17 shows the summary information rail and bus options broken out in terms of individual modes (bus and rail) and markets (Lincoln-Omaha, Fremont-Omaha, and Blair-Omaha). Rail is shown for Lincoln-Omaha, and bus is shown for Lincoln-Omaha, Fremont-Omaha, and Blair-Omaha. The table shows, for example, that rail alone in the Lincoln-Omaha corridor, generates a cost per new rider of $76.64. This figure is more than $16 per rider higher than for than Scenario A, consisting of rail and bus options, having a cost per new rider of $61.28 (Table 8-16). This difference is because the lower costs per new riders for express buses in the Fremont-Omaha and Blair-Omaha corridors mitigate the high cost per new rider for commuter rail in the Lincoln-Omaha corridor.

Table 8-17: Summary of Mode/Market-specific Transit Options				
	Rail	**Bus**	**Bus**	**Bus**
	Lincoln-Omaha	**Lincoln-Omaha**	**Fremont-Omaha**	**Blair-Omaha**
Capital Cost at Start-up	$79.3 million	$3.0 million	$2.1 million	$2.1 million
Ridership in 2010	199,000	81,000	29,000	32,000
Fare Box Recovery in 2010	22%	55%	59%	78%
Cost per New Rider	$76.64	$9.70	$12.30[2]	$10.03[3]
Economic Savings in 2010	$1.0 million	$0.7 million	$0.1 million	$0.1 million
Source: Wilbur Smith Associates				

Summary Evaluation

Table 8-18 presents a qualitative summary evaluation of the three scenarios based on various criteria, such as ease of implementation, ridership potential, and so on. These criteria are defined below. In the table, each of the criteria has equal weight. Valuations are on a 1 to 5 scale, with 5 being the highest. The individual criteria valuations for the scenarios are totaled at the bottom. The all-bus options, Scenarios B and C, do significantly better in this analysis than does the rail-bus option, Scenario A. The reason has mostly to do with capital and operating costs, which are much higher than for the other two scenarios.

[2] The calculation assumes $231,984 in annualized capital costs and $125,000 in annualize operating costs, or a total of $356,984 in total annualized costs.

[3] The calculation assumes $234,009 in annualized capital costs and $85,000 in annualized operating costs, or a total of $319,009 in total annualized costs.

Table 8-18: Summary Valuation of Scenarios A, B and C			
Criteria	**Scenario A**	**Scenario B**	**Scenario C**
Ease of Implementation	1	4	5
Ridership Potential	5	4	3
Financial Performance	1	5	5
Funding Eligibility	1	5	5
Benefits versus Costs	1	3	4
Total	9	21	22

Source: Wilbur Smith Associates

- ***Ease of Implementation:*** This criterion captures the relative degree of capital costs and institutional arrangements required to establish a transit option. Commuter trains will have high start-up costs and will need agreements with the BNSF for use of railroad tracks. Bus options will have far fewer capital costs and require no agreements for the use of the highways. Thus, the all-bus options Scenario B and C score higher than Scenario A, which includes commuter trains.
- ***Ridership Potential:*** This is total ridership per transit option. Trains generate the highest ridership. Therefore, Scenario A, which includes a rail option, scores better than either of the two all-bus options.
- ***Financial Performance:*** This is the fare box recovery ratio calculation, which is the percent of operating costs covered by fares, the basic measure of the self-sufficiency for a transit agency. While none of the scenarios' fare revenues cover their operating costs, the all-bus scenarios come closer to doing so than Scenario A, which includes commuter trains with a best case fare box recovery of 16 percent in 2010.
- ***Funding Eligibility:*** The cost effectiveness of a project is probably the single most important determining factor when the FTA rates projects for federal funding. One measure used by Congress in determining cost effectiveness is the Cost-per-New-Rider index. This index is calculated by summing the annualized operating and capital costs divided by annual riders in the forecast year. Options with a cost per new rider of $25 or more get a low cost effectiveness rating. Options that have a cost per new rider of less than $13 have a medium high or better cost effectiveness rating. The all-bus options, Scenario B and C, have costs per new rider of between $9 and $11. By contrast, Scenario A, which includes commuter rail, has a cost per new rider index of more than $61. It is not likely that the FTA will fund the commuter rail option.
- ***Economic Benefit / Cost Ratio:*** In this analysis, economic savings in 2010 are compared against annualized operating and capital costs to get a sense of benefits versus costs. The economic benefits are accident cost, traveler cost, and marginal congestion cost savings, all three of which are driven by ridership. Because Scenario A has the potential for attracting the most riders, it has the highest accident, traveler cost, and congestion cost savings. However, these are set against the annualized costs for the service. Because Scenario A's costs are far higher than the costs of the all-bus Scenario B and C, it has a lower benefit / cost ratio. Assuming high-side ridership, the ratios are: Scenario A, 0.08; Scenario B, 0.62; and Scenario C, 0.85. Benefits do not exceed costs, but scenario C shows the highest utility.

Benefits versus costs were also calculated on a mode and market-specific basis. Rail in the Lincoln-Omaha corridor has a ratio of 0.07; bus Lincoln-Omaha, 0.85 (same as Scenario C); bus Fremont-Omaha, 0.39; and bus Blair-Omaha, 0.41.

Chapter 9
NEXT STEPS TOWARD IMPLEMENTATION

INTRODUCTION

This chapter discusses the next steps for implementation of commuter rail service, express bus service, or a combination of both (i.e. Scenario A). Should the State of Nebraska seek to implement commuter rail and if FTA New Starts funding is desired, a more detailed alternatives analysis and environmental impact assessment will be required utilizing more sophisticated ridership estimating techniques and other more technical analysis than was completed for this feasibility assessment. The alternatives analysis process is noted below. If no federal funds are sought, no alternatives analysis will be required.

NEXT STEPS

Assuming the popular will is to pursue any of the three service scenarios, or even individual elements of same, numerous steps remain on the road to implementation. The major ones are outlined below, more or less in their likely order. Logically enough, the first stop will be establishing the agency to sponsor the desired public transit services.

Suggested Legislation

Implementation of any alternative will require an agency to sponsor the service. This agency will have the authority to procure rolling stock, potentially negotiate with the railroad for access to tracks, hire an operator, secure funding, and so on. This study assumes that NTRAC, as currently configured, will not sponsor any service implementation or be able to conduct and manage an alternatives analysis. Rather, that would be a role for either a regional or State agency. Various models exist. One is a Joint Powers Authority (JPA), comprised on the various jurisdictions served by the new service. Three comparatively new commuter rail sponsoring agencies in California are JPAs. Another is a Regional Transportation Agency (RTA), which could encompass not only the new services but existing transit services in the corridor. The Chicago RTA, consisting of Metra commuter rail, CTA urban (elevated) rail system, and the Pace bus system, is a relevant model. A JPA likely can be formed under the provisions of the Interlocal Cooperation Act. An RTA may require special legislation, as it may have taxing authority to support ongoing operations and capital improvements.

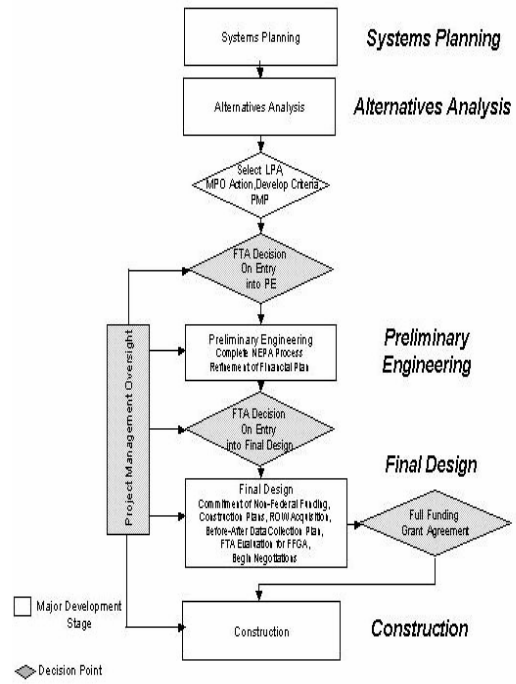
Defining the requirements and establishing the sponsoring agency will be the first steps in moving toward implementation. Once established, the agency would need to select an executive to handle further planning requirements, as outlined below. A budget and funding for the executive and perhaps a small ancillary staff will need to be secured. For alternatives analysis, the Nebraska Department of Roads could be the sponsoring agency.

Conduct Alternatives Analysis for Commuter Rail

An alternatives analysis is a complement of analytical tools designed to assist communities in making important decisions concerning costly infrastructure investments. An alternatives analysis is the first step in a multi-step process of project development and implementation: study, preliminary engineering, final design, construction and start-up as depicted in the figure. The first step in the alternatives process is to define a broad range of mobility enhancements. After identifying market segments, the project sponsor (typically using a consultant team) will develop an initial group of preliminary alternatives. At a minimum, the refined alternatives considered may include:

- No Build – today's system with committed improvements
- Baseline/Transportation System Management and demand management
- Enhanced express bus service
- HOV/HOT lanes and ramps
- Bus Rapid Transit (BRT)
- Commuter Rail

TEA-21 New Starts Planning and Project Development Process



Develop a Financing Plan for Implementation and Continuing Operation

Realistic funding sources for a preferred alternative must be identified. For example, funding sources for capital projects could include Section 5311 Non-Urbanized Area Formula Program funds. Funding to cover ongoing subsidies could come from new sales taxes. But beyond these sources, the financing mechanisms must be defined, i.e. when, how and to what degree the funding sources are applied to capital and operating needs. As an example, financing could include bonding of the unfunded capital improvements for the project, and bonding implies principal and interest payments in addition to recurring subsidies. The financing plan will detail the various funding sources and financing requirements over a 20-year period.

Negotiate Agreements with BNSF and with Transit Operators

If a rail option is selected, the sponsoring agency will need to negotiate an operating agreement with the Burlington Northern and Santa Fe Railway. This agreement will specify the capital improvements required and conditions under which the passenger trains can operate on BNSF tracks between Lincoln and Omaha. Whether for rail, bus, or a combination of both, the sponsoring agency must enter into agreements with MAT and StarTran to provide efficient transit connections at rail stations and transit centers.

Conform to the Requirements of Funding Sources

Depending on the preferred option, funding sources could include New Starts, RRIF, CMAQ, Nebraska Transit Assistance Program funds, among others. For any of these sources, the sponsoring agency will have to file applications. This means that the agency will have to take the steps to ensure that the preferred alternative conforms to the requirements of the funding sources.

Initiate the Environmental Review and Preliminary Engineering Analysis

As noted in Chapter 7, all scenarios have some potential environmental impacts. The potential construction of rail stations or new park-and-ride facilities to support either a rail or bus option may trigger an environmental review, during which these impacts would be explored. The sponsoring agency would initiate the review. Also as noted in Chapter 7, this review likely would be an Environmental Assessment (EA). Preliminary engineering (PE) for the preferred alternative is aimed at refining cost estimates. PE can be done concurrently with the EA.

Procure Rolling Stock

The sponsoring agency will have to procure the rolling stock for the preferred alternative. An issue here is lead time for delivery of the equipment. If a rail option is chosen, the lead time for delivery of DMUs is about 14 months, according to Colorado Railcar, the manufacturer consulted in the development of the Commuter Rail Plan, Chapter 5. Lead time for express buses would be much shorter, as these are more “off the showroom floor” items than DMUs.

Initiate Final Engineering and Construction

Depending on the option, there will be track or road improvements, stations, support facilities, and park-and-ride facilities to be built, and environmental mitigation to be performed. This analysis assumed a construction time for improvements for either the rail or bus option of about a year.

Hire an Operator and Management Team

If a rail option is chosen, the operator could be either Amtrak or private contractors such as Herzog Transit Services, which operates both Altamont Commuter Express (ACE) in Northern California and Trinity Railway Express (TRE) in Dallas-Fort Worth. There are numerous potentials for bus operators. The sponsoring agency must identify the operator(s) for the preferred alternative. This can be done through a public procurement procedure. It is conceivable that BNSF may require its crews to operate DMUs, if a rail option is chosen. BNSF provides crews today for Metra commuter trains running on its lines in Chicago and for The Sounder commuter trains running on its lines in Seattle. At this time, the agency executive would likely need to build a professional staff, inclusive of a controller and technical support, to execute the affairs of a soon-to-be up-and-running transit agency. The executive will need also to contract for various services such as marketing, legal services, and financial auditing.

Debug and Implement the Service

What remains will be to test the rolling stock and other systems prior the first revenue day. After that, the various powers-that-be can cut the ribbon!

LESSONS LEARNED

The foregoing analysis permits various observations about potential commuter trains and express buses in future Nebraska transit corridors.

- ***Rail's High Cost per New Rider Works Against the Potential for Federal Funding –*** Commuter rail's cost per new rider, even when combined with express bus services, is higher than federal agencies such as the FTA would consider as eligible for federal funding. Accordingly, it is unlikely that federal funds would be available for commuter rail, as currently envisioned.
- ***Local Funding Sources Need to be Found for Transit Options*** – Without the potential for federal funds, State and local funding sources would be needed for the implementation and ongoing operations of a commuter rail option. Express bus alternatives have more attractive costs per new rider, and may be eligible for federal funds. But the bus options would need a source for covering operating subsidies. A common mechanism for funding transit improvements are sales taxes levied at the State and local levels.
- ***Public Policy Decisions and Employer Action Can Spur Rail Ridership –*** Major policy decisions, like establishing a mix of higher density residential and commercial uses around stations (i.e. transit oriented development or TOD), can help lower operating subsidies by encouraging rail ridership. (It should be noted that TOD will be successful only to the extent that communities around stations will permit high residential development.)

  Also, large employers like the University of Nebraska could encourage ridership by subsidizing employees' train fares, at least to some degree. (The University could go even further and offer subsidies for students' fares.) Such actions could lower a rail transit option's cost per new rider to within sight of federal funding eligibility.
- ***Transit Integration –*** Both rail and bus options will depend on integration with existing transit operations in Omaha and Lincoln to carry commuters from their trains to their workplaces in the morning and back again in the evening. For both commuter rail and bus, local bus operators will need to modify existing routes. There likely will be revenue and cost impacts in doing so for the local operators. These were not calculated in this study.
- ***Overall Feasibility –*** All scenarios and modal options considered are feasible physically. As shown in Chapter 7, there are no obvious environmental fatal flaws to any of the options. However, some are more practical and easier to implement than others. Express bus options have capital costs that are a small fraction of commuter rail. Also, over time, they show the promise of almost covering their operating costs. On balance, they appear easier and more practical to implement than commuter rail.

APPENDICES

Appendix A
RIDERSHIP COMPARISONS

ACE Comparison

Altamont Commuter Express (ACE) operates commuter service between Stockton and San Jose via Pleasanton. The service provides 3 peak direction round trips to Silicon Valley employment centers in the morning and returning in late afternoon. For this analysis, 3 origin stations in the Tri-Valley area were selected, and compared with 3 destination stations in the South Bay Area. (Ridership from San Joaquin Valley stations could not be compared because local MOP travel data does not identify travel from individual traffic analysis zones in that area.) ACE ridership between specific stations was not available, so point to point ridership was estimated using on and off counts provided by ACE for a typical commute day (Wednesday, May 8, 2002). The rail share of morning home to work trips for these station pairs ranged from under 1 percent to nearly 17 percent. As with Caltrain, the share generally increases with trip distance. Trips to Santa Clara exhibit unusually low rail shares. This may be because Santa Clara was recently added to the ACE system, and ridership may not have developed to the same extent as other stations. The results for ACE ridership are shown below. Great America is the major southbound stop, and accordingly ridership there has the largest shares.

Table A-1: ACE Current Share of Morning Work Trips

Station Pair	Trains	MTC AM Peak HBW Trips	ACE Commuter Avg. Weekday Trips	Rail Share	Miles
Vasco Road-Fremont	3	150	11.4	0.076	22.4
Vasco Road-Great America	3	373	63.2	0.169	35.0
Vasco Road-Santa Clara	3	227	12.7	0.004	39.0
Livermore-Fremont	3	758	14.4	0.018	19.7
Livermore-Great America	3	1,709	80.0	0.047	32.3
Livermore-Santa Clara	3	1,035	14.8	0.014	36.3
Pleasanton-Fremont	3	1,499	28.4	0.019	12.9
Pleasanton-Great America	3	3,608	171.1	0.047	25.5
Pleasanton-Santa Clara	3	2,329	27.3	0.012	29.5
Totals		**11,688**	**423.3**	**0.036**	

Note: Average ACE trips estimated by WSA from available on and off counts for a typical weekday.

Caltrain Comparison

Caltrain operates intensive commute service on the San Francisco Peninsula, between San Francisco, San Jose, and Gilroy. Caltrain's service pattern includes "skip stop" service during peak hours, with some trains skipping selected stations in order to reduce running times. The weekday service consists of 40 round trips between San Francisco and San Jose. Analysis of selected station pairs used the local MPO's travel model data and compared the data with actual 2001 September and October ridership on trains operating during the morning peak period (trains arriving by 9:00 am). The analysis revealed a rail mode share ranging from under one percent to as high as 55 percent[1]. The higher rail shares are for longer trips, and in general for trips to San Francisco, where high parking costs contribute to a high level of transit use for daily work trips. The results of the Caltrain analysis are shown below.

Table A-2: Caltrain Current Rail Share of Morning Work Trips

Station Pair	Trains	MTC AM Peak HBW Trips	Caltrain Avg. Weekday Trips	Rail Share	Miles
Burlingame-San Francisco	7	1,941	150.6	0.078	16.3
Redwood City-San Francisco	8	1,118	178.4	0.160	25.4
Palo Alto-San Francisco	11	447	95.9	0.214	30.1
Mountain View-San Francisco	11	359	197.9	0.551	36.1
Santa Clara-Palo Alto	12	2,141	62.4	0.029	14.6
Burlingame-Palo Alto	4	5,420	29.9	0.006	13.8
San Carlos-Mountain View	7	710	41.8	0.059	12.9
Hillsdale-San Jose	5	680	18.7	0.028	27.2
Palo Alto-San Jose	6	3,532	24.6	0.007	17.4
Totals		**16,348**	**800.2**	**0.049**	

,

(This space intentionally left blank. See next page for Table AC.)

[1] The unusually high 55.1 percent rate for Mountain View-San Francisco may reflect greater availability of parking, which attracts more riders to Mountain View than normally would be anticipated based on home and work locations.

Table A-3: Southeast High Speed Rail Study Estimate of Modal Demand

Major Market		Annual Person Trips						
		Auto	Air	Rail	Bus	Total	% Rail	% Bus
Washington, DC-VA-MD	Richmond-Petersburg, VA	21,440,500	5,500	106,000	7,100	21,559,100	0.49%	0.03%
Washington, DC-VA-MD	Newport News-Norfolk-VaBch, VA	7,884,300	27,400	52,200	500	7,964,400	0.66%	0.01%
Washington, DC-VA-MD	Raleigh-Durham, NC	562,500	141,900	27,300	1,000	732,700	3.73%	0.14%
Washington, DC-VA-MD	Greensboro NC	409,200	56,100	8,400	600	474,300	1.77%	0.13%
Washington, DC-VA-MD	Charlotte, NC	152,300	105,100	7,900	700	266,000	2.97%	0.26%
Washington, DC-VA-MD	Greenville-Spartanburg, SC	52,200	37,700	5,600	300	95,800	5.85%	0.31%
Washington, DC-VA-MD	Atlanta, GA	119,700	512,200	17,400	700	650,000	2.68%	0.11%
Washington, DC-VA-MD	Columbia, SC	32,700	48,300	6,500	100	87,600	7.42%	0.11%
Washington, DC-VA-MD	Charleston, SC	61,700	103,300	7,100	-	172,100	4.13%	-
Washington, DC-VA-MD	Savannah, GA	27,800	25,900	4,600	-	58,300	7.89%	-
Washington, DC-VA-MD	Jacksonville, FL	14,900	81,000	1,300	-	97,200	1.34%	-
Richmond-Petersburg, VA	Newport News-Norfolk-VaBch, VA	11,623,300	600	8,000	4,600	11,636,500	0.07%	0.04%
Richmond-Petersburg, VA	Raleigh-Durham, NC	488,000	8,200	2,500	400	499,100	0.50%	0.08%
Richmond-Petersburg, VA	Greensboro NC	251,500	12,400	1,100	400	265,400	0.41%	0.15%
Richmond-Petersburg, VA	Charlotte, NC	164,900	34,100	1,600	200	200,800	0.80%	0.10%
Richmond-Petersburg, VA	Greenville-Spartanburg, SC	40,400	12,100	-	-	52,500	-	-
Richmond-Petersburg, VA	Atlanta, GA	93,100	145,200	-	200	238,500	-	0.08%
Richmond-Petersburg, VA	Columbia, SC	33,600	7,800	1,100	-	42,500	2.59%	-
Richmond-Petersburg, VA	Charleston, SC	26,800	13,300	2,400	-	42,500	5.65%	-
Richmond-Petersburg, VA	Savannah, GA	15,400	-	200	-	15,600	1.28%	-
Richmond-Petersburg, VA	Jacksonville, FL	19,600	22,700	1,100	-	43,400	2.53%	-
Raleigh-Durham, NC	Greensboro NC	2,458,800	3,100	11,800	-	2,473,700	0.48%	-
Raleigh-Durham, NC	Charlotte, NC	1,424,600	35,000	14,500	700	1,474,800	0.98%	0.05%
Raleigh-Durham, NC	Greenville-Spartanburg, SC	186,100	-	-	-	186,100	-	-
Raleigh-Durham, NC	Atlanta, GA	158,300	205,500	-	100	363,900	-	0.03%
Raleigh-Durham, NC	Columbia, SC	39,800	2,900	800	-	43,500	1.84%	-
Raleigh-Durham, NC	Savannah, GA	28,800	7,500	400	-	36,700	1.09%	-
Raleigh-Durham, NC	Jacksonville, FL	5,600	21,800	600	-	28,000	2.14%	-
Greensboro NC	Charlotte, NC	5,029,300	8,000	3,400	1,700	5,042,400	0.07%	0.03%
Greensboro NC	Greenville-Spartanburg, SC	304,400	9,200	300	-	313,900	0.10%	-
Greensboro NC	Atlanta, GA	246,000	199,900	1,800	500	448,200	0.40%	0.11%
Charlotte, NC	Greenville-Spartanburg, SC	2,220,300	6,100	200	600	2,227,200	0.01%	0.03%
Charlotte, NC	Atlanta, GA	538,800	166,800	1,900	1,400	708,900	0.27%	0.20%
Charlotte, NC	Columbia, SC	3,353,100	7,500	-	1,000	3,361,600	-	0.03%
Charlotte, NC	Jacksonville, FL	45,900	40,600	-	200	86,700	-	0.23%
Greenville-Spartanburg, SC	Atlanta, GA	1,871,600	17,000	1,700	1,500	1,891,800	0.09%	0.08%
Augusta, GA-SC	Atlanta, GA	1,826,700	11,200	-	-	1,837,900	-	-
Columbia, SC	Atlanta, GA	561,400	38,700	-	-	600,100	-	-
Columbia, SC	Augusta, GA-SC	2,367,500	-	-	-	2,367,500	-	-
Columbia, SC	Savannah, GA	80,000	-	200	-	80,200	0.25%	-
Columbia, SC	Jacksonville, FL	69,300	3,000	500	100	72,900	0.69%	0.14%
Charleston, SC	Savannah, GA	152,700	400	2,000	-	155,100	1.29%	-
Charleston, SC	Jacksonville, FL	94,500	15,400	1,000	-	110,900	0.90%	-
Savannah, GA	Jacksonville, FL	396,500	100	700	500	397,800	0.18%	0.13%
Total		66,974,400	2,200,500	304,100	25,100	69,504,100		
						AVE	1.81%	0.11%
						MEDIUM	0.98%	0.10%

Source: "Southeast High Speed Rail Market & Demand Study," Final Report, August 1997. Authors: KPMG, et al.
Exhibit 2-6, "Existing Person Trips by Mode Spring 1995 Surveys and other Data."

Appendix B
COMMUTER RAIL COSTS

Appearing in this appendix are various costs for commuter rail service operating between Lincoln and Omaha. The costs, both operating and capital, appear in the following tables.

- Table B-1: Operating costs for a minimum service level
- Table B-2a: Omaha station estimate
- Table B-2b: Omaha suburban station estimate
- Table B-2c: Gretna station estimate
- Table B-2d: Lincoln at N. 48th St. station estimate
- Table B-2e: Lincoln Deport estimate
- Table B-3a: Lincoln maintenance facility estimate
- Table B-3b: Omaha Layover facility estimate
- Table B-4a: Melia siding estimate
- Table B-4b: Ralston siding estimate
- Table B-4c: Chalco siding estimate

Table B-1
Minimal Service Option

Operating Costs

Equipment: 3 train sets consisting of Colorado Railcar DMUs (DMU plus single-level trailer coach)
Frequencies: 45-50 minute at peak.
Weekdays: 8 1-way trips plus deadhead from Omaha Friday p.m.; deadhead to Omaha on Monday a.m.
Commuter train crews work split shifts, but no individual works more than 8 total hours per day
Maintenance facility in Lincoln, layover facility in Omaha
Stations: 5 stations; use existing stations at Lincoln and Omaha

Contract Operator Expenses

Transportation

Labor	Wages & Salaries	Employees	Cost
Train Operator-Regular	60,000	3	180,000
Train Operator-Relief crew	19,980	3	59,940
Train Operator-Fringes	25,800	3	77,400
Supervisor-Regular	70,000	1	70,000
Supervisor-Overtime	-	1	-
Supervisor-Fringes	30,100	1	30,100
Office Staff-Regular	35,000	1	35,000
Office Staff-Fringes	15,050	1	15,050
Total			467,490

Other	Cost
Low value tools and equipment	600
Automotive	18,000
Telecommunications	1,200
Telephone equipment rental	1,200
PC rentals	6,000
Copier	600
Office supplies	240
Payroll service	1,200
Postage and express per month	240
Coffee and water per month	1,200
Total	30,480

Assumptions	
Relief crew for vacation, special events, sick days, training, etc.	33%
Fringes	43%
Miscellaneous tools per operator	200
Auto / pickup truck expense per month	1,500
Telecommunications per month	100
Phone equipment per month	100
Personal computers	5
PC rental per month	100
Copiers	1
Copier rental per month	50
Office supplies per month	20
Payroll service per month	100
Postage and express per month	20

Coffee and water per month	100	
Annual train miles (weekday and fall special event runs)	123,041	
Maintenance of Equipment		436,796
Assumptions		
Annual vehicle miles (same as train miles)	123,041	
Maintenance cost per vehicle mile per Colorado Rail Car	3.55	
Management		
Contractor general manager-Regular		90,000
Contractor general manager-Fringes		38,700
Total		128,700
Assumptions		
Contractor general manager	90,000	
Contractor fringes	43%	
Subtotal Contractor Expenses		1,063,466
Management Fee at 10%		106,347
Total Contractor Expenses		**1,169,812**
Payments to BNSF		
Dispatching		78,657
Access		595,885
Total		**674,542**
Assumptions		
Dispatching cost per train mile	0.66	
Access and MOW charge per train mile	5.00	
Annual train miles	119,177	
Fuel		
Assumptions		**186,830**
Gallons per mile for 3-car DMU per Colorado Rail Car	1.16	
Anticipated annual train miles	123,041	
Price per gallon for diesel (less retail sales tax)	1.19	
Allowance for spillage and idling	10%	
Facilities at Lincoln (shop) and Omaha (layover)		
Contract car cleaning at Omaha		100,000
Supplies (cleaning)		10,000
Utilities		10,000
Janitorial services at Lincoln facility office		1,200
Total		**121,200**
Station Services		
Contracted Services		
Custodian services		100,000
Revenue services		100,000

Fare inspection			150,000
Telephonic info. services shared with MAT and StarTrans			10,000
Total			360,000
Other			
Materials and supplies			10,000
Utilities			20,000
Communications charges			10,000
Total			40,000
Total station services			**400,000**
Assumptions			
Number of stations	5		
Materials and supplies per station	2,000		
Utilities per station	4,000		
Communications charges estimate	2,000		
Insurance and Claims			**2,050,000**
Assumptions			
Insurance premiums	1,850,000		
Reserve fund	200,000		
General and Administrative			
Labor			
Agency General Manager-Regular	100,000	1	100,000
Agency General Manager-Fringes	35,000	1	35,000
Agency Controller-Regular	80,000	1	80,000
Agency Controller-Fringes	28,000	1	28,000
Agency Accounting Clerk-Regular	41,600	1	41,600
Agency Accounting Clerk-Fringe	14,560	1	14,560
Agency Administrative assistant-Regular	20,800	1	20,800
Agency Administrative assistant-Fringes	7,280	1	7,280
Total			327,240
Other			
Legal, accounting and consulting services			48,000
Marketing services			48,000
Telecommunications			1,200
Telephone equipment rental			1,200
PC rentals			4,800
Copier			600
Office supplies			240
Travel and meetings			3,000
Office lease			28,800
Total general and administrative			**356,040**
Assumptions			
Fringes for Agency personnel	35%		
Legal, accounting and consulting fees per month	4,000		

Advertising per month	4,000	
Telecommunications per month	100	
Phone equipment per month	100	
Personal computers	4	
PC rental per month	100	
Copiers	1	
Copier rental per month	50	
Office supplies per month	20	
Payroll service per month	50	
Postage and express per month	50	
Coffee and water per month	50	
Subscriptions per month	25	
Travel and meetings per month	250	
Office lease per month (includes janitorial services)	2,400	
Total O&M Costs		**4,958,424**

Summary of Operating Costs

	Estimate	Percent
Transportation	1,169,812	24%
Payments to BNSF	674,542	14%
Fuel	186,830	4%
Facility Maintenance	121,200	2%
Station Services	400,000	8%
Insurance	2,050,000	41%
General and Administrative	356,040	7%
Total	4,958,424	100%

O&M Cost per train mile	**40.30**

Table B-2a
Omaha Station Estimate

Bus Shelter	5 ft wide	20 ft long	***Area (ft^2)***	100	\$150 per ft^2
Paving Area	108 ft wide	250 ft long	***Area (ft^2)***	27000	
Lighting	5 each				\$2,000 each
Curb and Gutter	800 ft total length				\$16 per ft
Asphalt	6 in thick	**Density**	153 lb/ft^3		\$45 per ton
Concrete Sidwalk and Pad	200 ft^2				\$5 per ft^2
Earthwork	3000 yd^3				\$15 per yd^3
Ticket vending machine (TVM)	2 each				\$65,000 each
Land Acquisition	33750 ft^2				\$10 per ft^2

Cost estimate	**Omaha**
Bus Shelter	\$15,000
Excavation	\$45,000
Asphalt	\$47,000
Concrete Sidwalk and Pad	\$1,000
Curb and Gutter	\$13,000
Signage	\$2,000
TVM's	\$130,000
Exterior Lighting	\$10,000
Land Acquisition	\$338,000
Contingency (30%)	\$181,000
Engineering (10%)	\$45,000
Construction (10%)	\$45,000
	\$872,000

Assumptions:

Bus Shelter is a standard shelter without special roofing
Utility Services supplied by local utility companies
Asphalt is standard City of Omaha or Nebraska Department of Roads Mix
90 parking stalls, 10 ADA parking stalls
Approximately 27,000 ft^2 of asphalt pavement constructed
Land Acquisition based average unit price for ROW acquisition
Assume site soils are suitable for building and parking lot construction
6" Concrete Class 47B-3000 Surfacing
2 Ticket Vending Machines

Table B-2b
Omaha Suburban Station Estimate

Bus Shelter	5 ft wide	20 ft long	***Area (ft^2)***	100	$150 per ft^2
Paving Area	108 ft wide	250 ft long	***Area (ft^2)***	27000	
Lighting	8 each				$2,000 each
Curb and Gutter	800 ft total length				$16 per ft
Platform	15 ft wide	200 ft long	***Area (ft^2)***	3000	$100 per ft
Asphalt	6 in thick	**Density**	153 lb/ft^3		$45 per ton
Concrete Sidwalk and Pad	200 ft^2				$3 per ft^2
Earthwork	3200 yd^3				$15 per yd^3
Ticket vending machine (TVM)	2 each				$65,000 each
Land Acquisition	33750 ft^2				$5 per ft^2

Cost estimate	
Bus Shelter	$15,000
Excavation	$48,000
Asphalt	$47,000
Concrete Sidwalk and Pad	$600
Curb and Gutter	$13,000
Signage	$2,000
TVM's	$130,000
Platform	$300,000
Exterior Lighting	$16,000
Land Acquisition	$169,000
Contingency (30%)	$172,000
Engineering (15%)	$112,000
Construction (15%)	$112,000
	$1,136,600

Assumptions:
Bus Shelter is a standard shelter without special roofing
Utility Services supplied by local utility companies
Asphalt is standard City of Omaha or Nebraska Department of Roads Mix
90 parking stalls, 10 ADA parking stalls
Approximately 27,000 ft^2 of asphalt pavement constructed
Land Acquisition based average unit price for ROW acquisition
Assume site soils are suitable for building and parking lot construction
6" Concrete Class 47B-3000 Surfacing
2 Ticket Vending Machines

Table B-2c
Gretna Station Estimate

Paving Area	108 ft wide	81 ft long	***Area (ft^2)***	8748	
Lighting	4 each				\$2,000 each
Curb and Gutter	490 ft total length				\$16 per ft
Platform	15 ft wide	200 ft long	***Area (ft^2)***	3000	\$100 per ft
Asphalt	6 in thick	**Density**	153 lb/ft^3		\$45 per ton
Earthwork	1300 yd^3				\$15 per yd^3
Ticket vending machine (TVM)	1 each				\$65,000 each
Land Acquisition	10935 ft^2				\$5 per ft^2

Cost estimate	
Excavation	\$20,000
Asphalt	\$16,000
Curb and Gutter	\$8,000
Signage	\$1,000
TVM's	\$65,000
Platform	\$300,000
Exterior Lighting	\$8,000
Land Acquisition	\$55,000
Contingency (30%)	\$126,000
Engineering (15%)	\$82,000
Construction (15%)	\$82,000
	\$763,000

Assumptions:
Utility Services supplied by local utility companies
Asphalt is standard City of Omaha or Nebraska Department of Roads Mix
27 parking stalls, 3 ADA parking stalls
Approximately 9,000 ft^2 of asphalt pavement constructed
Land Acquisition based average unit price for ROW acquisition
Assume site soils are suitable for building and parking lot construction
1 Ticket Vending Machine

Table B-2d
Lincoln at N. 48th St. Station Estimate

Bus Shelter	5 ft wide	20 ft long	***Area (ft^2)***	100	\$150 per ft^2
Paving Area	108 ft wide	250 ft long	***Area (ft^2)***	27000	
Lighting	8 each				\$2,000 each
Curb and Gutter	800 ft total length				\$16 per ft
Platform	15 ft wide	200 ft long	***Area (ft^2)***	3000	\$100 per ft^2
Asphalt	6 in thick	**Density**	153 lb/ft^3		\$45 per ton
Concrete Sidwalk and Pad	200 ft^2				\$3 per ft^2
Earthwork	3200 yd^3				\$15 per yd^3
Ticket vending machine (TVM)	2 each				\$65,000 each
Land Acquisition	33750 ft^2				\$10 per ft^2

Cost estimate	
Bus Shelter	\$15,000
Excavation	\$48,000
Asphalt	\$47,000
Concrete Sidwalk and Pad	\$600
Curb and Gutter	\$13,000
Signage	\$2,000
TVM's	\$130,000
Platform	\$300,000
Exterior Lighting	\$16,000
Land Acquisition	\$338,000
Contingency (30%)	\$172,000
Engineering (15%)	\$112,000
Construction (15%)	\$112,000
	\$1,305,600

Assumptions:
Bus Shelter is a standard shelter without special roofing
Utility Services supplied by local utility companies
Asphalt is standard City of Omaha or Nebraska Department of Roads Mix
90 parking stalls, 10 ADA parking stalls
Approximately 27,000 ft^2 of asphalt pavement constructed
Land Acquisition based average unit price for ROW acquisition
Assume site soils are suitable for building and parking lot construction
6" Concrete Class 47B-3000 Surfacing
2 Ticket Vending Machines

Table B-2e

Lincoln Depot Estimate

Bus Shelter	5 ft wide	20 ft long	***Area (ft^2)***	100	\$150 per ft^2
Paving Area	108 ft wide	126 ft long	***Area (ft^2)***	13608	
Lighting	4 each				\$2,000 each
Curb and Gutter	600 ft total length				\$16 per ft
Asphalt	6 in thick	**Density**	153 lb/ft^3		\$45 per ton
Concrete Sidwalk and Pad	200 ft^2				\$5 per ft^2
Earthwork	1500 yd^3				\$15 per yd^3
Ticket vending machine (TVM)	2 each				\$65,000 each
Land Acquisition	17010 ft^2				\$10 per ft^2

Cost estimate	**Lincoln**
Bus Shelter	\$15,000
Excavation	\$23,000
Asphalt	\$24,000
Concrete Sidwalk and Pad	\$1,000
Curb and Gutter	\$10,000
Signage	\$2,000
TVM's	\$130,000
Exterior Lighting	\$8,000
Land Acquisition	\$171,000
Contingency (30%)	\$64,000
Engineering (10%)	\$28,000
Construction (10%)	\$28,000
	\$504,000

Assumptions:

Bus Shelter is a standard shelter without special roofing

Utility Services supplied by local utility companies

Asphalt is standard City of Omaha or Nebraska Department of Roads Mix

45 parking stalls, 5 ADA parking stalls

Approximately 15,000 ft^2 of asphalt pavement constructed

Land Acquisition based average unit price for ROW acquisition

TVM (Ticket vending machines)

Assume site soils are suitable for building and parking lot construction

6" Concrete Class 47B-3000 Surfacing

2 Ticket Vending Machines

Table B-3a
Lincoln Maintenance Facility Estimate

Building	250	ft wide	500 ft long		***Area (ft²)***	125000	$45 per ft²
Fenced Area	268	ft wide	550 ft long		***Area (ft²)***	147400	$20 per linear ft
Trackwork	4,400	ft total length					$140 per ft
Rail bed sub-ballast	***Avg. depth (ft)***	0.5	***Avg. width (ft)***	19.5	***Area (yd²)***	9534	$10 per yd²
Rail bed Excavation	30	ft wide per spur					
Switches	6	each					$215,000 per each
Asphalt	6	in thick	**Density**	153 lb/ft³			$45 per ton
Earthwork	52000	yd³					$10 per yd³
Land Acquisition	715275	ft²					$8 per ft²

Cost estimate	**Lincoln**
Building (complete)	$175,000
Excavation	$520,000
Asphalt	$279,000
Curb and Gutter	$10,000
Fencing	$33,000
Subballast	$96,000
Trackwork	$616,000
Switches	$1,290,000
Shop Machinery	$250,000
Generator	$7,500
Electrical (20%)	$655,300
HEP Power Hook-up	$100,000
Fueling Facility	$50,000
Washing Facility	$100,000
Property Maintenance Equipment	$40,000
Land Acquisition	$5,723,000
Contingency (30%)	$2,984,000
Engineering (10%)	$721,000
Construction (10%)	$721,000
	$14,370,800

Assumptions:
Building is pre-fabricated structure with a typical footing design
Building has a basic finished interior
Building is wide enough to accommodate three tracks
Utility Services supplied by local utility companies
Bus Shelters will be 2 MAT standard size shelters
Sidewalk will be constructed at the bus shelter locations
Asphalt is standard City of Omaha or Nebraska Department of Roads Mix
Area inside fence and outside of building is asphalt
Maintenance access to rail is asphalt
Access road is 300 feet long and 24 feet wide without curb
Automobile pavement will include curb and gutter
Fencing is chain link
Trackwork price includes rail, ties, ballast and other track materials
Switches are power operated
Assume site soils are suitable for building and track construction
Property Maintenance Equipment will be leased or subcontracted
Land Acquisition based average unit price for ROW acquisition

Table B-3b
Omaha Layover Facility Estimate

Building		24 ft wide		24 ft long	***Area (ft^2)***	576	$75 per ft^2
Fenced Area		42 ft wide		74 ft long	***Area (ft^2)***	3108	$20 per linear ft
Trackwork		700 ft total length					$140 per ft
Rail bed sub-ballast	***Avg. depth (ft)***	0.5	***Avg. width (ft)***	19.5	***Area (yd^2)***	1517	$10 per yd^2
Rail bed Excavation		30 ft wide per spur					
Switches		2 each					$215,000 per each
Asphalt		6 in thick	**Density**	153 lb/ft^3			$45 per ton
Earthwork		3000 yd^3					$10 per yd^3
Land Acquisition		1999 ft^2					$8 per ft^2

Cost estimate	**Omaha**
Building (complete)	$175,000
Excavation	$30,000
Asphalt	$53,000
Curb and Gutter	$13,000
Fencing	$5,000
Exterior Lighting	$50,000
Subballast	$16,000
Trackwork	$98,000
Switches	$430,000
HEP Power Hook-up	$100,000
Generator	$7,500
Property Maintenance Equipment	$40,000
Land Acquisition	$16,000
Contingency (30%)	$311,000
Engineering (10%)	$133,000
Construction (10%)	$133,000
	$1,610,500

Assumptions:
Building is pre-fabricated structure with a typical footing design
Building has a basic finished interior
Utility Services supplied by local utility companies
Asphalt is standard City of Omaha or Nebraska Department of Roads Mix
Approximately 92,000 ft^2 of asphalt pavement constructed
Maintenance access to rail is asphalt
Access road is 300 feet long and 24 feet wide without curb
Automobile pavement will include curb and gutter
Fencing is chain link
Trackwork price includes rail, ties, ballast and other track materials
Switches are power operated
Site soils are suitable for building and track construction
Land Acquisition based average unit price for ROW acquisition
Property Maintenance Equipment will be leased or subcontracted

Table B-4a
Melia Siding

Description	Unit	Unit Price	Quantity	Amount
136# Rail, Ties, Ballast & OTM	Track Mile	$ 740,000	1.6	$ 1,184,000
6" Subballast	SY	$ 6	47,000	$ 282,000
Earthwork/Grading	CY	$ 10	86,000	$ 860,000
Centralized Traffic Control	Track Mile	$ 100,000	1.6	$ 160,000
#24 Power Operated Switches with Signals	Each	$ 750,000	2	$ 1,500,000
Seeding	Acre	$ 1,500	10	$ 15,000
Right of Way	Acre	$ 3,000	16	$ 48,000
Wetland Mitigation	Acre	$ 15,000	1.6	$ 24,000
Subtotal				$ 4,073,000
Misc. Construction & Contingency			20%	$ 814,600
Subtotal				$ 4,887,600
Est. Engineering & Architecture Services			8%	$ 391,008
Subtotal				$ 5,278,608
TOTAL				**$ 5,278,608**

Source: HWS Consulting
Note: Prices above may vary depending on supply of material and economic conditions

Table B-4b
Ralston Siding

Description	Unit	Unit Price	Quantity	Amount
136# Rail, Ties, Ballast & OTM	Track Mile	$ 740,000	0.8	$ 592,000
6" Subballast	SY	$ 6	23,500	$ 141,000
Earthwork/Grading	CY	$ 10	43,000	$ 430,000
Centralized Traffic Control	Track Mile	$ 100,000	0.8	$ 80,000
#24 Power Operated Switches with Signals	Each	$ 750,000	2	$ 1,500,000
Seeding	Acre	$ 1,500	5	$ 7,500
Right of Way	Acre	$ 3,000	8	$ 24,000
Wetland Mitigation	Acre	$ 15,000	0.8	$ 12,000
Subtotal				$ 2,786,500
Misc. Construction & Contingency			20%	$ 557,300
Subtotal				$ 3,343,800
Est. Engineering & Architecture Services			8%	$ 267,504
Subtotal				$ 3,611,304
TOTAL				**$ 3,611,304**

Source: HWS Consulting
Note: Prices above may vary depending on supply of material and economic conditions

Table B-4c
Chalco Siding

Description	Unit	Unit Price	Quantity	Amount
136# Rail, Ties, Ballast & OTM	Track Mile	$ 740,000	0.9	$ 666,000
6" Subballast	SY	$ 6	26,400	$ 158,400
Earthwork/Grading	CY	$ 10	48,000	$ 480,000
Centralized Traffic Control	Track Mile	$ 100,000	0.9	$ 90,000
#30 Power Operated Switches with Signals	Each	$ 800,000	2	$ 1,600,000
Seeding	Acre	$ 1,500	6	$ 9,000
Right of Way	Acre	$ 3,000	10	$ 30,000
Wetland Mitigation	Acre	$ 15,000	1	$ 15,000
Subtotal				$ 3,048,400
Misc. Construction & Contingency			20%	$ 609,680
Subtotal				$ 3,658,080
Est. Engineering & Architecture Services			8%	$ 292,646
Subtotal				$ 3,950,726
TOTAL				**$ 3,950,726**

Appendix C
BUS PARK-AND-RIDE LOTS

Appearing in this appendix are construction costs for new park-and-ride facilities in Fremont and Blair to support express bus services. The costs appear in the following tables.

- Table C-1: Fremont Park-and-Ride cost estimate
- Table C-2: Blair Park-and-Ride cost estimate

Table C-1
Fremont Park-and-Ride Cost Estimate

Bus Shelter	5 ft wide	20 ft long	***Area (ft^2)***	100	\$150 per ft^2
Area	108 ft wide	135 ft long	***Area (ft^2)***	14580	
Lighting	4 each				\$2,000 each
Curb and Gutter	600 ft total length				\$16 per ft
Asphalt	6 in thick	**Density**	153 lb/ft^3		\$45 per ton
Concrete Sidewalk and Pad	200 ft^2				\$3 per ft^2
Earthwork	1600 yd^3				\$15 per yd^3
Land Acquisition	18225 ft^2				\$5 per ft^2

Cost estimate	**Fremont**
Bus Shelter	\$15,000
Excavation	\$24,000
Asphalt	\$26,000
Concrete Sidwalk and Pad	\$600
Curb and Gutter	\$10,000
Signage	\$2,000
Ticket Vending Machine (TVM)	\$65,000
Exterior Lighting	\$8,000
Land Acquisition	\$92,000
Contingency (30%)	\$46,000
Engineering (15%)	\$30,000
Construction (15%)	\$30,000
	\$348,600

Assumptions:
Bus Shelter is a standard shelter without special roofing
Utility Services supplied by local utility companies
Asphalt is standard City of Omaha or Nebraska Department of Roads Mix
50 parking stalls, 5 short term stalls, 5 ADA parking stalls
Approximately 15,000 ft^2 of asphalt pavement constructed
Land Acquisition based average unit price for ROW acquisition

Assume site soils are suitable for building and parking lot construction
6" Concrete Class 47B-3000 Surfacing

Table C-2
Blair Park-and-Ride Cost Estimate

Bus Shelter	5 ft wide	20 ft long	***Area (ft^2)***	100	\$150 per ft^2
Area	123 ft wide	135 ft long	***Area (ft^2)***	16605	
Lighting	4 each				\$2,000 each
Curb and Gutter	600 ft total length				\$16 per ft
Asphalt	6 in thick	**Density**	153 lb/ft^3		\$45 per ton
Concrete Sidewalk and Pad	200 ft^2				\$3 per ft^2
Earthwork	1900 yd^3				\$15 per yd^3
Land Acquisition	20756 ft^2				\$5 per ft^2

Cost estimate	**Blair**
Bus Shelter	\$15,000
Excavation	\$29,000
Asphalt	\$29,000
Concrete Sidwalk and Pad	\$600
Curb and Gutter	\$10,000
Signage	\$2,000
Ticket Vending Machine (TVM)	\$65,000
Exterior Lighting	\$8,000
Land Acquisition	\$104,000
Contingency (30%)	\$48,000
Engineering (15%)	\$31,000
Construction (15%)	\$31,000
	\$372,600

Assumptions:
Bus Shelter is a standard shelter without special roofing
Utility Services supplied by local utility companies
Asphalt is standard City of Omaha or Nebraska Department of Roads Mix
50 parking stalls, 5 short term stalls, 5 ADA parking stalls
Approximately 15,000 ft^2 of asphalt pavement constructed
Land Acquisition based average unit price for ROW acquisition
Assume site soils are suitable for building and parking lot construction
6" Concrete Class 47B-3000 Surfacing

Appendix D
NTRAC MEMBERS

The following are the current members of the Nebraska Transit and Rail Advisory Council.

- Duane Eitel, Olsson Associates, Lincoln, NE, representing the general public
- Georgia Janssen, Nebraska Association of Transportation Providers, Winside, NE, representing the general public
- Paul Mullen, Metropolitan Area Planning Agency, Omaha, NE, representing local government
- Roger Figard, City of Lincoln, NE, representing local government
- Allan Abbott, City of Lincoln, NE, representing local government
- Anne Boyle, representing the Nebraska Service Commission
- Dave Gilfillan, representing the Nebraska Department of Economic Development
- Steve McBeth, representing the Nebraska Department of Roads
- Gary Ruegg, Metro Area Transit
- Roberto Mungia, Burlington Northern and Santa Fe Railway
- Thomas Mulligan, Union Pacific Railroad

Duane Eitel and Allan Abbott jointly serve as NTRAC Chairs.