Submitted to

St. Louis and Lake Counties Regional Railroad Authority

Minneapolis-Duluth/Superior
Restoration of Intercity Passenger Rail Service
Comprehensive Feasibility Study and Business Plan

Submitted by

TEMS

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in association with

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Introduction

The Minneapolis-Duluth/Superior Intercity Passenger Rail Corridor Study has advanced from an initial concept study to a feasibility study to a business plan to create a 21st century intercity passenger rail corridor proposal. This proposal reflects the paradigm shift in the manner in which intercity passenger service can be provided in Minnesota, and indeed the whole of the Midwest. It recommends an enhanced partnership be developed between the cities and counties of the Minneapolis-Duluth/Superior Corridor (i.e., the cities of Minneapolis and Duluth, and St. Louis, Hennepin, Anoka, Isanti, Pine, and Douglas counties), Minnesota DOT, Wisconsin DOT, USDOT FRA, and the freight railroads in planning and providing intercity passenger rail service. The intercity passenger rail system will need to be developed with the freight railroads and will need to recognize the interest of all stakeholders. The system as proposed will use existing railroad rights-of-way to connect the major communities of the corridor. However, in doing this it must ensure that existing and future railroad needs are not harmed or restricted by the introduction of passenger rail, but rather enhanced in operations and efficiency. At the same time, the passenger rail system must meet both financial and economic goals to secure public financing for the project. To meet these goals it is essential to produce an efficient passenger rail operation that meets the market needs of the corridor. To achieve this objective the proposed system needs to take advantage of the latest rail technology both in terms of trains, track, and signaling systems.

As a result, this Business Plan proposes a transformation of rail operations in the Minneapolis-Duluth/Superior Corridor that will provide enhanced freight and passenger train operation, enhanced safety through improved signaling and cross protection, enhanced mobility for travelers in the corridor, and enhanced economic development for all the communities connected by the system. The system would afford the opportunity to:

- Introduce a modern intercity passenger rail system throughout the corridor.
- Achieve significant reductions in travel times and improve train frequency and service reliability.
- Introduce passenger rail service to areas of Minnesota that are currently not well served by public transportation.
- Introduce an alternative to auto to many towns and cities lacking travel choices.
- Introduce an intercity passenger rail system designed to generate revenue that covers operating costs when fully implemented.

- Develop an intercity passenger rail system to Minneapolis with connections to St. Paul, and the Minneapolis/St. Paul Airport being developed by Ramsey County, and the Twin Cities Metropolitan Council.
- Provide major capital investments in rail infrastructure to improve passenger and freight train efficiency, safety, capacity and reliability on shared rights-of-way.
- Provide an impetus for station-area joint development, downtown redevelopment, and economic development for growth in travel and tourism in all the communities along the route.
- Develop attractive public/private partnerships that will enhance the rail travel options in Minnesota.

Collectively, the key elements of the plan will provide Minneapolis-Duluth/Superior travelers with an efficient and effective means of traveling in the corridor. Implementation of the system will require the following actions:

- Upgrading existing rail rights-of-way to permit frequent, reliable, high-speed passenger train operations.
- Development of "sealed corridors" with fencing and safety signaling improvements to prevent highway grade crossing collisions.
- Introduction of advanced modern train equipment with improved amenities operating at speeds up to 110-mph on shared rights-of-way.
- Provision of multimodal stations and terminals that will provide access to each community.
- Introduction of a franchised passenger rail operation that will provide improvements in efficiency, reliability and on-time performance.

A fully built-out corridor system as envisioned in Exhibit 1.1 would encompass a rail network of more than 150 route miles that would cover the length the corridor connecting all of the major cities, towns and communities. It would provide modern passenger rail service at speeds comparable to those available today only in the Northeastern United States, serving the corridors major communities including Minneapolis, Coon Rapids/Blaine, Cambridge, Hinckley, Superior, and Duluth.

In addition to the basic corridors, a number of multimodal connections are proposed for the corridor. These include:

- **Minneapolis (Northstar station) to St. Paul (Union Depot station)**: This includes a rail service being developed by Ramsey County, and a central corridor LRT connection.
- **Minneapolis (Northstar station) to Minneapolis St. Paul Airport**: This connection is already implemented by the Hiawatha LRT service.
- **Minneapolis (Northstar station) to Big Lake/St. Cloud**: This service is being developed as a commuter rail connection.
- **Duluth-Two Harbors**: A summer service to Two Harbors, and its possible extension to Biwabik provided by the North Shore Scenic Railroad (Exhibit 1.2)
- **Duluth/Superior**: Integration with potential commuter rail shuttle, and local and feeder bus services, providing access to rural areas (e.g., Wentworth).

This proposed intercity rail Business Plan will require a significant level of funding, but intercity passenger rail is very cost effective to build ($2-5 million per mile) and is likely to be supported by Federal funding as well as by state, local and private sector contributions. Federal funding potential is considered to be in the 50 to 80 percent range based on recent and current bills before Congress. However, before Federal funding support can be established, affordability by the communities of the corridor is likely to be a key issue. This requirement for "affordability" by the state, county and private sector means in particular that the initial phases of the project should reflect reasonable capital investments as the system begins to develop.

Exhibit 1.1: Potential Minneapolis-Duluth/Superior Corridor and Potential Connections

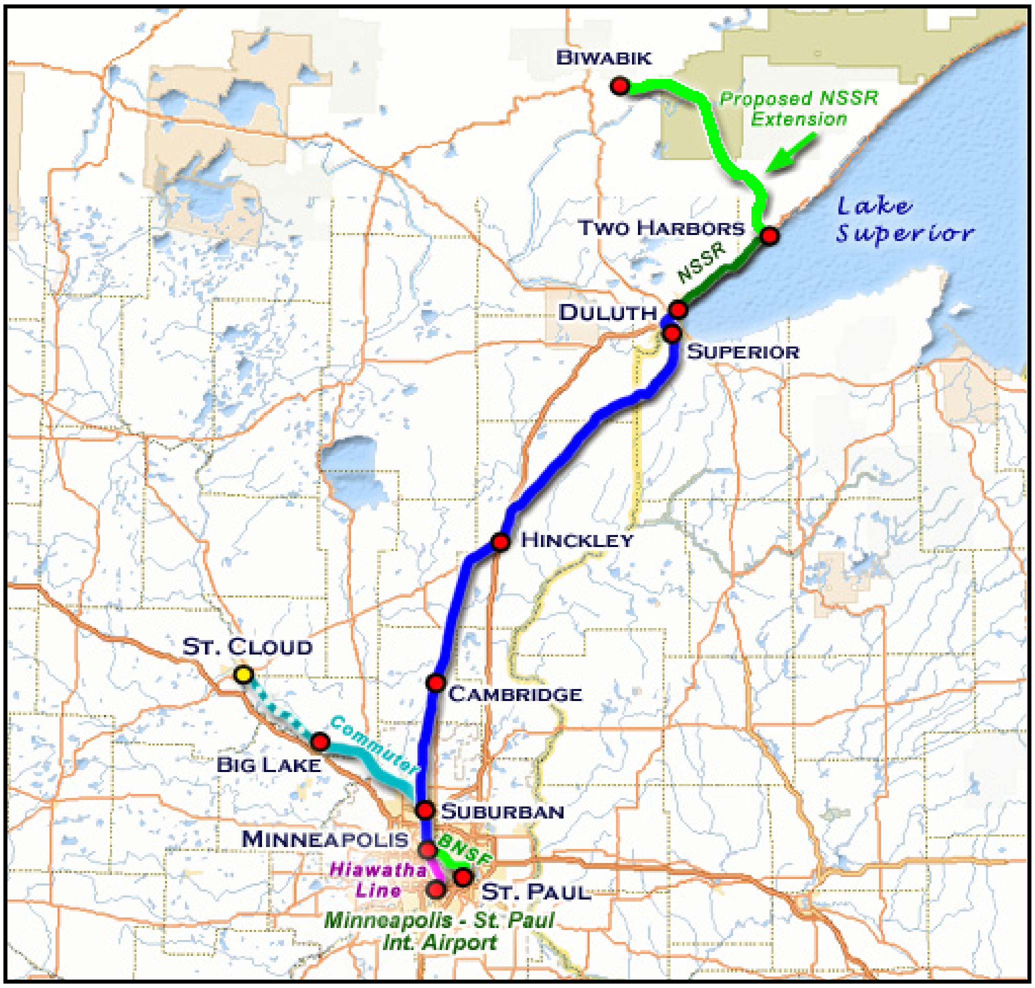


Exhibit 1.2: Zoom In of Proposed North Shore Scenic Railroad extension from Two Harbors to Biwabik

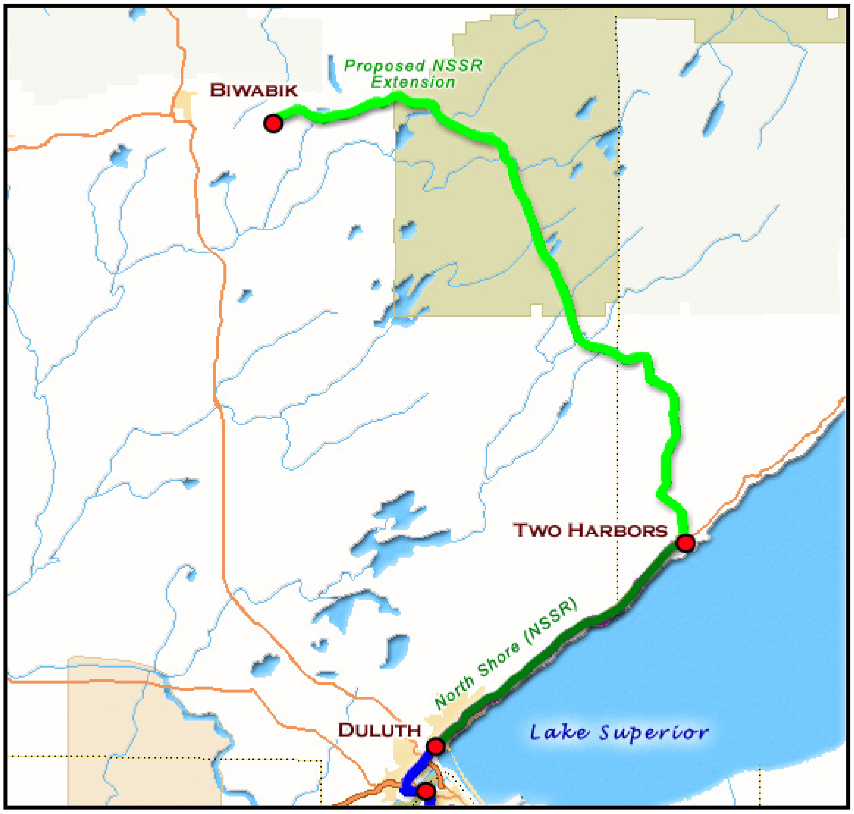
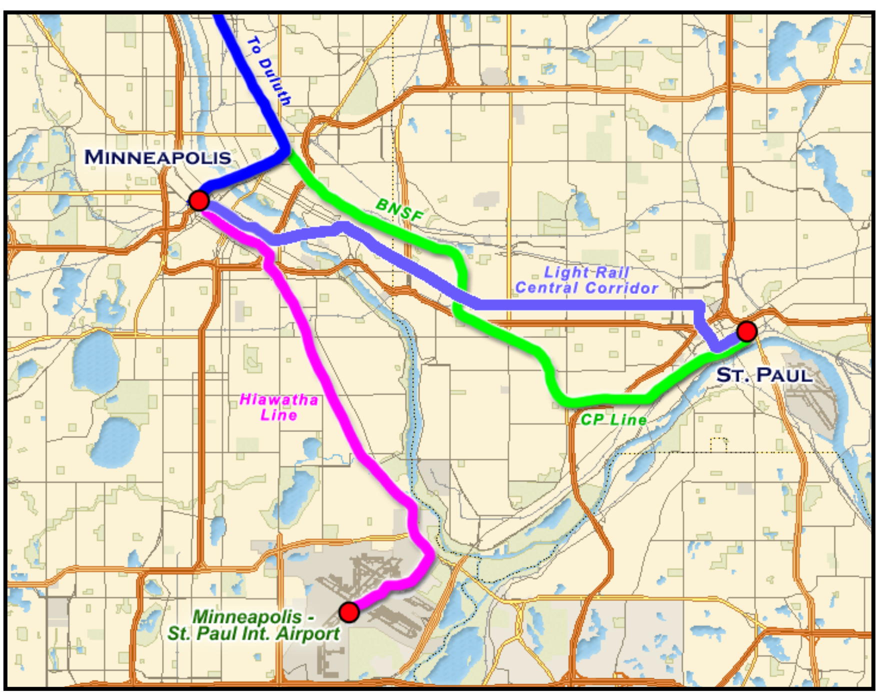


Exhibit 1.3: Zoom In of Minneapolis-St. Paul Rail and LRT Extension



1.1 Steps Required to Develop the Corridor System

To develop the corridor system, a series of guidelines were developed about the pace of implementation. These were:

- Service is to be implemented as quickly as possible.
- The most cost effective approach possible to implementation should be used.
- Broad geographic coverage is to be achieved as early as possible.
- Project should be consistent with the demand for service and affordability.

To meet "affordability" criteria, it is evident that the routes to be developed should where possible seek to use rights-of-way in the following order:

- Co-mingle freight and passenger trains on existing low volume or abandoned freight corridor track.
- Co-mingle freight and passenger trains adding increased capacity to hold the freight railroad harmless on existing moderately used freight track.
- Add dedicated track to heavily used freight rail segments.
- Develop new passenger rail alignments on new rights-of-way.

Moving down this hierarchy, the cost of intercity passenger rail typically increases from the range of $2-3 million per mile for comingled up to $8-20 million per mile for a dedicated fully grade separated system. To meet "operating effectiveness" criteria, it has been found that:

- The basic form of intercity rail with a maximum speed of 79-mph usually does not offer travel times that are competitive with auto travel, and does not generate enough ridership or revenue to be able to cover its operating cost.
- It has been found necessary in most cases for intercity rail systems to be upgraded to 110-mph to ensure time-competitiveness with auto and air.
- Upgrading intercity rail beyond 110-mph to 125-mph incurs heavy expense, since FRA regulations require full grade separation of public and private highway crossings at speeds beyond 124-mph.
- Once a full grade separation is achieved trains might as well increase speeds to the 130-150-mph that is the maximum speed that non-electric diesel trains can achieve.

Typically, 110-mph is the minimum speed that is capable of returning a positive operating ratio. 79-mph systems typically require a heavy operating subsidy, but 110-mph or better will often produce a positive operating cash flow.

As such, it is often found that the basic corridor Passenger Rail System should be implemented using 110-mph running on existing rail rights-of-way, with 79-mph being used for compatibility in areas of train congestion, close to stations, and in urban areas. A 110-mph speed will provide a positive operating ratio for an affordable level of capital investment. Systems operating at a slower speed will typically require an ongoing operating subsidy, whereas systems at 125-mph or above often encounter problems justifying and obtaining the high level of capital investment needed. A 110-mph system offers a "sweet spot" that balances an acceptable operating performance with an affordable level of capital investment.

1.2 Study Approach

To fully evaluate the potential for Minneapolis-Duluth/Superior Corridor, a business planning approach has been adopted. This approach quantifies the financial and economic tradeoffs for specific corridor passenger rail options. The final deliverable product of this study is a Business Plan that lays out a systematic, step-by-step approach for implementing a commercially successful rail passenger service in the Minneapolis-Duluth/Superior Corridor. The business plan has been developed in six stages, as shown in Exhibit 1.4 on the next page. The Plan includes:

- Market analysis
- Infrastructure needs analysis
- Operating and service plans
- Financial and economic analysis
- Year-by-year financial statements
- Phased implementation plan

The Business Plan includes pro forma financial statements for use in pursuing public and private funding to support the capital needs and operational elements of the rail service. Equally importantly, the plan addresses a phased implementation of the rail services, including several phase alternatives developed for contingency planning, to ensure smooth introduction of the new services.

Stage 1 – Market Assessment

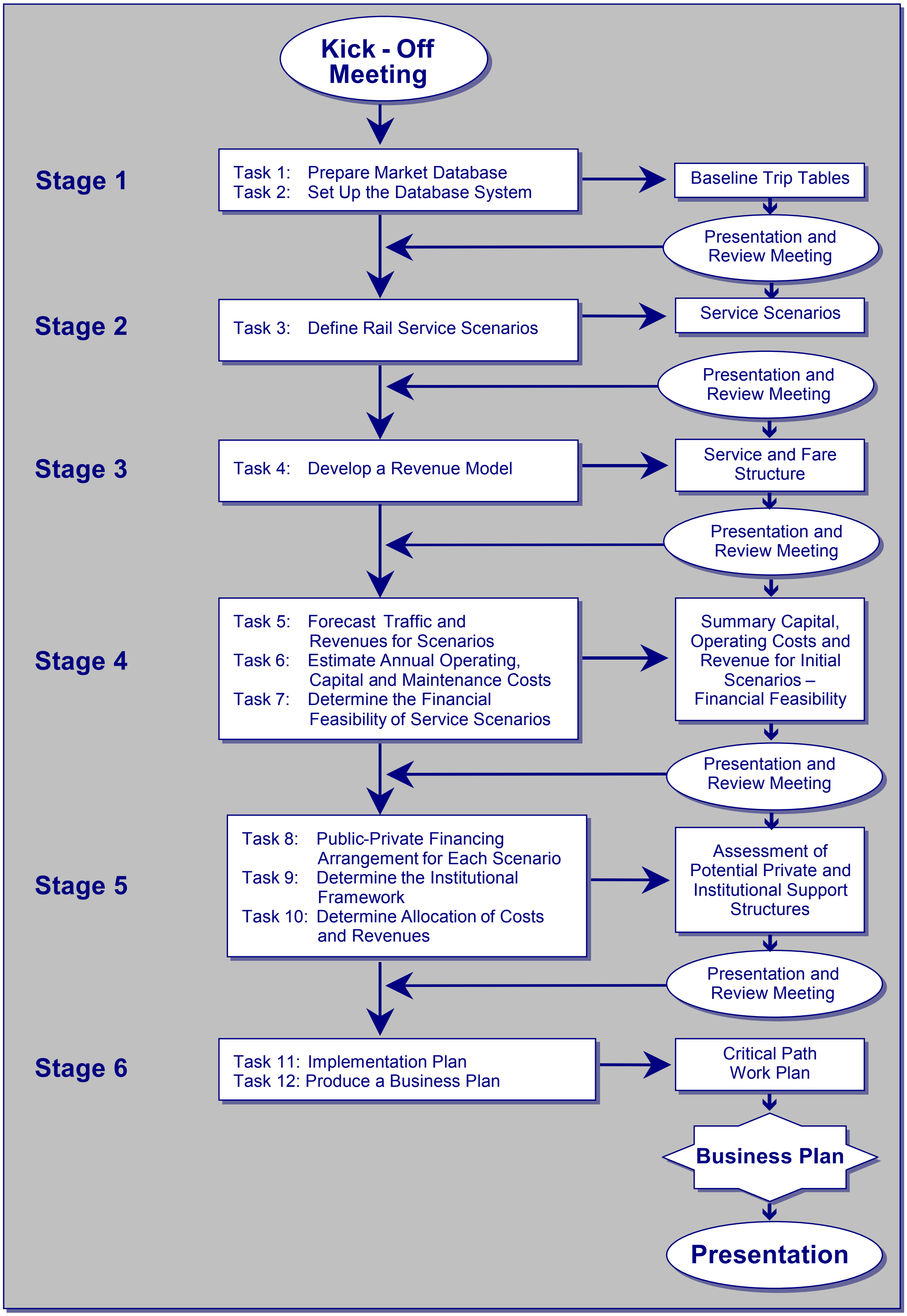
The data developed in the earlier Midwest (2003) and Duluth (2001) corridor studies has been updated to provide a current market analysis. This analysis using investment grade methodology provides the output needed for comprehensive business planning, and identifies in detail the opportunities for each type of rail for in the corridor. Model output includes the base year trip tables for incremental rail and for all competitive modes, which are given in the Appendix.

Stage 2 – Service Scenario Definition

In the second stage, the study team defined various rail service scenarios that will be developed for the rail service. Using specific data on the proposed layout of the rights-of-way and available rail technology, an interactive analysis was completed that allows both infrastructure and operating constraints to be jointly considered. The main focus of the planning effort at this stage was on determining the viability of the proposed passenger corridors, and on matching operations on each corridor to the projected level of passenger demand in each forecast year. The specific scenarios that have been developed are described in the next two sections of this chapter.

The service plans also recognize and consider existing or potential institutional, fiscal and policy constraints that are fundamental to the success of the project. A key element of this assessment has been the team's efforts to proactively anticipate freight railroads issues and concerns, in accordance with *BNSF's Passenger Principles* as laid out in the guidance memo that they provided to the study. Aside from the critical issues of full cost reimbursement, full insurance indemnification (that is further dealt with in the Operating Cost chapter), operating control and ownership, it is important to the freight railroads that passenger rail does not absorb required capacity and adds capacity at critical locations. The need for infrastructure improvements must be carefully assessed in order to develop a plan that will not compromise freight operations.

Exhibit 1.4: Steps in Development of an Incremental Rail Business Plan for the Corridor



As laid out in *BNSF's Passenger Principles*, at a minimum, freight railroads must be able to operate their trains as effectively as they could if the passenger service did not exist. This is also a policy position that was adopted by the Midwest Regional Rail System Steering committee, which includes representation from Minnesota DOT, and which included the ability to co-mingle freight with passenger trains on upgraded tracks at speeds up to 110-mph. This type of co-mingled operation was assumed for the proposed Chicago to Twin Cities MWRRS corridor and has since been adopted by Union Pacific on the St. Louis to Chicago line, and by Norfolk Southern and Amtrak on the Michigan line. In addition, BNSF itself routinely operates Amtrak's Southwest Chief at 90-mph using cab signals. This co-mingling assumption was also adopted for this study, subject to the completion of detailed capacity studies, which were beyond the scope of this preliminary feasibility-level analysis.

Beyond this, it is desirable to actually create benefits for freight railroads while developing the infrastructure necessary to support passenger services. Freight railroads must retain their ability to expand their own franchises for future traffic growth. At present the passenger proposals developed here are still unfunded and at a feasibility level. As a result, the work is not yet at a detailed enough level to satisfy the needs of the freight railroads. It is understood that in following detailed engineering and environmental studies, the details of integrating the proposed passenger operations with freight needs will be subject to close negotiations with the railroads. This will include detailed engineering and operation studies. The final capital plan will eventually need to be worked out in negotiations with the freight railroads.

Stage 3 – Revenue Assessment

A revenue yield assessment has been completed to optimize the fare systems and train frequencies for the final service plan. For each service, the market data and the service plan has been used to derive revenue and ridership estimates that reflect the supply and demand conditions that will exist. These fares and frequencies, when applied to the market, provide the key input to financial models for basic traffic and the ancillary revenues of the incremental rail services.

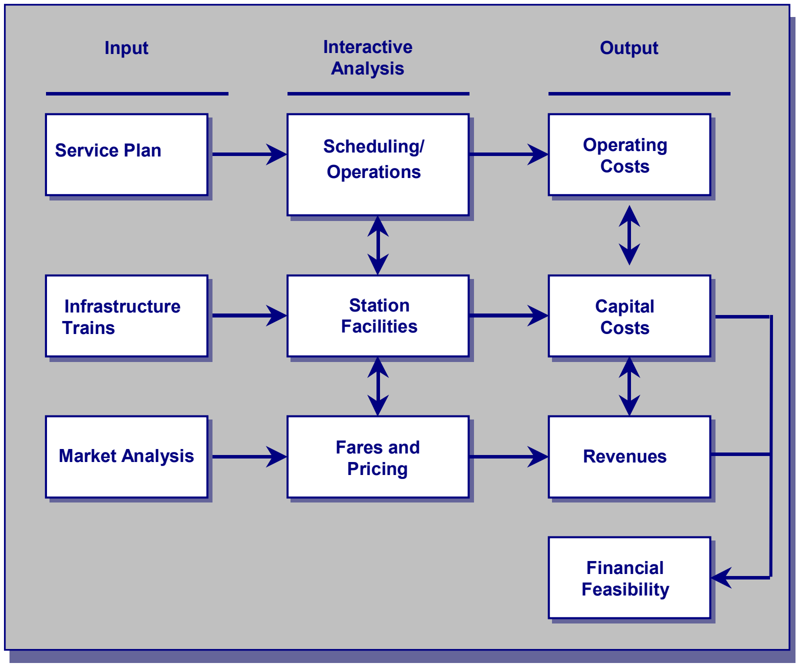
Stage 4 – Service Analysis

In the fourth stage, the market analysis, service plan and fare structures developed in Stages 1 through 3 are brought together to define the specific infrastructure, train operations and support system requirements. Exhibit 1.5 shows the iterative character of the interactive analysis process that is used in Stage 4. The analysis identifies these critical inputs/costs:

- Annual operating and maintenance cost,
- Infrastructure capital,
- Train costs,
- Crew costs,
- Basic station requirements - platforms, ticketing,
- Station support staff,
- Maintenance facilities, and
- Interface access systems for auto and transit traffic

The interactive analysis evaluates the performance of the system based on the economic criteria established for the project, mainly relative to FRA *Commercial Feasibility*[1] requirements. Specific recommendations have been developed for the incremental rail services and the revenue process has been examined to maximize the financial and economic success of the project.

Exhibit 1.5: Interactive Analysis Process



Stage 5 – Institutional and Financing Plan

In the tasks associated with Stage 5, an institutional framework for the project has been defined to include potential public-private partnerships, franchise potentials and others. Although the costing models used in this study assume typical North American business practice, possible alternative organizational structures will be discussed.

Stage 6 – Business Plan Preparation

In Stage 6, a system Implementation Plan was developed that defines the year-by-year milestones for implementing an incremental rail service. This detailed plan was produced in line with affordability criteria. This phase also included the documentation of the study work products and preparation of the final report.

1.3 Rail Route Alternatives

To address immediate needs for improved transportation options, this study places a special emphasis on developing a strategy for quickly implementing passenger rail service in the Minneapolis-Duluth/ Superior Corridor by upgrading existing rail lines.

[1] U.S. Federal Railroad Administration, *High-Speed Ground Transportation for America*, pp. 3-7 and 3-8, September 1997.

As shown in Exhibit 1.6 and 1.7, two route alternatives were considered for different parts of the corridor.

- **Hinckley Diversion**: This alternative (Exhibit 1.6) evaluated the potential for diverting the passenger rail service in Hinckley to provide direct access to the Grand Casino facility. The Grand Casino facility has 3.5 million visitors, generates nearly 7 million one-way trips per year in the I-35 corridor, plus another 1 million employee trips. This is equivalent to the level of rail trip making associated with a city with a population of between 500,000 and a million people. The Grand Casino rail station would be located in the "lobby" of the facility and would provide a very direct and easy access to its very large number of visitors.
- **Duluth/Superior Access**: Exhibit 1.7 shows the two potential routes that might be used to access Duluth and Superior. Analysis was performed to show the impact of using each route.

Exhibit 1.6: Hinckley Alternative Rail Networks

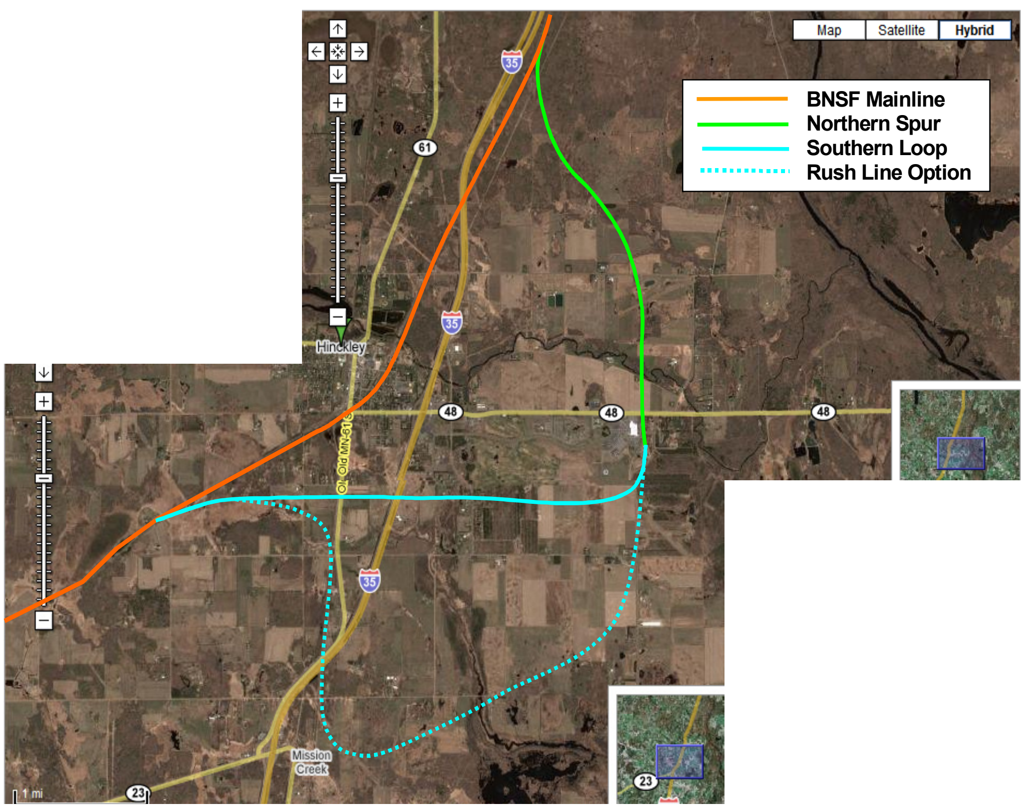
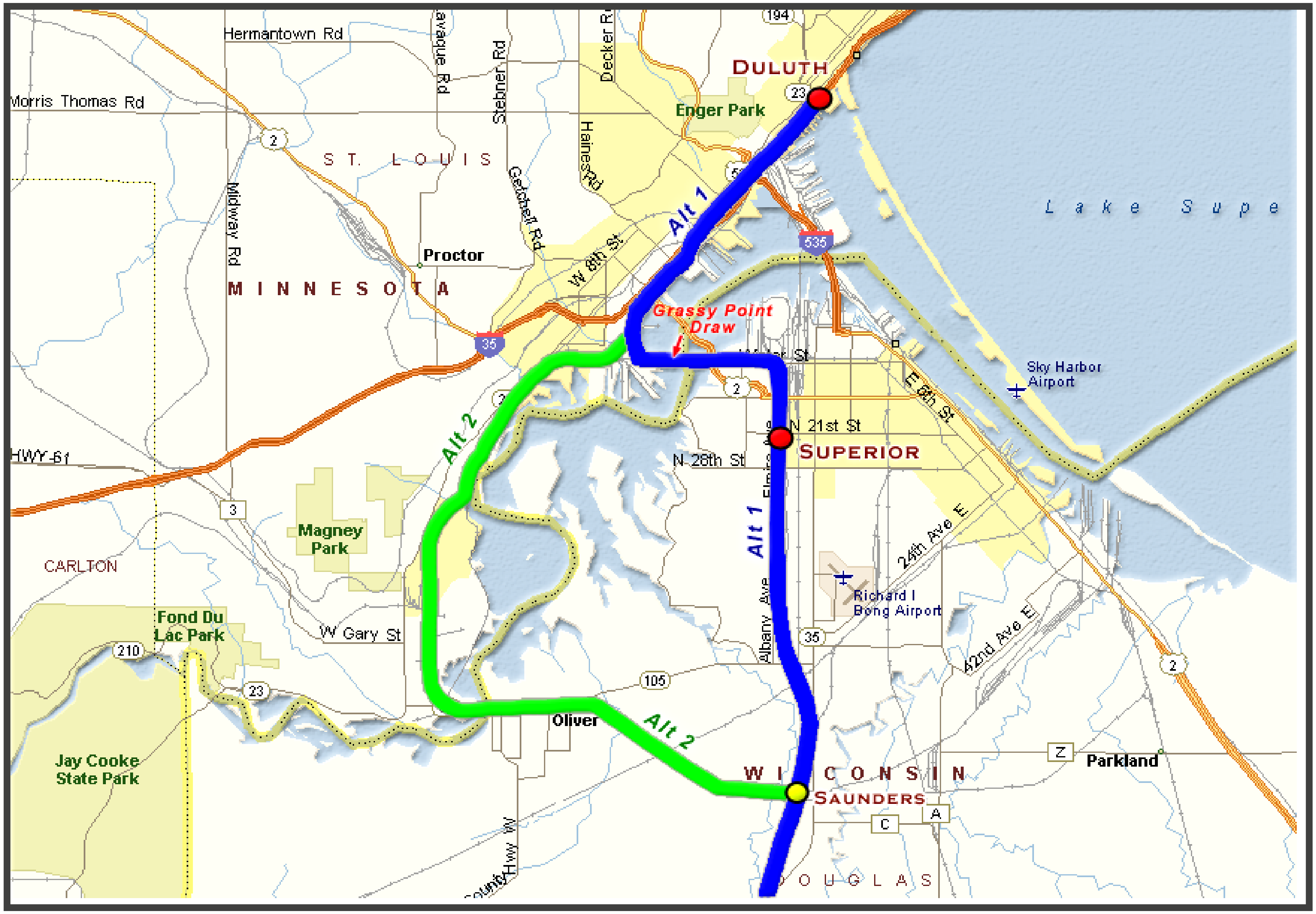


Exhibit 1.7: Duluth/Superior Alternative Rail Networks



1.4 Organization of the Report

As the planning for the passenger rail system continues, there is a continual need to update and revise the related documentation. To meet this need, this Business Plan was created to support the plan that provides the critical information associated with the concept and feasibility studies conducted to date and establishes a format for documenting project work. The Business Plan includes the sections shown in Exhibit 1.8.

Exhibit 1.8: Minneapolis-Duluth/Superior Incremental Rail Business Plan

---	**Executive Summary**	Summary of the Business Plan for reference by senior decision-makers.
Chapter 1	**Introduction**	Summary of the overall systems to be developed and approach.
Chapter 2	**The Market for Intercity Passenger Rail**	Detailed description of target markets, market segments, associated rail service options, and fare structures.
Chapter 3	**Capital Investment Needs for Intercity Passenger Rail Operations**	Summary of capital investment needs for implementing the rail service.
Chapter 4	**Operating Strategy**	Operating plan development including train technology assessment, line speed profiles, infrastructure layout and train scheduling issues.
Chapter 5	**Operating Costs**	Operations costing methodology and assumptions applied to scenario evaluations.
Chapter 6	**Financial and Economic Viability**	Financial and economic results for alternative options for incremental rail service implementation.
Chapter 7	**Implementation and Financial Plan**	A year-by-year comprehensive assessment of the costs and benefits of the proposed incremental rail system. It includes a comprehensive set of 5, 10, 15 and 20 year pro forma financial projections including annual costs, revenues, operating statements, investment needs and total financing requirements.
Chapter 8	**Corridor Impact Analysis**	An assessment of the economic impact of rail service on the corridor communities.

Chapter 9	**Institutional Framework**	A description of the institutional arrangements between members of the steering committee and the operating and contracting entities.
Chapter 10	**Conclusions and Next Steps**	Study findings, conclusions, and recommendations.
----	**Appendices**	Detailed data tabulations supporting individual chapters.

2

The Market for Intercity Passenger Rail

This chapter describes the steps taken to evaluate the passenger rail market for the Minneapolis-Duluth/Superior Corridor Study. The evaluation assesses the public response in the Minneapolis-Duluth/Superior Corridor to various levels of rail service as defined by characteristics including train frequency, travel time, train and station amenities, and fares. The analysis also evaluates the impact of the rail service on the markets for other modes and can assess the results of any competitive response by these modes. In particular, the analysis can estimate how rail demand changes in relation to other mode, times, and costs, e.g., increased gas prices and congestion on highway travelers. It can also assess a competitive response from other public modes such as, to increased service and lower fares for bus or air travelers.

2.1 Target Markets

The market for intercity travel in the Minneapolis-Duluth/Superior Corridor is currently over 21 million trips[1]. The vast majority of travel in the corridor is by auto. Over 95 percent of travelers use auto for the wide array of different trips of trips made in the corridor. This includes travel for business, commuting, social and tourist purposes.

Business Travel: This accounts for about 33 percent of travel in the corridor and while mostly oriented to auto, it provides a large volume of the air travelers in the corridor. However, air travel only accounts for just over 1.5 percent of total travelers. These are individuals who are able to afford the higher fare that airlines charge (i.e., $160-200 for an economy fare).

Other Travel: Other travel accounts for the bulk of trips in the corridor, and includes commuting, social and recreation trips. This travel category includes such trips as those to the Veterans Administration, and Mall of America, as well as to the MSP airport. Again, auto accounts for the majority of the trips although intercity bus also plays a small role. Bus accounts for less than 1 percent of the market. The reasons for this are that typically a bus trip is a slow trip (3-4 hours), and the cost are in the range of $23-54 for Jefferson Lines and Greyhound respectively. For many auto owners, the slowness of the trip and the fact that bus fares are similar to the cost of gas for auto use means that travelers find it uncompetitive.

Commuter Travel: Commuting is particularly heavy in the southern part of the corridor south of Cambridge, although there is also some travel from north of Cambridge from Isanti, Kanabec, Chisago, and even Pine County. Along I35W there is a strong orientation by commuters towards Minneapolis,

[1] Estimated from MnDOT traffic counts, bus and air passenger statistics.

while along I35E the focus is more to St. Paul. From an AADT of 20,000 on the north end of the corridor, the volume of auto travelers increases to an AADT 140,000 on I35W at Minneapolis, and to 120,000 on I35E in St. Paul. This puts these highways close to capacity, and the recent loss of the I35W Bridge only emphasizes the congestion into the Central Business District. A rail commuter service from Cambridge into Minneapolis can be expected to be especially competitive to auto due to the lack of direct I35 connectivity between these points, since Cambridge lies somewhat to the west of the main I35 corridor.

Recreation Travel: One of the most surprising characteristics of the corridor is the volume of recreational trips. In particular, the volume of trips to Hinckley is very large given that it is a small community of 1,432 inhabitants (2006 estimate). The AADT just south of Hinckley is just under 20,000 trips per day, most of who are going to or from the Hinckley Grand Casino. The Grand Casino is owned by the Mille Lacs Band of Ojibwe and has 3.5 million visitors per year.

In addition to the casino, there are also significant additional recreational trips in the Duluth/Superior area associated with summer and winter activities. In summer there is hunting, fishing, boating, golf and other recreational activities at the resorts, and second homes, on and along Lake Superior and the Northern shore. In winter there is skiing and snowmobiling in the parks and skiing facilities around the towns. Duluth itself has an Aquarium and Canal Park, which provide shopping, recreational and dining areas close to Lake Superior and downtown Duluth. All these activities depend on weekenders and vacationers from the Twin Cities and beyond, creating a substantial recreational market.

Rail Service Potential: In terms of the potential for rail service, leaving aside the large volumes of travelers to the Hinckley Grand Casino, the corridor reflects many of the socioeconomic characteristics (e.g., population, density) of the Boston-Portland corridor, and it is likely that as in that corridor there is a substantial potential for rail use. The Boston-Portland corridor is one of the fastest growing corridors on the Amtrak system, and the Minneapolis-Duluth/Superior Corridor is likely to be equally successful in terms of its basic traffic.

However, there is no equivalent to the Hinckley Grand Casino on the Boston-Portland corridor, and as a result it has no equivalent single attractor for visitors. The closest analogy to the Hinckley Grand Casino would be if the L.L. Bean Factory Outlet in Freeport, Maine (that has 3 million visitors per year) were moved to Portsmouth, New Hampshire, some eighty miles north (by rail) from Boston. Overall, the impact of the Grand Casino Hinckley is to increase trips to the area as if Hinckley had a population between 0.5 and 1 million inhabitants. As a result, the potential rail trips from Hinckley south to Minneapolis is greatly increased by casino visitors, and the forecast rail volumes are therefore much higher than what might be expected if a comparison is made with the basic Boston-Portland corridor.

North of Hinckley, the population density is very low through Pine County and the more than 1-hour trip by auto is very tedious until the twin ports of Superior and Duluth are reached. While there is important tourism, port, industrial and governmental activity in both cities, they are poorly served by public transport. There are only six flights per day to Twin Cities by air, and only two express frequencies per day by bus. As a result, a passenger rail service linking each of the cities in the corridor could meet a significant market need by offering:

- **a competitive alternative** to auto for commuting, social, tourist and business travel
- **fast** travel times (i.e., less than auto time)

- **reasonable** prices (i.e., less than air fares but more than bus fares)
- **comfortable** travel in a modern spacious vehicle, and
- **convenient** access to the Hinckley Casino as well as to Duluth and Twin Cities attractions.

Trains must appeal to the North American and in particular to the Midwestern common-sense “value for money.” They must be both comfortable and time-competitive with auto, air and bus to be effective. In addition, they need to go where the travelers want to go, and at times when travelers want to get there.

As such, rail needs to offer travel times of around 2 hours from Duluth to Minneapolis to be competitive with air, auto and bus. What rail can bring to the table is the ability to link cities and communities along the corridor in a way that air cannot, while providing a level of comfort and convenience that historically only air, among all the public modes of travel, has been able to offer in the last fifty years. At the same time, rail fares must be between $30-$100 with an emphasis on fares comparable to bus at the low end, and only 50-60 percent of air fares at the high end. For passenger rail to be most successful it must hit a “sweet spot” by offering a timetable of 2 hours or less, coupled with a full fare under $80, and discounted fares in the range of $30-$60.

2.2 Measuring the Market

To measure the size of the market and assess the relative competitiveness of modes, a travel demand model was developed using the TEMS COMPASS™ model. The creation of the travel demand model for the Minneapolis-Duluth/Superior Corridor Study required the definition of a zone system, and the collection of data sets including socioeconomic data, behavioral data, origin-destination data; and development of transportation network data for the competing intercity modes of travel (auto, air, and bus). An Investment Grade methodology was used in developing and calibrating the model.

2.2.1 The Zone System

The first step in the development of the travel demand model was establishing a zone system. The zone system provides a representation of the market area for which travel occurs between origins and destinations. In intercity rail, most zones can be represented by county-level information. However, where it is important to identify more refined trip origins and destinations, such as in urban areas the counties are split into two or more zones. The travel demand model forecasts the total number of trip origins and destinations by each zone.

Fifty-seven zones were identified for the Minneapolis-Duluth/Superior Corridor Study. Exhibit 2.1 illustrates the study area’s internal zone system. Finer zones in the Twin Cities region (see Exhibit 2.2) represent aggregations of census tract-level information. The study also includes two special airport zones (for Minneapolis-St Paul and Duluth International Airports) and one special casino zone (Grand Casino Hinckley). The airports and casino serve as special trip generators/attractors within the travel demand model, and the long-term growth forecasts the specific zonal growth rates rather than the mere general demographics used for other zones.

Exhibit 2.1: Study Area's Internal Zone System

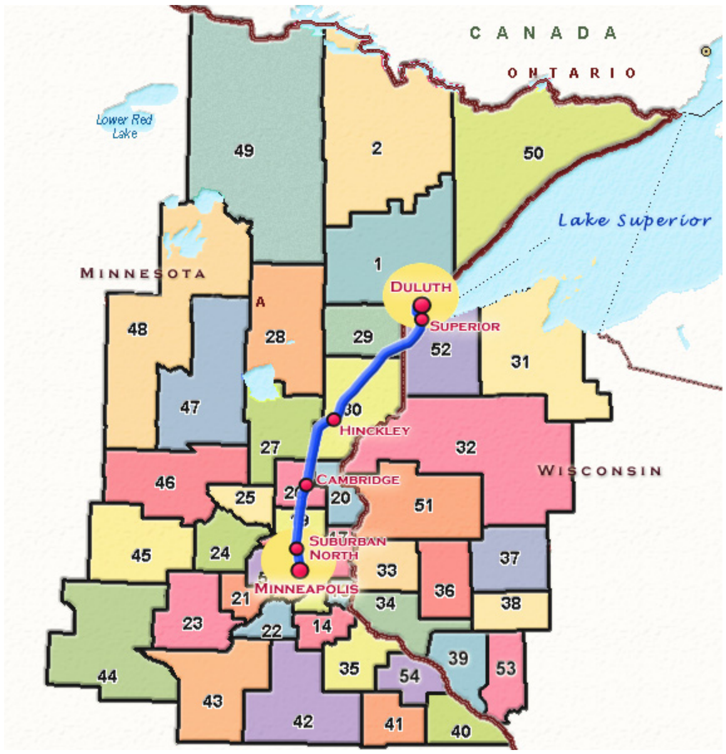
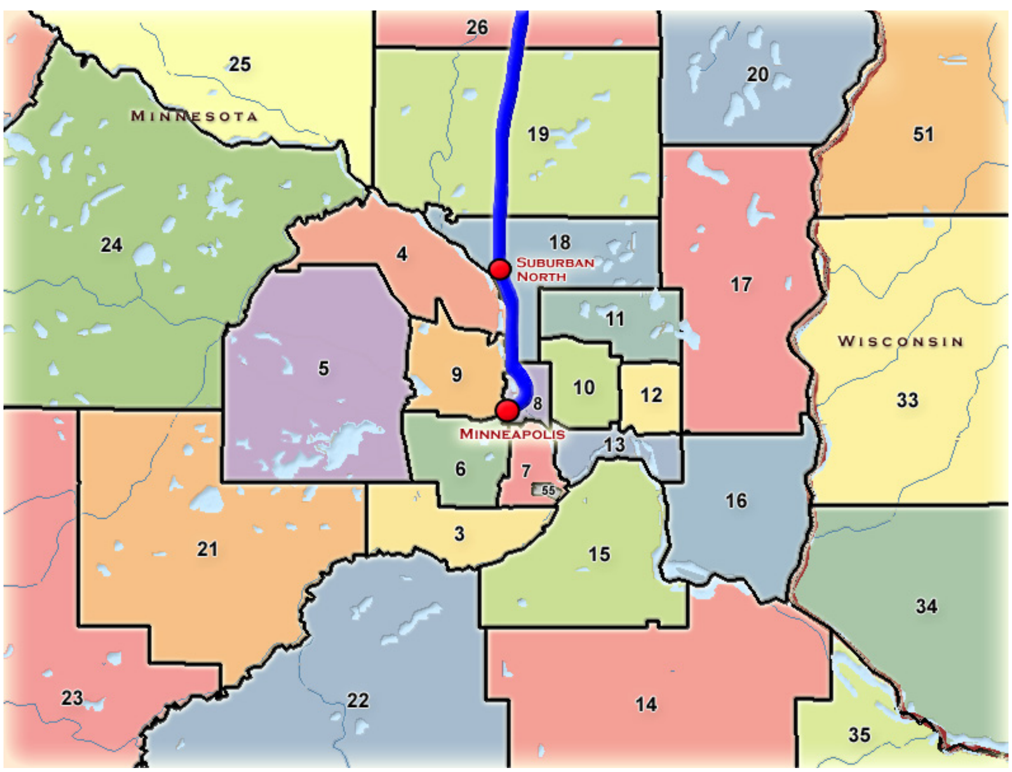


Exhibit 2.2: Study Area's Internal Zone System: Zoom-in of Minneapolis Region



2.2.2 Socioeconomic Data

In the COMPASS™ model forecasting travel demand between the model's zones required base year estimates and forecasts of three socioeconomic variables – population, employment and household income – for each of the zone in the study area. Socio-economic database was established for the base-year (2006) and the forecast years (2010-2040). The data was developed at five-year intervals using the most recent census data, as well as the latest economic forecasts. To allow for assessment of the financial and operational feasibility of the system over its full life-cycle of 30 years, socioeconomic variables were forecasted through the year 2040.

Base-year estimates were developed using county-level, census-tract level and community-level data from the U.S. Census Bureau databases (Bureau of Economic Analysis, U.S. Department of Commerce)[2] and Metropolitan Council[3]. Future year forecasts were obtained applying socio-economic projections from multiple sources. For zones in Minnesota we used population, household and employment projections developed by Minnesota Planning State Demographic Center[4], Metropolitan Council and Minnesota Department of Employment and Economic Development[5]. For zones in Wisconsin socio-economic projections were prepared using the forecasts provided by State of Wisconsin – Department of Administration[6] and Wisconsin Department of Workforce Development[7]. Income projections for zones in both states were prepared using growth rates forecasted by Woods & Poole, Inc[8]. Additional sources used in socio-economic database development mainly include U.S. Department of Labor[9], St. Louis County Planning Department[10] and Minneapolis-St. Paul International Airport[11]. Projections beyond 2030 (if not available from the official sources) are based on 1996-2030 trend lines.

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[2] See: American FactFinder database (http://factfinder.census.gov/) and USA counties database (http://censtats.census.gov/usa/usa.shtml).

[3] The Metropolitan Council is the regional planning agency serving the Twin Cities seven-county metropolitan area, see: http://www.metrocouncil.org/metroarea/stats.htm.

[4] Minnesota State Demographic Center. Office of Geographic and Demographic Analysis. Minnesota Department of Administration. See: http://www.demography.state.mn.us/projections.html

[5]The Minnesota Department of Employment and Economic Development (DEED) is the state's principal economic development agency, with programs promoting business recruitment, expansion, and retention; workforce development; international trade; and community development, see: http://www.deed.state.mn.us/lmi/tools/projections/default.aspx

[6] State of Wisconsin – Department of Administration (DOA) supports other state agencies and programs with services like centralized purchasing and financial management, see: http://www.doa.state.wi.us/

[7] Wisconsin Department of Workforce Development (DWD) is primarily responsible for providing job services, training and employment assistance to people looking for work. At the same time DWD works with employers on finding the necessary workers to fill current job openings. See: http://www.dwd.state.wi.us/dwd/aboutdwd.htm

[8] Woods & Poole, Inc. is an independent, widely respected firm that specializes in long-term economic and demographic projections. Its clients include public and private institutions from a number of different industries, e.g., the Wisconsin Department of Transportation, AOL/Time Warner, Coca-Cola, McKinsey & Co. and PricewaterhouseCoopers.

[9] Employment Projections. Bureau of Labor Statistics, U.S. Department of Labor, see: http://www.bls.gov/emp/home.htm

[10] St. Louis County Planning Department, see: http://www.co.st-louis.mn.us/slcportal/SiteMap/HomePage/Departments/Planning/tabid/79/Default.aspx

[11] New Study Measures Economic Impacts of Minneapolis-St. Paul International Airport. News Release: March 1st 2005. Minneapolis - St. Paul International Airport, see:

Exhibit 2.3 summarizes the base-year and forecast-year socioeconomic data for the Minneapolis-Duluth/Superior Corridor Study area using three regions as defined in Exhibit 2.4. This area includes all zones of the internal zone system - areas closely connected to the Minneapolis-Duluth/Superior Corridor stations. The zones are located in two states – Minnesota and Wisconsin. Zones of Twin Cities region are separated into a special group[12]. Exhibits 2.5 through 2.7 illustrate the forecasts by aggregation region for three key socioeconomic variables – population, employment and average household income- within the Minneapolis-Duluth/Superior Corridor Study area.

Exhibit 2.3: Summary of Historic, Base[13] and Projected Socioeconomic Data: Population

	Historic, Base and Forecast Years						Average Annual Growth Rate 2000 - 2040
	2000	2006	2010	2020	2030	2040	
Twin Cities Region	2,642,056	2,847,150	2,971,460	3,224,920	3,411,300	3,581,944	0.85%
Other Minnesota Regions*	1,585,932	1,693,993	1,764,060	1,932,590	2,073,130	2,250,432	0.88%
Wisconsin Region*	560,882	594,370	616,033	660,586	693,016	744,695	0.71%
Total	4,788,870	5,135,513	5,351,553	5,818,096	6,177,446	6,704,743	0.84%

Exhibit 2.3 (continued): Employment

	Historic, Base and Forecast Years						Ave. Annual Growth Rate 2000 - 2040
	2000	2006	2010	2020	2030	2040	
Twin Cities Region	1,972,269	2,044,034	2,148,037	2,531,200	2,713,120	2,982,410	1.04%
Other Minnesota Regions*	955,899	1,032,206	1,091,326	1,242,918	1,395,049	1,546,793	1.21%
Wisconsin Region*	329,371	348,128	367,984	419,689	470,812	521,936	1.16%
Total	3,257,539	3,424,368	3,607,347	4,193,807	4,578,981	5,051,138	1.10%

[12] Twin Cities region is the same as Minnesota 7 County Minneapolis-St. Paul economic development region, and contains seven counties, namely – Anoka, Carver, Dakota, Hennepin, Ramsey, Scot and Washington. Wisconsin region includes parts of Northwest, West Central, and Western Wisconsin.
[13] 2006 base year data is mostly the estimates based on the most recent data.

Exhibit 2.3 (continued): Average Household Income (2006 $)

	Historic, Base and Forecast Years						Ave. Annual Growth Rate 2000 - 2040
	2000	2006	2010	2020	2030	2040	
Twin Cities Region	$80,609	$86,728	$91,668	$103,820	$118,157	$131,745	1.24%
Other Minnesota Regions*	$63,071	$67,175	$70,679	$79,155	$88,866	$98,209	1.11%
Wisconsin Region*	$59,637	$60,065	$63,293	$70,886	$79,323	$87,702	0.97%
Average	$72,345	$77,193	$81,494	$91,888	$103,970	$115,597	1.18%

Note: Asterisk (*) mark indicates that base and forecast year socioeconomic data refers to the part of the state and is smaller than state totals.

Exhibit 2.4: Minneapolis-Duluth/Superior Corridor Regional System

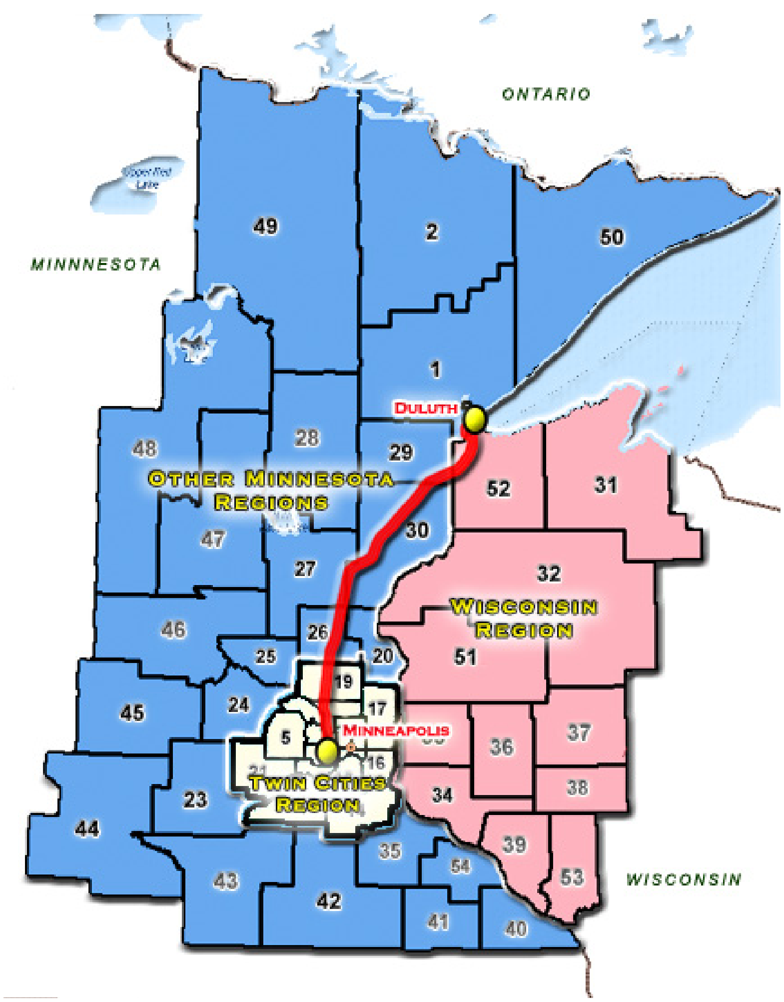


Exhibit 2.5: Population Growth Forecasts

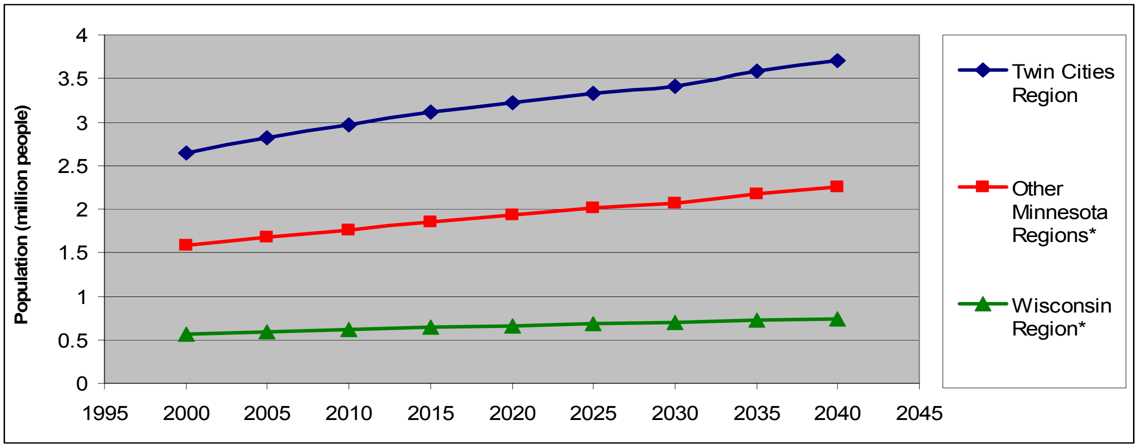


Exhibit 2.6: Employment Growth Forecasts

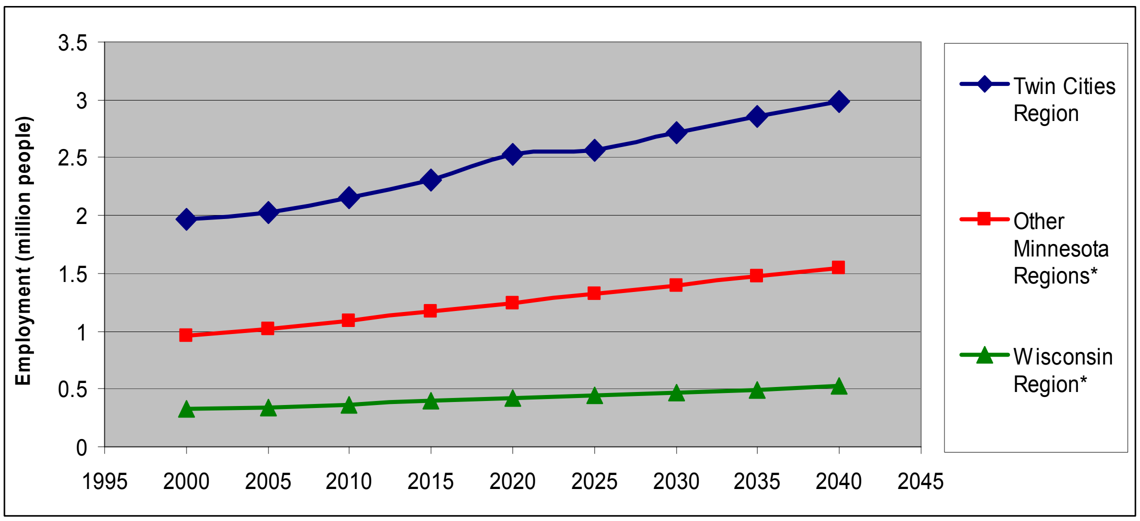
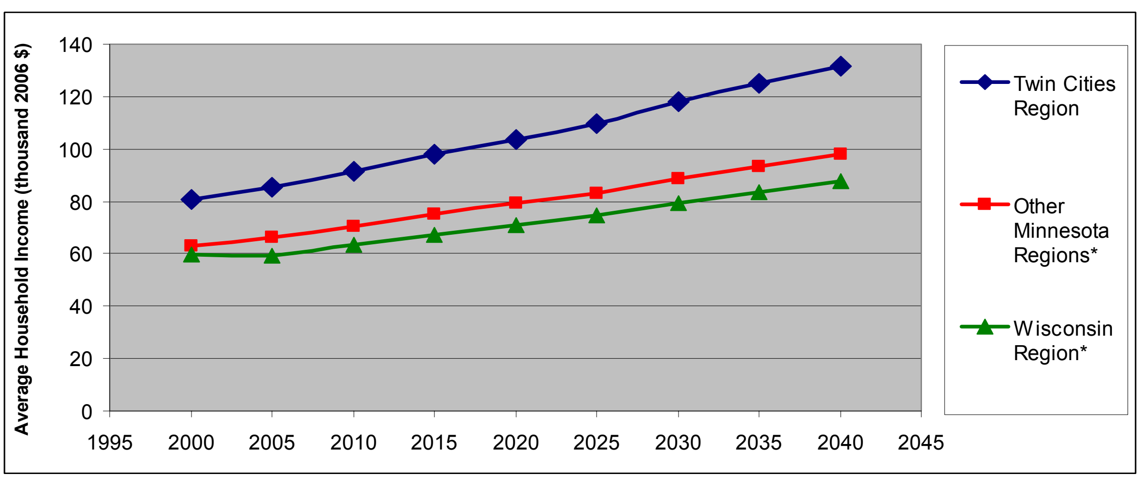


Exhibit 2.7: Average Household Income Growth Forecasts



Note: Asterisks (*) indicate the states with base- and forecast-year socioeconomic data smaller than state/province totals.

2.2.3 Behavioral Data

A vector of attributes, such as time, cost, and frequency, are typically used to describe the relative competitiveness of different travel modes in a corridor. Behavioral data, such as value of time and value of frequency, reflect the relative importance that passengers place on each factor. Behavioral data is typically elicited by stated preference survey. In 2001, 1,528 stated preference surveys were conducted in Midwest for MWRRI[14] project by TEMS. The behavioral data used in this study comes from MWRRI study, which is presented in Exhibit 2.8 and Exhibit 2.9[15]. Values of time are found to vary by purpose and mode with air values being the highest and bus values the lowest. The values of frequency tend to be 50 to 70 percent of values of time. This is in line with the results of other TEMS studies[16].

Exhibit 2.8: Value of Time

Mode /Purpose	Air($/hr)	Bus($/hr)	Car ($/hr)	Rail ($/hr)
Business	54	16	22	26
Others	27	13	16	15

Exhibit 2.9: Value of Frequency

Mode /Purpose	Air($/hr)	Bus($/hr)	Car ($/hr)	Rail ($/hr)
Business	29	13	-	14
Others	19	11	-	9

2.2.4 Origin-Destination Data

The multi-modal intercity travel analyses developed from the *COMPASS*™ model required the collection of origin-destination (O-D) data describing annual passenger trips between zone pairs. For each O-D zone pair, the annual passenger trips were broken down by transportation mode (auto, air, rail and bus) and by trip purpose (*Business* and *Other*). As shown in Exhibits 2.8 and 2.9, Business travelers value their time highly. Although business travelers are willing to pay more than other kinds of riders, their high Value of Time means that their modal choice is very sensitive to the speed of the train. Very few business travelers will be captured by a 79-mph service, which tends to depress the revenue yield. Other trip purposes such as commuter and leisure trips have been found to have similar, but lower values of time. These riders may be willing to ride a 79-mph train if the fare is competitive. In terms of the performance of the *COMPASS*™ model, it provides a three step process to forecast traffic.

- First, the model estimates over time the growth of the total market for travel for all modes.
- Second, the modes then estimate the impact of any changes in the quality of service for travel (i.e., changes in the levels of fares, travel time, and ease of access) by all modes to estimate whether or not the change in quality of service increases or decreases traffic in a corridor.
- Third, the model splits the market between each available mode and identifies market shares, trip volumes, trip lengths, and revenues by year depending on the quality of service each mode offers. The better the service a mode offers, the larger its share. Typically, auto

[14] TEMS, Midwest Regional Rail Initiative Project Notebook, June 2004.
[15] Value of frequency is not defined for car because the car user does not have constraint on its operating hours.
[16] TEMS, The Ohio & Lake Erie Regional Rail: Ohio Hub Study, July 2007

provides the majority of trips in the corridor, equally 80-90 percent of total trips while air, bus, and rail provide a small share of the market.

The detailed functionality of the COMPASS™ model is described in the Appendices.

Because the goal of the study was to evaluate intercity travel, the O-D data collected for the model reflected travel *between* zones (*i.e.*, between counties, neighboring states and major urban areas) rather than *within* zones. Local traveling characteristics (short distance trips) were not included in the analysis in order to maintain accuracy in forecasting intercity trip making.

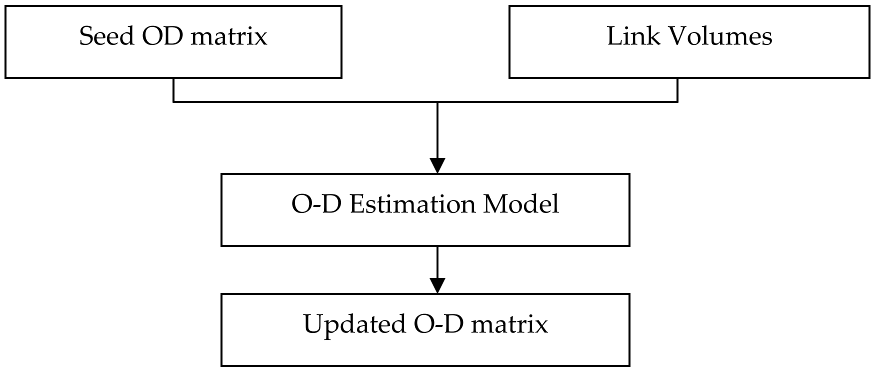
Data collected for MWRRI study were used in conjunction with new Minneapolis-Duluth/Superior Corridor data to provide the overall 2006 O-D data requirements. The latest information was collected from existing sources in the travel and transportation industries, including highway network, bus schedule and stops, airline schedule, ridership, and ticket sample data, highway speed limit and AADT (Annual Average Daily Traffic). All of these data are integrated to generate accurate demand forecasting.

Exhibit 2.10 illustrates how an O-D matrix for the existing modes (air, auto and bus) of transport in the corridor were generated in the study[17]. As shown in Exhibit 2.10, a seed O-D matrix and link volumes are fed into an O-D estimation model to produce a new O-D matrix. This can be derived from a number of sources such as a historic O-D matrix or data obtained by surveys. Alternatively, if such information is unavailable, TEMS will use a trip generation model, which relates total travel volumes in the corridor to interzonal movements using a regression relationship between socioeconomic variables, and travel characteristics (i.e., generalized cost of travel). The total travel volumes were derived from highway AADT, airline ridership and bus loading. The analysis is carried out for each mode on a purpose basis. This analysis gives the trips between zones that add up to the total travel in the corridor. Such an analysis produces reasonable results, as the critical factors that determine travel are included in the regression.

General Procedure: The objective of O-D estimation model is to produce a new trip matrix calibrated to the link volumes. The seed trip matrix is assigned to the network firstly; and then the assigned link volumes are compared to actual link volumes: In the calibration, the discrepancy between the assigned and actual link flows is minimized to develop a revised trip matrix. An iterative procedure is adopted until a best fit is obtained. Finally a new full O-D matrix is generated.

[17] The method used to generate O-D trips for rail will be described later.

Exhibit 2.10: General Procedure to Generate O-D Matrix



Special Attractor/Generators: Given the impact of Hinckley Grand Casino on regional travel, it was treated as a special trip generator and its trips were added to the basis seed O-D matrix which being based on socioeconomic factors ignores the impact of the casino. In 2005, Grand Casino Hinckley attracted 3.5 million visitors[18], which is equivalent to approximately 7 million trips. In addition, the casino has more than 1,700 employees. Adding these daily employee trips brings the total trip generation up to 8 million. These trips were updated to 2006 trip data, and then allocated to originating zones and transportation modes based on socioeconomic characteristics of zones, travel characteristics (i.e., generalized costs) of transportation modes, and visitor trip data provided to the study on a confidential basis by the Grand Casino Hinckley.

Modal Data: assumptions and methodologies used to develop the base Minneapolis-Duluth/Superior Corridor travel market data for each mode of travel as described below.

2.2.4.1 Air Mode

The"10% ticket sample" and domestic segment data were obtained from the office of Airline Information of the Bureau of Transportation Statistics (2006)[19]. Only commercial air traffic is considered in this study – private charter or corporate jet travel is not included. The ticket sample data contains the number of air passenger trips for each respective O-D airports. The domestic segment data give the number of enplanements, or passenger trips between airports.

A trip purpose split analysis was performed on each respective O-D combination by extrapolating the results of the MWRRI surveys to similar routes. Finally, the airport-to-airport ticket sample data were distributed to the respective catchment zones based on generalized cost and socioeconomic characteristics to yield the seed O-D matrix by trip purpose.

[18] http://industry.exploreminnesota.com/
[19] http://www.transtats.bts.gov/

The domestic segment data were used to represent link volumes as mentioned in Exhibit 2.10.

Finally, the seed O-D matrix and link volumes were fed into O-D Estimation Model to produce the final, zonal, O-D trip matrix by trip purpose.

Exhibit 2.11 summarizes the actual and estimated riderships for flights to Duluth, MN. As can be seen, the estimated riderships are reasonably close to the actual riderships. The estimates for flights from Detroit and Milwaukee are only 2% higher than the actual riderships, while the estimate for flights from Twin Cities is only 3% lower than the actual ridership.

Exhibit 2.11: Actual and Estimated Two-Way Riderships (2006)

Flight	Actual Ridership	Estimated Ridership
Detroit-Duluth	21,215	21,645
Twin Cities-Duluth	234,263	227,361
Milwaukee–Duluth	42,048*	43,277

*Estimated value assuming a loading factor of 60%. This service operated in the base year 2006 that was used for forecasting purposes, but no longer exists.

2.2.4.2 Auto Mode

To develop the auto data, a base year seed analysis was performed using the TEMS trip generation model. The link volumes on I-35 were defined as the 2006 AADT, which was obtained from Minnesota Department of Transportation[20]. The O-D estimation model updated the seed O-D matrix based on link volumes.

Exhibit 2.12 shows the actual and estimated AADTs along I-35, and Exhibit 2.13 shows the zoom in area of Exhibit 2.12. I-35 is the major highway connecting Minneapolis/St. Paul and Duluth/Superior. Minneapolis is connected to I-35 by I-35W and St. Paul is connected to I-35 by I-35E. The speed limit of I-35 is 70-mph and the lowest AADT is 14,800. As seen in Exhibit 2.12, the model closely reproduces the AADT[21]. On average, the estimated AADT is only 5% lower than the actual AADT.

[20] http://www.dot.state.mn.us/traffic/data/html/volumes.html

[21] We did not compare the forecasted and actual AADTs near Minneapolis/St. Paul and Duluth because the intra-zone trips in the urban area account for high percent of AADTs. As mentioned before, local trips were not included in the analysis in order to maintain accuracy in forecasting intercity trip making.

Exhibit 2.12: Minnesota Route 35 Traffic Volumes (2006$)

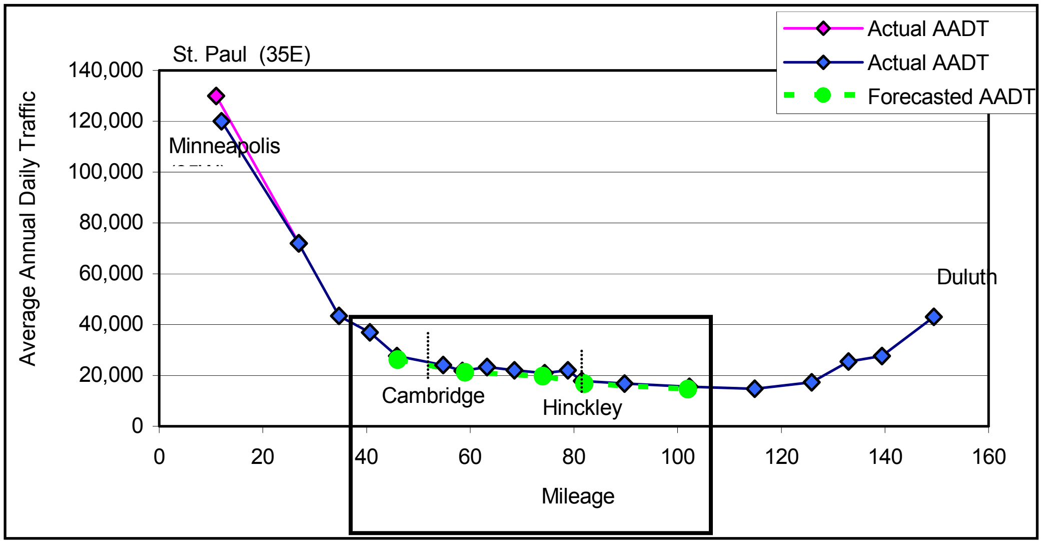
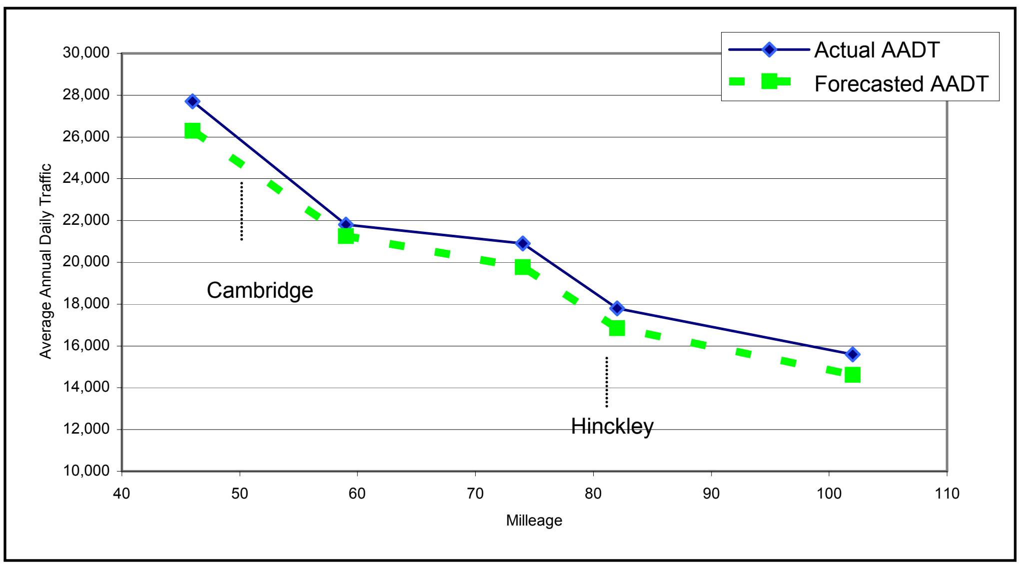


Exhibit 2.13: Zoom in of Exhibit 2.12



2.2.4.3 Bus Mode

The seed O-D trip matrix for bus mode by purpose was produced by TEMS trip generation model. The link volumes for each bus were also estimated assuming the loading factor of 60%.

The average daily load for bus links between Minneapolis and Duluth/Superior is estimated as 158 two-way passengers, which accords well to the current bus total volumes derived from published data.

2.2.4.4 Rail Mode

Amtrak has not provided passenger service between Minneapolis and Duluth/Superior since 1985[22]. Therefore, the base-line forecast for the corridor was derived, based on a trip generation rates for Amtrak service in other corridors in the Midwest that have similar socioeconomic and trip-making characteristics. The base-line rail service assumed Amtrak 79-mph service with a frequency of 2 trains per day, a three hour running time from Minneapolis to Duluth, and a 22 cents per mile fare. The base-line rail service is summarized in Exhibit 2.14.

Exhibit 2.14: Base Case Level of Rail Service

Train	Highest Speed (mile/hour)	Frequency (train/day)	Running time (minute)	Fare ($/mile)
Amtrak P42	79	2	170	0.22

The base case rail ridership 2006 is estimated as 151,000 passengers, and in 2020 222,000 passengers. This ridership was compared with the TEMS study (2000) and the actual results for Boston-Portland corridor.

The earlier TEMS study (2000) [23] estimated that the rail ridership would be 209,000 in 2000 and 262,000 in 2020, which is 47% higher than the base case estimate. This difference can be explained by two facts. Firstly, the TEMS study (2000) assumed that a Talgo T21 would be adopted for 79 mph service, which is not assumed in the current study. First the, Talgo is a "modern train" and provides both a faster service (20-30 minutes) and higher levels of user comfort than a typical Amtrak P42 train. Secondly, these two studies used different assumptions about the Casino connectivity. In TEMS study (2000), it is assumed that the casino was connected directly to the rail station, while for the base case in this study it is assumed that casino is connected to the rail station by shuttle bus. This reduced access and egress to the Casino lowers ridership. The impact of theses two factors would lower the year 2000 study forecast by as much as 30 to 40 percent (i.e., a reduction from 160,000 to 144,000 trips). As a result, the initial forecast is in line with the current estimate of base case demand.

The base case year 2006 estimated rail ridership in the Minneapolis-Duluth/Superior Corridor can also be compared to the existing Boston-Portland corridor rail traffic. The Boston-Portland corridor was selected for comparison for a number of reasons. First, while the Minneapolis-Duluth/Superior line is longer, both corridors have similar socioeconomic characteristics. Second, in both cases the corridors have lopsided population distribution heavily weighted to the major endpoint cities in each corridor, as shown in Exhibit 2.15.

[22] http://www.everything2.com/
[23] TEMS, "Study of Restoring Passenger Service to Duluth and the Iron Range", February 2000.

Exhibit 2.15: Population Distribution (million)

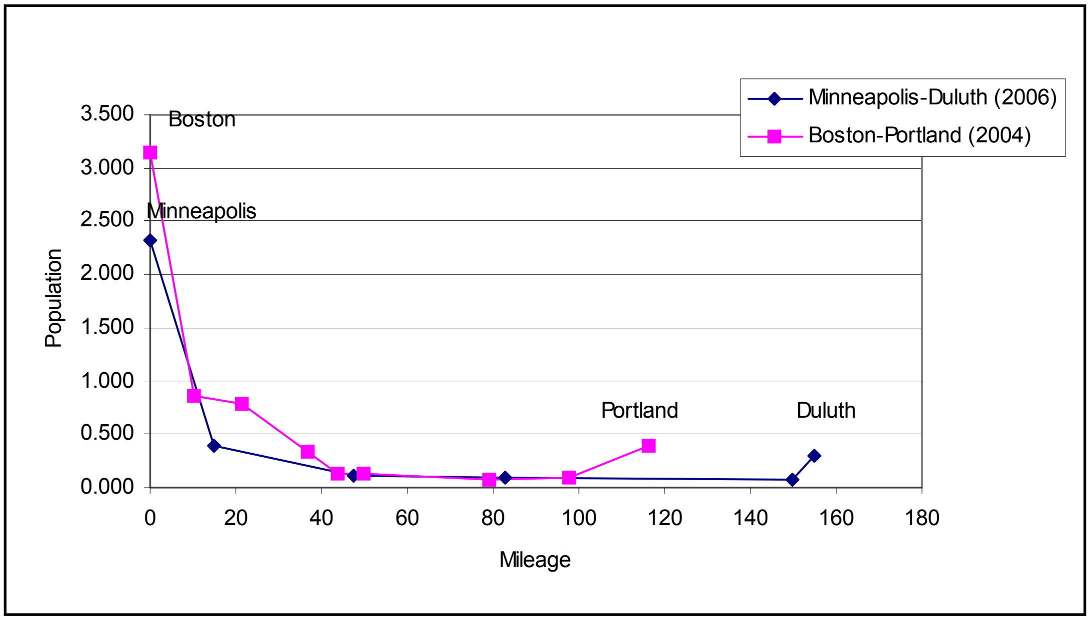
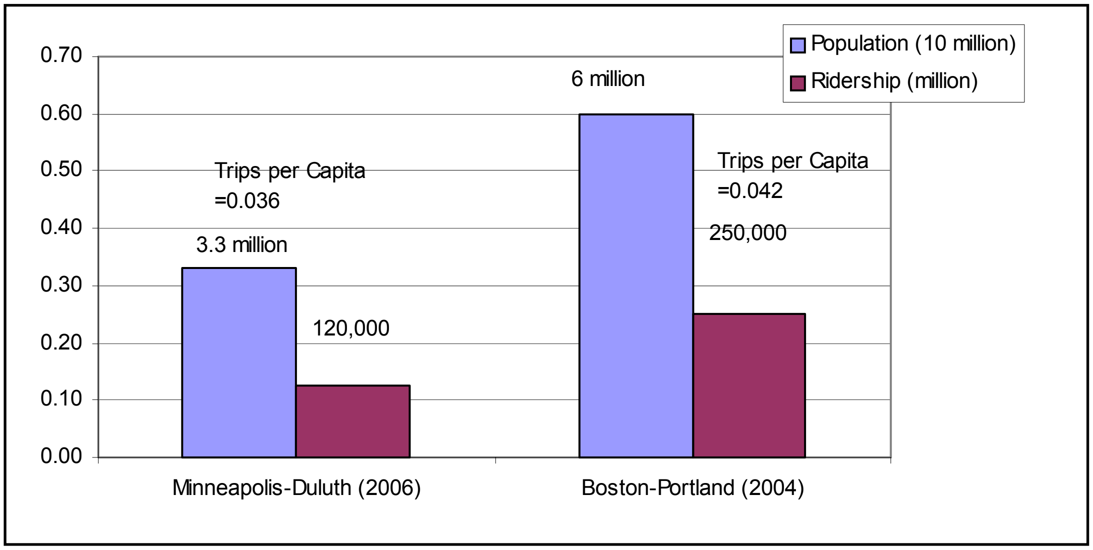


Exhibit 2.16 benchmarks the ridership and population of these two corridors[24]. As can been seen, the base year rail ridership in the Minneapolis-Duluth/Superior Corridor is estimated to be slightly lower per capita than in Boston-Portland Corridor. Trips per capita were found to be 0.042 in the Boston-Portland corridor while those estimated in the Minneapolis-Duluth/Superior Corridor were 0.036. This suggests that the Boston-Portland corridor actually generates more rail trips per capita than does the Minneapolis-Duluth/Superior Corridor. This suggests that all things being equal, the Minneapolis-Duluth/Superior Corridor generates fewer trips than the Boston-Portland corridor.

Exhibit 2.16: Corridor Ridership and Population Comparison



[24] For compassion, the ridership of Minneapolis-Duluth corridor excluded the trips generated by Grand Casino Hinckley.

Given its compatibility with both the earlier ridership estimates and those of the Boston Portland system, the base year O-D estimate for rail service is both reasonable and conservative.

2.3 The Networks

Networks for the base and forecast years were developed for four modes of travel (air, auto, bus and rail).

Each network link was developed using schedule and fare information for public modes (air, bus and rail) and costs for highway driving and auto access times. Fares and auto costs for each network link were also distinguished by trip purpose; since business trip costs are typically higher than leisure trip costs. Key attributes allocated to individual links by mode are shown in Exhibit 2.17; detailed networks for each mode are shown in the Appendices.

Exhibit 2.17: Key Components of Typical Networks

Attributes	Public Modes	Auto
Time	In-vehicle Time Access/Egress Times Number of Interchanges Connection Wait Times	Travel Time
Cost	Fare Access/Egress Costs	Operating Cost Tolls Parking (All divided by occupancy)
Reliability	On-time Performance	
Schedule	Frequency of Service Convenience of Times	

2.3.1 Air Network

Air network attributes contain a range of variables that includes time and distances between airports, fares, on-time performance measures and connection times. Travel times and frequencies are derived from the Official Airline Guide (OAG). For travel time, the study team obtained the non-stop, shortest-path distance between airports. Airline fare information was provided by the official Internet websites of major airlines serving airports in the study area. This was cross-referenced with the Federal Aviation Administration's (FAA) revenue yields and average fares information obtained from the *Domestic Airlines Fares Consumer Report (Fourth Quarter 2005)* database. On-time performance measures were obtained from the FAA Delay and On-Time Statistics databases accessed from their website.

Two air carriers currently provide the most service at the Duluth International Airport: Northwest Airlines and Midwest Airlines. Northwest Airlines goes to Twin Cities, MN and Detroit, MI. Midwest Airlines provides services to Milwaukee, WI. The flight information is summarized in Exhibit 2.18.

Exhibit 2.18: Air Service Characteristics for the Selected City-Pairs (2006$)[25]

Flight	Price (one-way)	Frequency (one-way daily)	Duration
Detroit-Duluth	$246-555	1	1 hr 55 min
Twin Cities-Duluth	$161-199	6	42-50 min
Milwaukee, WI –Duluth	$122-274	3	1 hr 20 min

2.3.2 Bus Network

Bus network attribute data, such as fares, were obtained from official Internet websites (*e.g.*, Greyhound), while routes and schedules were obtained directly from Russell's *Official National Motor Coach Guide (2000)*. Fares were cross-referenced with fares obtained directly from Greyhound on selected routes within the study area.

Greyhound Lines Inc. and Jefferson Lines provide intercity bus services from Twin Cities to Duluth. Greyhound offers one express bus service daily, while Jefferson Lines offers one bus service daily, which stops at twelve intermediate stops. Additional buses might be put into use to accommodate passengers beyond the seating capacity of a single bus. The entire trip time for Greyhound bus is 2 hours 20 minutes, while the entire trip time for Jefferson Lines is 4 hours and 15 minutes. The fare for Greyhound bus is $54.5, while the fare for Jefferson Lines is $23.

2.3.3 Auto Network

The auto network was developed to reflect the major highway segments within the study area. The Internal Revenue Service (IRS) Standard Mileage Rate was used to develop the auto network cost data. The values provided by the IRS consist of an average cost of 48.5 cents per mile for *Business* travel and 11 cents per mile for *Other* travelers. The *Business* figure reflects the IRS estimate of the full cost of operating a vehicle because a business is required to pay the full cost for the use of an auto. *Other* costs are set at a marginal cost, which reflects how most social travelers perceive what their car costs to operate.

In the future year, it is assumed that the auto travel time increases 0.5% per year to model the increasing congestion on highway.

2.3.4 Rail Network

Six rail strategies were developed to forecast the ridership and revenue, which is summarized in Exhibit 2.19. The strategies were designed to consider different combinations of speeds (79, 110 and 125-mph) and frequencies (2, 4 and 8 train per day). The full fare is assumed to be $0.22 per mile for low speed rail (79-mph) and $0.35 per mile for the high speed rail (110-mph and 125-mph). Business travel is increased by 10 percent to reflect late booking, while other forms of travel are discounted by 10 percent.

[25] Based on inquires on June 1, 2007

Exhibit 2.19: Summary of Rail Service

	79/2 (base)	79/4	110/4	110/8	125/4	125/8
Train	P42	P42	T21	T21	T21	T21
Speed (mph)	79	79	110	110	125	125
Frequency (train/day)	2	4	4	8	4	8
Full Fare ($/mile)	0.22	0.22	0.35	0.35	0.35	0.35
Running Time (minutes)	170	170	120	120	110	110

2.4 Ridership and Revenue Forecasts

The Minneapolis-Duluth/Superior Corridor Study evaluates the impact of the rail service, including train frequency, train speed (or travel time), on rail demand and revenue. In addition, the model also considers the rail demand responses to gas price increase and highway congestion.

Passengers associated with the Midwest Regional Rail Initiative are considered in this study, and it is assumed that passengers from Midwest region have to transfer from St Paul to Minneapolis. However, the level of the MWRRI connectivity is estimated independently so that the viability of the service without MWRRI connectivity can be estimated.

Two sets of forecasts have been developed for Grand Casino Hinckley. The first case is based on a shuttle bus connection from a rail station in downtown Hinckley to the casino. The second case is direct connection to casino. In this case, the casino would be connected to the rail station directly. The second case was only developed for high-speed rail (110-mph and 125-mph), as a direct connection will directly increase the frequency of service and the level of rail service that can be offered.

Exhibit 2.20 shows the ridership forecasts for the six rail scenarios defined in Exhibit 2.19 and for two cases of the casino-rail connection. The total demand consists of corridor demand, casino demand and MWRRI demand. In the case of shuttle bus connection to casino, corridor demand accounts for 70% of the total demand, casino demand accounts for 19% of the total demand, and MWRRI demand accounts for 11% of the total demand. For a direct connection to the casino, corridor demand accounts for 46% of the total demand, casino demand accounts for 47% of the total demand, and MWRRI demand accounts for 7% of the total demand.

Exhibit 2.21 shows the ridership in the case of a shuttle bus connection to casino. It can be seen that demand is very sensitive to speed and frequency. Based on this study, the elasticity of speed is 0.94 and the elasticity of frequency is 0.65. In other words, the demand will increase 94% when speed doubles, and the demand will increase 65% when frequency doubles.

Exhibit 2.22 shows the ridership in the case of a direct connection to casino. Comparing Exhibit 2.22 with Exhibit 2.21, it can be seen that casino passengers are very sensitive to access alternatives, i.e. how easily rail passengers can get from the train into the Casino and related resort facilities, e.g. the amphitheatre. Casino demand in the case of a direct connection to the casino will be three to four times higher than for a shuttle bus connection to casino. Based on this study, a direct connection to casino would induce approximately 200,000 new rail trips (100,000 new visitors), besides diverting existing trips from the automobile.

Exhibit 2.20: 2010 Minneapolis-Duluth/Superior Corridor Ridership (Thousands)

	79/2	79/4	110/4	110/8	125/4	125/8
Corridor	166	262	427	651	454	691
Casino A[1]	34	57	96	151	100	156
Casino B[2]	NA	NA	483	625	492	638
MWRRI	29	41	72	87	75	90
Total A[1]	**229**	**360**	**595**	**889**	**628**	**937**
Total B[2]	**NA**	**NA**	**982**	**1,363**	**1,021**	**1,419**

1: Connect Casino and Rail Station with Shuttle Bus
2: Connect Casino and Rail Station Directly

Exhibit 2.21: 2010 Minneapolis-Duluth/Superior Corridor Ridership (Shuttle Bus Connection to Casino)

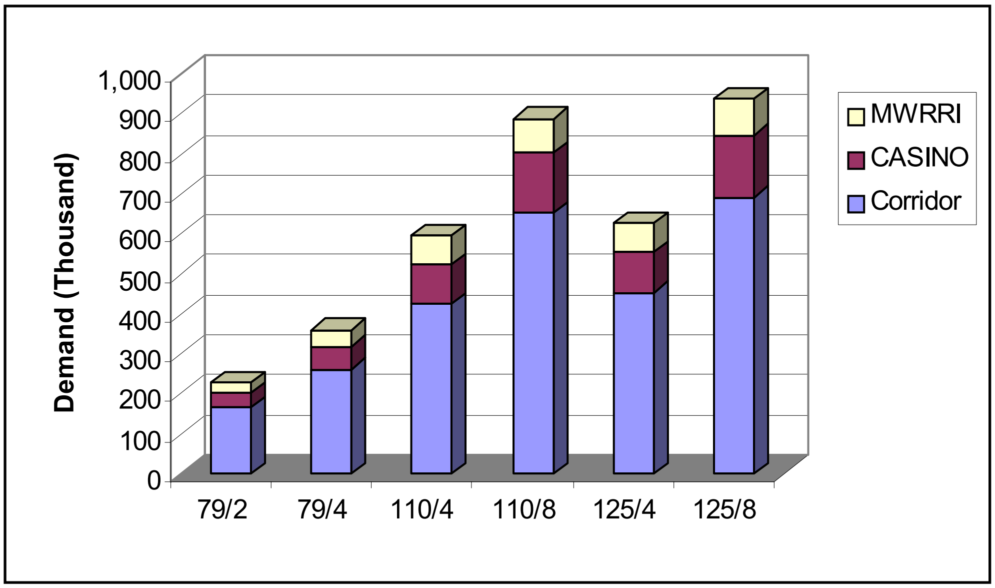
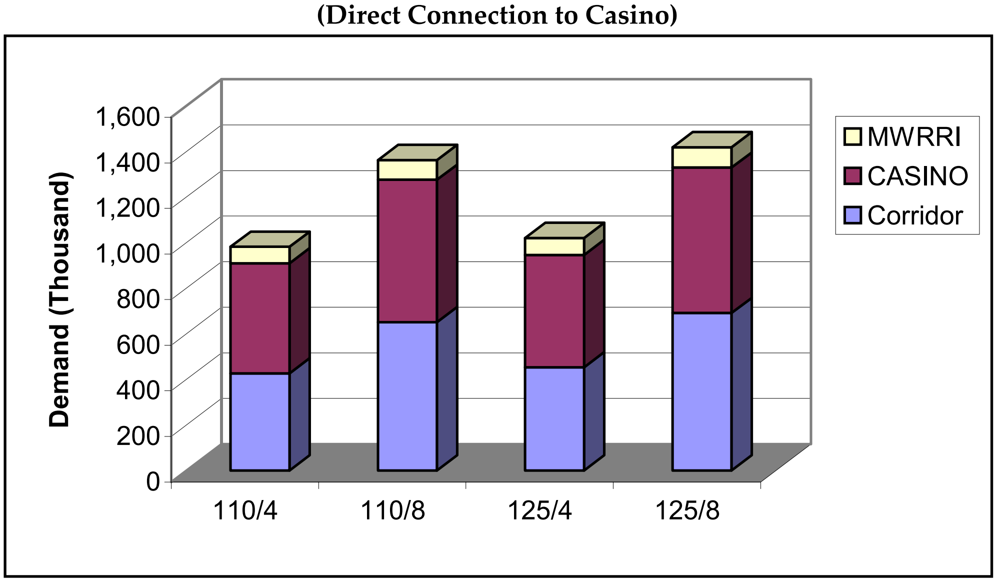


Exhibit 2.22: 2010 Minneapolis-Duluth/Superior Corridor Ridership (Direct Connection to Casino)

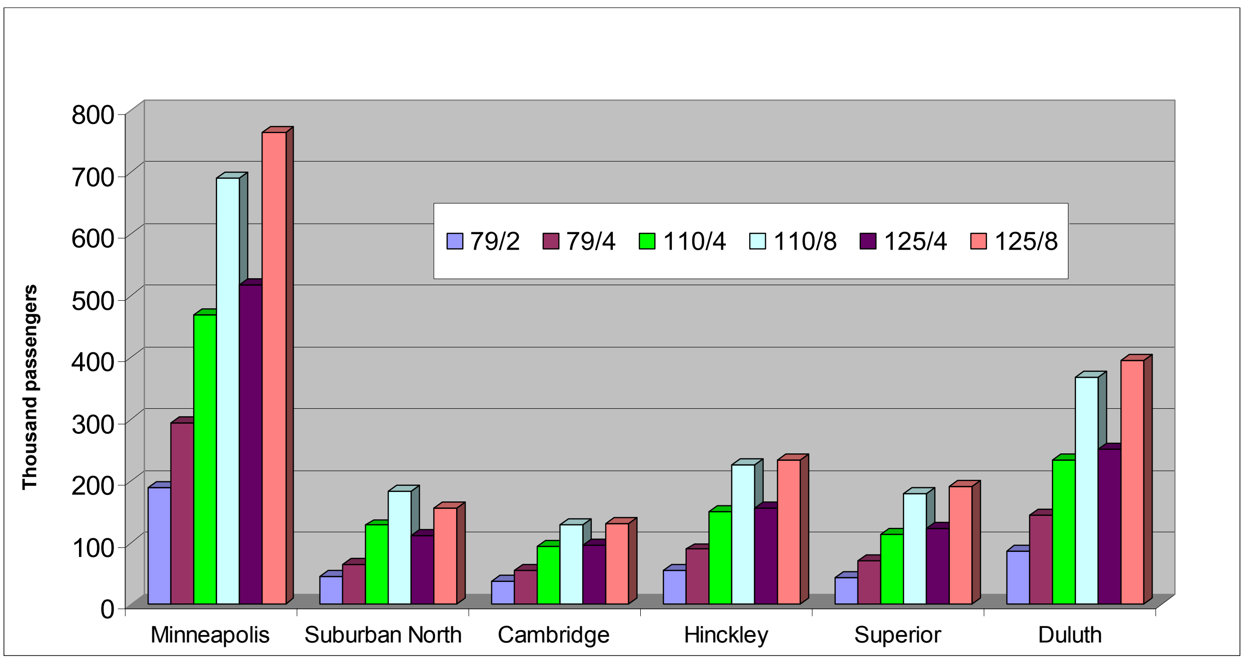


2.4.1 Station Volumes

Exhibit 2.23 shows the forecasted station volumes in 2010 in the case of *shuttle bus* connection to casino. As expected, the ridership forecasts show significant numbers of trip origins and destinations at Minneapolis and Duluth terminal stations.[26] The station volumes at both stations account for approximately 60% of the total volumes. This traffic pattern is understandable since Minneapolis is the largest city in Minnesota and adjoins Saint Paul, the state capitol; and Duluth is a popular center for tourism. Minneapolis attracts lots of business trips and Duluth area attracts lots of tourism trips. The station volume at Hinckley station accounts for 12% of the total volumes, 60% of which are attracted/generated by Grand Casino.

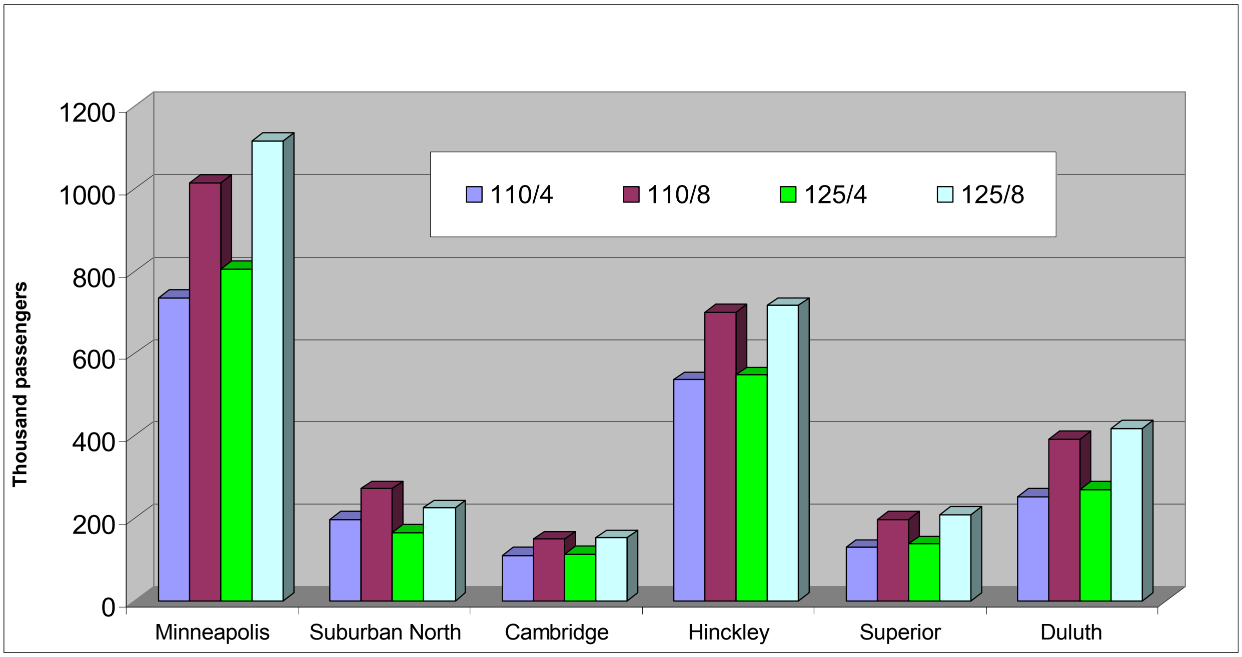
Exhibit 2.24 shows the forecasted station volumes in 2010 in the case of a *direct connection* to the casino. As can be seen, station volume at Hinckley station would be lower than only that of the Minneapolis station. The station volume at Hinckley station accounts for 26% of the total volumes, 90% of which would be attracted/generated by Grand Casino.

Exhibit 2.23: 2010 Forecasted Annual Station Volumes
(Shuttle Bus Connection to Casino)



[26] The station volume consists of the annual number of passengers boarding and alighting at each station. If passengers enter the system at a bus feeder station, they are not considered to be boarding and alighting at the rail station, but rather at the bus feeder station.

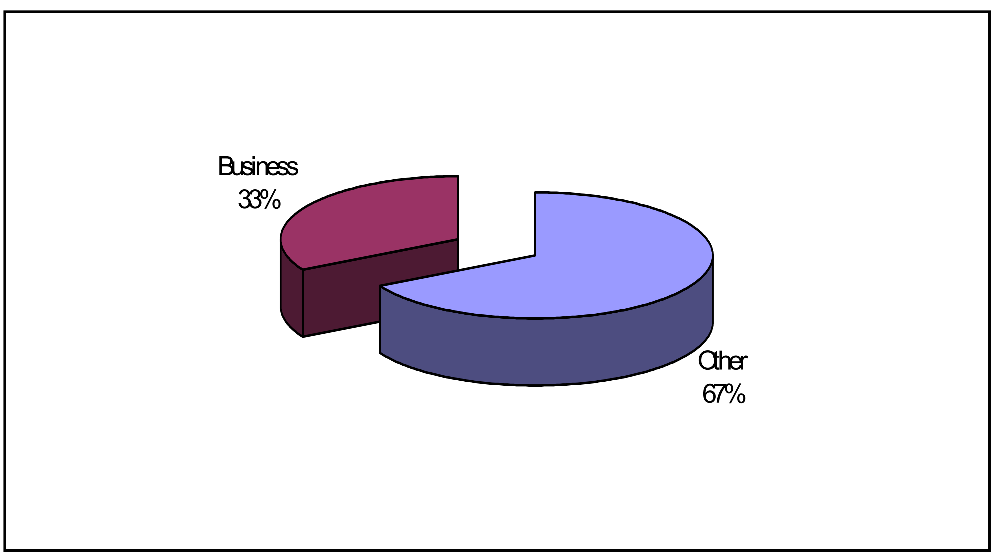
Exhibit 2.24: 2010 Forecasted Annual Station Volumes
(Direct Connection to Casino)



2.4.2 Trip Purpose Breakdown

Ridership forecasts were broken down by two trip purposes: *Business*, which accounts for employer-reimbursed travel and *Other*, which includes resident leisure and social travelers and tourists. As expected, the dominant trip purpose was found to be *Other*, which accounts for approximately 67 percent of the total rail trips, which is shown in Exhibit 2.25.

Exhibit 2.25: 2010 Trip Purpose Breakdown



2.4.3 Trip Distribution by Trip Characteristics

The demand forecasting model estimates total rail ridership by forecasting natural growth, induced demand and diverted trips. *Natural growth* reflects changes in socioeconomic factors that contribute to changes in total travel demand in the corridor. *Socioeconomic factors* include population, employment and income used in this Study. *Induced demand* reflects the travel demand changes due to a modification in a transportation mode, which accommodates new trip-making characteristics that would not exist under present conditions. Induced demand is based on the improvements in accessibility offered by the rail mode within the total transportation system. *Diverted trips* illustrate the mode-to-mode shifts that result when an improved alternative is added to the network and influences travelers' choice of travel mode. For example, a new intercity rail option will divert trips from auto and air.

Exhibit 2.26 shows the components of rail demand in 2010 in the case of shuttle bus connection to casino. As can be seen, natural growth and induced demand account for 10% to 20% of forecasted traffic, while diverted trips account for more than 80% of forecasted traffic. In consequence, the implementation of high-speed rail would relieve the congestion of other modes by diverting passengers from another mode to rail.

Exhibit 2.27 shows the components of rail demand in 2010 in the case of direct connection to casino. As can be seen, natural growth and induced demand account for 20% to 30% of forecasted traffic, which is much higher than what is shown in Exhibit 2.24. This is because passengers are very sensitive to access alternatives, and many more trips will be induced to rail by the direction connection to casino.

Exhibit 2.28 shows the trip diversion to rail by mode for forecast year 2010. As can be seen, more than 80 percent of diverted trips come from the auto mode. As shown in Exhibit 2.25 and Exhibit 2.26, 70% to 80% of forecasted traffic is diverted trips. As a result, with a direct casino access, approximately 70% of the future rail trips would come from the auto mode.

Exhibit 2.26: 2010 Components of Demand Forecasts
(Shuttle Bus Connection to Casino)

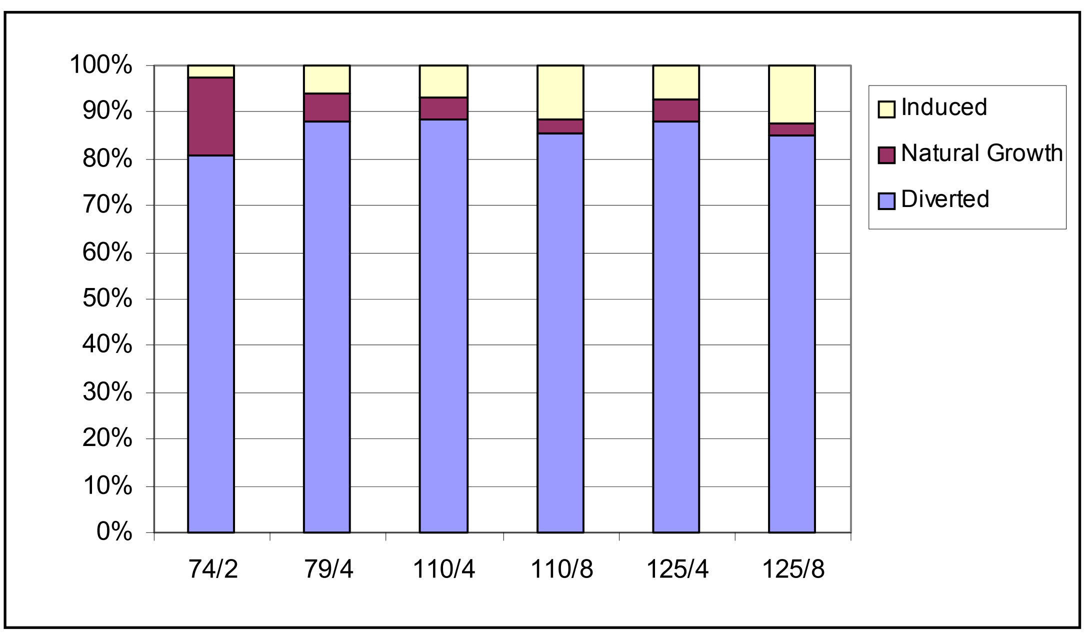


Exhibit 2.27: 2010 Components of Demand Forecasts (Direct Connection to Casino)

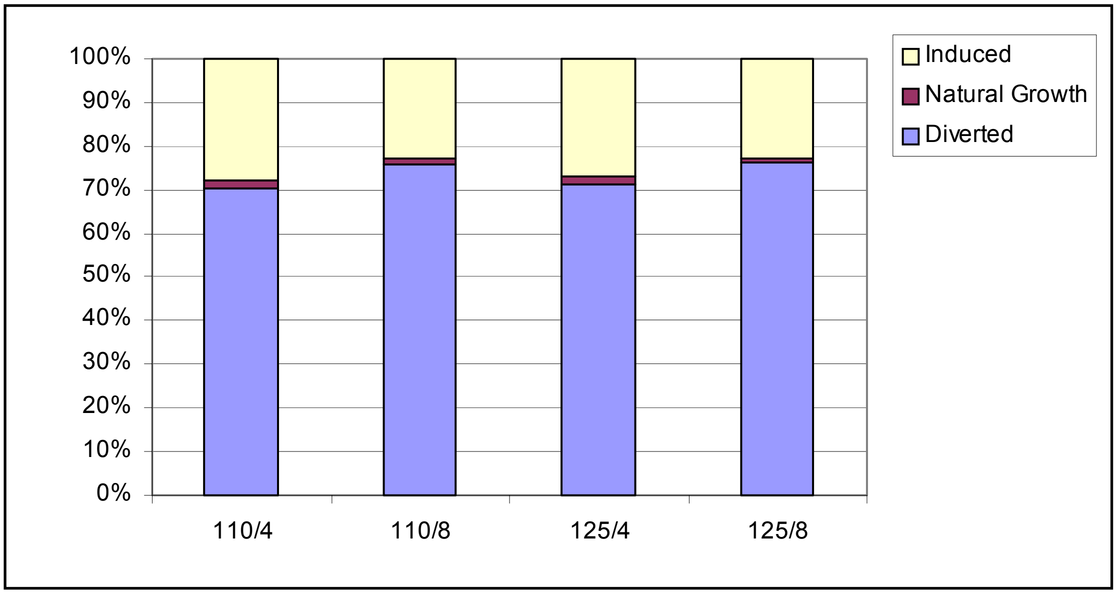
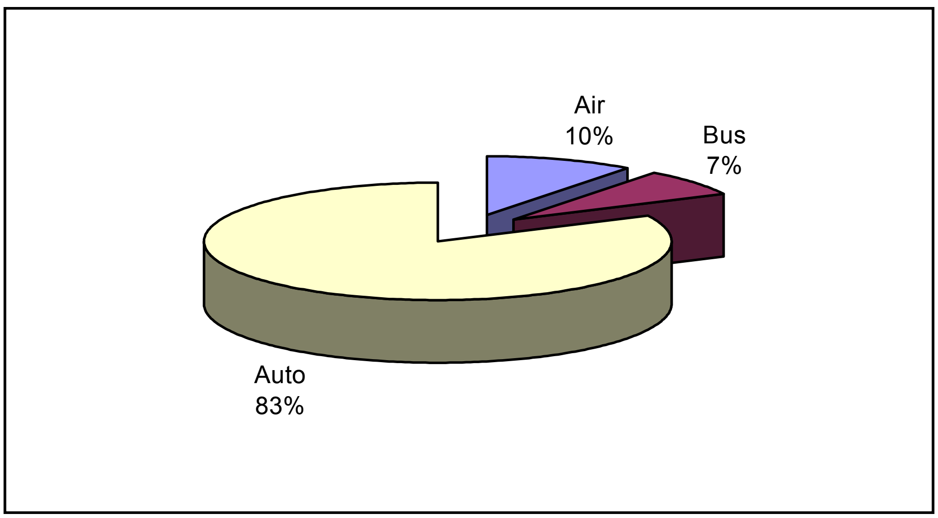


Exhibit 2.28: Trips Diverted to Rail in 2010



2.4.4 Modal Split

The demand forecasting model also provides data on the market shares by mode, or *modal split*. Exhibit 2.29 shows the market share in the case of shuttle bus connection to casino. As shown in Exhibit 2.29 the automobile remains the dominant mode, accounting for more than 94 percent of all trips within the study area during the 2010 forecast year. The modal share for the best rail service (125/8) is forecasted as 2.16 percent of the total travel demand, which is almost twice higher than the air market share. The modal share for the base rail service (79/2) is forecasted as 1.03 percent of the total travel demand, which is a little lower than the air market share. Considering the short length of this corridor, the rail option is more favorable than air.

Exhibit 2.30 shows the market share in the case of direct connection to casino. As can be seen, rail got about 2% higher market shares in Exhibit 2.30 than in Exhibit 2.29. The modal share for the best rail service (125/8) is forecasted as 6.18 percent of the total travel demand, which is more than three times higher than the air market share.

Exhibit 2.29: 2010 - Modal Market Share of Total Travel Demand by Mode (Shuttle Bus Connection to Casino)

Scenario	Air	Bus	Auto	Rail
79/2	1.81%	0.70%	96.46%	1.03%
79/4	1.70%	0.64%	96.03%	1.62%
110/4	1.65%	0.61%	95.08%	2.66%
110/8	1.55%	0.56%	93.95%	3.95%
125/4	1.63%	0.61%	94.96%	2.80%
125/8	1.53%	0.55%	93.76%	4.16%

Exhibit 2.30: 2010 - Modal Market Share of Total Travel Demand by Mode (Direct Connection to Casino)

Scenario	Air	Bus	Auto	Rail
110/4	1.62%	0.59%	93.48%	4.32%
110/8	1.52%	0.52%	92.01%	5.95%
125/4	1.61%	0.58%	93.33%	4.48%
125/8	1.50%	0.52%	91.80%	6.18%

2.4.5 Ridership and Revenue

Exhibit 2.31-2.33 show the ridership and revenue forecasts for six future scenarios in the case of shuttle bus connection to casino. These exhibits also give passenger-mile statistics. As can be seen, revenue increases much faster than the ridership when the service improves and fare increases. In this study, when speed doubles, the demand increases 94%, while the revenue increases 200%. When frequency doubles, the demand increases 65%, while the revenue increases 115%. Although the fare of high-speed rail is higher than that of low speed rail, better service still attracts more passengers to rail.

Exhibit 2.34-2.36 illustrate increase in the ridership, revenue and passenger-miles over time. It can be found that the demand increases 60% and revenue increases 36% when connecting casino to rail station directly.

Exhibit 2.31: 2010 Ridership Forecast (in millions riders)

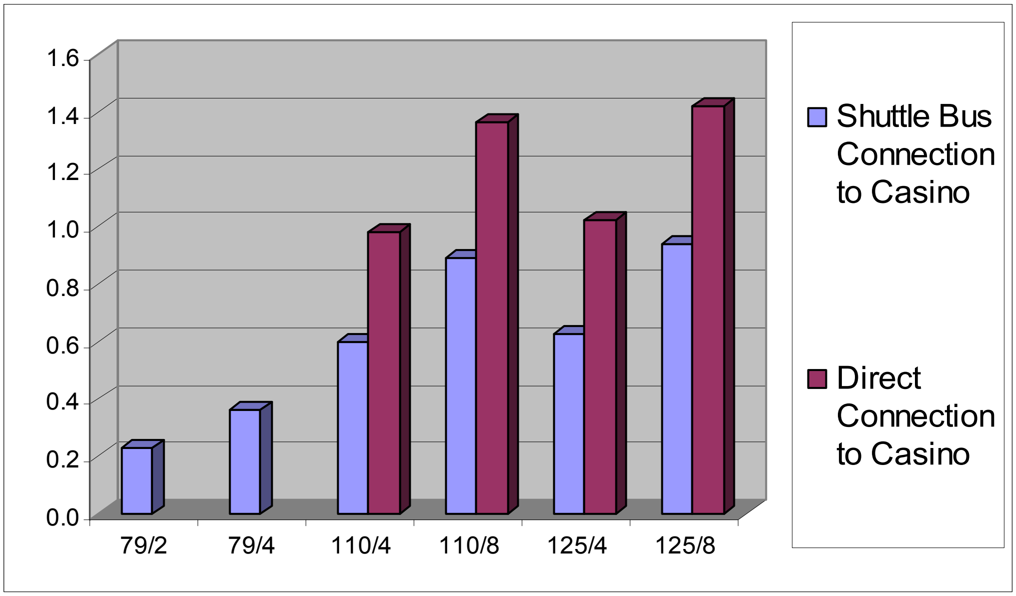


Exhibit 2.32: 2010 Passenger-Miles Forecast (in millions)

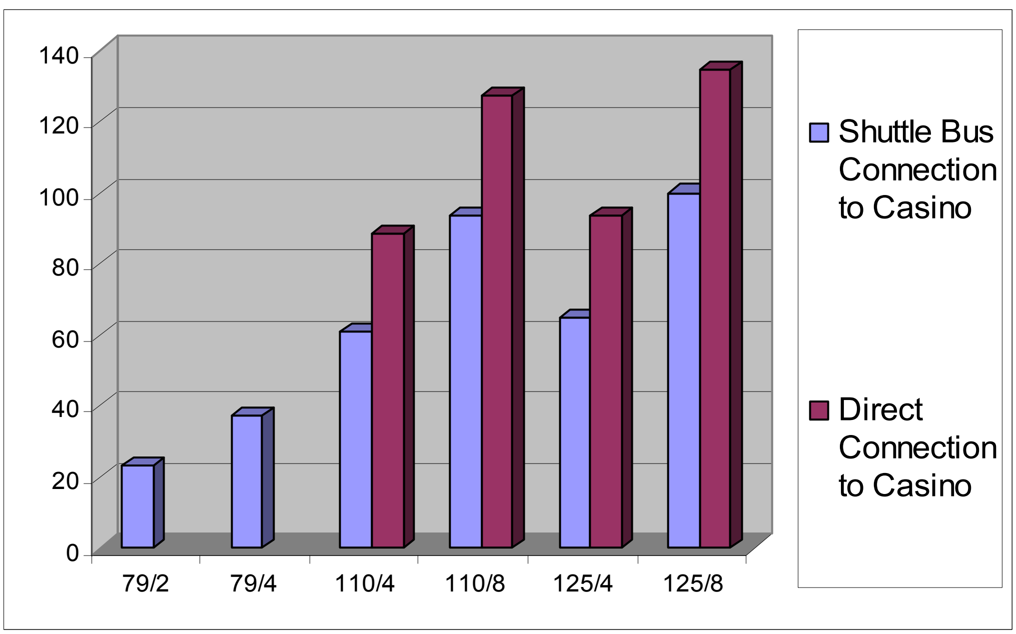


Exhibit 2.33: 2010 Revenue Forecast (in millions of 2006$)

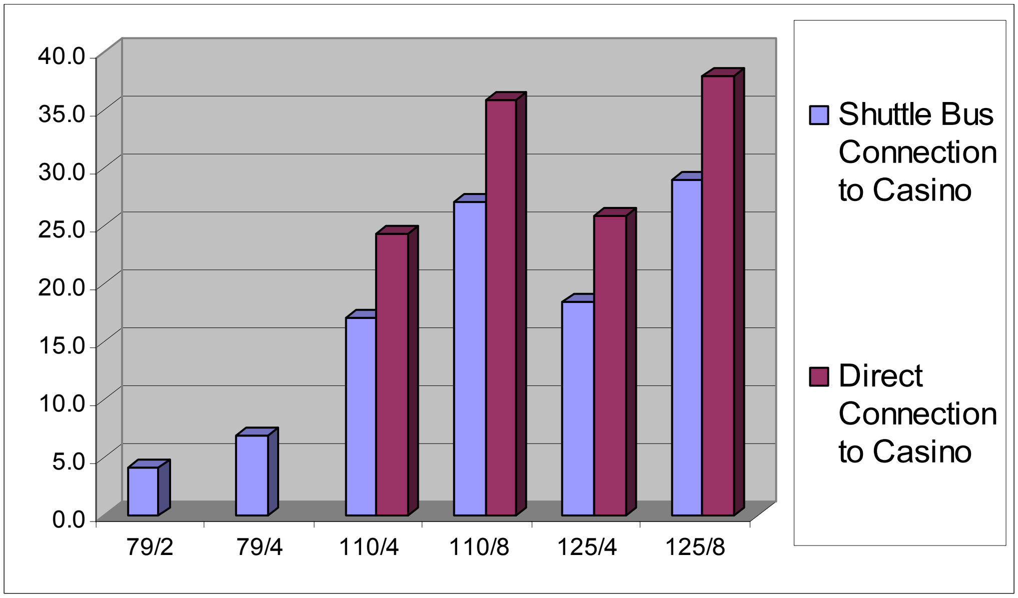


Exhibit 2.34: 2010-2040 Ridership Forecast, 110-mph/8 Train Option

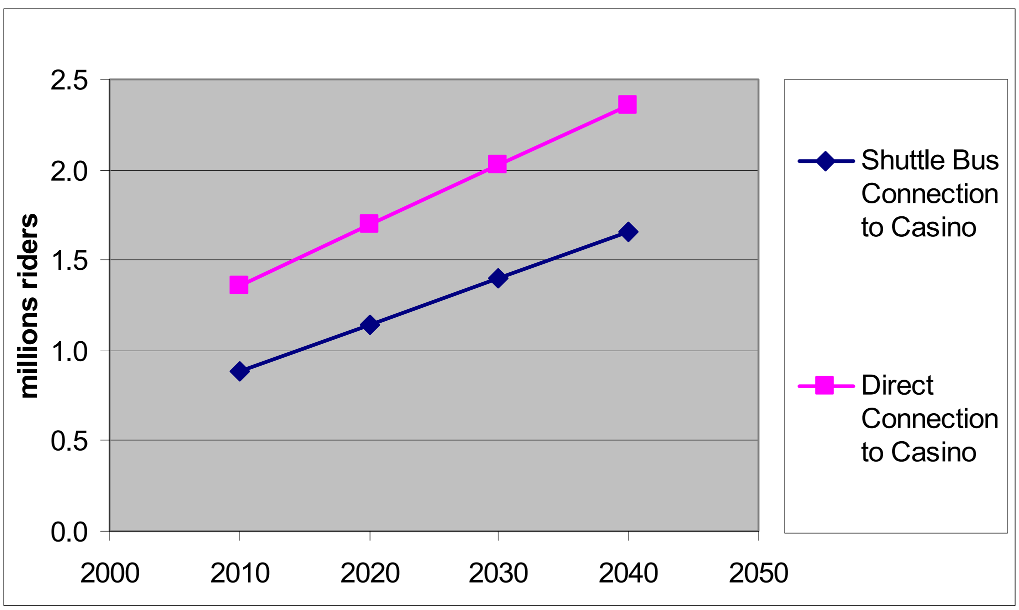


Exhibit 2.35: 2010-2040 Passenger-Miles Forecast, 110-mph/8 Train Option

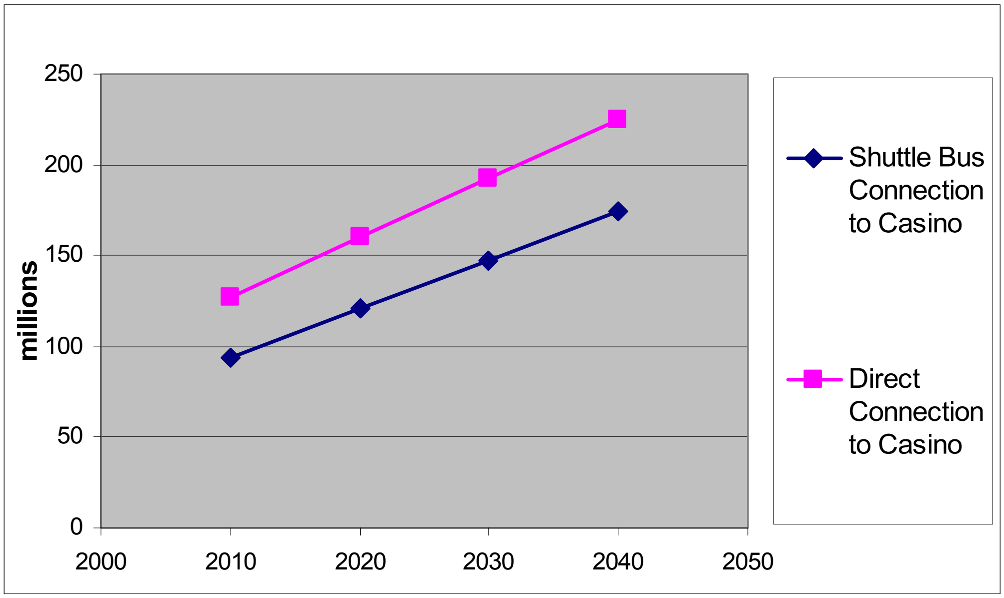


Exhibit 2.36: 2010-2040 Revenue Forecast, 110-mph/8 Train Option