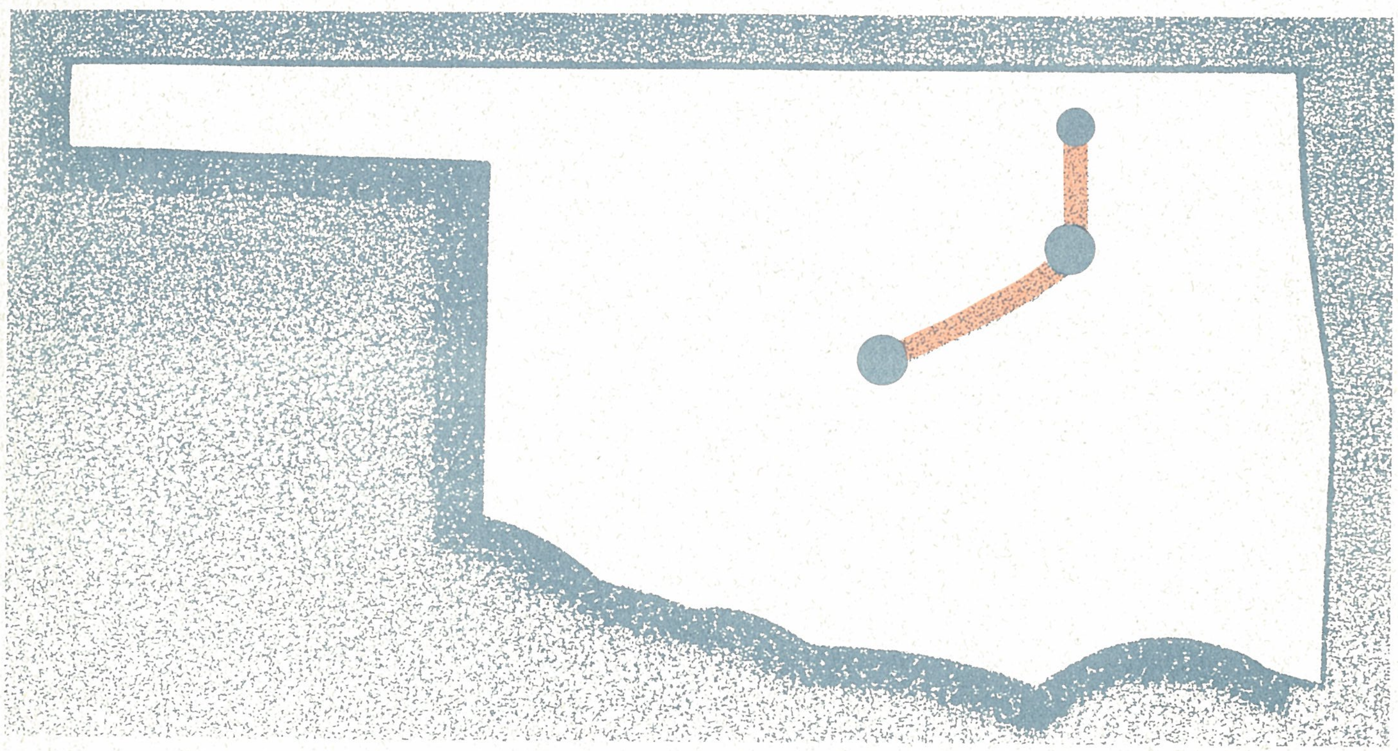
# OKLAHOMA FIXED GUIDEWAY TRANSPORTATION SYSTEM STUDY

## Interurban Feasibility Study Phase I-Final Report



Prepared for
**The State of Oklahoma**
**Department of Transportation**

Prepared by
**Parsons Brinckerhoff**
**Quade & Douglas, Inc.**

# OKLAHOMA FIXED GUIDEWAY INTERURBAN COMMUTER STUDY

## PHASE I - FEASIBILITY STUDY

## TASK 14.0

## FINAL INTERURBAN FIXED GUIDEWAY FEASIBILITY STUDY

Submitted to:

**Oklahoma Department of Transportation**

Submitted by:

**Parsons Brinckerhoff Quade & Douglas, Inc.**

In association with:

**Barnard Dunkelberg & Company**
**MGR, Inc.**
**RGDC, Inc.**

September 1989

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# 1.0 INTRODUCTION

The Oklahoma Department of Transportation has begun to investigate alternatives to the private automobile as the primary means of intra- and intercity transportation. As rights-of-way become increasingly limited and expensive, and as public acceptance to additional freeway lanes declines, ODOT has been investigating the cost-effectiveness and potential for alternative public transportation for travel within and between cities. In 1988, ODOT selected Parsons Brinckerhoff Quade & Douglas, Inc. to conduct three studies. Two of them centered on assessing the potential for future fixed guideway transit in the urban areas of Tulsa and Oklahoma City. Fixed guideways include buslanes, light rail transit, rapid rail, and automated guideway transit, among others. This, the third study investigated the potential for rail passenger service between Oklahoma City and Tulsa, and between Tulsa and Bartlesville. The study has been divided into two phases: the first phase focusing on determining the feasibility of interurban commuter system development and the second phase presenting a transit development phasing and implementation program should the results of the first study phase prove promising.

In determining the feasibility of the future development of the interurban commuter system, the first phase of the study addresses the following:

- Projected passenger volumes
- Technology assessment
- Capital needs and costs
- Financial feasibility
- Integration with other passenger modes
- Engineering feasibility

Based on these key issue findings, the study makes policy recommendations and development guidance for the integration on the interurban system with the intraurban systems being contemplated.

## 1.2 NATIONAL TRENDS IN INTER-URBAN TRAVEL

Intercity transportation demand may be met with several modes of travel: air, auto/small truck, bus, and rail. The current trends in intercity passenger travel (in passenger miles) include a leveling off of commercial air traffic, continued increases in automobile travel, and a leveling off of the long-term declines in intercity bus. Of note, the annual gains in Amtrak ridership have continued since 1983 and rail commutation has been increasing at a steady annual rate. Table 1.2.1 shows the intercity travel by mode (in terms of passenger miles) from 1970 to 1988. Intercity rail transportation carries less than one percent of all intercity modes. Table 1.2.2 shows the growth in intercity rail passenger transportation since 1979. Thus, while the growth in the intercity rail passenger service has been steady, compared to the travel market, this mode carries a small share of the demand.

The travel characteristics of intercity rail passenger service differ from other intercity modes. The trip length of the average Amtrak rider is 259 miles, while for the commuter it is 21.9. The average intercity bus rider travels 123 miles, while the airline passenger flies 779 miles. Table 1.2.3 shows the length of haul for passengers by intercity mode. Figure 1.2.1 depicts this same information for 1975 and 1987. The length of rail commutation has declined slightly while the length on the Amtrak trip has increased. Thus, Amtrak trips are about one-sixth the length of of air passenger trips. Table 1.2.4 presents a listing of the general statistics of intercity rail travel for 1985. This is for commutation only, not Amtrak. Table 1.2.5 provides information on the systems providing commuter rail service as well as the maximum number of rail vehicles in service in 1985.

One of the key issues associated with intercity passenger modes is revenue. How much of the cost of service provision are covered by passenger fares and what subsidy remains? Figure 1.2.2 shows the trend in public passenger revenue for air, bus, Amtrak, and commuter rail. In the domestic intercity commercial rail, Amtrak, fare levels remained

## Table 1.2.1

## Domestic Intercity Travel By Mode (Billions of Passenger-Miles)

| Year | Grand Total | | Private Carrier | | | | | | Public Carrier | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Auto[a] | | Air[b] | | Total | | Air | | Bus | | Rail[c] | | Total | |
| | Amount | % | Amount | % | Amount | % | Amount | % | Amount | % | Amount | % | Amount | % | Amount | % |
| 1945 | 345.5 | 100 | 220.3 | 63.8 | – | – | 220.3 | 63.8 | 4.3 | 1.2 | 27.4 | 7.9 | 93.5 | 27.1 | 125.2 | 36.2 |
| 1970 | 1,180.8 | 100 | 1,026.0 | 86.9 | 9.1 | .8 | 1,035.1 | 87.7 | 109.5 | 9.3 | 25.3 | 2.1 | 10.9 | .9 | 145.7 | 12.3 |
| 1975 | 1,354.5 | 100 | 1,170.7 | 86.5 | 11.4 | .8 | 1,182.1 | 87.3 | 136.9 | 10.1 | 25.4 | 1.9 | 10.1 | .7 | 172.1 | 12.7 |
| 1980 | 1,557.9 | 100 | 1,300.4 | 83.5 | 14.7 | .9 | 1,315.1 | 84.4 | 204.4 | 13.1 | 27.4 | 1.8 | 11.0 | .7 | 242.8 | 15.6 |
| 1981 | 1,573.4 | 100 | 1,319.3 | 83.9 | 14.6 | .9 | 1,333.9 | 84.8 | 201.4 | 12.8 | 27.1 | 1.7 | 11.0 | .7 | 239.5 | 15.2 |
| 1982 | 1,608.7 | 100 | 1,344.9 | 83.6 | 13.1 | .8 | 1,358.0 | 84.4 | 213.6 | 13.3 | 26.9 | 1.7 | 10.2 | .6 | 250.7 | 15.6 |
| 1983 | 1,644.9 | 100 | 1,364.1 | 82.9 | 12.7 | .8 | 1,376.8 | 83.7 | 232.2 | 14.1 | 25.6 | 1.6 | 10.3 | .6 | 268.1 | 16.3 |
| 1984 | 1,687.2 | 100 | 1,388.1 | 82.2 | 13.0 | .8 | 1,401.1 | 83.0 | 250.7 | 14.9 | 24.6 | 1.5 | 10.8 | .6 | 286.1 | 17.0 |
| 1985 | 1,744.2 | 100 | 1,418.3 | 81.3 | 13.0 | .8 | 1,431.3 | 82.1 | 277.8 | 15.9 | 23.8 | 1.4 | 11.3 | .6 | 312.9 | 17.9 |
| 1986 | 1,807.8 | 100 | 1,452.1 | 80.3 | 12.4 | .7 | 1,464.5 | 81.0 | 307.9 | 17.0 | 23.7 | 1.3 | 11.7 | .7 | 343.3 | 19.0 |
| 1987 | 1,897.2 | 100 | 1,520.7 | 80.2 | 12.1 | .6 | 1,532.8 | 80.8 | 329.2 | 17.4 | 23.0 | 1.2 | 12.2 | .6 | 364.4 | 19.2 |
| 1988 | 1,968.2 | 100 | 1,586.0 | 80.6 | 12.1 | .6 | 1,598.1 | 81.2 | 334.2 | 17.0 | 23.1 | 1.2 | 12.8 | .6 | 370.1 | 18.8 |

a Includes small trucks used for travel purposes.
b General aviation operations, including air taxi and small air commuter.
c Includes both long-haul intercity and short-haul commutation operations, but not urban rail transit.

Source: Transportation In America: A Statistical Analysis of Transportation in the United States, Seventh Edition. The Eno Foundation for Transportation, Inc. May 1989.

## Table 1.2.2

## Railroad Intercity and Commutation (Millions of Passenger-Miles)

| | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|---|---|---|---|---|
| Intercity[a] | | | | | | | | | | |
| Amtrak | 4,867 | 4,503 | 4,762 | 4,172 | 4,246 | 4,552 | 4,785 | 5,011 | 5,631 | 5,838 |
| Commutation[b] | 6,492 | 6,516 | 6,213 | 6,027 | 6,097 | 6,207 | 6,547 | 6,659 | 6,819[d] | 6,989[d] |
| Totals[c] | 11,359 | 11,019 | 10,975 | 10,199 | 10,343 | 10,759 | 11,332 | 11,670 | 12,180 | 12,827 |

a Traffic by other than Amtrak and classified as non-commutation. ICC no longer collects such data.
b Figures from 1977 are from American Public Transit Association surveys of railroads still providing rail commutation service.
c Totals through 1979 are slightly lower than those shown in intercity travel table since latter includes data for smaller, other classes of railroads.
d Preliminary

Source: Transportation In America: A Statistical Analysis of Transportation in the United States, Seventh Edition. The Eno Foundation for Transportation, Inc. May 1989.

## Table 1.2.3

## Average Length of Haul of Domestic Modes (Miles)

| Year | Domestic Air Carriers (Scheduled) | Intercity Bus (Regular Route) | Intercity Rail | | | |
|---|---|---|---|---|---|---|
| | | | Non-Commuter [a] | Amtrak [c] | Commuter [b] | All |
| 1970 | 679 | 106 | 79 | | 22.3 | 37 |
| 1975 | 698 | 113 | 74 | 224 | 23.2 | 37 |
| 1980 | 736 | 125 | 69 | 217 | 23.6 | 37 |
| 1981 | 749 | 123 | See d below | 226 | 23.2 | See d below |
| 1982 | 766 | 133 | | 215 | 23.3 | |
| 1983 | 765 | 138 | | 223 | 23.3 | |
| 1984 | 759 | 133 | | 227 | 23.2 | |
| 1985 | 758 | 121 | | 232 | 23.5 | |
| 1986 | 767 | 123 | | 249 | 22.0 | |
| 1987 | 779 | 123[e] | | 259 | 21.9 | |

a Railroads classified passenger traffic as commuter and non-commuter, the latter representing longer-distance traffic and shorter-distance traffic not moving on commuter tickets. This accounts for the relatively short distances for the all category.

b Represents rail passengers purchasing commuter tickets. Does not include urban rail transit passengers.

c Figures after 1970 are Amtrak traffic and represent all of its passengers, a small amount of which was commutation but now has been turned over to state/local authorities. Excluding the commutation, the distances were about 35 miles longer; i.e. 219 in 1970, 266 in 1975, and 251 in 1980.

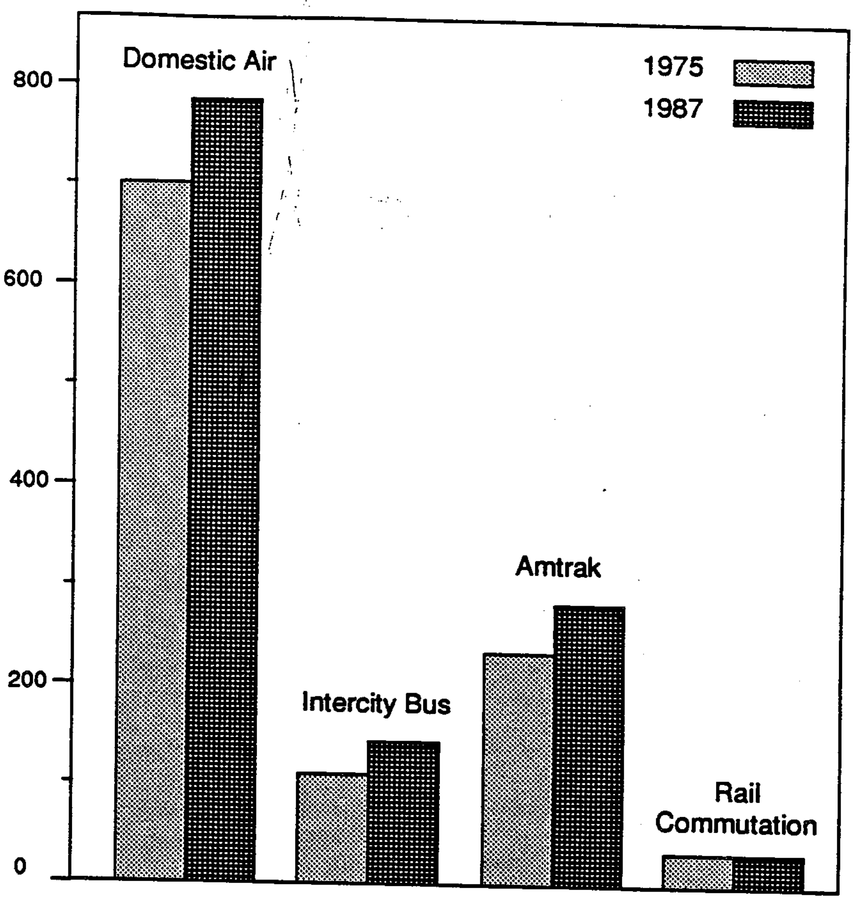
d ICC discontinued collection of rail passenger data after 1980.

e Revised.

Source: Transportation In America: A Statistical Analysis of Transportation in the United States. Seventh Edition. The Eno Foundation for Transportation, Inc. May 1989

## Figure 1.2.1

### Average Length of Passenger Trip




Source: Transportation In America: A Statistical Analysis of Transportation in the United States. Seventh Edition. The Eno Foundation for Transportation, Inc., May 1989

fairly constant from 1983 to the present. These are, however, slightly below the average cost of goods as indicated by the consumer price index. Intercity bus fares have generally followed consumer prices, while commuter rail fares have exceeded general consumer prices. Table 1.2.6 presents additional information on revenues among modes and compared to consumer prices. Of note, the average revenue per passenger mile traveled in 1987 was between $.1057 to $.1232 per passenger mile for passenger rail services. Figure 1.2.2 shows the average revenue per passenger mile by node. For the Oklahoma study, a fare of $ .11 per passenger mile was assumed.

To summarize, commuter rail and intercity rail ridership is on the upswing; however, total intercity demand is also increasing for all modes. Thus, the relative share of travel carried by rail is remaining at levels of less than one percent of total intercity passenger travel. While a small percentage of total travel, rail accounted for over 12.8 billion passenger miles of travel, not an insignificant number.

## Table 1.2.4

## U.S. Commuter Rail Industry
## Summary Statistics - 1985 *

| | |
|---|---|
| Urbanized Areas Served | 7 (1) |
| Commuter Rail Operations | 16 |
| Maximum Trains Operated Weekday | 1,204 |
| Annual Train Miles (Thousands) (2) | 34,482.7 |
| Annual Train Revenue Miles (Thousands) | 32,141.7 |
| Annual Passenger Miles (Millions) | 6,533.9 |
| Annual Passenger Trips (Millions) | 275.3 |
| Average Operating Expenses per Vehicle Mile | $2.70 |
| Average Operating Expense per Vehicle Operated | $168,342 |
| Average Operating Expense per Vehicle Hour | $113.80 |
| Average Operating Expense per Passenger Mile | $.10 |
| Average Operating Expense per Passenger Trip (unlinked) | $2.34 |

* Excludes Amtrak — 403(b) - commuter train service which are trains operated at the request of a state or local government and 403(d) - "sunset" trains which only applies to services operating when Amtrak began.

(1) Includes Boston, New York/New Jersey, Philadelphia, Pittsburgh, Detroit, Chicago and San Francisco. Detroit service was discontinued October, 1983.

(2) A train consists of one or more vehicles hooked together. Vehicle miles equals the number of vehicles per train times the train miles.

Source: Urban Mass Transportation Administration. National Urban Mass Transportation Statistics, 1985: Section 15 Annual Report, 1987

## Table 1.2.5

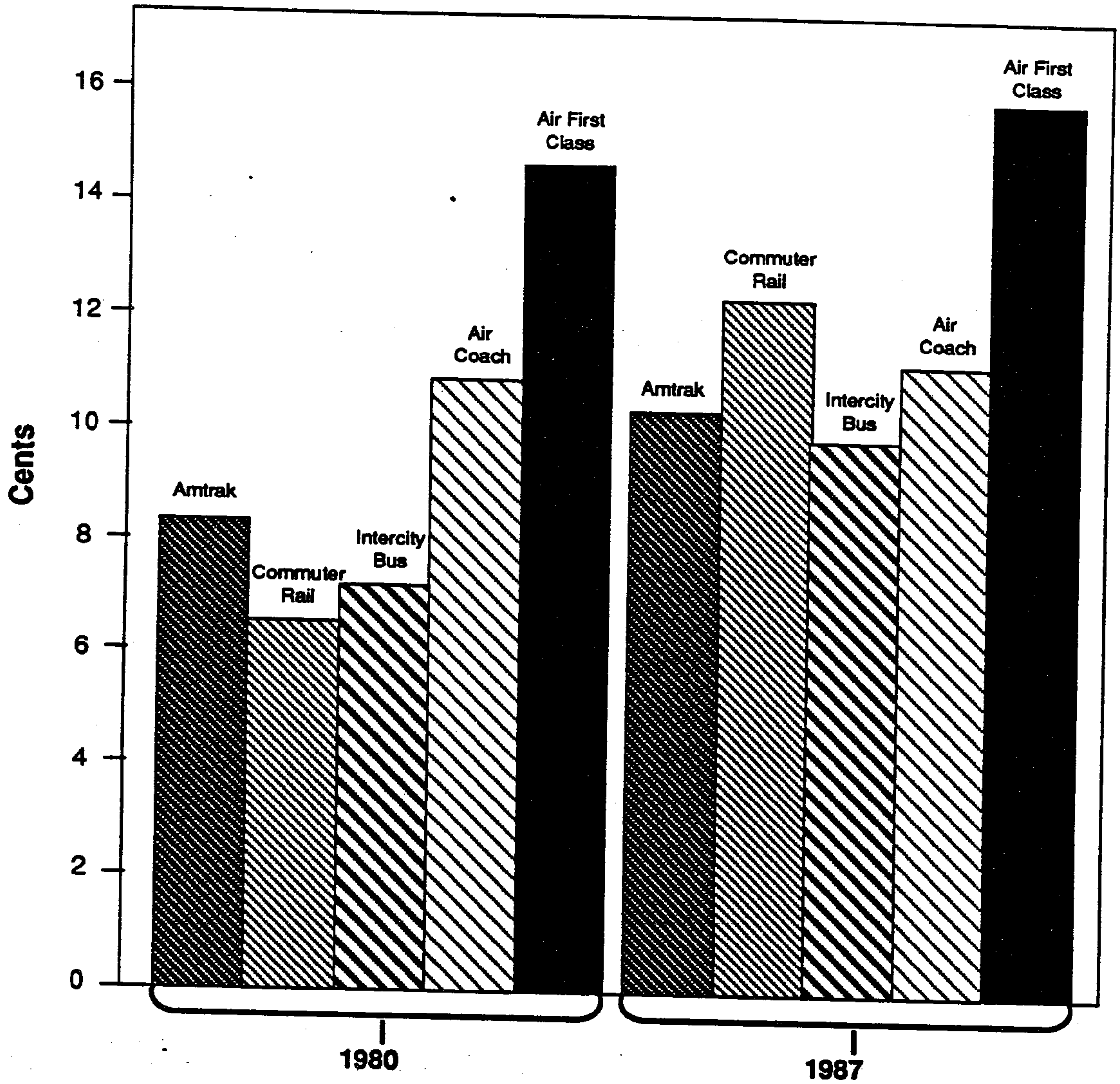
## U.S. Commuter Rail Operators

| Commuter Rail Operators | Maximum Vehicles in Service |
|---|---|
| Newark NJT Corporation | 788 |
| New York LIRR | 1,035 |
| Philadelphia | 245 |
| Pittsburgh - PAT | 8 |
| New York MTNR | 624 |
| Chicago - Commuter Rail Bd | 301 |
| Chicago NW Tr. Co. | 345 |
| Chicago Illinois Central | 159 |
| Chicago Burlington Northern | 171 |
| Boston BGM/MBTA | 202 |
| San Francisco - CALTRANS | 97 |
| Indiana Commuter TD | 39 |

Source: Urban Mass Transportation Administration. National Urban Mass Transportation Statistics, 1985: Section 15 Annual Report, 1987

## Figure 1.2.2

## Revenue per Passenger-Mile by Mode




Source: Transportation In America: A Statistical Analysis of Transportation in the United States. Seventh Edition. The Eno Foundation for Transportation, Inc., May 1989

# 2.0 INTERCITY DEMAND

## INTRODUCTION TO INTERCITY DEMAND

The purpose of the Interurban Commuter Study is to examine the potential for future development of fixed guideway facilities in the interurban corridors between Oklahoma City and Tulsa and between Tulsa and Bartlesville. These fixed guideway facilities would provide an alternative ground transportation system to complement the existing intercity highway and (for Oklahoma City - Tulsa) air transportation systems.

The future potential for fixed guideway development will depend on several factors: the growth in population and employment in each urban area, the increase in interaction among the urban areas, and the relative attractiveness of fixed guideway travel compared to other available modes.

The remainder of this report is organized into three sections. Section 2.1 describes existing travel demand in the Oklahoma City - Tulsa and Tulsa - Bartlesville corridors. Section 2.2 presents forecasts of year 2005 travel demand in these corridors. Section 2.3 provides forecasts of 2005 fixed guideway ridership, a portion of the total travel demand in the two corridors.

## 2.1 EXISTING TRAVEL DEMAND

### 2.1.1 Oklahoma City - Tulsa

At present, persons traveling between Oklahoma City and Tulsa have three modal options: by private automobile, by intercity bus, and by air. Given these three options, the vast majority travel by private automobile. Highway travel data is available from an origin-destination survey of travel on the Turner Turnpike conducted in 1987 by Wilbur Smith Associates for the Oklahoma Turnpike Authority. The survey identified 6,322 weekday vehicle trips by automobiles and two-axle trucks between the two urban areas, only counting traffic with an origin in one urban area and a destination in the other urban area. These 6,322 vehicle trips carried 8,624 passengers. Of these trips, 10.4% were for recreation purposes, 14.2% for personal purposes and 75.4% for business purposes.

Some intercity automobile travel likely also occurs on non-toll routes, primarily SH 66. Reliable information on the origins and destinations of traffic on SH 66 between Tulsa and Oklahoma City is not available. However, with a low-point volume of 2,300 per day, between Stroud and Bristow, the intercity volume is likely no more than 500 to 1,000 vehicles, with 700 to 1,400 person trips.

Bus service between the two cities is offered by Greyhound Lines. Ridership data is not available. However, with five daily trips each way, the maximum ridership would only be on the order of 400 person trips per day.

Commercial air travel between the two cities is very light, about 20 person trips per day. Some travel by private plane is likely, but data is not available.

In total, about 10,000 daily one-way person trips are made between the Oklahoma City and Tulsa urban areas, with at least 85% of these being made by private automobile on the Turner Turnpike.

### 2.1.2 Tulsa - Bartlesville

At present, travel between Tulsa and Bartlesville is made via the highway system, primarily U.S. 75, either in private automobiles or by bus or limousine service. Origin-destination data for travel between Tulsa and Bartlesville is not available; however approximate numbers can be hypothesized by examining traffic count data. 1987 volumes on U.S. 75 at the Tulsa/Washington County line are approximately 7,300 vehicles per day. While this includes commercial truck traffic and trips with origins and/or destinations outside of Tulsa and Bartlesville, it is likely that most, say 75%, of the traffic is between the two cities, i.e., approximately 5,500 vehicle trips and 7,500 person trips per day.

In addition to private automobile traffic, some travel is made utilizing Greyhound service, three round-trips per day, and a limousine service between Bartlesville and Tulsa International Airport provided by Phillips Petroleum. Ridership data for Greyhound is unavailable, but is likely on the order of 200 persons per day, maximum. The Phillips Petroleum limousine service ridership is estimated by company officials to be 30,000 to 40,000 per year, with 75% by company employees and the remainder by other travellers on a space-available basis, or about 100 - 125 trips per day.

## 2.2 2005 PROJECTED TRAVEL DEMAND

### 2.2.1 Oklahoma City - Tulsa

As noted in the previous section, the vast majority of travel between Tulsa and Oklahoma city utilizes the Turner Turnpike. Over the past 16 years (1971-1987), averaged over good economic times and bad, traffic on the Turnpike has increased at a rate of 3% per year.

Applying this growth rate to interurban travel yields an estimate of 2005 Oklahoma City -Tulsa travel demand of approximately 17,000 daily person trips.

### 2.2.2 Tulsa - Bartlesville

An examination of traffic volumes at the Tulsa/Washington County line over the past 16 years (1971-1987) shows a growth rate of 4% per year.

Applying this growth rate to interurban travel yields an estimate of 2005 Bartlesville - Tulsa travel demand of approximately 16,000 daily person trips.

## 2.3 2005 PROJECTED FIXED GUIDEWAY RIDERSHIP

### 2.3.1 Forecast Methodologies

As noted in Section 2.1, the transportation marked for interurban travel in the Oklahoma City - Tulsa and Tulsa - Bartlesville corridors is firmly held by the private automobile. Mode choice decisions favoring automobile travel are generally most sensitive to cost and convenience factors. In contrast, intercity air travel is most sensitive to travel time factors, in fact more so than any other mode, with air time a positive factor favoring air travel and with ground time a negative factor. It is, therefore, in this context that the market demand for interurban fixed guideway (both conventional and high speed) is driven by a combination of service features, the strongest of which are travel time, cost and passenger comfort and convenience.

Ridership forecasts for fixed guideway technologies require a thorough understanding of existing intercity trip patterns and traveller characteristics. Since service characteristics influence mode choice, demand estimates are traditionally derived from econometric models that quantify travellers' responses to service variations. These variations include: travel time, cost, frequency of service, and accessibility.

With these factors in mind, the study team reviewed available methodologies for estimating potential fixed guideway ridership for a high speed passenger system in the Oklahoma City - Tulsa and Tulsa - Bartlesville corridors. Given the virtual absence of modal competition in these corridors, it was not possible to calibrate a forecasting methodology based on local, observed data. Rather, the approach was to borrow usable methodologies developed elsewhere. Two methodologies were chosen, which provide a range of values for estimated fixed guideway ridership, one developed for AMTRAK, the other by Wisconsin DOT (WisDOT). Each model is described below, in turn.

#### 2.3.1.1 AMTRAK Model

The AMTRAK intercity passenger demand model has been used extensively over the past few years in AMTRAK's route planning process. The model was originally developed by Peat, Marwick, Mitchell & Co. in 1978-1979 to develop baseline passenger demand estimates for the Houston to Dallas-Fort Worth corridor.

The AMTRAK model utilizes the following input variables: population, rail fares and auto costs, rail travel times, frequency of rail service, and the relative attractiveness of each intercity terminal point.

The passenger demand equation takes the following form:

$$\text{Annual Ridership} = e^{2.468 + ti + tj)} \times (popi \times popj)^{0.6085} \times time^{-0.7298} \times freq^{0.7736} \times (\text{auto cost} / \text{fare})^{1.0294}$$

where:

popi and popj are the population of the city pairs;
time is the scheduled rail time in minutes;
freq(quency) is the number of daily round trips;
auto cost is the out-of-pocket cost of driving between i and j;
fare is the projected one-way rail fare between i and j; and,
ti and tj are the attraction factors of each city.

To forecast ridership, year 2005 population for each of the urban areas was used as input into the model. Three time variables were used, one assuming standard Amtrak, with average speeds of about 45 mph, the second assuming enhanced Amtrak service with average speeds of about 55 mph, and the third high speed service with average speeds of about 65 mph. For the frequency variable, 10 daily round-trips were assumed between each city pair. Out-of-pocket auto operating costs were calcuated at 10 cents per mile, plus tolls. One-way fixed guideway fares were assumed to be an average of 11 cents per mile. For all three cities an attraction factor of 1.0, indicating average attractiveness, was assumed.

#### 2.3.1.2 WisDOT Model

The WisDOT model was developed in 1980 by Wisconsin DOT during the development of the State Highway Plan. The WisDOT mode choice model was developed using a direct utility assessment technique, which involves calibrating the model based on responses to a series of hypothetical situations which have been constructed using a experimental design. The model is then validated on observed travel data.

The model has a multinomial logit form, designed to estimate the probability of choosing each of four travel modes: bus, rail, air, and auto, for each of three travel purposes, recreation, personal and business. The multinomial logit model formulation is:

$$Pi = e^{Ui} \; / \; \text{Sum}\, e^{Uj}$$

Where Pi is the mode share for mode i, Ui is the utility function for mode i, and Uj is the utility function for mode j.

The utility functions by purpose and mode are as follows (with cost coefficients adjusted to reflect 1989 dollars):

Recreation

Bus: Ub = -1.27 - .105 Cb/d - .85 Tb/d - .58/Fb
Rail: Ur = -0.10 - .105 Cr/d - .85 Tr/d - .58/Fr
Air: Ua = -0.66 - .098 Ca/d - .094 Ta/d - .010/fa
Auto: Uh = -.025 g

Personal

Bus: Ub = -0.73 -.105 Cb/d -.93 Tb/d -.93/Fb
Rail: Ur = -0.18 -.105 Cr/d -.93 Tr/d -.93/Fr
Air: Ua = -0.86 -.035 Ca/d -.16 Ta/d -.064/Fa
Auto: Uh = -.036 g

Business

Bus: $U_b = -2.11 - .068\ C_b/d - 1.25\ T_b/d - 1.86/F_b$

Rail: $U_r = -0.30 - .068\ C_r/d - 1.25\ T_r/d - 1.86/F_r$

Air: $U_a = -0.57 - .017\ C_a/d - 0.72\ T_a/d - 0.26/F_a$

Auto: $U_h = -.023\ g$

Where,

$C_i$ is the one-way cost of mode i in cents;
d is the one-way auto distance in miles;
$T_i$ is the time difference between mode i and auto, including access time, in minutes;
$F_i$ is the daily frequency of trips on mode i; and,
g is the gasoline price in cents per mile.

To forecast ridership, the cost, time and frequency assumptions will be the same as described for the AMTRAK model. Assumed access times for Oklahoma City - Tulsa bus and rail trips will be 60 minutes, for Oklahoma City - Tulsa air trips will be 90 minutes, and for Tulsa - Bartlesville bus and rail trips will be 45 minutes. Gasoline cost will be assumed at 4.5 cents per mile. The distribution of trips by purpose, for both corridors, will be assumed to be the same as reported for trips on the Turner Turnpike, i.e., 10.4% recreation, 14.2% personal, and 75.4% business.

### 2.3.2 Oklahoma City - Tulsa

Using the methodologies described above produced the following estimates of 2005 daily inter-urban fixed guideway travel:

| | AMTRAK | WisDOT | Average |
|---|---|---|---|
| Standard AMTRAK | 195 | 1,425 | 810 |
| Enhanced AMTRAK | 225 | 1,795 | 1,010 |
| High Speed | 250 | 2,090 | 1,170 |

### 2.3.3 Tulsa - Bartlesville

Using the methodologies described above produced the following estimates of 2005 daily inter-urban fixed guideway travel:

| | AMTRAK | WisDOT | Average |
|---|---|---|---|
| Standard AMTRAK | 40 | 720 | 380 |
| Enhanced AMTRAK | 50 | 990 | 520 |
| High Speed | 60 | 1,240 | 650 |

# 3.0 INTRODUCTION TO POTENTIAL CORRIDOR ALIGNMENTS

## 3.1 STUDY PURPOSE

The purpose of this chapter is to outline the potential placement and layouts for future rail passenger service development between three urban areas: Oklahoma City, Tulsa, and Bartlesville. The primary thrust of the analysis is to present design and operating data on the major existing freight railroad lines running between these urban areas. These include the Burlington Northern Railroad (BN) between Oklahoma City and Tulsa, and the Atchinson, Topeka, Santa Fe Railroad (AT&SF) between Tulsa and Bartlesville. The existing highway facilities between these cites are also briefly evaluated for potential utilization of high occupancy vehicle lanes and/or commuter rail. These highways include the Turner Turnpike (I-44) and SH 66 between Oklahoma City and Tulsa, and US 75 between Tulsa and Bartlesville. These facilities were selected for consideration based upon availability of railroad trackage and directness of connectivity. Figure 3.1.1 shows these facilities considered for potential interurban commuter passenger travel.

### 3.2.1 Potential Railroad Alignments

#### 3.2.1.1 Summary

As requested by the Oklahoma Department of Transportation, Parsons Brinckerhoff Quade and Douglas, Inc. (PBQD) conducted a field survey of the track conditions between Oklahoma City and Tulsa, and between Tulsa and Bartlesville. The survey determined that it is technically feasible to use existing railroad facilities for establishing a passenger service between the aforementioned cities. There are some areas which require further review and because of a time constraint, the field survey was conducted without the benefit of information which was requested from the respective railroads. If patronage studies support further investigation of this concept in the second phase of work, additional work and documentation should be developed regarding the cost of upgrading existing traffic protection at road crossings, adequacy of the existing train control system to incorporate passenger trains, and the preferred Central Business District (CBD) station sites.

#### 3.2.1.2 General Description

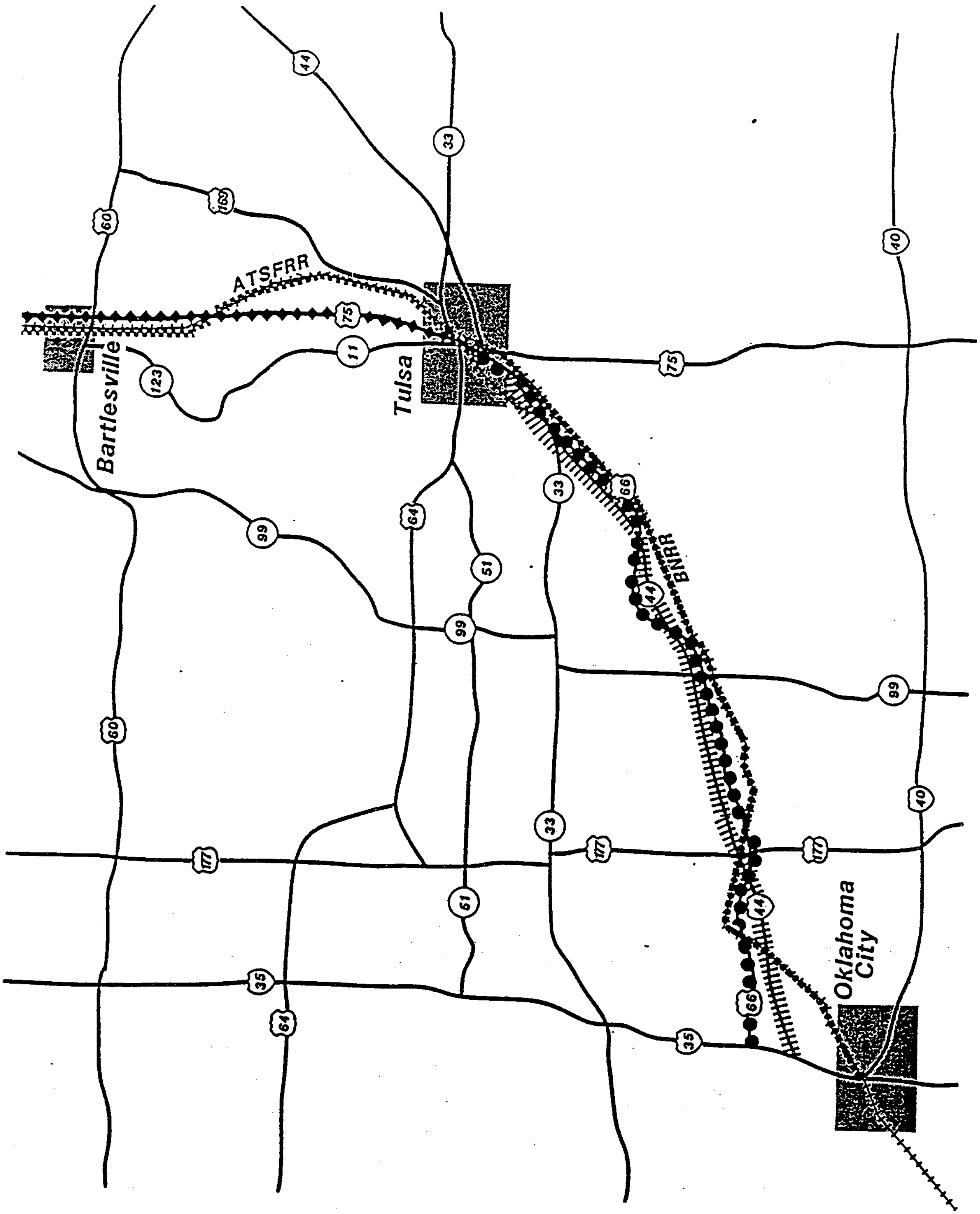
The proposed route between Oklahoma City and Tulsa would utilize the existing Burlington Northern Railroad tracks for an approximate distance of 120 miles and then utilize the AT&SF Railroad between Tulsa and Bartlesville for an additional 50 miles. The proposed route can be subdivided as follows.

| | |
|---|---|
| • Oklahoma City CBD | 4.5 miles |
| • BN mainline to Sapulpa | 99.5 miles |
| • Sapulpa to Tulsa | 14.0 miles |
| • Tulsa CBD | 1.0 miles |
| • Tulsa to Owasso | 11.0 miles |
| • Owasso to Bartlesville | 38.0 miles |
| • Bartlesville CBD | 1.0 miles |

The track conditions vary from Class 1 (poor) to about Class 4 (good). The Federal Railroad Administration (FRA) classification system which relates permissible train speed to track conditions is as follows.

| | FREIGHT TRAINS | PASSENGER TRAINS |
|---|---|---|
| CLASS 1 | 10 MPH | 15 MPH |
| CLASS 2 | 25 MPH | 30 MPH |
| CLASS 3 | 40 MPH | 60 MPH |
| CLASS 4 | 60 MPH | 80 MPH |
| CLASS 5 | 80 MPH | 90 MPH |
| CLASS 6 | 110 MPH | 110 MPH |

The majority of the trackage between Oklahoma City and Tulsa is Class 4 or can be brought to that level with minor rehabilitation. The local BN personnel in Oklahoma City stated that the top speed between Sapulpa and Oklahoma City is presently 49 mph. This is consistent with the observed track conditions.




| Parsons Brinckerhoff<br>Parsons Brinckerhoff Quade & Douglas, Inc.<br>Engineers • Architects • Planners | *Oklahoma Fixed Guideway Transportation System Study* | Figure |
|---|---|---|
| | **POTENTIAL CORRIDOR ALIGNMENTS** | **3.1.1** |

The majority of the track leaving Tulsa and going to Owasso is Class 2 with some Class 1 close to downtown Tulsa. The track between Tulsa and Owasso is within "yard limits" and therefore operates at slow speeds (20 mph max). Between Owasso and Bartlesville the track condition is Class 3. The local AT&SF personnel in Owasso advised the top speed to Bartlesville was about 40 mph with some 25 mph speed restrictions.

#### 3.2.1.3 Field Survey

The field survey noted the following conditions:

**3.2.1.3.1 Oklahoma City CBD (4.5 miles):** The yard limits for the Burlington Northern Railroad begin near the railroad interlocking on the east side of Oklahoma City. This interlocking is called the Greig Interlocking and is the location where the Missouri Kansas Texas Railroad (MKT) and the Santa Fe Railroad cross the Burlington Northern Railroad.

Two possible CBD alignments may initiate at this point. The first possibility requires that a new track connection be constructed permitting a train access to the CBD via the former Rock Island Railroad now owned by ODOT. This route could access the existing AT&SF station or a new station could be constructed. The rail in the ODOT track is bolted rail, 90lb OH 1922. This means that the rail is joined together with metal joint bars and weighs 90lbs per yard. It was manufactured by the Open Hearth process and was produced in 1922. The track conditions are poor for this section. It will require extensive upgrading particularly in the CBD area where the track would be graded as class 1. The rail exhibited end batter and was bent in the vertical plane because of poor tie and ballast conditions. The track bed improved as it approached the Greig Interlocking with the Burlington Northern Railroad.
It would be considered as class 2.

The second approach to the CBD would not require a new connection. The Burlington Northern Railroad accesses a former passenger station at the south end of the CBD. The rail in the BN track is 115lb, CC 1955. This is larger rail than used on the ODOT/MKT route and is control cooled (CC). The cooling process reduces rail breaks caused by entrapped hydrogen during rail manufacture. The track is generally in class 3 to class 4 condition.

The first connection would avoid potential coordination problems with the existing yard operations at the BN's East Yard. The second approach would require coordination with the Santa Fe Railroad which also uses this route into the CBD. The BN route operates under Yard Rules. This limits the maximum speed to 20 mph and requires trains to operate with the ability to stop within one-half of the stopping distance of any object. Relief from, or mitigation of, this type of operation would be required to expedite passenger train operations. It is not known at this time what operating rules are used on the ODOT trackage, but it is probable that a similar operation is used on that route.

**3.2.1.3.2 BN mainline to Sapulpa (99.5 miles):** The mainline to Sapulpa consists initially of bolted 115lb rail and after about 8 miles becomes continuously welded rail (CWR). The track condition is class 4 and should not require additional upgrading of remedial action. The trains are operated under rules governing radio controlled operations. Under this system, train location and movement are determined using radio communications. This method of controlling train operations may not be adequate if passenger trains run on high frequencies. At a low level of service, however, it should not present a major problem.

In Sapulpa, the rail becomes bolted rail as the mainline enters the yard area just west prior of the WYE interlocking. The track condition is class 3.

**3.2.1.3.3 Sapulpa to Tulsa (14.0 miles):** The "WYE" track in Sapulpa permits 25 mph movement to the Mainline to Tulsa. The rail in the Sapulpa to Tulsa segment is 132lb welded rail and the track condition is either class 3 or class 4. The trains movements are controlled by CTC and the maximum speed is 55 mph. A classification yard, called Cherokee Yard, exists on the south side of Tulsa and may impose a speed restriction to through movements.

**3.2.1.3.4 Tulsa CBD (1.0 miles):** The Burlington Northern continues through Tulsa and is mainly grade separated from CBD traffic. The actual passenger station could be located on Main Street. Two side tracks are available for passenger service. Some re-working of track connections may be needed depending upon the exact location of the platform. This area is under yard rules. This should not impose a major problem to passenger train operations because of its relatively short length and the need for the passenger train to slow down transversing thru turnouts.

**3.2.1.3.5 Tulsa to Owasso (11.0 miles):** The Santa Fe track commences at Greenwood Ave through a turnout from the BN Railroad. The track condition is class 2 and the rail which is initially bolted 100lb rail, quickly changes to 90lb OH 1928 rail. The track condition varies from class 1 to class 2, but the track condition does improve as it approaches the airport area on the northeast side of Tulsa. This section of track is designated as yard track and does not justify significant upgrading for freight train traffic. Because of its length, it is undesirable for passenger trains to be restricted to the present yard speed. Some rehabilitation would be necessary.

**3.2.1.3.6 Owasso to Bartlesville (38.0 miles):** A Santa Fe yard exists in Owasso at the northern limit of yard operating rules. Although the rail is 90lb OH 1928, the general track condition is class 3. The timber tie condition and ballast condition is good. About 5 miles south of Bartlesville, the 90 lb rail has been replaced with 131 continuously welded rail. This section of track is class 4.

**3.2.1.3.7 Bartlesville CBD (1.0 miles):** The track within Bartlesville is class 2. Some upgrading should be accomplished in this section. The former passenger station has been rehabilitated and would require no major reconstruction.

### 3.2.1.4 Other Factors

**3.2.1.4.1 Horizontal Alignment:** The track condition is only one factor which limits the operating speed. The horizontal alignment can be more restricted in certain locations. The detailed information contained in the railroad valuation sections and track charts provided the data to determine a maximum speed based on curvature and amount of track superelevation at respective railroads. The field inspection noted numerous curves on the segment between Oklahoma City and Sapulpa. If the track is used for freight and passenger service, there will be a limit placed upon the amount of superelevation applied to a curve to achieve a higher speed.

**3.2.1.4.2 Road Crossing Protection:** Numerous road crossings exist and most crossings have some protection such as flashers. If trains are operating at different speeds some modification to the crossing protection equipment will be necessary. An estimate will be requested from the respective railroads concerning this issue if the results of this feasibility study indicate further detailed study should be pursued.

**3.2.1.4.3 Freight Train Operations:** The present freight traffic between Oklahoma City and Tulsa is two trains per day. Each train consists of 80 to 100 cars. The traffic between Sapulpa and Tulsa may be influenced by the"WYE" connection and the classification yard at Tulsa.

The present traffic between Tulsa and Bartlesville is also two trains per day. Each train consists of 20 to 80 cars. Additional traffic exists because of local switching of industries in Bartlesville.

The level of freight train traffic does not appear to be significant enough to pose a problem if some additional traffic for passenger service is added to the routes. More data on the proposed level of passenger service and the method of controlling train traffic will be developed if the second phase of the study continues. A level of passenger service exists which the existing tracks and train control system cannot support.

#### 3.2.1.4.4 High Speed Operations:
A detailed analysis of high speed passenger operations cannot be conducted until the railroads send more definitive alignment information. The amount of curvature on the discussions with yard staff, is not conducive to high speed operation.

#### 3.2.1.5 Estimated Speed for Passenger Trains

Although a precise speed for passenger train operation cannot be determined at this time, an estimate of the average speeds achievable by segment is provided in order to guide potential level of service offered by each segment.

Oklahoma City CBD
4.5 miles, upgraded to class 3, 30 to 35 mph, estimated travel time = 9 minutes

BN Mainline to Sapulpa
99.5 miles, maintain to class 4, 50 to 60 mph, estimated travel time = 119 minutes.

Sapulpa to Tulsa
14.0 miles, maintain to class 3, 40 to 50 mph, estimated travel time = 21 minutes

Tulsa CBD
1.0 miles, upgrade to class 3, 20 to 25 mph, estimated travel time = 3 minutes

Tulsa to Owasso
11.0 miles, upgrade to class 3, 30 to 40 mph, estimated travel time = 22 minutes

Owasso to Bartlesville
38.0 miles, upgrade to class 4, 50 to 60 mph, estimated travel time = 45 minutes

Bartlesville CBD
1.0 miles, upgrade to class 3, 20 to 25 mph, estimated travel time = 3 minutes

The above travel times are rough approximations; they do serve as an indication of each segments potential. Based on these estimates the total travel time between Oklahoma City and Tulsa is about 2.5 hours. The travel time between Bartlesville and Tulsa is about 1 hour and 15 minutes.

### 3.2.2 POTENTIAL HIGHWAY ALIGNMENTS

#### 3.2.2.1 Oklahoma City to Tulsa

Two highway facilities provide direct transportation linkages between the urban areas of Tulsa and Oklahoma City. These include the Turner Turnpike (I-44) and SH 66. The former falls under the jurisdiction of the Oklahoma Turnpike Authority ( ) and the second falls under the jurisdiction of the Oklahoma Department of Transportation. The approximate road mileage distance between the two urban areas is 87 miles on I-44 and 97 miles on SH 66. Figures 3.2.2.1 and 3.2.2.2 show the existing traffic volumes on these two highways respectively.

Between 1977 and 1987 traffic on the Turner Turnpike increased at an average of 4 percent annually. Likewise, traffic on SH 66 has been growing at an average of 5 percent per year. Table 3.2.2.1 on the next page shows the physical design information for these roads.

#### 3.2.2.2 Tulsa to Bartlesville

The transportation corridor between Tulsa and Bartlesville is served primarily by US 75. The road mileage distance between the two urban areas is approximately 46 miles. Figure 3.2.2.3 shows the current traffic volumes; this traffic grew at an average of 9 percent per year during the 1977-1987 period. Table 3.2.2.1 also presents the physical design data on US 75.

## 3.3 RECOMMENDATIONS

With limited exceptions outlined in section 2.13, the two primary freight railroad lines between Bartlesville, Tulsa and Oklahoma City generally offer Class 3 and 4 rail service (from 60 to 80 mph for passenger trains). It is recommended that the potential alignments for the potential interurban commuter market focus on utilizing the existing railroad lines. With freight train service presently limited to two trains between Oklahoma City and Tulsa and two trains between Tulsa and Bartlesville, the level of freight train traffic does not appear to

**Table 3.2.2.1**

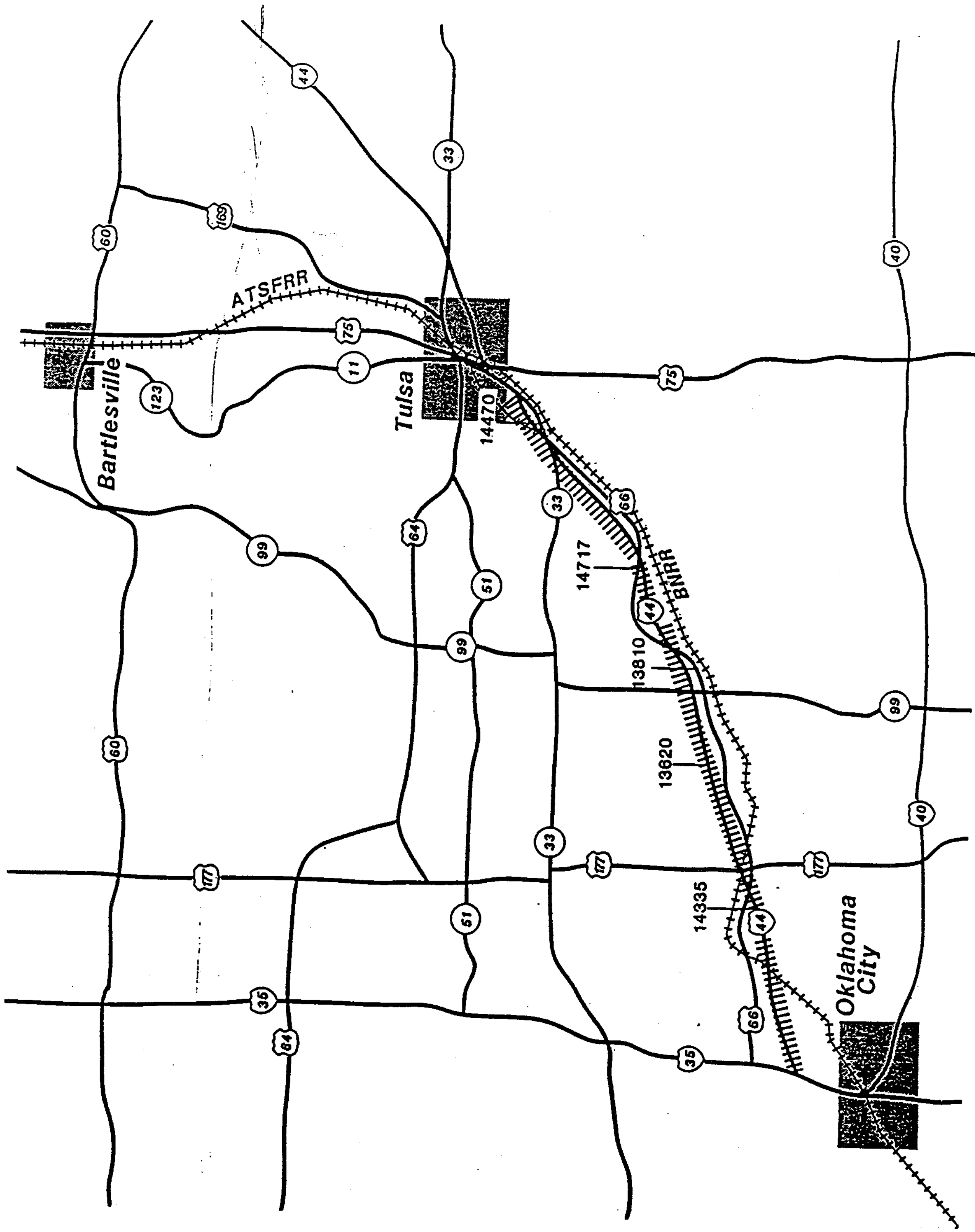
**Physical Characteristics of the Highways for Potential Use for Passenger Rail**

| | DRIVING LANES | SHOULDERS | MEDIAN | RIGHT-OF-WAY |
|---|---|---|---|---|
| SH 66 | 2-12' | 6' (sod) | none | 80' |
| US 75 | 4 divided | 10' and 4' | 40' | 300' |
| US 60 | 44' | - | - | 80' |
| I-444 | 4-12' | 12' and 1.5' | 12' | 200' |

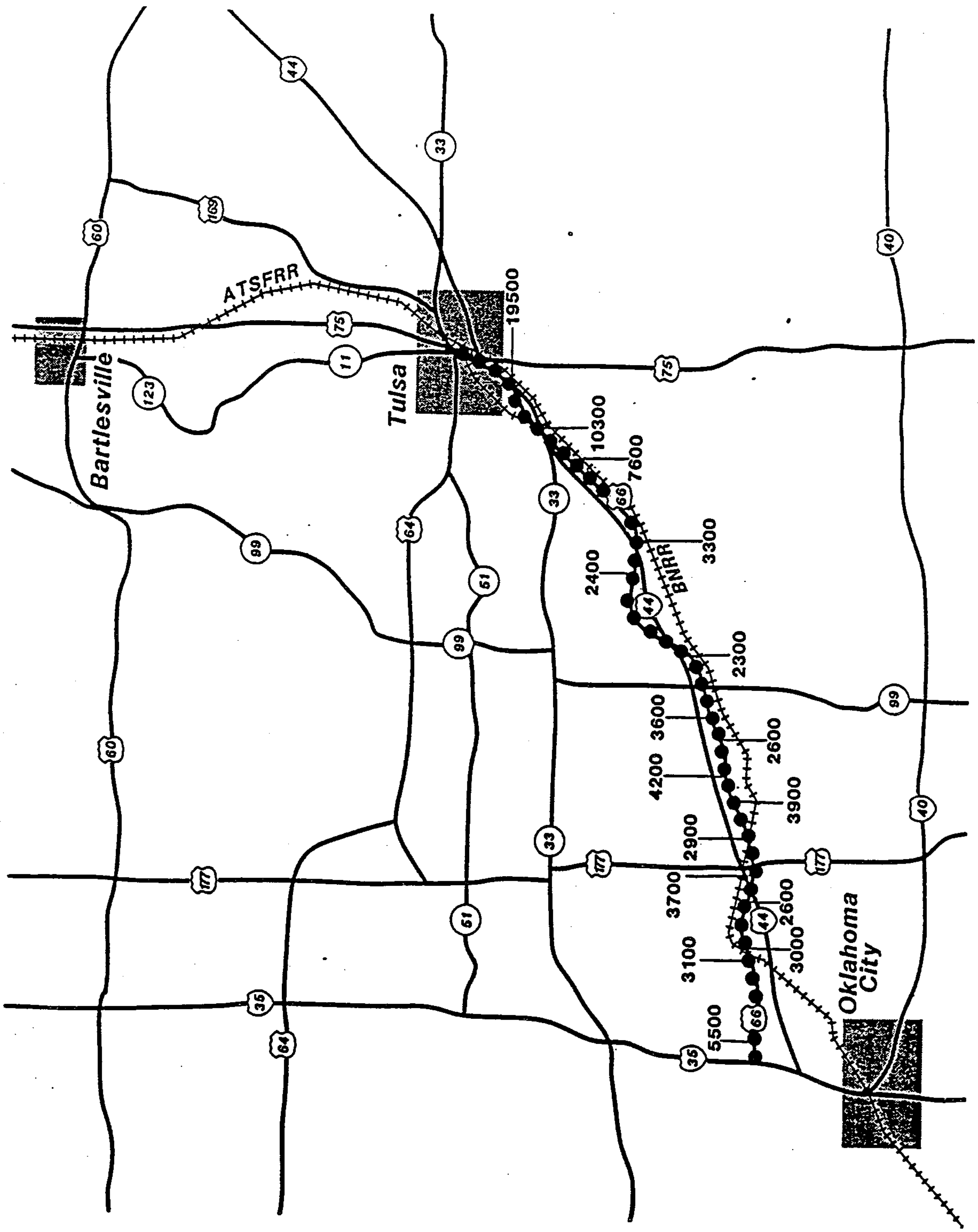
Source: Oklahoma Department of Transportation, 1989.
Oklahoma Turnpike Authority, 1989.

be significant enough to pose a problem if passenger service were to be added to these lines. Because of the curvature of the BN between Tulsa and Oklahoma City, it is unlikely that this freight rail line, as it presently exists, could support high speed passenger rail operations.

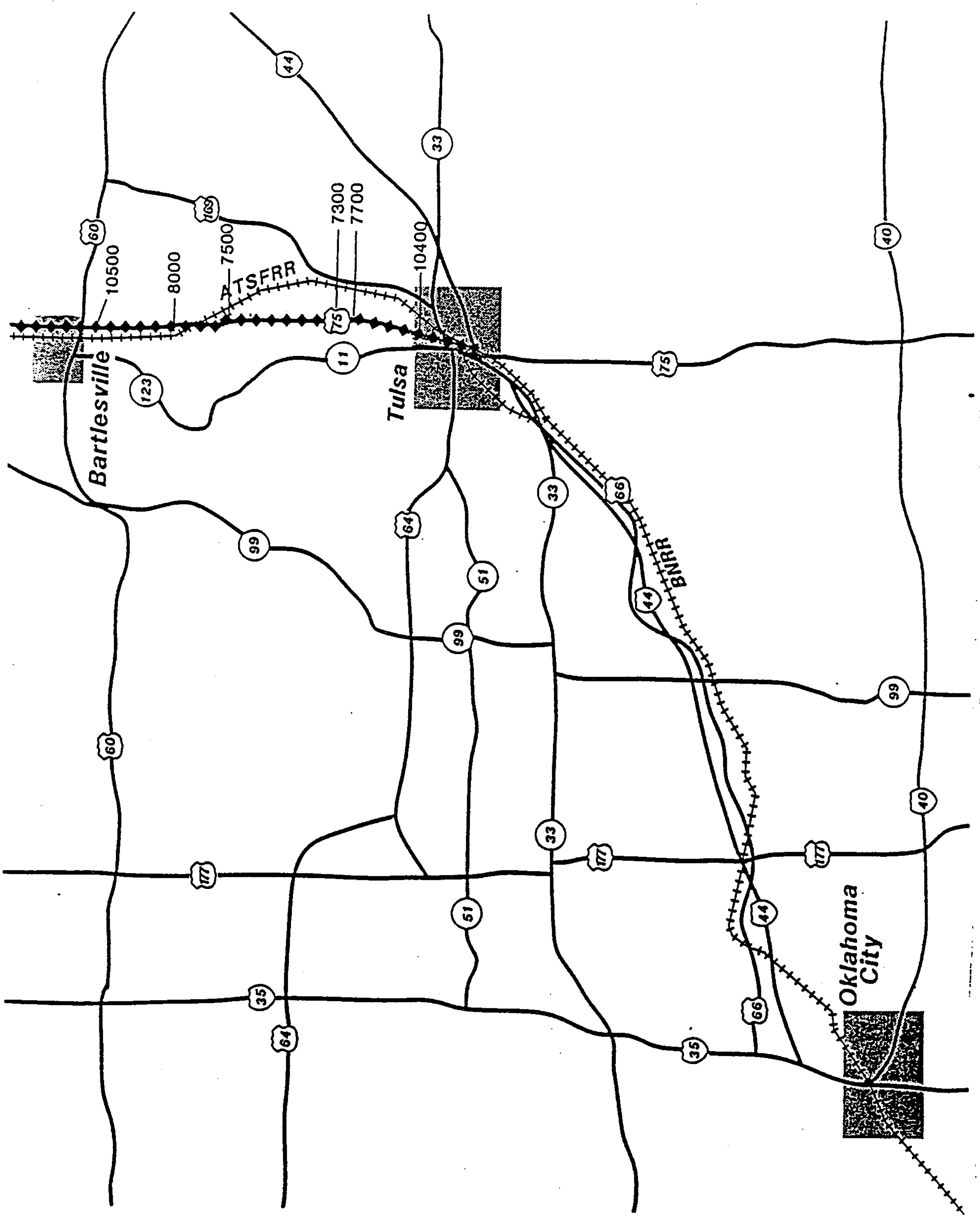
As traffic on the Turner Turnpike and US 75 grows, OTA and ODOT may consider providing limited priority treatment for high occupancy vehicles (carpools, vanpools, and/or buses). For example, a bypass lane could be provided at the toll booth plaza to provide a travel time advantage to high occupancy vehicles. Similarly, priority entrance both to US 75 at Bartlesville and to the exit at the Tulsa International Airport and/or the CBD could be provided. In other cities across the country, such priority treatment for high occupancy vehicles has been instrumental in the development of shared ride transportation. This not only provides travel time savings to shared ride passengers but also increases the person carrying capacity of existing highways.




| | | |
|---|---|---|
| Parsons Brinckerhoff<br>Parsons Brinckerhoff Quade & Douglas, Inc.<br>Engineers • Architects • Planners | *Oklahoma Fixed Guideway Transportation System Study* | Figure |
| | **PRESENT DAILY TRAFFIC VOLUMES** | **3.2.2.1** |




| Parsons Brinckerhoff<br>Parsons Brinckerhoff Quade & Douglas, Inc.<br>Engineers • Architects • Planners | *Oklahoma Fixed Guideway Transportation System Study* | Figure |
|---|---|---|
| | **DAILY TRAFFIC VOLUMES - 1987** | **3.2.2.2** |




| Parsons Brinckerhoff<br>Parsons Brinckerhoff<br>Quade & Douglas, Inc.<br>Engineers • Architects • Planners | *Oklahoma Fixed Guideway Transportation System Study* | Figure |
|---|---|---|
| | **PRESENT DAILY TRAFFIC VOLUMES** | **3.2.2.3** |

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# 4.0 INTRODUCTION TO TECHNOLOGY OPTIONS

## 4.1 PURPOSE

The purpose of this section is to present various transit systems and technologies currently available or in operation which may be considered for deployment in intercity transit applications. Additionally, this section also explains the technologies presently under development.

Section 4.2, Intercity Transit System Technologies, presents the range of technologies applicable to the intercity corridors identified between Oklahoma City and Tulsa and Tulsa and Bartlesville. Conventional rapid rail, high speed rail, and super-speed rail technologies are subclassified with a brief discussion of each. The subclassifications are presented for several purposes. First, they are intended to help differentiate the subtle differences between the technologies in any classification. Secondly, the subclassifications are intended to allow study outputs to be related directly to transit systems employed in other cities. Finally, the subclassifications help assure that equipment suppliers understand the conclusions reached in Oklahoma once the systems and technologies are made in the Oklahoma Interurban Commuter Study.

A major consideration in selecting an intercity transit technology is the compatibility of the specific technology with interurban transit services. For example, diesel fueled technologies are not directly compatible with light rail transit technologies. Thus, a transit transfer center would be a component of either the intercity or intracity systems to afford passengers a modal change from one transit system to the other.

Appendix A, Definitions and Glossary of Terms, provides a glossary for ease of identification of the various types of technologies discussed in the memorandum.

Appendix B summarizes the major classifications of transit technologies.

## 4.2 INTERCITY SYSTEM TECHNOLOGIES

This section discusses the range of intercity transit system technologies applicable to the Oklahoma City-Tulsa-Bartlesville Corridors. Four categories of technology exist:

**Conventional Technologies — up to 80 MPH**
- Urban/Suburban Bus
- High-Capacity Commuterway
- High-Capacity Busway
- Articulated Guided Bus
- Heavy Rail — Conventional and Automated
- Commuter Rail

**Rapid Rail Technologies — 80 to 125 MPH**
- LRC Train
- High-Speed Train (HST)
- T-200 Train
- Amtrak AEM-7
- Amtrak F 40 PH
- SPV 2000

**High-Speed Rail Technologies — 125 to 185 MPH**
- ET 403 Train
- ETR 401 Train
- Advanced Passenger Train (APT)
- Series 961 Bullet Train
- Tres Grand Vitesse PSE (TGV-PSE)
- Intercity Express (ICE)

**Super-Speed Technologies — Greater than 185 MPH**
- MAG-LEV TR06
- MAG-LEV MLU-001

### 4.2.1 Conventional Technologies

#### 4.2.1.1 Urban/Suburban Bus

Bus transit is the dominant mode of public transportation in the world. Conventional vehicles can accommodate from 12 to 66 seated passengers, as well as some standees. (An articulated bus can accommodate 40 to 66 seated passengers in addition to standees, for a total capacity of 100 to 125 passengers.) In most cases, buses operate in mixed flow with other traffic vehicles, but they can operate in an exclusive bus-only lane or exclusive busway. Bus technology can be conventional diesel, electric trolley, guided bus, or dual-propulsion (diesel and electric).

Two types of urban bus service exist. In the first type, buses travel on street transit routes and these routes comprise the entire transit network. In the second type of service, buses are not the exclusive transit mode, but instead serve as a supplementary feeder service to rail networks. In the latter form of service, buses can overlap somewhat with dial-a-ride in low-volume suburban routes. At the upper end of their application, buses can serve lines with 3,000 to 5,000 persons/hr.

Suburban bus service is provided by fast, comfortable buses on long routes with widely spaced stops. Compared to urban bus service, suburban buses provide more comfortable travel at higher speeds, but between fewer points and sometimes at a higher price. The reliability of suburban service depends on traffic conditions along the route.

#### 4.2.1.2 High-Capacity Commuterway

Commuterways, typically, are lanes restricted to buses and high-occupancy vehicles (carpools and vanpools) whose purpose is to provide express operations by segregating buses from normal traffic lanes. Buses travel on the roadway with few, or without any, stops to the Central Business District (CBD) or major activity centers, then use streets for distribution; routes have few coordinated transfers with other routes. Because this type of operation is generally provided only during peak travel periods, it usually represents commuter, rather than regular, transit. In addition, lanes can suffer from enforcement difficulties: if traffic is sufficiently dense to make an high occupancy vehicle (HOV) lane useful, it becomes tempting for non-HOV traffic to use the lane.

#### 4.2.1.3 High Capacity Busway

Busways are essentially bus-only lanes or roadways providing buses with an exclusive right-of-way (ROW) which is grade-separated from all other traffic. Busways do not require the introduction of new technology and they can be used by many bus routes serving a large area. In heavily traveled corridors, bus-only lanes speed up bus operations at a cost and implementation time approximately equal to that of major roadway construction. Depending upon headways, the passenger capacity of a busway ranges from 10,000 to 32,000 passengers per hour, versus 4,000 to 11,000 on arterial streets. The upper range of busway capacities is obtainable at lower speeds which permit closer headways.

#### 4.2.1.4 Articulated Guided Bus

Articulated guided bus systems are now operating in Adelaide, Australia and Essen, West Germany. An articulated guideway bus is a bus whose steerable axles can be automatically steered when the bus is traveling on a specially equipped roadway. If the bus is operating outside this special roadway, it must be manually steered by the driver, who is always on board the vehicle. Any common bus technology can be guided.

Guided bus roadways, like busways, provide a dedicated road system. Stations can be either on-line or off-line. To reduce ROW requirements and acquisition costs — as well as the cost of the roadway, which can be at-grade, elevated or in a tunnel — various guideway systems can be used to tightly control the trajectory of the vehicle. Several types of guidance schemes, both electronic and mechanical, have been developed.

#### 4.2.1.5 Commuter Rail

This mode, also known as regional rail, is generally operated by a public agency on a railroad right-of-way; the right-of-way is usually grade-separated, but uses signalized grade crossings. Traction power is either electric or diesel, but when electric traction power is used, each car (coach) may or may not have motors. If diesel power is used, the locomotive is capable of pushing or pulling 1 to 10 cars (push-pull operation). Seating capacity ranges from up to 128 seats in single-level cars to as many as 175 seats in double-decker cars. Double-decker cars are used in Chicago (by Illinois Central), in San Francisco (by Southern Pacific) and in Toronto and Paris. The service is characterized by longer trip lengths and longer spacings between stations. In addition, commuter rail has a high labor rate because a train conductor is always present.

Most regional rail networks comprise several lines radiating from the CBD, with most stations located at suburban town centers. Park-and-ride, kiss-and-ride, feeder buses and walking are used as access modes. Central city stations are often combined with intercity rail stations, but these stations are limited in number and provide little downtown coverage. Because commuter rail is predominantly suburb-to-CBD service, it often has heavily peaked and highly directional passenger volumes. Lines that offer regular headways of 20, 30, or 60 minutes throughout the day may also have reasonable evening and weekend service. Good regional rail systems can be found in many cities throughout the world, including Chicago, New York, Philadelphia, San Francisco, Boston, Toronto, Glasgow, London, Moscow, Sydney, Zurich, Paris, Rome, and Tokyo.

In recent years, with the spatial growth of cities, some existing regional rail systems have been reorganized into heavy rail systems by the construction of CBD tunnel connections between rail lines to improve CBD coverage. The Munich S. Bahn and Paris R.E.R. systems are good examples of this restructuring. New systems with this feature include the San Francisco BART and Philadelphia PATCO systems as well as New Jersey Transit and the Frankfurt S. Bahn. These modern commuter rail systems have provided metropolitan regions with an excellent regional transportation network heavily integrated with local transit.

### 4.2.2 Rapid Rail Technologies

#### 4.2.2.1 LRC Train

The LRC (light, rapid, comfortable) train is Canada's entry into the field of lightweight, high-speed rail passenger equipment. It utilizes an LRC diesel electric locomotive, separately or in multiple units for push-pull service, to haul tilt-body, lightweight, LRC coaches. The banking body coaches permit higher speeds around curves without exceeding passenger comfort limits and without requiring the reworking of existing track to provide the greater superelevation normally required for higher speed operations.

A typical LRC trainset consists of one locomotive and up to five coaches for single directional use, or two locomotives, one at each end, with up to 10 coaches between. Control trainlines are used for this application. The production locomotive uses a V-16 engine and the seating arrangement in coaches can be specified by the purchaser. Conventional Amtrak coaches capable of carrying 84 passengers, and snackbar coaches capable of carrying 60 passengers, can be included in the trainset.

Although the locomotive trucks do not provide a banking capability, the passenger car trucks allow carbody banking. The banking feature is achieved by separating the car trucks into two major parts: the truck proper and the body banking system. The banking mechanism consists of a tilting bolster supported by a swing linkage mounted on the truck frame. The linkage places the roll axis at the approximate point where the passenger's hip is located when seated — a point below the coach's center of gravity. This results in maximum passenger comfort because there is minimum translation of the passenger's body. Banking is achieved by two hydraulic cylinders mounted diagonally between the tilt booster and the truck frame. Because the banking system employs conventional hardware, it can be classified as a proven system and concept. In the event of a malfunction, the banking system assumes a neutral position (no banking) and locks, while the remainder of the suspension system remains unaffected.

#### 4.2.2.2 High-Speed Train (HST)

HST, or Intercity 125, is a high-speed "lightweight" train with diesel-electric locomotives hauling coaches in a pull and push unit-train. This fairly conventional locomotive-hauled unit train has been in revenue operation in the United Kingdom since 1976. The HST can achieve maximum operating speeds of 125 mph on non-electrified routes within the U.K., with an average operating speed of 90 mph.

Normal HST trainsets operate with two special lightweight diesel-electric locomotives, one at each end, with up to eight coaches in between. The multiple unit (MU) control resides in the lead cab for the push-pull operation. The locomotive also contains a small baggage compartment at the rear to increase luggage capacity. Trainsets consist of five coaches, one snackbar/coach and two locomotives, providing a 306-passenger capacity. The locomotives, with aerodynamically shaped cab ends at either end, provide bidirectional capacity.

#### 4.2.2.3 T-200 Train

The T-200 is a high-speed trainset now being developed by Swedish State Railways. It features radial-alignment axles and banking carbodies designed to operate at 124 mph over existing, upgraded rail lines. The active body-tilt control system has been designed to achieve 30 percent higher speeds without changing the curved alignments.

#### 4.2.2.4 Amtrak AEM-7

This locomotive, considered state-of-the-art in domestic electric passenger train propulsion, hauls Amfleet cars in the Northeast Corridor at speeds up to 120 mph.

#### 4.2.2.5 Amtrak F 40 PH

This locomotive is also considered state-of-the-art in domestic-electric passenger train propulsion. The unit is a converted freight locomotive of excessive weight necessary for high-speed operations.

#### 4.2.2.6 SPV 2000

The SPV 2000 is a self-propelled railway passenger car built by the Budd Company and now owned by Transit America, Inc. The diesel engine unit can be used for single-car operation or in trains of up to 10 cars traveling at a maximum speed of 120 mph. There are approximately 23 cars now in domestic passenger service in Connecticut and New York, but this vehicle is no longer being manufactured.

### 4.2.3 High-Speed Rail Technologies

#### 4.2.3.1 ET 403 Train

The experimental German Federal Railway ET 403 train is a streamlined, lightweight, high-speed, all-electric passenger train. It has been developed to operate at 125 mph on present and future electrified lines. Train features include high acceleration rates and motored axles to reduce the maximum axle loading.

#### 4.2.3.2 ETR 401 Train

The Italian ETR 401 train, now in limited revenue service, is a lightweight, high-speed, all-electric, multiple-unit train. It features high acceleration rates and tilt-body vehicles that maintain passenger comfort as the train travels around the sharply curved sections of the Italian roadway.

#### 4.2.3.3 Advanced Passenger Train (APT)

The British APT is a high-speed, lightweight, articulated, tilt-body train. It is presently being developed for use on Britain's electrified lines.

#### 4.2.3.4 Series 961 Bullet Train

The Series 961 is a six-car prototype for a high-speed, lightweight, electric multiple-unit trainset developed for the Japanese National Railways. Although somewhat lighter and more powerful than the older operating bullet trains, this trainset incorporates little advanced technology; it represents the refined use of conventional components. Trains operate on a dedicated track and consist of separable, individually powered passenger cars traveling in married pairs. Speed is currently restricted to 130 mph to comply with energy conservation and noise standards. Design speed is 160 mph with a passenger-carrying capacity of 352.

#### 4.2.3.5 Tres Grand Vitesse PSE (TGV-PSE)

The TGV-PSE, the French National Railways' high-speed, lightweight articulated train, consists of two separable electric locomotives, one at each end, and an articulated section of eight passenger coaches. Operating on rail lines dedicated exclusively to passenger rail, this train is currently operating at speeds of up to 186 mph and carrying as many as 386 passengers per train set.

#### 4.2.3.6 Intercity Express (ICE)

The German ICE is a high-speed, electrically powered, push-pull multiple-unit train consisting of two powered end cars and a variable number of non-powered center cars. It operates at a maximum speed of 185 mph. Now under development, this trainset is not yet in revenue service.

### 4.2.4 Super-Speed Technologies

Two principal forms of super-speed systems under consideration for commercial application exist: the German (attraction) Maglev TR 06, and the Japanese (repulsion) Maglev MLU-001 systems. Magnetically levitated (Maglev) systems generally consist of short trains — one to four passenger cars — operating on top of an elevated guideway. The trains are held aloft by the dynamic interaction between magnetic forces with electromagnetic forces providing propulsion. The forces for both suspension and propulsion are generated in the guideway beneath the train. While one form or another of Maglev has been under development for a number of years, neither approach is yet in commercial service. This makes it difficult to obtain reliable data regarding cost or the ability to operate under adverse weather conditions. Additional data still need to be developed and confirmed before Maglev technology can be evaluated on an equal footing with the high-speed and rapid rail technologies presently in operation.

#### 4.2.4.1 Maglev TR06

The West German Transrapid consortium continues to develop this system using an extensive test facility for prototype testing at speeds in excess of 248 mph. Attraction Maglev operates with conventional electro-magnets which are vehicle-borne and attracted upward to steel rail. These magnets operate at very small air gaps of approximately 1/3 inch, and require servo-controlled electric magnetic drive. As a result of the small gap, attraction Maglev is relatively intolerant of guideway irregularities and requires a secondary suspension system on the vehicle. An on board linear motor provides propulsion.

#### 4.2.4.2 Maglev MLU-001

These Maglevs are now under development by Japanese National Railways (JNR). The Canadian Institute for Guided Ground Transport has proposed their use in the Toronto-Montreal Corridor at speeds of 270 mph. Speeds in excess of 300 mph have been achieved by the JNR on a three-car test train.

Repulsion Maglevs operate with vehicle-borne superconducting magnets reacting against an aluminum guideway. Lift is obtained through the action of eddy currents as the vehicle travels down the track; there is no lift at zero speed. Repulsion Maglev, operating with large air gaps of up to one foot, can tolerate guideway irregularities. Power collection is difficult and involves the use of a linear motor whose windings are continuously spaced along the active guideway. At very high speeds, magnetic drag becomes a limiting factor, requiring the expenditure of considerable energy to overcome this drag force and aerodynamic drag.

Appendix B provides a summary of characteristics of these technologies.

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# 5.0 INTRODUCTION TO SYSTEM CAPITAL AND OPERATING COSTS

## 5.1 PURPOSE

Costs for providing three different levels of commuter/intercity passenger rail service between Oklahoma City, Tulsa, and Bartlesville, Oklahoma were developed to provide policy makers with information on intercity passenger rail service. This approach provides some insight into the increase of expenditure required to increase train speed and/or ride quality. For the purposes of this section the following descriptions and definitions apply:

**Standard Commuter Rail Service:** Commuter rail service coexisting with freight railroad operations without special treatment. An economical approach to construction and rehabilitation by retaining most of the geometrics and ride quality characteristics of the existing railroad alignments.

**Enhanced Standard Commuter Rail Service:** Commuter Rail service coexisting with freight railroad operations but with revisions to the geometrics of the alignment (primarily increased track superelevation) which favors the operation of the commuter rail service. In addition to increased speed, the quality of the ride (in terms of passenger comfort) will be noticeably enhanced because of the improved track conditions.

**High Speed Commuter Rail Service:** Commuter Rail service coexisting with freight railroad operations but with revisions to the geometrics of the alignment (primarily increased track superelevation) which favors the operation of the commuter rail service. The commuter rail service requires special equipment enabling higher speeds for the same geometric condition, compared to speeds achievable with standard commuter rail equipment. In addition to increased speed, the quality of the ride (in terms of passenger comfort) will be noticeably enhanced because of the improved track conditions.

## 5.2 METHODOLOGY

Conceptual cost estimates have been developed for three levels of passenger rail service. These are Standard, Enhanced quality, and Higher speed commuter rail service. These have been based on analysis of features identified from USGS topographic maps and field surveys of the existing railroad tracks. All costs are in 1989 dollars. The cost estimates are conceptual in nature, based on rudimentary analysis. They are appropriate for comparisons if order of magnitude costs relative to the three alternatives. The accuracy of the estimates, however, are not reliable for budgetary purposes.

The capital cost estimates for the three levels of passenger rail service are:

- Standard Commuter Rail Service - $30.8 Million
- Enhanced Commuter Rail Service - $58.3 Million
- High Speed Commuter Rail Service - $92.6 Million

These costs do exclude right-of-way or track rights from the involved railroads.

The costs of providing rail service can be broken into two areas. The first is construction and rehabilitation costs, and the second is equipment costs. A discussion of each, component is presently separately.

## 5.3 CAPITAL COST ESTIMATES

### 5.3.1 Construction and Rehabilitation Costs - Summary

The construction and rehabilitation costs for the three levels of rail service are:

- Standard Commuter Rail Service - $15.8 Million
- Enhanced Commuter Rail Service - $43.3 Million
- High Speed Commuter Rail Service - $67.6 Million

#### 5.3.1.1 Standard Commuter Rail Service

Under this alternative, no attempts to increase track superelevation has been assumed which avoid all but minimum capital costs. The assumption that the speed and ride quality provided by the existing track conditions was, in most cases, acceptable has been made. The only track segments which include rehabilitation are:

- The segment of ODOT owned trackage west of Oklahoma City;
- The 11 miles of AT&SF yard track north of Tulsa; and,
- The tracks leading to downtown Bartlesville.

It was also assumed some upgrading or modifying the traffic protection at the highway crossings would be necessary along the alignment. Cost for an Oklahoma City station, a station between Oklahoma City and Tulsa, a Tulsa Station, and a Bartlesville station are included in the estimate. The estimate also includes a new track connection with the BNRR and a separate station track in Tulsa. Appendix C shows these detailed cost estimates.

#### 5.3.1.2 Enhanced Commuter Rail Service

Under this alternative, it was assumed that to increase speed and ride quality considering characteristics of conventional diesel/electric commuter rail equipment. It assumes that the ODOT track and the AT&SF yard track north of Tulsa were completely reconstructed. Resurfacing the BNRR track and increasing superelevation on the curves were also assumed under this cost estimate. It was also assumed that some upgrading and modifying the traffic protection at the highway crossings would be necessary along the alignment. Costs for an Oklahoma City station, a station between Oklahoma City and Tulsa, a Tulsa Station, and a Bartlesville station are included in the estimate. The estimate also includes a new track connection with the BNRR and a separate station track in Tulsa. In addition, this cost estimate assures that a passing track was added between Oklahoma City and Tulsa in order to run trains in both directions during the peak periods. Appendix C shows these detailed cost estimates.

#### 5.3.1.3 High Speed Commuter Rail Service

This alternative basically assures the same conditions as the service alternative; however, it includes two additional cost categories. First, it assumes that all sections of bolted rail were replaced with second hand continuously welded rail. The second cost category considers the higher dynamic loads resulting from higher speeds. Therefore, a budget for bridge and culverts modification was included for this alternative. If this alternative is pursued further, the rating for each bridge and structure should be reviewed in order to evaluate the full cost impacts of high speed commuter rail operations. Appendix C presents these detailed cost estimates.

### 5.3.2 Equipment Costs

The equipment cost for the three levels of rail service are:

Standard Commuter Rail Service - $15.0 Million
Enhanced Commuter Rail Service - $15.0 Million
High Speed Commuter Rail Service - $25.0 Million

#### 5.3.2.1 Standard Commuter Rail Service

The equipment for providing a basic commuter rail service would consist of a diesel/electric locomotive with one passenger car. There would be one set of this equipment for morning (AM) run from Oklahoma City to Tulsa, one set for the AM run from Tulsa to Oklahoma City, and one set for the AM run from Bartlesville to Tulsa. This equipment would provide sufficient capacity and level of service for the proposed routes. A spare coach car is included in the estimate. Although desirable, a spare locomotive would be unwarranted for this type operation.

Each basic set of equipment costs about $3 million. The locomotive will costs about $2 million and the coach car will cost about $1 million. There are refurbished locomotives and coach cars available and the equipment cost could be dropped 30% to 40% if the that approach is selected. There is also the possibility of leasing equipment rather than procurement. There are several options where lease and/or lease-maintenance agreements can be developed. There is some cost associated with maintaining the equipment. A daily servicing area for fueling, sanding, and light maintenance is needed. In addition an interior and exterior car wash area would be needed. An allowance of $5 million for the maintenance facility is included in the equipment costs. It would provide daily servicing and cleaning.

#### 5.3.2.2 Enhanced Commuter Rail Service

The equipment costs and associated maintenance facilities are assured to be the same for this alternative as for the standard commuter rail service.

#### 5.3.2.3 High Speed Commuter Rail Service

The usual approach for high speed service is equipment similar to the Japanese bullet trains or the French TGV service. The equipment is designed for speeds of operation over 100 MPH and the alignment permits such speed. This system requires new dedicated right-of-way with straight horizontal and vertical alignment compared to existing rail alignments. Although the Standard and Enhanced rail service includes both electric and diesel propulsion, the High Speed rail uses solely electric propulsion and overhead catenary lines. This approach, however, will not work with the alignment conditions which exist between Oklahoma City and Tulsa. The technology which permits higher speeds on alignments with extensive curvature is called tilting train technology. This technology is being used in some areas of Europe in order to reduce travel times on alignments similar to the Oklahoma City/Tulsa segment. In order to increase speed on a curve, without the passenger experiencing undesirable centripetal forces, the car body tilts into the curve cancelling centripetal effects as perceived by the passenger. While the concept is simple, the execution has been limited. The applications have been limited to high passenger density routes with electrified equipment and complicated wayside to train indicators to control the tilting mechanism.

There is not equipment on the market which currently meets the existing conditions of this route between Tulsa and Oklahoma City. If it existed, it would be diesel/electric powered, have a tilting body and operate along a corridor without wayside to train communications. Technologically, there is no reason why such equipment could not be developed, but the premium cost would be about double the standard equipment. Based on this assumption, the equipment cost per set would be around $6 million. The maintenance facility would still cost about $5 million.

### 5.4 TRAVEL TIMES SAVINGS

The potential travel times for the three levels of rail passenger service are:

OKC TO TULSA

| | Hours | Minutes |
|---|---|---|
| Standard Commuter Rail Service | 2 | 30 |
| Enhanced Commuter Rail Service | 1 | 05 |
| High Speed Commuter Rail Service | 1 | 49 |

TULSA TO BARTLESVILLE

| | Hours | Minutes |
|---|---|---|
| Standard Commuter Rail Service | 1 | 11 |
| Enhanced Commuter Rail Service | 0 | 58 |
| High Speed Commuter Rail Service | 0 | 49 |

Table 5.4.1 details travel speeds by segment and type of service. Table 5.4.2 presents the travel time estimates.

## Table 5.4.1

**Estimate of Travel Speeds for Three Levels of Rail Service**

| Segment | Miles | Standard Service | High Quality | High Speed |
|---|---|---|---|---|
| Oklahoma City CBD | 4.5 | 30.00 | 35.00 | 40.00 |
| BN Mainlane | 99.50 | 50.00 | 60.00 | 70.00 |
| Sapulpa to Tulsa | 14.00 | 40.00 | 50.00 | 55.00 |
| Tulsa CBD | 1.00 | 30.00 | 30.00 | 30.00 |
| Tulsa to Owasso | 11.00 | 30.00 | 40.00 | 50.00 |
| Owasso to Bartlesville | 38.00 | 50.00 | 60.00 | 70.00 |
| Bartlesville CBD | 1.00 | 30.00 | 30.00 | 30.00 |

Source: Parsons Brinckerhoff, May 1989

## Table 5.4.2

**Travel Time (Minutes)**

| Segment | Miles | Standard Service | High Quality | High Speed |
|---|---|---|---|---|
| Oklahoma City CBD | 4.50 | 9.00 | 7.71 | 6.75 |
| BN Mainlane | 99.50 | 119.40 | 99.50 | 85.29 |
| Sapulpa to Tulsa | 14.00 | 21.00 | 16.80 | 15.27 |
| Tulsa CBD | 1.00 | 2.00 | 2.00 | 2.00 |
| Tulsa to Owasso | 11.00 | 22.00 | 16.50 | 13.20 |
| Owasso to Bartlesville | 38.00 | 45.60 | 38.00 | 32.57 |
| Bartlesville CBD | 1.00 | 2.00 | 2.00 | 2.00 |
| TOTALS | 169.00 | 221.00 | 182.51 | 157.08 |
| Travel Time in Hours | | 3.68 | 3.04 | 2.62 |

Source: Parsons Brinckerhoff, May 1989

## 5.5 CAPITAL COSTS

### 5.5.1 SUMMARY

The capital costs for providing rail service along this corridor would range from $30.8 to $92.6 million. It is doubtful that an expenditure less than $30.8 million would provide an acceptable level of rail service. A $92.6 million expenditure would reduce the travel times as much as is physically possible given the circuitous nature of the existing railroad alignment. If the travel time is still not desirable then the only recourse would be a major realignment project with per mile cost of ranging from $3.0 to $5.0 million.

## 5.6 OPERATING AND MAINTENANCE COSTS

In order to estimate the annual costs for operating and maintaining a commuter rail system, some rough operating plan must be assumed. Attached is a operating plan which provides a minimal level of service and the capacity is well beyond the forecasted patronage.

The operating plan assumes a train based in Oklahoma City, Tulsa, and Bartlesville. The service would consist of a shuttle between the cities with a small layover after each trip. The cost per year for the entire system is estimated at $3.23 Million. The cost of the Oklahoma City to Tulsa service is approximately $2.08 million and the Tulsa to Bartlesville service would be $1.16 million. It should be noted that the Tulsa to Bartlesville service is twice as frequent as the Oklahoma to Tulsa service. This is due to the shorter distance and quicker travel times between Tulsa and Bartlesville. Two major assumptions were made that greatly effect the annual costs. The first is that trackage rights would cost about $.50 per vehicle mile. The cost of both of these items can vary widely and further investigation should be conducted into aforementioned costs if this concept of rail service is pursued further. Table 5.6.1 shows the initial operating schedules assumed for estimating operating costs. Appendix D provides the cost model components for estimating operating and maintenance costs.

## Table 5.6.1

## Initial Operating Schedules

*Typical Oklahoma City to Tulsa (and Vice Versa):*

| | | | |
|---|---|---|---|
| Tulsa | (Depart Time) | 7:00 | |
| | Run Time | | 2.50 hours |
| | Layover | | 0.50 hours |
| Oklahoma City | | 10:00 | |
| | Run Time | | 2.50 hours |
| | Layover | | 0.50 hours |
| Tulsa | | 1:00 | |
| | Run Time | | 2.50 hours |
| | Layover | | 0.50 hours |
| Oklahoma City | | 4:00 | |
| | Run Time | | 2.50 hours |
| | Layup | | 0.50 hours |
| Storage Yard | | 7:00 | |
| | | | 12.50 hours |

*Typical Bartlesville to Tulsa:*

| | | | |
|---|---|---|---|
| Storage Yard | | 5:00 | |
| | Make Ready | | 0.50 hours |
| Bartlesville | | 5:30 | |
| | Run Time | | 1.17 hours |
| | Layover | | 0.33 hours |
| Tulsa | | 7:00 | |
| | Run Time | | 1.17 hours |
| | Layover | | 0.33 hours |
| Bartlesville | | 8:30 | |
| | Run Time | | 1.17 hours |
| | Layover | | 0.33 hours |
| Tulsa | | 10:00 | |
| | Run Time | | 1.17 hours |
| | Layover | | 0.33 hours |
| Bartlesville | | 11:30 | |
| | Run Time | | 1.17 hours |
| | Layover | | 0.33 hours |
| Tulsa | | 1:00 | |
| | Run Time | | 1.17 hours |
| | Layover | | 0.33 hours |
| Bartlesville | | 2:30 | |
| | Run Time | | 1.17 hours |
| | Layover | | 0.33 hours |
| Tulsa | | 4:00 | |
| | Run Time | | 1.17 hours |
| | Layover | | 0.33 hours |
| Storage Yard | | 5:30 | |
| | | | 12.50 hours |

# 6.0 INTRODUCTION TO ENVIRONMENTAL ISSUES

## 6.1 PURPOSE

The purpose of this section is to inventory and document the environmental factors (natural, social, and human) in the potential fixed guideway transit corridors identified between Oklahoma City and Tulsa and between Tulsa and Bartlesville.

This section represents a narrative description of twelve environmental factors and their presence or absence in each corridor. The twelve elements that were inventoried and are included in this section follow with a brief description of each factor considered:

- Archaeological Sites
- Floodplains
- Hazardous Waste Sites
- Indian Lands
- National Register Historic Sites
- Noise Sensitive Land Uses
- Parks, Recreation Lands and Wildlife Refuges
- Prime and Unique Farmlands
- Slopes over 9%
- Superfund Sites
- Threatened and Endangered Species
- Wetlands

Archaeological sites are areas where the material remains (i.e., fossils, relics, artifacts, and monuments) of past human life and activities have been discovered. There are a number of existing archaeological sites in the corridors, but these rural lands are largely unsurveyed. Therefore, there remains the potential for the discovery of significant archaeological sites anywhere in the corridor. The highest potential for discovery of unknown archaeological sites are in the floodplain terrace areas of the rivers and creeks that drain the area. These sites are regulated at the national level by the Advisory Council on Historic Preservation and are administered at the state level by the State Historic Preservation Officer (SHPO).

Floodplains are areas having a statistical probability of being submerged by floodwaters at least once every one hundred years. These floodways are regulated nationally by the Federal Emergency Management Agency. The Oklahoma Water Resources Board regulates water quality in the state, but does not have jurisdiction over floodplains.

Hazardous waste sites are investigated by the Environmental Protection Agency for inclusion in the Superfund Program. These sites are regulated nationally by the Resource Conservation and Recovery Act and the Comprehensive Environmental Response Compensation and Liability Act. The state liaisons are the Oklahoma State Department of Health and the Oklahoma Water Resource Board.

Indian lands are lands under the jurisdiction or control of an Indian tribe. These lands are restricted from being developed and are exempt from taxation or actions of eminent domain by any city, county, state or federal governmental body. The Muskogee Office of the Bureau of Indian Affairs and the Shawnee Agency administer and record Indian lands within the study corridors.

National Register of Historic Sites are those districts, sites, buildings, structures, or objects included in the National Register of Historic Places. The Advisory Council on Historic Preservation regulates these sites nationally. The SHPO administers this program in the state.

The identification of noise sensitive land uses consists of establishing the location of churches, schools, libraries, hospitals, residential lands or other land uses particularly sensitive to noise. In future phases of project development, existing noise levels would be measured and forecast levels developed using computer models, and noise sensitive residential areas would be identified. Mitigation measures may be considered in further studies.

The identification of parks, recreation lands, and wildlife refuges includes some miscellaneous public open spaces such as golf courses and some of the larger cemeteries where they were included in the maps of the area. Parks, recreation lands, and wildlife refuges are protected by the U.S. Departments of Interior, Agriculture, and Housing and Urban Development, plus the Oklahoma Department of Tourism and the State Liaison Office on Recreation Lands. Encroachment of a project on these types of lands may require more detailed analyses and further documentation.

The analysis of prime and unique farmlands includes the identification of soil types that have been determined by the Soil Conservation Service to be prime farmlands. There are no soils considered unique farmlands in the study area. Identification of prime agricultural soils have been made on two levels: Those areas where soils are all prime farmland and those areas where prime agricultural soil is mixed with soil that is not considered prime. The U.S. Department of Agriculture administers this program nationally. There are no state agencies with jurisdiction over the farmlands.

The identification of slopes over nine (9) percent is important because certain transit technologies are not capable of operating at slopes exceeding 9% or require alternative routing or special construction techniques.

Superfund sites are toxic waste areas designated by the Environmental Protection Agency to be permanently cleaned up using advanced treatment technology. These sites are covered by the Comprehensive Environmental Response, Compensation, and Liability Act. The state liaisons are the Oklahoma Water Resources Board and the Oklahoma State Department of Health. There are no known Superfund sites in the Bartlesville/Tulsa Interurban Corridor or the Tulsa/Oklahoma City Interurban Corridor.

The threatened or endangered species that may be seen in Oklahoma along the Interurban Corridors are dominated by a number of species of migrating birds. There is one species of resident bird whose historic range once included much of the land to the west of Tulsa, but now only occurs in four western counties of the State. This is the Black-Capped Vireo (*Vireo atricapillus*). This bird lives in early successional brushy areas and has not adapted well to changes in the land due to urbanization and farming. The migratory birds are dominated by the Interior Least Tern (*Sterna antillarum*), the Piping Plover (*Charadrius melodus*), and Bald Eagle (*Haliaeetus leucocephaus*) which winters in Creek, Tulsa and many of the surrounding Counties in eastern Oklahoma. There also may be rare sitings of the American Peregrine Falcon (*Falco peregrinus anatum*), the Arctic Peregrine Falcon (*Falco peregrinus tundrius*), and the Whooping Crane (*Grus americana*) all of which are known to migrate through this section of Oklahoma. There are no known wintering or nesting grounds for any of these species in the Bartlesville/Tulsa Interurban Corridor or the Tulsa/Oklahoma City Interurban Corridor. The highest probability of sighting one of the migrating birds would be along the rivers, lakes and wetlands in the area. The protection of these species is the responsibility of the U.S. Fish and Wildlife Service at the national level and both the Oklahoma Department of Agriculture and the Department of Wildlife Conservation at the state level.

Wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The documentation of wetland ecosystems includes two general types of wetland ecosystems. These two types are palustrine wetlands which include marshes, bogs, swamps, and other shallow water wetland types with varied and often emergent vegetation; and lacustrine wetlands which among other parameters, are lake ecosystems having a water depth of over six and six tenths (6.6) feet. The U.S. Army Corps of Engineers is responsible for regulating the nation's wetlands.

This section is intended to provide an inventory of environmental factors for each potential transit corridor. The descriptions are of a general nature and reflect the reporting of secondary information sources only. No on-site inventory has been performed. The information presented in this memorandum will provide information required for use in evaluating the potential travel corridors. If any of these corridors are brought forth into a second study phase, additional environmental inventories and descriptions will be made.

Section 6.2 presents a brief description of only those environmental factors found within each corridor. The location of these known environmental factors are also displayed on maps. The technical memorandum closes with a tabular comparison of the environmental factors within each potential transit corridor.

Appendix E shows the references used to compile this environmental inventory.

## 6.2 BARTLESVILLE/TULSA INTER-URBAN CORRIDOR TULSA/OKLAHOMA CITY INTERURBAN CORRIDOR

### 6.2.1 Archaeological Sites

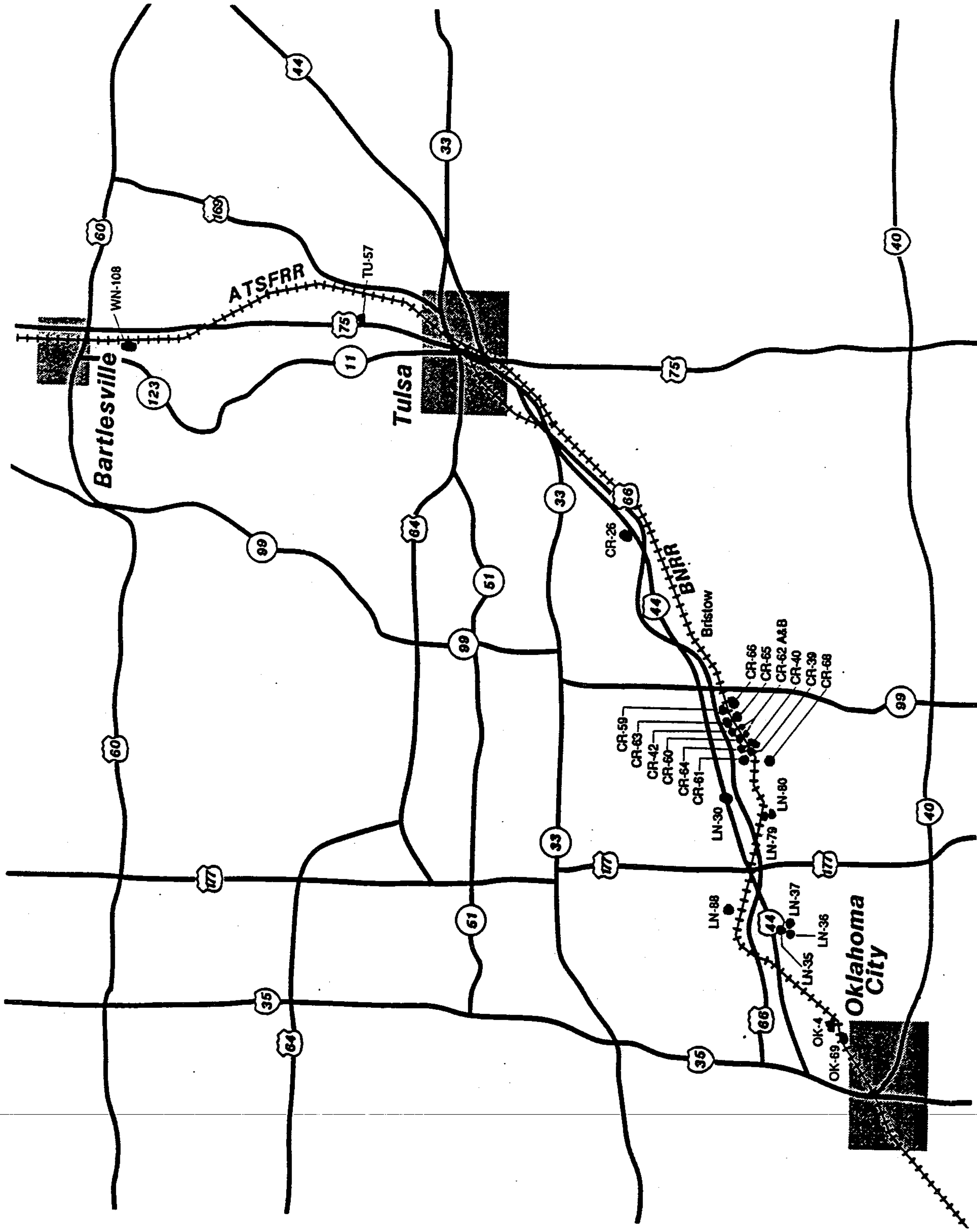
In the Bartlesville/Tulsa Interurban Corridor there are two (2) known archaeological sites. As shown in Figure 6.2.1, one (1) of the sites is on the west side of the Atchison, Topeka and Santa Fe Railroad approximately five miles south of downtown Bartlesville. The second site is to the east of US Highway 75 three and one-half miles south of State Highway 20. These sites are listed in Table 6.2.1 on the next page.

There are twenty two (22) known archaeological sites in the Tulsa/Oklahoma City Interurban Corridor as shown in Table 6.2.1 and on Figure 6.2.1. These sites are distributed among three counties; Creek County has thirteen (13) sites, Lincoln County has seven (7) sites, and Oklahoma County has two (2) sites. These sites are generally distributed throughout the corridor. One group of nine sites in Creek County were discovered in association with a study of State Highway 66 just west of Bristow.

### 6.2.2 Floodplains

The one hundred year floodplains of the Bartlesville/Tulsa Interurban Corridor are interspersed throughout the corridor and shown on Figure 6.2.2. They occur primarily along the Caney River in Bartlesville, to the south of Bartlesville, along Horsepan Creek north of Collinsville, and along a tributary of Bird Creek in Owasso.

The floodplains in the Tulsa/Oklahoma City Interurban Corridor follow the creekbeds of the rivers and streams that drain the land the corridor passes through. These are also mapped on Figure 6.5.2. The floodplains have the greatest contact with the corridor when either I-44 or the Burlington Northern Railroad is parallel to one of the rivers or streams. Conversely, the floodplains have the least contact with the corridor where the corridor crosses the river or stream at or near a perpendicular angle.

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|---|---|---|
| | **ARCHAEOLOGICAL SITES** | **6.2.1** |

## Table 6.2.1

## Archaeological Sites

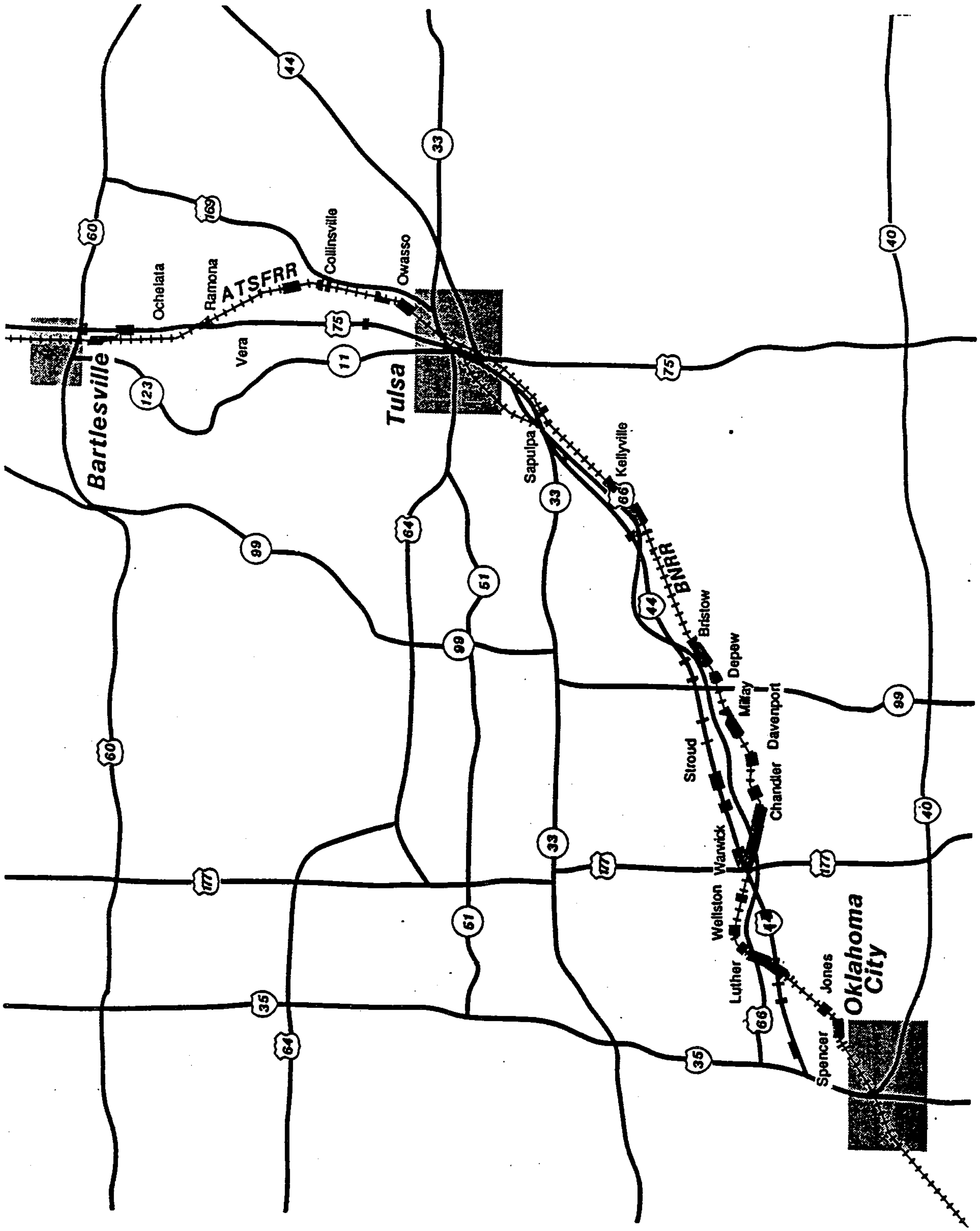
**Bartlesville/Tulsa Interurban Corridor**

| No. | Description |
|---|---|
| TU 57 | Historic homestead, unknown vintage. |
| WN 108 | Historic log cabin, 1920's. |

**Tulsa/Oklahoma City Interurban Corridor**

| No. | Description |
|---|---|
| CR-26 | Prehistoric (undetermined age), camp, inventory. |
| CR-39 | Prehistoric (undetermined age), quarry/ workshop, inventory. |
| CR-40 | Prehistoric (undetermined age), camp, inventory. |
| CR-42 | Prehistoric (undetermined age), quarry/ workshop, not significant. |
| CR-59 | Prehistoric (undetermined age), quarry/ workshop, inventory. |
| CR-60 | Prehistoric (undetermined age), camp, inventory. |
| CR-61 | Prehistoric (undetermined age), quarry/ workshop, inventory. |
| CR-62 | Prehistoric (archaic and/or woodland), camp, inventory. |
| CR-63 | Prehistoric (undetermined age), camp, not significant. |
| CR-64 | Prehistoric (undetermined age), camp, inventory. |
| CR-65 | Prehistoric (possibly archaic and/or woodland), camp, inventory. |
| CR-66 | Prehistoric (undetermined age), camp, inventory. |
| CR-68 | Prehistoric (undetermined age), quarry/ workshop, not significant. |
| LN-30 | Historic homestead, Anglo, inventory. |
| LN-35 | Historic homestead (1930-1950), Anglo, inventory. |
| LN-36 | Historic homestead, Anglo, inventory. |
| LN-37 | Historic homestead, Anglo, inventory. |
| LN-79 | Prehistoric (undetermined age), camp, not significant. |
| LN-86 | Prehistoric (undetermined age), camp, not significant. |
| LN-88 | Prehistoric (undetermined age), camp, inventory. |
| OK-4 | Prehistoric (A.D. 1300) Cemetery, Spiro phase Caddo, National Register Site. |
| OK-69 | Prehistoric (undetermined age), quarry/ workshop, inventory. |

Source: State Archaeologist, Oklahoma Archaeological Survey, 1988.
Historic: A.D. 1800 to the present.




| | | |
|---|---|---|
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| | **FLOODPLAINS** | **6.2.2** |

### 6.2.3 Hazardous Waste Sites

There are no known hazardous waste sites in the Bartlesville/Tulsa Interurban Corridor.

There are three (3) hazardous waste sites in the Tulsa/Oklahoma City Interurban Corridor which have been studied by the Environmental Protection Agency (EPA) for inclusion in the Superfund program. These sites are listed in Table 6.2.3.1 and mapped on Figure 6.2.3.1. One (1) of the sites is currently under study for inclusion in the Superfund program, it is a refinery located on the northeast side of Sapulpa. Its legal description designates its location to be all of Section 25. It is possible that further investigation will place this refinery on a smaller site within Section 25. The remaining two sites are near Oklahoma City and have been determined by the EPA to require no further action. One of the sites is on the west side of I-35/I-44 approximately one mile north of the I-35/I-44 split northeast of Oklahoma City. The other site is along the north side of the Burlington Northern Railroad less than one mile east of Jones.

### 6.2.4 Indian Lands

There are thirteen (13) parcels of Indian lands in the Bartlesville/Tulsa Interurban Corridor. As shown on Figure 6.2.4.1, they are spread evenly throughout the corridor along both US Highway 75 and the Atchison, Topeka and Santa Fe Railroad.

There are eleven (11) parcels of Indian lands in the Tulsa/Oklahoma City Interurban Corridor shown in Figure 6.2.4.1. Nine (9) of these sites are east of Stroud, which is roughly the midpoint of the corridor. The remaining two (2) sites are west of Stroud.

### 6.2.5 National Register Historic Sites

In the Bartlesville/Tulsa Interurban Corridor, there is one (1) building that is included in the *National Register of Historic Places*. This site, listed in Table 6.2.5.1 and shown on Figure 6.2.5.1, is located along the Atchison, Topeka and Santa Fe Railroad on the north side of Bartlesville, north of US Highway 60 and south of the Caney River.

There are eight (8) sites on the National Register of Historic Places in the Tulsa/Oklahoma City Interurban Corridor as shown in Table 6.2.5.1 and on Figure 6.2.5.1. Of these sites, three (3) are located in Stroud, and the remaining five (5) sites are associated with separate cities.

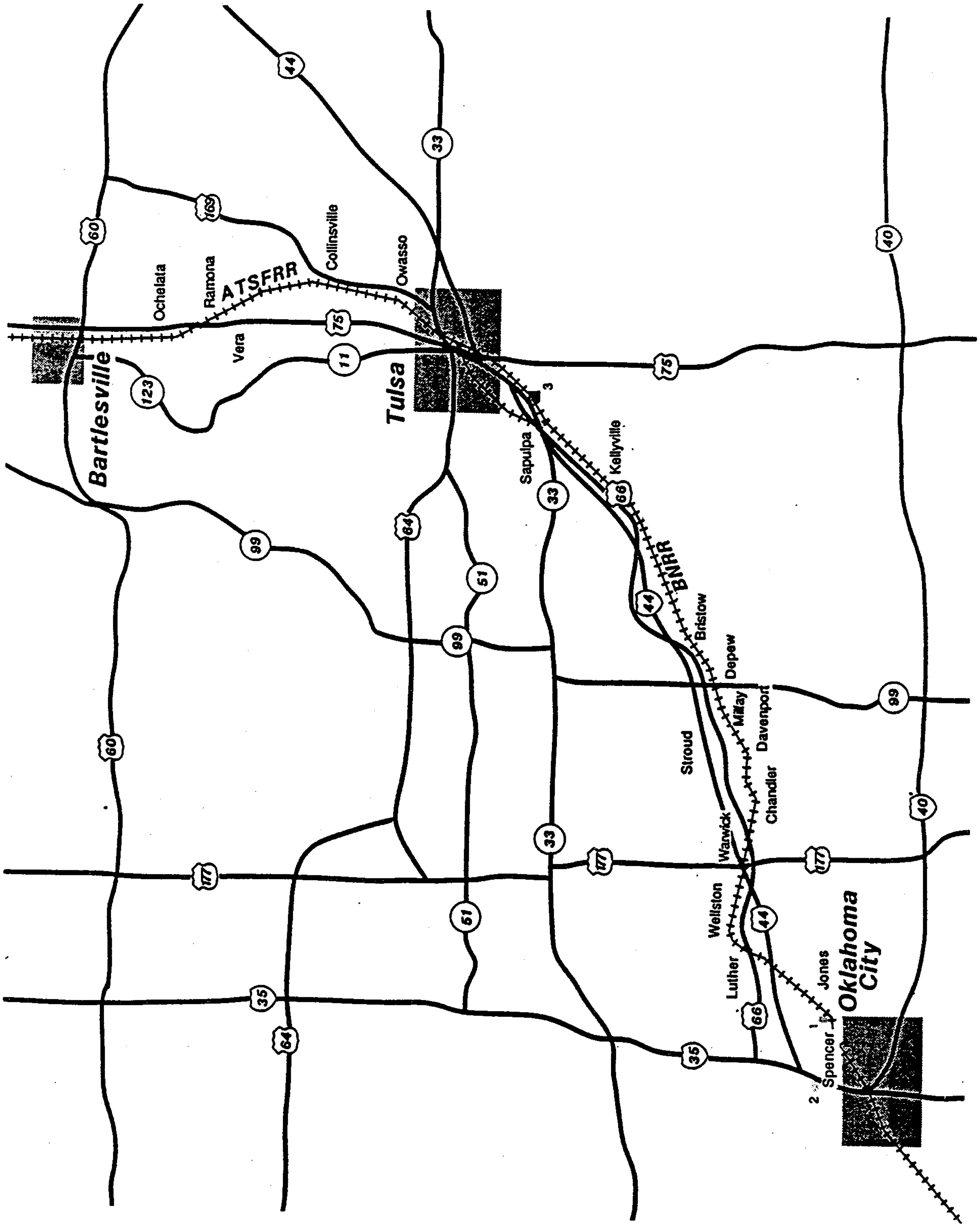
**Table 6.2.3.1**

**Hazardous Waste Sites**

**Tulsa/Oklahoma City Interurban Corridor:**

| No. | Name | Address | Status |
|---|---|---|---|
| 1 | Madewell & Madewell | 114 S. Main, Luther. | No Further Action |
| 2 | Red Rock Petroleum (Trucker's Village) | 8400 NE Expressway, Oklahoma | City No Further Action |
| 3 | Conoco Inc./Sapulpa Refinery | Sec 25, T18N R11E | Under Investigation |

Source: "Cerclis," database list 8, Environmental Protection Agency, 1988.

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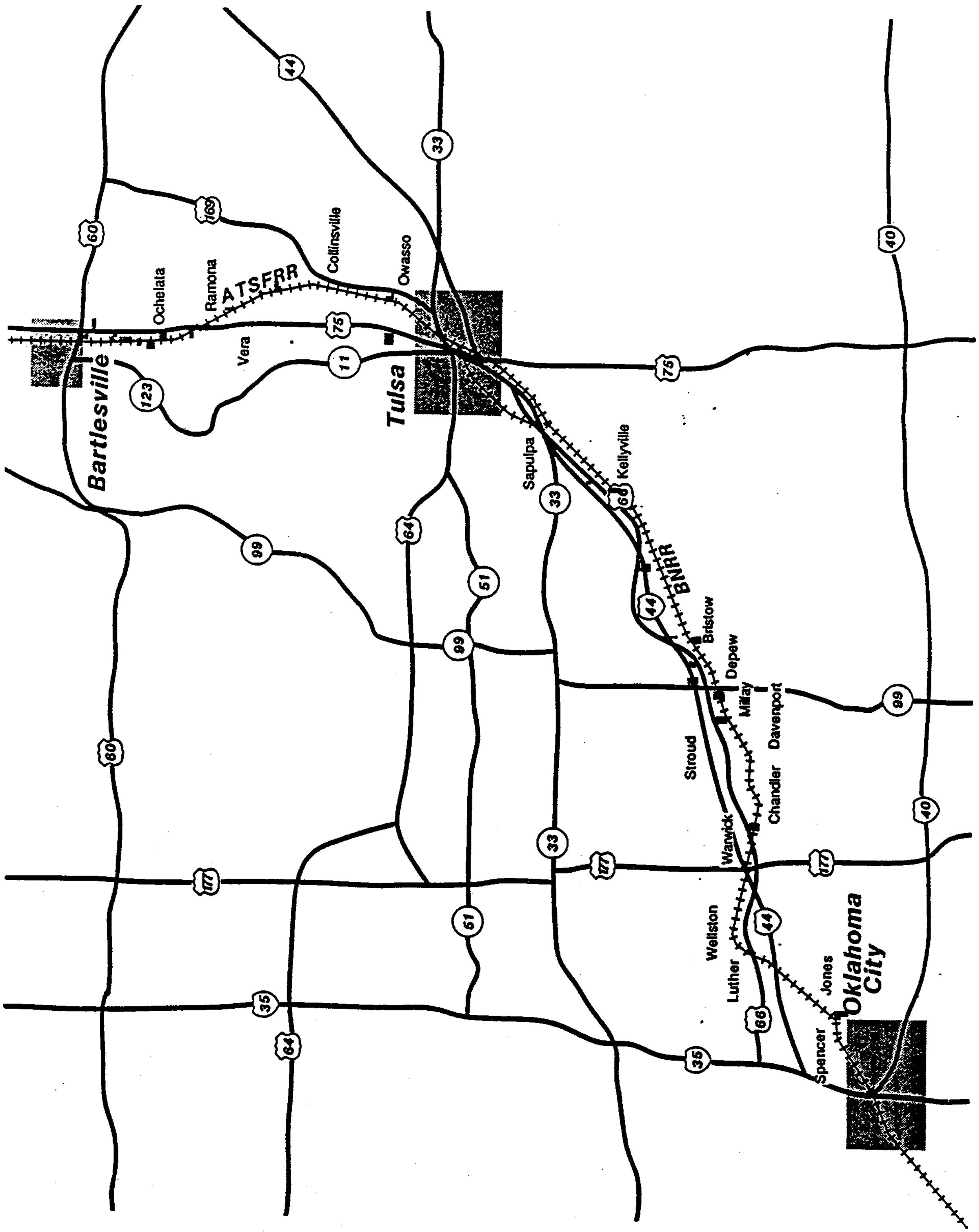
|---|---|---|
| | **HAZARDOUS WASTE SITES**<br>■ Under Investigation ▩ No Further Study Necessary | **6.2.3.1** |




| Parsons Brinckerhoff<br>Parsons Brinckerhoff<br>Quade & Douglas, Inc.<br>Engineers • Architects • Planners | ***Oklahoma Fixed Guideway Transportation System Study*** | Figure |
|---|---|---|
| | **INDIAN LANDS** | **6.2.4.1** |

Table 6.2.5.1

National Register Historic Sites

| No. | Name | Address |
|---|---|---|
| **Bartlesville/Tulsa Interurban Corridor:** | | |
| 1 | Nellie Johnstone No. 1 | Johnstone Park, Bartlesville. |
| **Tulsa/Oklahoma City Interurban Corridor:** | | |
| No. | Name | Address |
| 2 | Engles Dry Goods Store | 114 S. Main, Luther. |
| 3 | Nagle Site | Spencer vicinity. |
| 4 | Creek County Courthouse | 2221 E. Dewey, Sapulpa. |
| 5 | Bristow Presbyterian Church | 6th & Elm, Bristow. |
| 6 | Bon Ton House | 404 n. 4th Ave., Stroud. |
| 7 | James W. Stroud House | 110 E. 2nd St., Stroud. |
| 8 | Trading Cômpany Building | Main & 2nd Ave., Stroud. |
| 9 | Johnson House | 503 Manvel Ave., Chandler. |

Source: State Historic Presentation Officer, Historic Conservation Handbook, 1988.

### 6.2.6 Noise Sensitive Land Uses

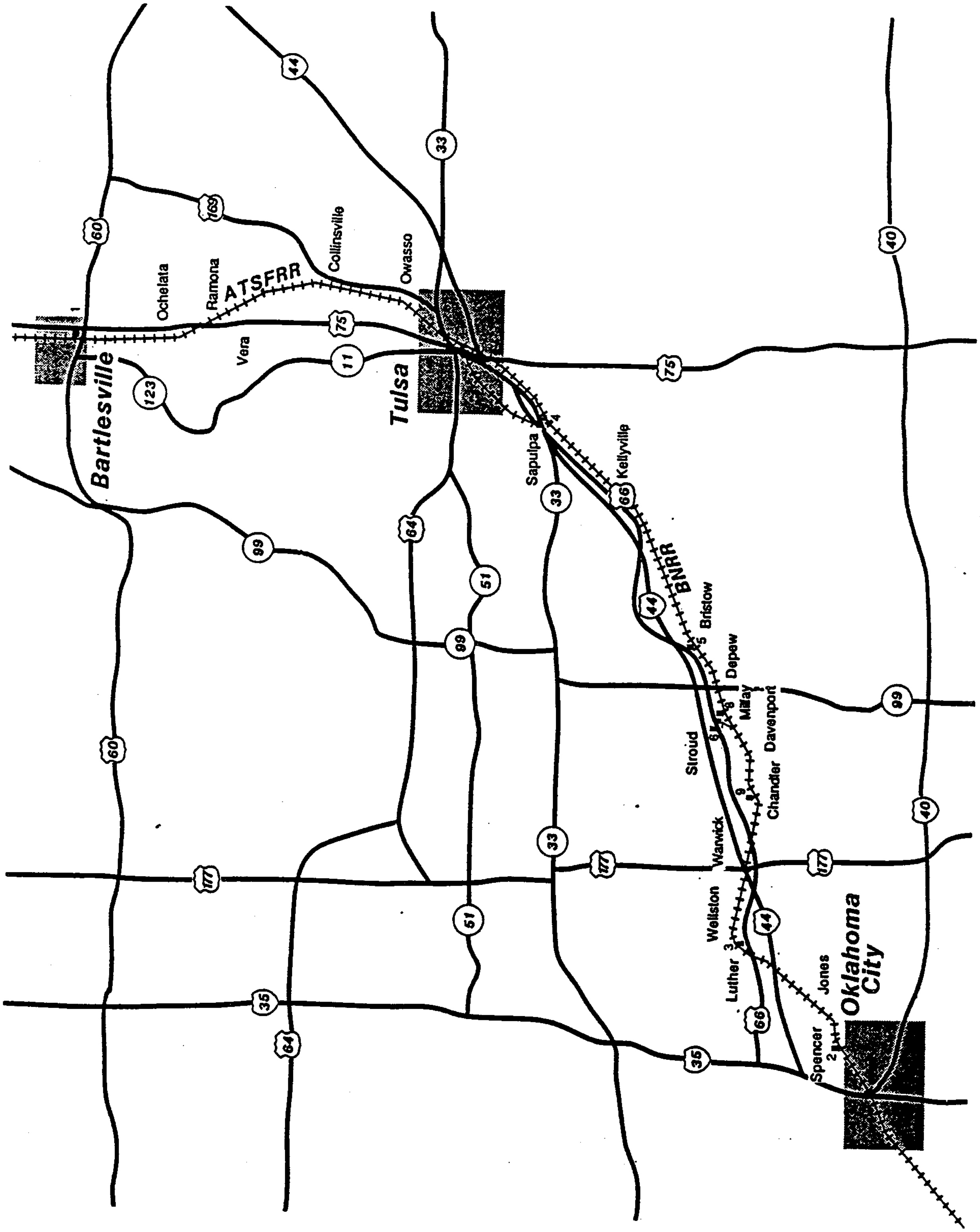
Noise sensitive land uses are found throughout the Bartlesville/Tulsa Interurban Corridor. They are in both the urban and rural parts of the study area but are concentrated in the Cities of Bartlesville, Ochelata, Ramona, Vera, Collinsville, and Owasso. These noise sensitive land uses are shown in Table 6.2.6.1 and the cities are located on Figure 6.2.6.1.

The noise sensitive land uses in the Tulsa/Oklahoma City Interurban Corridor occur predominantly within the urban influence or the cities along the corridor. In addition, there are many scattered rural residences along the corridor between the urbanized areas. These noise sensitive land uses are shown in Table 6.2.6.1 and the cities are located on Figure 6.2.6.1.

### 6.2.7 Parks, Recreation Lands and Wildlife Refuges

There are four (4) parks and one (1) cemetery in the Bartlesville/Tulsa Interurban Corridor (See Figure 6.2.7.1). Three of the parks and the cemetery are in Bartlesville along the Atchison, Topeka and Santa Fe Railroad. The fourth park is on the southern border of the corridor on the east side of US Highway 75. There are no known wildlife refuges in the corridor.

There are sixteen (16) city parks and open spaces in the Tulsa/Oklahoma City Interurban Corridor (See Figure 6.2.7.1). Eight of these properties are cemeteries, most of which are rural. Of the eight parks, five are in Sapulpa, and one is in each of the cities of Bristow, Jones and Luther. There are no known wildlife refuges in the corridor.




| Parsons Brinckerhoff<br>Parsons Brinckerhoff Quade & Douglas, Inc.<br>Engineers • Architects • Planners | *Oklahoma Fixed Guideway Transportation System Study* | Figure |
|---|---|---|
| | **NATIONAL REGISTER HISTORIC SITES** | **6.2.5.1** |

**Table 6.2.6.1**

**Noise Sensitive Land Uses**

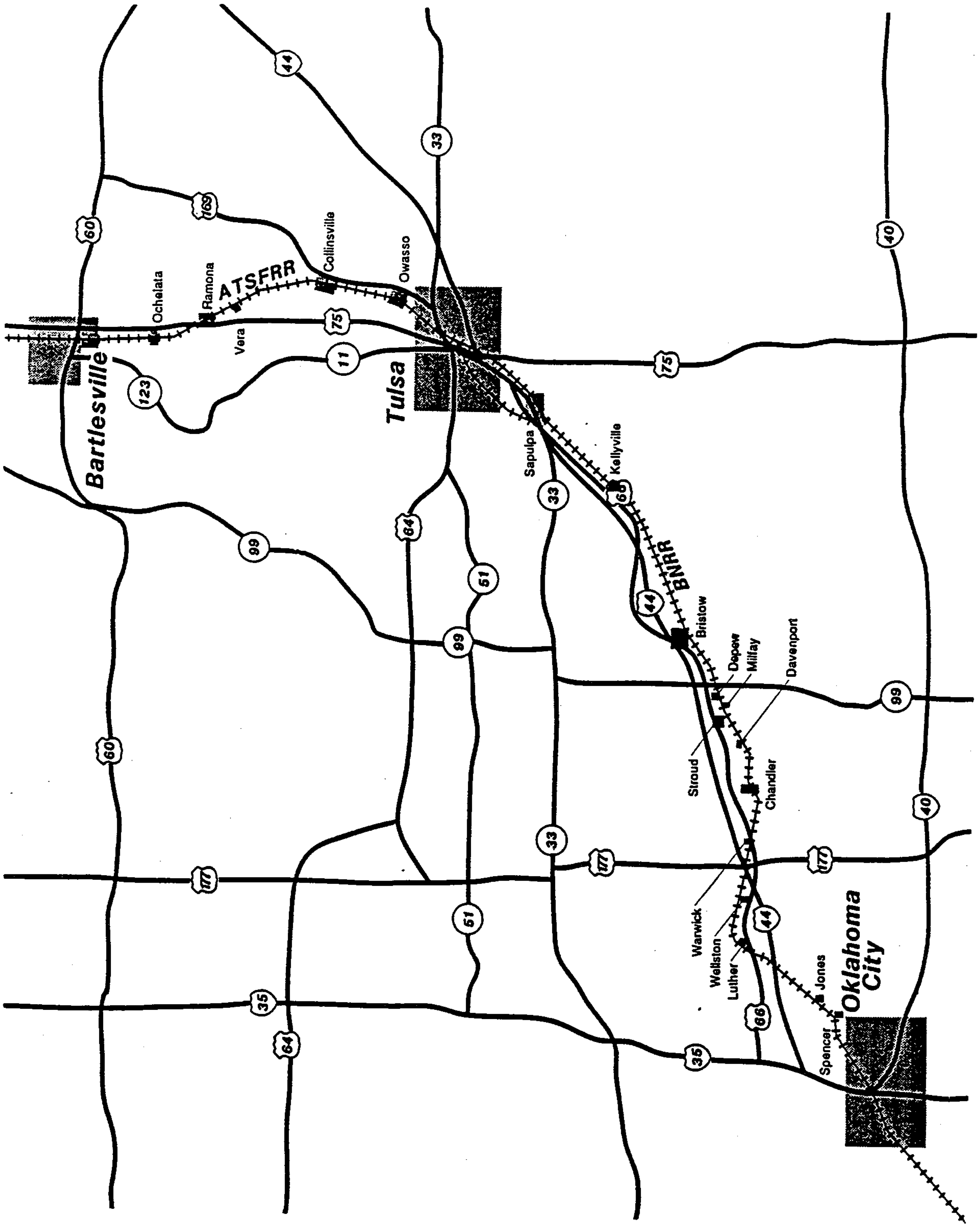
**Bartlesville/Tulsa Interurban Corridor:**

| City | Churches | Hospitals | Libraries | Schools |
|---|---|---|---|---|
| Bartlesville | 30 | 2 | 1 | 6 |
| Collinsville | 13 | 0 | 0 | 1 |
| Ochelata | 5 | 0 | 0 | 1 |
| Owasso | 7 | 0 | 0 | 1 |
| Ramona | 5 | 0 | 0 | 1 |
| Vera | 4 | 0 | 0 | 2 |
| Unincorporated | 2 | 0 | 0 | 0 |
| Corridor Total | 66 | 2 | 1 | 12 |

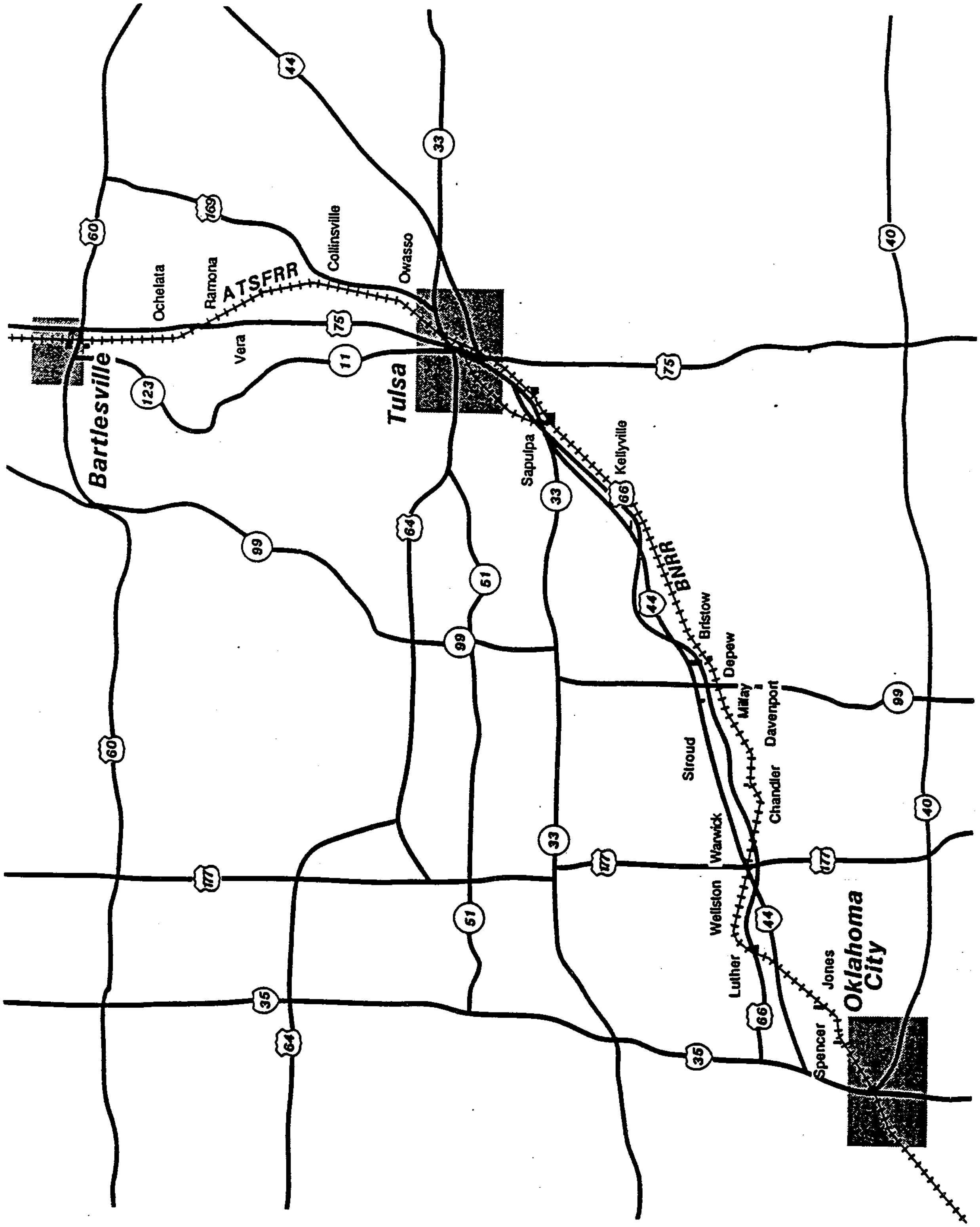
**Tulsa/Oklahoma City Interurban Corridor:**

| City | Churches | Hospitals | Libraries | Schools |
|---|---|---|---|---|
| Bristow | 23 | 0 | 1 | 4 |
| Chandler | 18 | 0 | 0 | 2 |
| Davenport | 4 | 0 | 0 | 2 |
| Depew | 7 | 0 | 0 | 2 |
| Jones | 5 | 0 | 0 | 3 |
| Kellyville | 5 | 0 | 0 | 1 |
| Luther | 8 | 0 | 0 | 1 |
| Milfay | 1 | 0 | 0 | 1 |
| Oklahoma City | 0 | 0 | 0 | 0 |
| Sapulpa | 30 | 0 | 0 | 8 |
| Spencer | 3 | 0 | 0 | 3 |
| Stroud | 6 | 0 | 0 | 3 |
| Warwick | 1 | 0 | 0 | 1 |
| Wellston | 7 | 0 | 0 | 1 |
| Unincorporated | 7 | 0 | 0 | 0 |
| Corridor Total | 125 | 0 | 1 | 32 |

Source: USGS Quadrangle Maps.




| Parsons Brinckerhoff<br>Parsons Brinckerhoff<br>Quade & Douglas, Inc.<br>Engineers • Architects • Planners | *Oklahoma Fixed Guideway Transportation System Study* | Figure |
|---|---|---|
| | **NOISE SENSITIVE LAND USES** | **6.2.6.1** |




| Parsons Brinckerhoff<br>Parsons Brinckerhoff<br>Quade & Douglas, Inc.<br>Engineers • Architects • Planners | *Oklahoma Fixed Guideway Transportation System Study* | Figure |
|---|---|---|
| | **PARKS, RECREATION LANDS AND WILDLIFE REFUGES** | **6.2.7.1** |

## 6.2.8 Prime and Unique Farmlands

The heaviest concentrations of prime and unique farmland in the Bartlesville/Tulsa Interurban Corridor are found in the northern sections of the corridor near Bartlesville (see Figure 6.2.8.1). In the north, over seventy-five percent (75%) of the land the corridor passes through is either all prime or mixed prime and non-prime. In the southern sections of the corridor, less than fifty percent (50%) of the land the corridor passes through is prime or mixed prime and non-prime.

Figure 6.2.8.1 shows extensive areas of all prime farmland and mixed prime and non-prime farmland in the Tulsa/Oklahoma City Interurban Corridor. These lands are distributed throughout the corridor where I-44 and the Burlington Northern Railroad pass through these agricultural lands.

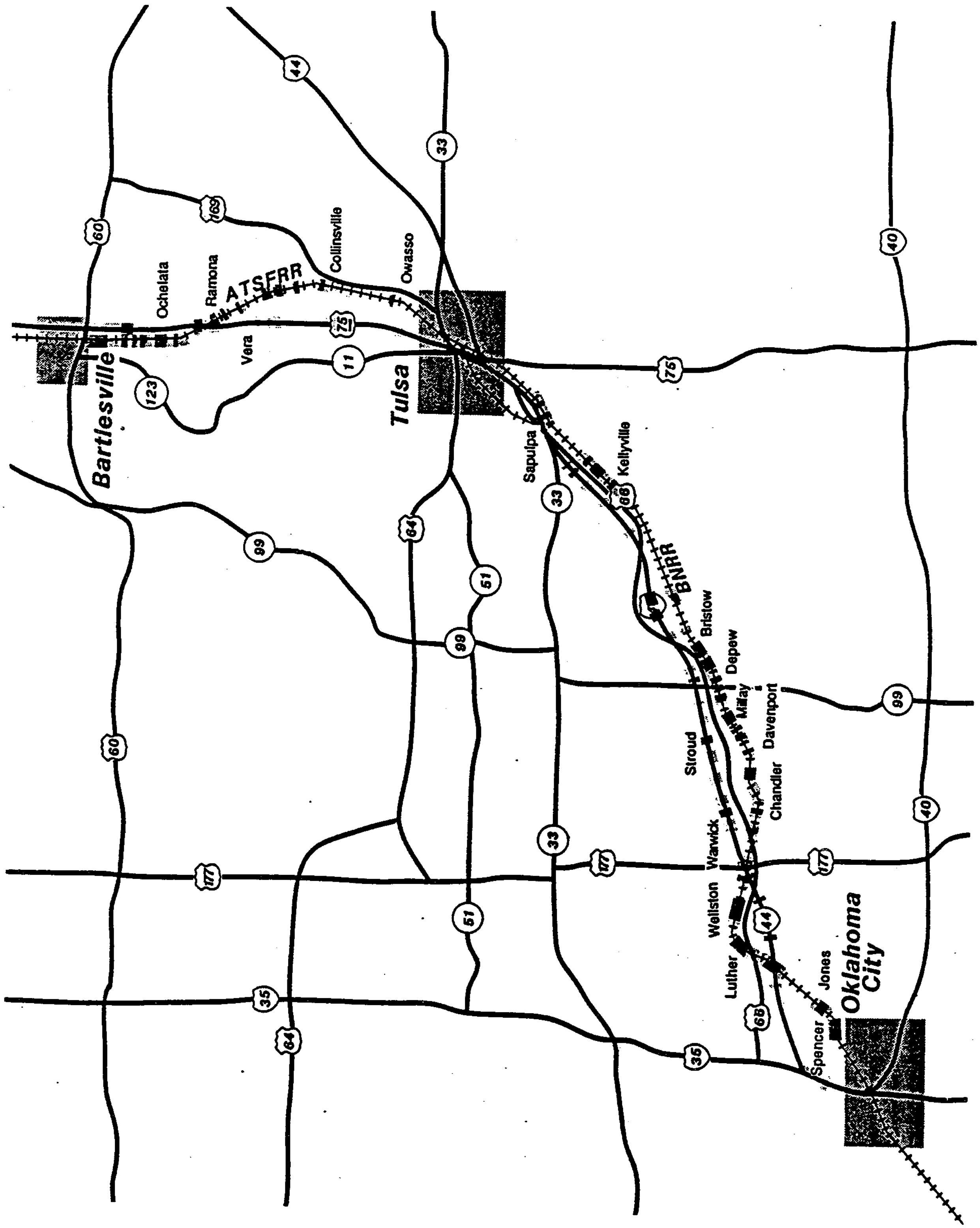
## 6.2.9 Slopes over 9%

The Bartlesville/Tulsa Interurban Corridor passes through many areas where the slopes exceed nine percent (9%) (see Figure 6.2.9.1). In the area between Bartlesville and Tulsa, there is a mix of floodplains and hilly uplands, with a higher frequency of hilly uplands in the north near Bartlesville. These undulating landforms have the greatest impact on the corridor when it crosses land making the transition between upland and floodplain or when it actually runs along the floodplain in the floodplain terraces.

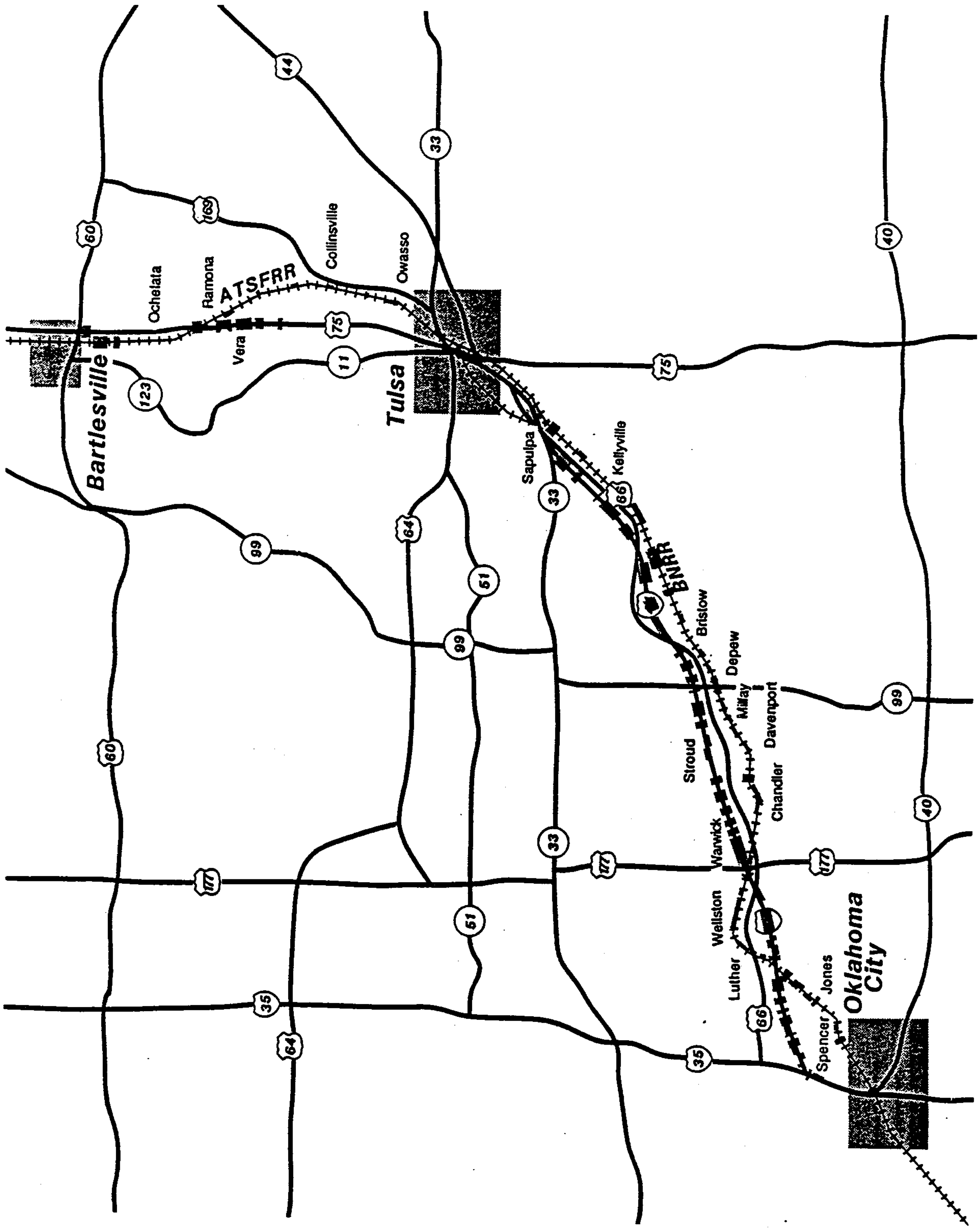
Figure 6.2.9.1 shows many areas with slopes that are greater than nine percent (9%) in gradient in the Tulsa/Oklahoma City Interurban Corridor. These areas are interspersed along the length of I-44 and the Burlington Northern Railroad. Of the two routes, the I-44 route runs through slightly more areas with slopes over nine percent (9%) than does the Burlington Northern Railroad.

Palustrine wetlands are encountered along the entire length of the Bartlesville/Tulsa Interurban Corridor as shown on Figure 6.2.10.1. A higher frequency of wetlands and larger wetlands is in the north along the Caney River floodplain. To the south there is a more even distribution of wetlands. Some are along the Atchison, Topeka and Santa Fe Railroad and others are along US Highway 75. In addition, there are two (2) lacustrine wetlands in the corridor, located on the west side of US Highway 75 between Bartlesville and Ramona. They are approximately two (2) miles apart.

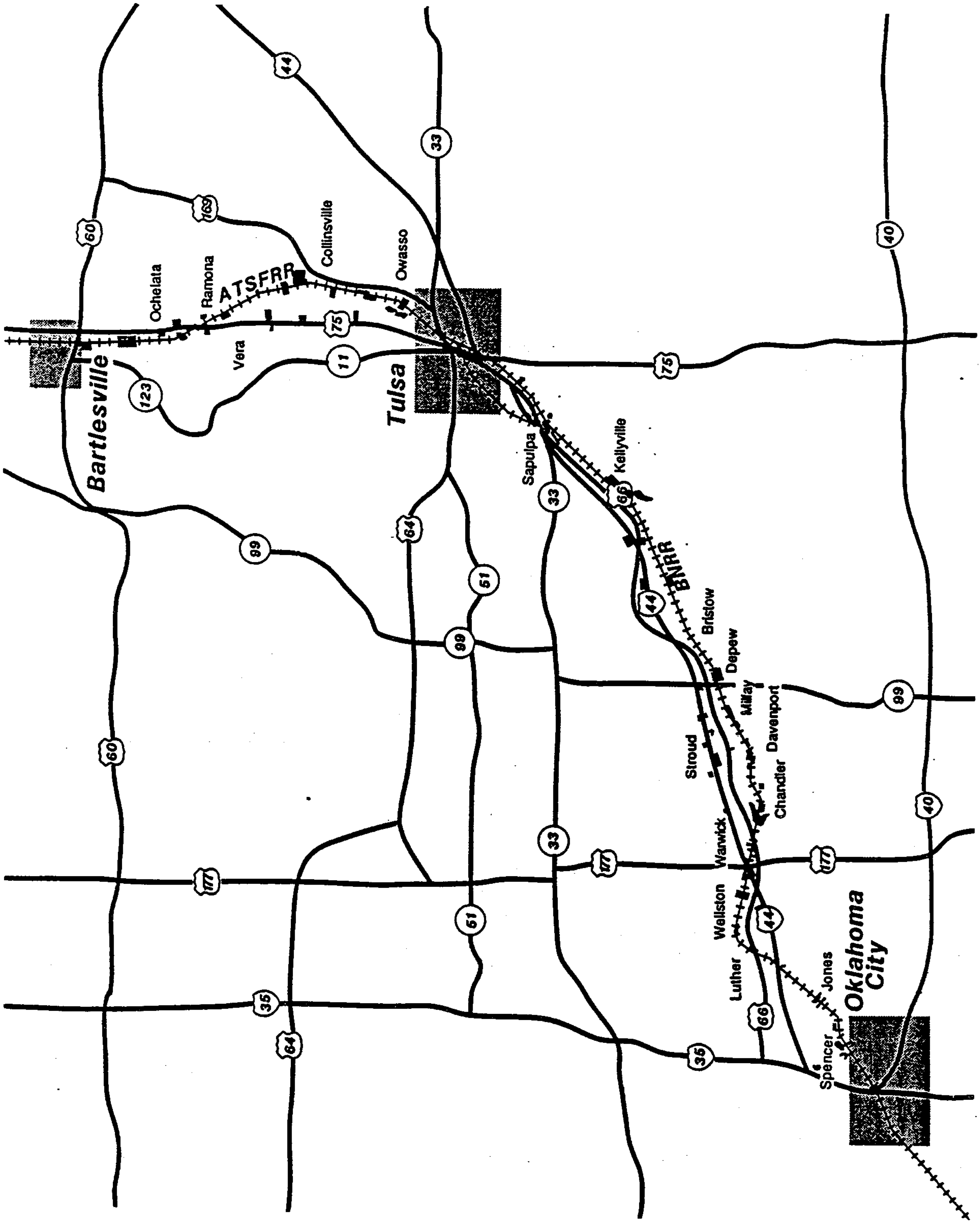
There are many palustrine wetland sites in the Tulsa/Oklahoma City Interurban Corridor and two (2) lacustrine sites. As shown in Figure 6.2.10.1, the palustrine sites are distributed throughout the lowlands of the corridor and in the river and stream floodplains. The two (2) lacustrine wetlands are found along the Burlington Northern Railroad two miles to the west of Chandler.




| Parsons Brinckerhoff<br>Parsons Brinckerhoff<br>Quade & Douglas, Inc.<br>Engineers • Architects • Planners | *Oklahoma Fixed Guideway Transportation System Study* | Figure |
|---|---|---|
| | **PRIME AND UNIQUE FARMLANDS**<br>■ All Prime ▩ Mixed | **6.2.8.1** |




| Parsons Brinckerhoff<br>Parsons Brinckerhoff Quade & Douglas, Inc.<br>Engineers • Architects • Planners | *Oklahoma Fixed Guideway Transportation System Study* | Figure |
|---|---|---|
| | **SLOPES OVER 9%** | **6.2.9.1** |




| Parsons Brinckerhoff<br>Parsons Brinckerhoff<br>Quade & Douglas, Inc.<br>Engineers • Architects • Planners | ***Oklahoma Fixed Guideway Transportation System Study*** | Figure |
|---|---|---|
| | **WETLANDS** | **6.2.10.1** |

## 6.3 SUMMARY

The corridor specific environmental factors provide a base inventory. Table's 6.3.1 and 6.3.2 summarizes the twelve (12) environmental factors present in each corridor. Of the Twelve environmental factors, there are no known Superfund sites in the corridors, there are no known nesting sites for any of the threatened or endangered species in the corridors, and the Bartlesville/Tulsa Interurban Corridor has no hazardous waste sites. Only the Tulsa/Oklahoma City Interurban Corridor contains hazardous waste sites. Of the other environmental factors, all the corridors contain archaeological sites; floodplains; Indian Lands; national register historic sites; noise sensitive land uses; parks, recreation lands and wildlife refuges; prime and unique farmlands; slopes over nine percent (9%); and wetlands over ten (10) acres. Subsequent analysis will be performed using this environmental inventory if the study goes into the second phase of work.

**Table 6.3.1**

**Environmental Inventory**

| | Bartlesville to Tulsa | Tulsa to Oklahoma City |
|---|---|---|
| Archaeological Sites | 2 | 22 |
| National Register of Historic Sites | 1 | 8 |
| Floodplains | yes | yes |
| Wetlands | yes | yes |
| Hazardous Waste Sites | 0 | 3 |
| Superfund Sites | no | no |
| Indian Lands | 13 | 11 |
| Noise Sensitive Land Uses | 81 | 157 |
| Parks, Recreation Lands and Wildlife Refuges | 4 | 16 |
| Prime and Unique Agricultural Land Slopes over 9% | yes | yes |
| Threatened and Endangered Species | no | no |

**Table 6.3.2**

**Environmental Factors**

| Environmental Factors | Bartlesville/ Tulsa Interurban Corridor | Tulsa/ Oklahoma City Interurban Corridor |
|---|---|---|
| Archaeological Sites | • | • |
| Floodplains | • | • |
| Hazardous Waste Sites | -- | • |
| Indian Lands | • | • |
| National Register Historic Sites | • | • |
| Noise Sensitive Land Uses | • | • |
| Parks, Recreation Lands, and Wildlife Refuges | • | • |
| Prime and Unique Farmlands | • | • |
| Slopes over 9% | • | • |
| Superfund Sites | -- | -- |
| Threatened and Endangered Species | -- | -- |
| Wetlands | • | • |

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# 7.0 FUNDING AND FINANCIAL OPPORTUNITIES

## 7.1 INTRODUCTION

The purpose of this section is to outline potential funding mechanisms for intercity commuter rail development in intercity commuter rail development in Oklahoma. Specifically, this section provides an overview of transit funding sources and mechanisms, and relates each type of fund with its characteristics. It reviews national commuter rail funding and provides information on four existing commuter programs. Next, it briefly reviews Urban Mass Transportation Administration funding. The next section outlines Amtrak Commuter Rail funding. The section also contains an appendix which provides supplemental information on potential funding sources.

## 7.2 TYPES OF TRANSIT SYSTEM FUNDING

Many potential supplemental funding sources exist for financing transit systems. The various mechanisms include taxes and fees, loans and grants, public bonding, and private financing. Federal, state and/or local funding sources are being used by transit systems throughout the country.

Table 7.2.1 shows the characteristics of transit funding sources and mechanisms. Taxes and fees (state-wide or local option) that might be used for supplemental funding include:

- Sales/Use tax
- Motor vehicle excise tax
- Business/Occupation tax
- Motor fuel tax
- Vehicle registration fee
- Driver license fee
- Income tax
- Utility excise tax
- Services tax
- Employment head tax
- Payroll tax
- Household head tax
- Property tax
- Real estate transfer tax
- Visitor tax
- Sin taxes
- Parking tax

Other sources might be fines and/or forfeitures, lottery proceeds, and special tax districts which require payment by property owners and/or developers. Grants may be grants given by the state to a transit system or federal grants from the Urban Mass Transportation Administration (UMTA). Private financing might come through joint-development opportunities for station development, for example.

State transit funding can be used for a variety of system needs, including operating expenses and capital projects. Most transit development is financed through a combination of state and local funds with financing programs frequently paralleling the division of planning and operating responsibilities between state and local jurisdictions. Many states require local matching funds or minimum farebox recovery goals. Some states subsidize commuter rail operations.

The Appendix F includes a summary of transit funding in several states. It also contains case study summaries for several transit agencies.

### 7.2.1 Commuter Rail Funding

In general, supplemental funding for commuter rail comes from either UMTA, the state, or cities and counties served. Table 7.2.1.1 contains a summary of funding subsidy information for the following four commuter rail operators: MARC (Baltimore), METRA (Chicago), SEPTA (Philadelphia), and CALTRAIN (San Francisco). UMTA grants and State subsidized Amtrak service are two of the mechanisms for supplementing commuter rail funding.

For the most part, the states which presently have commuter rail are paying for any new service and/or paying to maintain the service. The State of

## Table 7.2.1

## Characteristics of Transit Funding Sources/Mechanisms

| Mechanism | Revenue Yield | Revenue Reliability | Burden Group | Acceptability | Collection Management | Admin. |
|---|---|---|---|---|---|---|
| Federal Funds | High | Poor | U.S. Taxpayers | Very High | State/Region | Established |
| Fares | Low/ Moderate | Moderate | Users | Very High | Region | Straight-forward |
| Sales/Use Tax<br>• Local Option Increment | High | Good | Regional Residents | Moderate | State | Established |
| MVET | Moderate | Excellent | Regional Auto Users | Moderate | State | Established |
| Business/ Occupation Tax | Low | Good | Business Owners | Moderate/ Low | Region | Established |
| Concession Income | Very Low | Poor | Tenant Business Owners | Very High | Region | Straight-forward |
| State Grants (General Fund) | Unknown (Moderate) | Moderate/ Poor | State Taxpayers | Unknown (Low) | State | Straight-forward |
| Sales/Use Tax<br>• Local Option Auto-Related | Moderate/ High | Good | Regional Auto Users | Moderate | Region | Moderately Difficult |
| Motor Fuel Tax<br>• Local Option Increment | Moderate | Moderate | Regional Auto Users | Moderate/ High | State(?) | Moderately Difficult |
| Property Tax (Countywide) | Low/ Moderate | Very Good | Property Owners | Very Low | Local | Straight-forward |
| Vehicle Registration Fee<br>• Local Option Increment | Moderate | Excellent | Auto Owners | Moderate | State | Established |
| Driver License Fee | Low/ Moderate | Excellent | Drivers | Moderate | State | Established |
| Income Tax | Unknown (High) | Good | State/ Regional | Very Low | State | Difficult |
| Utility Excise Tax | Low | Moderate | Homeowners/ Business Owners | Low | Local | Straight-forward |
| Service Tax (or full VAT) | Moderate | Good | Residents | Moderate/ Low | State | Moderately Difficult |

## Table 7.2.1

### Characteristics of Transit Funding Sources/Mechanisms (Continued)

| Mechanism | Revenue Yield | Revenue Reliability | Burden Group | Acceptability | Collection Management | Admin. |
|---|---|---|---|---|---|---|
| Parking Tax | Low/ Moderate | Moderate/ Poor | Commuters | Moderate | Local/ Region | Moderately Difficult |
| Employment "Head" Tax | Low/ Moderate | Moderate/ Good | Employers/ Employees | Low | Local/ Region | Moderately Difficult |
| Payroll Tax | Low/ Moderate | Moderate/ Good | Employers | Moderate/ Low | Local/ Region | Moderately Difficult |
| Household "Head" Tax | Moderate | Very Good | Residents | Low | Local/ Region | Difficult |
| Real Estate Transfer Tax | Low/ Moderate | Poor | Property Owners (Existing) | Moderate/ Low | Local/ Region | Moderately Difficult |
| Visitor Taxes (Lodging) | Low/ Modeerate | Moderate/ Poor | Visitors | High | Local/ Region | Straight-forward |
| "Sin" Taxes<br>• Liquor<br>• Cigarettes | Low | Good | Residents | High | State | Straight-forward |
| Fines/Forfeitures | Very Low | Moderate/ Good | Residents | High | Local | Straight-forward |
| Lottery | Unknown | Moderate/ Good | Select Residents | Moderate/ High | State | Difficult |
| Tax Increment<br>• Sales<br>• Property | Low/ Moderate | Poor | Municipalities/ Residents | Low | Local | Difficult |
| Special Districts<br>• Ad Valorem<br>• Unitary<br>• Special<br>• Impact Fees | Low/ Moderate | Poor | Property Owners/ Developers | Moderate | Local | Difficult |

Florida is unique in that they are using highway funds to fund start-up commuter rail service. The funding source for Florida is the state transportation fund which receives a combination funding from the state's general fund and the state gas tax. The Florida State Department of Transportation can fund 100 percent of transit commuter projects.

### 7.2.2 UMTA Funding

Transit agencies receive federal revenues through UMTA's discretionary and formula programs. Local matching funds are generally required. The UMTA funds come through several different "sections" including Sections 3, 5, 6, 8, 9(a), 9(b), 16 and 18. Commuter rail operators have typically received UMTA funding through Section 3 and Section 9.

The Section 3 discretionary grant program provides funds for new fixed guideway systems, other new transit facilities, new technology, and expansion or enhancement of existing transit systems. Funds available through this program vary significantly from year to year. Section 3 requests require an extensive alternatives analysis process and there is fierce competition for the funds.

Section 9(a) funds are operating grants apportioned on a formula basis. Section 9(b) grants are distributed on a formula basis for capital construction only. The formulas are set by Congress as a part of the legislative funding process.

### 7.2.3 Amtrak Commuter Rail Funding

The Rail Service Passenger Act of 1970 created the National Rail Passenger Corporation (known as Amtrak). In 1978, the act was amended to give Amtrak the authority to operate commuter rail service provided a state, local, or regional agency reimbursed Amtrak for the avoidable costs of providing these services. This type of commuter service was defined as "service operated in metropolitan and suburban areas, usually characterized by reduced-fare, multiple ride, and commutation tickets and by morning and evening peak-period operations" and service that continued under this program is referred to as Section 403(d) service.

Another Amtrak program pertaining to intrastate, intercity rail passenger service is known as Section 403(b). This program enables state or regional agencies to obtain intrastate, intercity rail passenger service from Amtrak outside of Amtrak's original and restructured system, if the state or a regional agency assumes the following subsidy burden:

- 45 percent of the avoidable operating losses in the first year,
- 65 percent of the avoidable operating losses in the subsequent years, and
- 50 percent of the capital costs associated with the service.

Table 7.2.3.1 shows agencies that are presently using or have used Section 403(b) or 403(d) to provide state subsidies for commuter rail.

## Table 7.2.1.1

## Other Operator Subsidy Information

| | MARC Baltimore (1986) | METRA Chicago (1987 Proposed) | SEPTA Philadelphia (1987 Proposed) | CALTRAIN San Francisco (1986) |
|---|---|---|---|---|
| Federal Subsidies | • Heavy reliance on UMTA Section 9 operating grants; funds 50% of operating deficit.<br>• Moderate use of Section 9 capital grants - received $s for $17.8M in cap. expenditures (1982). | • Little reliance on UMTA Section 9 operating grants.<br>(See ratios below)<br>• Heavy use of UMTA 3 & 9 capital grants, funding 74.1% of $87M 1987 capital program. | • Moderate reliance on UMTA Section 9 operating grants.<br>(See ratios below)<br>• Little use of UMTA 3 & 9 capital grants. | • Moderate reliance on UMTA Section 9 operating grants.<br>(See ratios below)<br>• Information unavail-able regardung use of UMTA 3 & 9 capital grants. |
| State Subsidies | • State DOT funds 50% of operating deficit.<br>• State DOT provides overwhelming majority of local match for UMTA 3 & 9 capital grants. | • State Regional Trans. Authority (RTA) funds majority of operating deficit (96% projected for 1987).<br>• State RTA provides overwhelming majority of local match for UMTA 3 & 9 capital grants. | • State DOT provides block amounts of UMTA/State/Local $s to SEPTA, which, in turn, funds the Comm Rail division's operating deficit.<br>• State DOT provides overwhelming majority of local match for UMTA 3 & 9 capital grants. | • State DOT funds 50% of net operating deficit, after UMTA subsidies.<br>• State DOT provides overwhelming majority of local match for UMTA 3 & 9 capital grants. |
| Local Subsidies | • No local operating subsidy requirements.<br>• Limited and declining capital funding partici-pation; funds station improvements and station maintenance. | • No local operating subsidy requirements.<br>• No local capital funding participation (shared by METRA and the state). | • City of Philadelphia plus 4 surrounding counties match 36% of each state operating subsidy dollar.<br>• Limited capital participation. | • Three counties along the CALTRAIN track alignments pay 50% of the net operating deficit based on the proportion of rides originating in each county.<br>• Three counties and related transit agencies contributed small cap. amounts toward station improvements. |
| Operating Subsidy at a percentage of total operating expense | • Federal 19.2%<br>• State 30%<br>• Farebox Recovery 50.8% | • Federal 2%<br>• State 45%<br>• Farebox Recovery 53% | • Federal 8%<br>• State 40%<br>• Local 14%<br>• Farebox Recovery 38% | • Federal 7%<br>• State 27%<br>• Local 27%<br>• Farebox Recovery 39% |
| Source of Operating Subsidy | • Federal 39%<br>• State 61% | • Federal 3%<br>• State 75%<br>• Special State Funds 22% | • Federal 17%<br>• State 58%<br>• Local 25% | • Federal 11.1%<br>• State 44.7%<br>• Local 44.2% |

Sources:
- Telephone interviews with commuter rail service planners at MARC, METRA, SEPTA and CALTRAIN
- CALTRAIN 5-Year Plan, 1986 - 1991
- METRA Quarterly Report, April - June 1986
- SEPTA 1987 Operating Budget

## Table 7.2.3.1

## Amtrak Commuter Operations - 1983

| State | Route Description | Trains Per Day | Route Miles | Funding Program |
|---|---|---|---|---|
| Illinois | Chicago - Valparaiso | 4 | 44 | 403 (d) |
| Michigan | Detroit - Ann Arbor * | 2 | 38 | 403 (d) |
| NY/NJ/PA | New York City - Harrisburg | 2 | 194 | 403 (d) |
| | New York City - Philadelphia | 8 | 90 | 403 (d) |
| Pennsylvania | Philadelphia - Harrisburg | 5 | 104 | 403 (d) |
| Wash., D.C./MD/WV | Washington, D.C. - Martinsburg | 2 | 73 | 403 (d) |
| California | Los Angeles - San Diego | 6 | 126 | 403 (b) |
| | Oakland - Bakersfield | 4 | 307 | 403 (b) |
| Florida | Tampa - Miami | 2 | 260 | 403 (b) |
| Illinois | Chicago - Champaign | 2 | 127 | 403 (b) |
| | Chicago - Springfield | 2 | 185 | 403 (b) |
| | Chicago - Quincy | 2 | 262 | 403 (b) |
| Michigan | Chicago - Port Huron | 2 | 323 | 403 (b) |
| | Detroit - Ann Arbor * | 2 | 38 | 403 (b) |
| Minnesota | St. Paul - Duluth | 2 | 150 | 403 (b) |
| Missouri | St. Louis - Kansas City | 4 | 283 | 403 (b) |
| New York | Albany - Montreal | 2 | 241 | 403 (b) |
| | Syracuse - Niagara Falls | 2 | 166 | 403 (b) |
| Pennsylvania | Philadelphia - Harrisburg * | Multiple | 104 | 403 (b) |
| | Philadelphia - Pittsburgh | 2 | 349 | 403 (b) |

* Jointly funded projects originally funded under 403 (d) Program.

Source: Based on discussions with Mr. James Barker, Government Affairs Department, National Passenger Rail Corporation (AMTRAK), October 21, 1983.
**Commuter Rail Industry Profile, Peat, Marwick, Mitchell & Co.**

## 7.3 SUMMARY

The potential commuter rail funding sources presently available in Oklahoma are limited to UMTA Amtrak and local sources. The UMTA sources would be limited to the improvements in urban areas of Tulsa, Oklahoma City, and Bartlesville. The UMTA funds could be used especially for the intermodal transfer centers or stations. Amtrak funds require an operating subsidy guaranteed by the state or regional agency assuming the subsidy burden. Should the outlook for cost-effective rail passenger transportation be promising, Oklahoma officials may wish to investigate several of the state/regional/local revenue sources outlined in this section.

# 8.0 MECHANISMS FOR RIGHT-OF-WAY PRESERVATION

## 8.1 INTRODUCTION

This section outlines right-of-way reservation mechanisms to preserve corridors for potential future development of rail service. The local, state, and federal programs for reserving rights-of-ways are varied. The following outlines several right-of-way reservation tools and programs with potential applicability.

## 8.2 FEDERAL PROGRAMS TO OKLAHOMA

### 8.2.1 Urban Mass Transportation Administration

The Urban Mass Transportation Administration (UMTA) has several programs for acquiring railroad rights-of-way. These include UMTA Section 9 and 3 funds. Applicants from the public sector may apply for an UMTA grant to purchase railroad rights-of-way for use in passenger transportation. Recent UMTA grants have provided federal dollars to purchase railroads in Oklahoma City and Austin, among others. These included the Missouri Pacific Railroad in northeastern Oklahoma City and the old Southern Pacific line between Llano, Texas and Giddings, Texas, including Austin. UMTA requires applicants to show progress in planning for future passenger service within five years of securing the right-of-way.

### 8.2.2 National Trails System Act

In 1983 Congress amended Section 8 of the National Trails System Act to implement a declared national policy of preserving railroad rights-of-way for future reactivation of rail service. Section 1247(d) provides that rights-of-way that might otherwise be abandoned may be preserved and used on a interim basis as trails. The trail user assumes responsibility for liability in connection with trail use, including paying taxes and managing the corridor. This allows the route to remain intact and available for future railroad use while relieving the railroad of liability and financial responsibility during the interim use. This mechanism permits the railroad to "railbank" without having to apply for full abandonment authority. Because of the railbanking provision in the statute, the Interstate Commerce Commission (ICC) retains jurisdiction over the property and disposal of the property is subject to the possibility that rail service may be resumed.

When a railroad voluntarily agrees to transfer its interest to a trail operator, the Interstate Commerce Commission grants a Certificate of Interim Trail Use or Abandonment or Notice of Interim Trail Use or Abandonment. This permits the railroad to discontinue service and permits the carrier and trail operator to negotiate an agreement for interim trail use. If no trail use agreement is reached within 180 days, the certificate or notice reverts to a certificate or notice of abandonment.

## 8.3 STATE PROVISIONS

Since many railroad rights-of-way are on land which is not owned, but held as an easement or other fee simple determinable interests ("easements" or "reversionary interests"), such easements may or may not be limited to railroad use and may or may not revert if the rail use is abandoned. Frequently, these easements provide that upon abandonment of rail operations, the property reverts to the abutting landowner. State law governs disposition of reversionary interests. The I.C.C. still subjects the disposition of the easements to I.C.C. regulations of abandonments and the I.C.C. imposes conditions affecting most abandonment use of the property.

## 8.4 LOCAL PROVISIONS

While it may be argued that regulating disposition of railroad rights-of-way which are being abandoned could be considered an exercise of police power, review of local Oklahoma regulations did not uncover any requirements which could be used to preserve specifically rail corridors for future use. Available Oklahoma City, Tulsa, and Bartlesville regulations and plans did not reveal any provisions for rail corridor right-of-way preservation. The zoning regulations could be modified to provide for future transportation use as a protective interim measure. Such zoning has been used in limited areas to reserve land to be used for highway interchanges. The safest, legal way to preserve the rights-of-way would be to purchase the right-of-way prior to its being disassembled and sold.

## 8.5 SUMMARY

The use of UMTA funds to purchase railroad rights-of-way and the application of amended Section 8 of the National Trails System Act appear to have the greatest potential applicability for railroad right-of-way reservation in Oklahoma. Both allow agencies to maintain the abandoned railroad right-of-way intact while preserving the corridor for potential rail service in the future.

# 9.0 CONCLUSIONS AND RECOMMENDATIONS

## 9.1 CONCLUSIONS

In summary, this, the first phase of the interurban commuter study has identified the following important findings:

### 9.1.1 Commuter/Intercity Rail Alternatives

Four alternatives were initially considered. These include the standard Amtrak and Enhanced Amtrak alternatives, high speed alternative, and superspeed alternative. The first two would use available rail technology in operations throughout the United States. This technology is available from U.S. manufacturers. The third high speed technology suitable for the existing rail track conditions in the Oklahoma corridors between Oklahoma City and Tulsa and Tulsa and Bartlesville is not presently available. The needed tilt train technology could probably be developed in the U.S. The super speed technology, magnetic levitation, is not presently in operation in the U.S.; however, it operates in Japan and Germany, among other places throughout the world. States considering its implementation include Texas, Florida, California-Nevada, and Ohio. At a cost of $2.1 to $2.6 billion for the Oklahoma study corridors this technology would be prohibitively expensive for the demand it would serve. The first three could coexist with existing freight rail operations, while the superspeed could not.

### 9.1.2 Potential Demand

The range in demand for the four alternatives is from 1,200 to 2,500 daily trips. The regular Amtrak service would be approximately 1,200 daily trips, for enhanced Amtrak it is forecast to be about 1,500 trips. The high speed alternative would generate approximately 1,800 daily trips and the super speed about 2,500. These are for the year 2005. Compared to other systems in service today, these daily ridership forecasts are low.

### 9.1.3 Financial Feasibility and Costs

The range in capital costs for the four alternatives is from about $31 million to $2.6 billion measured in 1989 dollars. The standard Amtrak is estimated at $30.8 million, the enhanced Amtrak at $ 58.3 million, the high speed tilt-train service at $92.6 million, and the superspeed from $2.1 to $2.6 billion.

With potential funding sources of Amtrak Section 403(b) and UMTA Sections 3 or 9 for the urban area sections and intermodal transfer facilities, the financial feasibility of the first three improvements is promising. The Amtrak funding requires the state or regional agency to assume the financial burden of 45 percent of avoidable operating losses during the first year and 65 percent in subsequent years, and 50 percent of capital costs associated with the capital requirements. These funds are for intrastate, intercity rail passenger service only. The UMTA section money would cover up to 80 percent of the capital costs provided the funds were closely tied to urban public transit uses. Thus, the intermodal stations in Tulsa and Oklahoma City are potential UMTA projects, especially as these two stations would link the potential urban fixed guideway systems being studies. All of the alternatives, except the Memorial/Owasso crosstown focus service to the cities' central business districts. The light rail and automated guideway alternatives include downtown loops which could be integrated with intercity rail passenger systems.

The ability of the systems to cover their operating and maintenance (O&M) costs varies by alternative. Both the standard and enhance Amtrak service are projected to cover their O&M costs from the expected ridership and fares (fares are $.11 per passenger mile or $13.10 for the Tulsa to Oklahoma City leg, and $5.60 for the Bartlesville to Tulsa leg. The high speed tilt-train technology is expected to require an annual subsidy of $90,000 to $100,000. None of the systems is expected generate sufficient revenue to cover capital costs, even on an annualized basis.

### 9.1.4 Environmental Feasibility

The environmental inventory conducted for the rail corridors indicates that a majority of the twelve environmental issues inventoried, their instance is present in the Oklahoma City to Tulsa and Tulsa to Bartlesville corridors. These potential issues include archaeological and National Register Historic sites; floodplains and wetlands over ten acres; Indian lands; prime and unique agricultural lands; slopes over 9 percent; and parks, recreation lands, and wildlife refuges. There are no known Superfund sites or nesting/breeding grounds for any endangered or threatened species. The Bartlesville to Tulsa corridor has no known hazardous waste sites.

Analysis of the environmental inventory suggests that as long as the existing railroad rights-of-way are used for intercity rail passenger service, the environmental clearances should not be difficult with which to comply. If the superspeed alternative were to be implemented on separate rights-of-way, the environmental clearances and National Environmental Policy Act procedures could prove time-consuming; however, none of the issues identified in the initial inventory would likely prevent the project from being built.

### 9.1.5 Engineering Feasibility

Amtrak Service can be provided on the existing, slightly upgraded rail infrastructure in the corridors to reduce capital costs. Included in the upgraded infrastructure are upgrading three track segments, installing traffic protection at highways, development of four stations and maintenance yard, and two new track connections.

Enhanced Amtrak Service can also be provided with the same improvements as the Amtrak service alternative, as well as reconstruction of the ODOT and AT&SF yard tracks, resurfacing the BNRR track and increasing superelevation on the curves, making additional traffic protection improvements, and adding a passing track between Tulsa and Oklahoma City.

High Speed Passenger Rail Service can be provided with the improvements to the Enhanced Amtrak Service, as well as replacement of the existing bolted rail with continuously welded rail, and bridge and culvert modifications to serve the higher dynamic loads associated from higher operating speeds.

### 9.1.6 Right-of-Way Reservation Tools

Several sources of federal programs can be used for preserving rail corridors, should the existing rail operator decide to discontinue service. These include both UMTA and National Trails System Act funds. The UMTA funds include both Section 3 and 9 for which a public entity can apply. These funds have been used for rail acquisition in both Austin and Oklahoma City. In the former, the funds were used to purchase over 160 miles of track from the city of Llano to Giddings, Texas.

The National Trails System Act was passed in response to federal policy of reserving railroad rights-of-way for future reactivation of rail service. This mechanism permits the railroad to "railbank" without having to apply for full abandonment. In the interim, the entity agreeing to oversee the corridor may use it as a trail.

The UMTA funding seems most promising for securing railroad rights-of-way for use as passenger rail service. The National Trails System Act allows for temporary banking of the rail corridor with future reactivation. Thus, the two programs seem suitable for the preservation of rail corridors for future possible implementation of passenger rail service.

### 9.1.7 Summary

The following table shows the salient estimates of operating and capital costs, revenue, passenger ridership, and passenger miles of service for the standard and enhanced Amtrak alternatives and for the high speed rail alternative.

## SUMMARY OF OPERATIONS

| | Standard Amtrak | Enhanced Amtrak | High Speed Rail |
|---|---|---|---|
| Total Capital Costs ($ million) | 30.8 | 58.3 | 92.6 |
| Annualized 25 year/10% ($ million) | 3.4 | 6.4 | 10.2 |
| Annual Cap/Passenger ($) | 11.20 | 16.4 | 21.98 |
| Annual Cap./Passenger Mile ($) | .12 | .17 | .23 |
| Annual O&M Costs ($ million) | 3.2 | 3.2 | 4.9 |
| Annual O&M/Passenger ($) | 10.54 | 8.20 | 10.56 |
| Annual O&M/Passenger Mile ($) | .11 | .09 | .11 |
| Annual Passenger (000s ) | 308.5 | 390.2 | 464.1 |
| Annual Passenger Mile (million) | 29.37 | 37.22 | 43.72 |
| Annual Revenue per Passenger Mile * | .11 | .11 | .11 |
| Annual Revenue ($ million) | 3.23 | 4.09 | 4.81 |
| Fares (OK — Tulsa) | 13.10 | 13.10 | 13.10 |
| (Tulsa — Bartlesville) | 5.60 | 5.60 | 5.60 |

Trips: Tulsa — OKC = 118.5 miles
Tulsa — Bartlesville = 50.5 miles

Annual Operations: 255 days of weekday service.

* The assumed fare basis is 11¢/mile.

## 9.2 RECOMMENDATIONS

While the year 2005 forecast demand for intercity passenger rail service is not high (1,200 to 2,500 per day), neither are the estimated costs for the standard Amtrak or enhanced Amtrak service. Both alternatives are expected to generate sufficient ridership at today's average fare recovery (of $.11 per mile) to cover the operations and maintenance costs. Given this forecast, it is reasonable to make provisions to reserve the two rail corridors for future passenger service should the demand between the city pairs and corridor as a whole exceed the capacity of the existing ground transportation facilities. Thus, for example, the alternative to widening the Turner Turnpike, US 75, or SH 66 could be the rail passenger alternative. In the long run the State should be a position to preserve the railroad corridor as a whole, if the existing railroad owners choose to sell or abandon the service.

In the near term, the State may want to encourage ridesharing on the corridor highways. For example, the State could provide limited priority treatment for high occupancy vehicles (carpools, vanpools, and buses). This could include a bypass lane at the entrance ramps or toll plaza in order to provide travel time savings to group riders.

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# APPENDIX A

## DEFINITIONS AND GLOSSARY OF TERMS

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# Definitions and Glossary of Terms

**Accelerated Service:** A transit service (usually rail) in which some train units (TU's) travel without stopping at, or bypassing, some stations. Examples: skip-stop and zonal service.

**Articulated:** A term used in the transit industry for extra-long vehicles with body sections connected by a joint mechanism which allows the vehicle to traverse small (or tight) radius curves and yet have a continuous interior. This term also applies to rapid transit cars with separate bodies sharing a common truck.

**Automated Guideway Transit (AGT):** Any guided mode with fully automated operation (no crew on TU's); however, the term usually refers only to guided modes with small and medium size vehicles. Personal rapid transit (PRT), group rapid transit (GRT) and people mover systems (PMS) are typically included as systems found in the AGT family.

**Automatic Train Operation (ATO):** A control system which performs all functions of train operation along a transit line. Such operations include starting, stopping, opening/closing doors, etc.

**Automatic Train Protection (ATP):** A control system which assures that trains maintain a safe following distance, that overspeed is prevented, and that conflicting movements at junctions, crossings and switches are precluded.

**Automatic Train Supervision (ATS):** A system which controls movements of all trains on transit lines or a network. It performs the functions of assigning routes, dispatching trains, and maintaining or adjusting schedules.

**Bus Lane:** A traffic lane for dominant or exclusive use by buses.

**Cable Car:** A rail transit car, typically with single cars, without motors and propelled by a continuously moving cable located in an underground slot between the running rails.

**Cam Controller:** When the propulsion control hardware is shared by a pair of cars so that eight traction motors are controlled as a group and the rheostatic control is obtained by means of contactors actuated by a shaft. The classical rheostatic control of these motors is accomplished by series-parallel connections of the armatures, and by using external resistances in series with the armature and the field windings.

**Capacity:** There are two types of capacity: static and dynamic. Static capacity is the total number of persons a vehicle can accommodate. Dynamic capacity is the maximum number of vehicles, spaces, or persons which can be transported past a fixed point in one direction per unit of time (usually one hour).

**Category "A" Right-of-Way (R/W):** A fully controlled transit R/W without grade crossings or legal access by other vehicles or persons; also called "grade-separated", "private", or "exclusive" R/W. It can be a tunnel, aerial, or at grade.

**Category "B" R/W:** A transit R/W type which is longitudinally physically separated (by curbs, barriers, grade separation, etc.) from other traffic, but with grade crossings for vehicles and pedestrians, including regular street intersections.

**Category "C" R/W:** This R/W type allows mixed traffic, e.g. buses and cars, to operate in the same lanes. Transit may have preferential treatment, such as reserved, and will travel with other traffic.

**Chopper:** A chopper is a dc-to-dc static converter that varies the average value of the direct voltage applied to a load. In general, there are two classes of chopper circuits — a step-down chopper, in which the load voltage is less than, or equal to, the supply voltage, and a step-up chopper, in which the load voltage is equal to, or more than, the supply voltage.

**Commuter Railroad or Regional Rail:** A regional passenger service which consists of electric or diesel-powered trains on grade-separated railroad lines (sometimes with protected grade crossings).

**Commuter Transit:** Transit services operated during peak hours only, primarily serving work trips.

**Contraflow Bus Lane (CBL):** A term used to describe the movement of transit vehicles operating in the opposite direction from other traffic.

**Demand Responsive Transit:** Paratransit services with routes and schedules partially or fully determined by the travel desires of individual passengers. Examples include dial-a-ride taxi.

**Dial-A-Ride (D/R):** A paratransit service consisting of minibuses or vans directed from a central dispatching office to pick-up and drop-off individual passengers according to their desires expressed via telephone.

**Dual-Mode Operation:** A transit operation which involves, at one time or another, two radically different features or characteristics, such as first manually steered and later guided, or initially diesel powered and then electrically powered.

**Duo-Rail:** A term used to describe transit systems that ride on, or are suspended from, a dual-rail guideway. Examples include regional rail (RGR),rail rapid transit (RRT) and light rail transit (LRT).

**Exclusive Bus Lanes (EBL):** lanes, usually two, for bus use only, physically separated (by curbs or barriers) from other traffic.

**Fail-Safe:** A characteristic of a system which ensures that a fault or malfunction of any element affecting safety will cause the system to revert to a state which is known to be safe; alternatively, a system characteristic which ensures that any fault or malfunction will not result in an unsafe condition.

**Group Rapid Transit (GRT):** A term applied to the operation of medium-size vehicles operating automatically as single units or coupled trains on exclusive R/W with special guideways. Most GRT systems deployed to date have been rubber-tired and electrically propelled. They are also known as people mover systems (PMS).

**Guided Transit:** A term applied to transit services where the vehicles are physically guided by a guideway; includes rail, monorail, AGT and several other technologies.

**Heavy Duty Rail Transit or Heavy Rail:** See rail rapid transit.

**High Occupancy Vehicles (HOV):** Vehicles of any type (automobiles, vans, buses or others) which carry a certain prescribed number of passengers.

**Interurban:** Transit service between cities and towns.

**Kiss and Ride (K+R):** A term applied to a transit passenger who is driven to a transit station by another person, e.g., a spouse; the latter then departs, using neither the transit service or the station facilities. Also used to describe the facility or area where the passenger is dropped off.

**Level of Service (L/S):** An overall measure of all service characteristics that affect users.

**Light Rail Rapid Transit (LRRT):** Light rail transit with a Category "A" R/W on its entire length. It may have either low or high-level platforms and visual or cab signal control. It is a mode between LRT (see below) and rail rapid transit (LRT).

**Light Rail Transit (LRT):** A transit mode predominantly utilizing overhead power and using R/W Category "B", and sometimes "A" or "C", on different network sections. The electrically powered rail vehicles operate in 1 to 4-car TU's. The mode has a wide L/S range and performance characteristics. When a Category "A" R/W is utilized, this mode becomes an LRRT.

**Low-Level Platforms:** These are at-ground level platforms or one curb height above ground. Used by all streetcars and most LRT and regional or commuter rail systems.

**Married Pair Units:** A married pair are vehicles with shared mechanical and electrical equipment. Commonly used for rail rapid transit (RRT) and regional rail (RGR) systems, these units comprise two (A and B) or three (A, B and C) semipermanent coupled vehicles which cannot operate alone. The two-car units are most often used for RRT and the three-car configuration for RGR; the latter is powered or unpowered trailer.

**Monorail:** A guided transit mode riding on, or suspended from, a single rail, beam or tube; vehicles usually operate in trains.

**Monomotor Truck:** A monomotor truck is a type of propulsion design in which a single motor is placed between two axles, perpendicular to their directions. Its drive shaft powers both axles, thus rigidly connecting them. Since the 1950s, monomotor design has been increasingly used for LRT and RRT vehicles; its advantages over 2-motor truck designs include lower weight, simpler maintenance, and lower cost resulting from the use of one, instead of two, motors.

**Multiple Unit (MU) Train:** A multiple unit train consists of several powered cars (single units, married pairs, or other types) that are controlled by one driver. All RRT systems are operated in this manner to distinguish them from train consists with trailers.

**Paratransit:** Passenger transportation service modes consisting of small or medium-capacity highway vehicles offering services adjustable in varying degrees to meet an individual user's desires. Its categories include:

- Public paratransit: Services available to any user who pays a predetermined fare. Examples: taxi, jitney, dial-a-ride.
- Semi-public paratransit: Services available only to persons of a certain group, such as a company, neighborhood, etc. Examples: vanpools, subscription buses, elderly and described services.

**Park-And-Ride (P+R):** A term applied to a passenger who drives to a transit station and parks his/her automobile in the station's P+R lot. Possible with any transit mode, but most commonly used with rail modes, particularly RRT and RGR.

**People Mover (PM):** Same as group rapid transit (GRT).

**Performance (Transit System):** A composite measure of transit system operating characteristics, mostly quantitative, such as service frequency, speed, reliability, safety, capacity, and productivity.

**Pre-metro:** An LRT system designed with provisions for easy conversion into rail rapid transit (RRT). This can be achieved by upgrading the vehicles and/or stations and providing a Category "A" R/W.

**Personal Rapid Transit (PRT):** A transit mode of small-capacity (2 to 6-person seating capacity) vehicles traveling automatically over a system of guideways. Individuals or small groups use a vehicle to travel between origin and destination stations without stopping; this is possible because most stations are off-line.

**Rail Diesel Car (RDC):** A self-propelled passenger car typically used in commuter or branch line service. RDCs have their own power plant and can be operated in multi-unit service with several cars controlled from the lead car.

**Rail Rapid Transit (RRT):** A transit mode typically involving electrically powered rail vehicles operating in 4 to 10-car trains on R/W Category "A". High capacity, high commercial speed. Also termed "Metro".

**Rail Transit:** A term applied to describe a transit service involving steel wheels on steel rails. The major services, generally in ascending order of performance, are streetcars, light rail transit, rail rapid transit, commuter rail, and regional rail.

**Rapid Transit (RT):** A generic class of transit modes which operate exclusively on R/W Category "A" and have high speed, capacity, reliability and safety. Included, but not limited to RRT, LRRT, and most RGR systems.

**Regenerative Braking:** Is a form of braking that occurs when a load drives a motor, the motor acts as a dc generator, and if the induced voltage is greater than the source voltage, the armature current is reversed and is fed into the dc source.

**Regional Rail (RGR) or Commuter Rail:** A regional passenger service, usually provided by railroad agencies, which consists of electric or diesel-powered trains on grade-separated railroad lines (sometimes with protected grade crossings).

**Regional Transit:** A term used to describe either long-haul bus or rail transit lines with few stations and high operating speeds. These primarily serve long trips within metropolitan regions, as distinguished from city transit and short-haul transit.

**Regular Bus (RB) or Local Service:** Common urban bus routes serving all stops, as distinguished from short-haul and express service.

**Regular Bus Lane (RBL):** A lane or lanes on urban streets or freeways reserved for bus use only, separated from other lanes by pavement markings, signs or rubber cones, but not by fixed physical barriers.

**Right-Of-Way (R/W):** (1) a legally and physically separated strip of lane for exclusive use by transit vehicles; crossings may be allowed; (2) any path or way on which transit vehicles travel. Based on the second definition, transit rights-of-way are classified in three categories: "A", "B" and "C" (see Categories "A", "B" and "C" R/W previously defined).

**Rubber-Tired Rapid Transit (RTRT):** A term applicable to vehicles which ride on, and are guided by, rubber tires on a specially designed guideway. Switching and vehicle support, in cases of tire failure, may be provided by additional steel wheels and conventional rail tracks or by other mechanisms.

**Short-Haul Transit:** A form of low-speed transit services for circulation within small areas, usually with high travel density, such as CBDs, campuses, airports, exhibition grounds, and other major activity centers.

**Single-Body Vehicle:** A bus or rail vehicle with one rigid (non-articulated) body.

**Special Transit:** A form of transit service provided on special occasions, such as sporting events, exhibitions and public festivities, or for special groups, such as tourists, school students and the disabled.

**Specialized Technologies:** Transit modes with other than highway or rail technologies, mostly used for short-haul services or for special physical conditions (steep grades, water bodies, etc.). Also called specialized transit modes. Examples: cog railways, ski lifts (particularly those involving cabins), etc.

**Streetcar or Trolley (SCR):** A street transit mode consisting of electrically powered rail vehicles operating mostly on R/W Category "C", and quite often sharing traffic lanes with cars, trucks, buses, etc.

**Street Transit:** A generic class of modes operating on streets with mixed traffic (R/W Category "C"). Examples: regular bus, trolleybus and streetcar.

**Subway:** Transit in tunnels beneath street levels.

**Transit Mode Classes:** Groups of transit modes classified by their basic characteristics such as:

- Technology: Highway, rail and specialized technology
- R/W Category: Street (C), semirapid (B), and rapid transit (A)
- Service Type: Offered to the public by the transit operating agency

**Train Unit (TU):** One or more transit vehicles traveling together as a physical unit. Joint term for single vehicle and train.

**Trolley Bus (TB):** An electrically powered bus which obtains power via two trolley poles from two overhead wires along routes.

**Urban Public Transportation:** Transport systems for intra-urban or intra-regional travel available for use by a person.

**Vanpool Service:** A form of transit involving privately or publicly provided vans transporting groups of persons to and from work on a regular basis. Drivers are usually selected from each passenger group.

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# APPENDIX B

## SUMMARY OF MAJOR CHARACTERISTICS OF TRANSIT TECHNOLOGIES

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## RAIL/BUS CONVENTIONAL - Up to 80 MPH

Candidate Intercity Transit Technologies
Summary of Major Characteristics

| CATEGORY | NAME | APPLICATION | MAX SPEED MPH | CRUISE SPEED MPH | MAX CAPACITY PPH | STATUS |
|---|---|---|---|---|---|---|
| Bus | Urban/Suburban Bus | Mixed Traffic/Public Freeway<br><br>Collect/Distribute and Line Haul | 55 | Varies with Traffic | 1,200 to 3,000 | Mature |
| | High Capacity Commuterway | Preferential/HOV Lane<br><br>Collect/Distribute and Line Haul | 55 | 55 (Posted Limit) | 6,300 | Mature |
| | High Capacity Busway | Private Right-of-way - Busway<br><br>Collect/Distribute and Line Haul | 75 | 75 | 10,000 | Mature |
| | Articulated Guided Bus - Mercedes Benz O 405 G | Private Right-of-way - Busway with Guideway<br><br>Collect/Distribute and Line Haul | 60 | 55 | 3,450 | Mature |

## RAPID RAIL/GUIDEWAY - 80 TO 125 MPH

### Candidate Intercity Transit Technologies
### Summary of Major Characteristics

| CATEGORY | NAME | APPLICATION | MAX SPEED MPH | CRUISE SPEED MPH | MAX CAPACITY PPH | STATUS |
|---|---|---|---|---|---|---|
| Existing Upgraded Track; F.R.A.CL.7 | Commuter Rail | Exclusive Right-of-way with Overhead Wire Power Optional Line Haul | 80 | 80 | approx. 20,000 | Mature |
| | LRC - Canada | High Speed Line Haul<br>Existing Track Upgraded to FRA - CL.7, Minimum.<br>Tilt-Body Coaches | 125 | 125 | approx. 6,700 | Mature |
| | HST - England | High Speed Line Haul<br>Existing Track Upgraded To F.R.A CL.7 Minimum | 125 | 125 | approx. 5,700 | Mature |
| | T-200, Sweden | High Speed Line Haul<br>Tilt-Body Vehicles | 124 | | | Under Development |
| | Amtrak AEM-7 | High Speed Line Haul<br>All-Electric with Overhead Wire | 120 | | | Domestic State-of-the-Art; Outmoded |
| | Amtrak F 40 PH | High Speed Line Haul<br>Diesel-Electric | 103 | | | Domestic State-of-the-Art; Outmoded |
| | SPV 2000 Transit America | High Speed Line Haul<br>Self-Propelled Diesel | 120 | | approx. 6,500 | Mature<br>Out of Production |

## HIGH SPEED RAIL - 125 TO 185 MPH

Candidate Intercity Transit Technologies
Summary of Major Characteristics

| CATE-GORY | NAME | APPLICATION | MAX SPEED MPH | CRUISE SPEED MPH | MAX CAPACITY PPH | STATUS |
|---|---|---|---|---|---|---|
| State-of-the-Art New Track | ET-403 German | High Speed Line Haul<br>All-Electric on Exising, Improved Track | 125 | | | Revenue Service Limited |
| | ETR 401 -Italian | (Same as Above) Tilt-Body Vehicles | 155 | | | (Same as Above) |
| | APT-England | (Same as Above) Tilt-Body Vehicles | 125 | | | (Same as Above) |
| | Series 961 Bullet Train-Japan | High Speed Long-Haul<br>New Electrified Track | 160 | 130 | approx. 2,000 | Mature |
| | TGV- PSE, France | (Same as Above) | 185 | | approx. 2,300 | Mature |
| | ICE - German | (Same as Above) | 185 | | approx. 2,000 | Under Development |

## SUPER SPEED SYSTEMS - GREATER THAN 185 MPH

Candidate Intercity Transit Technologies
Summary of Major Characteristics

| CATEGORY | NAME | APPLICATION | MAX SPEED MPH | CRUISE SPEED MPH | MAX CAPACITY PPH | STATUS |
|---|---|---|---|---|---|---|
| Super-Speed Technologies | MAG-LEV, TR 06<br>Germany | High Speed Line Haul<br><br>Electromagnetically Suspended above Elevated Guideway | 248 | >185 | approx. 2,000 | Under Development |
| | MAG-LEV, MLU -001<br>Japan | High Speed Line Haul<br><br>Electrodynamically Suspended Above Elevated Guideway | 311 | >185 | unavailable | Under Development |

# APPENDIX C

## SYSTEM CAPITAL AND OPERATING COST ESTIMATES

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# Table C-1

## COST ESTIMATE FOR STANDARD COMMUTER RAIL SERVICE

SEGMENT 1 - OKLAHOMA CITY TO JUNCTION WITH BNRR
(approximately 4.5 miles)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| REMOVE RAIL | $25,000.00 | MILES | 2.00 | $50,000.00 |
| CONSTRUCT ROADBED | $50,000.00 | MILES | 2.00 | $100,000.00 |
| TRAFFIC PROTECTION | $40,000.00 | MILES | 4.50 | $180,000.00 |
| CONSTRUCT TRACK | $560,000.00 | MILES | 2.00 | $1,120,000.00 |
| TIES @ 650/MILE | $32,600.00 | MILES | 2.50 | $81,500.00 |
| REPLACE RAIL (2ND HAND CWR) | $162,000.00 | MILES | 2.50 | $405,000.00 |
| STATION | $450,000.00 | EACH | 1.00 | $450,000.00 |
| CONNECTING TRK | $106.00 | TRK FT | 1,200.00 | $127,200.00 |
| TURNOUTS | $53,000.00 | EACH | 2.00 | $106,000.00 |
| CONTROL FOR TURNOUTS | $150,000.00 | EACH | 2.00 | $300,000.00 |
| NEW ROADBED | $180.00 | TRK FT | 1,200.00 | $216,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $3,135,700.00 |
| 20% DESIGN AND MANAGEMENT = | $627,140.00 |
| 20% CONTINGENCY ALLOWANCE = | $752,568.00 |
| TOTAL SEGMENT COST = | $4,515,408.00 |

SEGMENT 2 - JUNCTION WITH BNRR TO SAPULPA
(approximately 99.5 miles)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| TRAFFIC PROTECTION | $20,000.00 | MILES | 99.50 | $1,990,000.00 |
| STATION | $450,000.00 | EACH | 1.00 | $450,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $2,440,000.00 |
| 20% DESIGN AND MANAGEMENT = | $488,000.00 |
| 20% CONTINGENCY ALLOWANCE = | $585,600.00 |
| TOTAL SEGMENT COST = | $3,513,600.00 |

SEGMENT 3 - SAPULPA TO TULSA CBD
(approximately 14 miles)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| TRAFFIC PROTECTION | $20,000.00 | MILES | 14.00 | $280,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $280,000.00 |
| 20% DESIGN AND MANAGEMENT = | $56,000.00 |
| 20% CONTINGENCY ALLOWANCE = | $67,200.00 |
| TOTAL SEGMENT COST = | $403,200.00 |

SEGMENT 4 - TULSA CBD
(approximately 1 mile)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| STATION | $450,000.00 | EACH | 1.00 | $450,000.00 |
| STATION TRACK | $106.00 | TRK FT | 1,000.00 | $106,000.00 |
| TURNOUTS | $53,000.00 | EACH | 2.00 | $106,000.00 |
| CONTROL FOR TURNOUTS | $150,000.00 | EACH | 2.00 | $300,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $962,000.00 |
| 20% DESIGN AND MANAGEMENT = | $192,400.00 |
| 20% CONTINGENCY ALLOWANCE = | $230,880.00 |
| TOTAL SEGMENT COST = | $1,385,280.00 |

SEGMENT 5 - TULSA TO OWASSO
(approximately 11 miles)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| TIES @900/MILE | $47,000.00 | MILES | 11.00 | $517,000.00 |
| TRAFFIC PROTECTION | $40,000.00 | MILES | 11.00 | $440,000.00 |
| REPLACE RAIL (2ND HAND CWR) | $162,000.00 | MILES | 11.00 | $1,782,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $2,739,000.00 |
| 20% DESIGN AND MANAGEMENT = | $547,800.00 |
| 20% CONTINGENCY ALLOWANCE = | $657,360.00\ |
| TOTAL SEGMENT COST = | $3,944,160.00 |

SEGMENT 6 - OWASSO TO BARTLESVILLE
(approximately 38 miles)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| TRAFFIC PROTECTION | $20,000.00 | MILES | 38.00 | $760,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $760,000.00 |
| 20% DESIGN AND MANAGEMENT = | $152,000.00 |
| 20% CONTINGENCY ALLOWANCE = | $182,400.00 |
| TOTAL SEGMENT COST = | $1,094,400.00 |

SEGMENT 7 - BARTLESVILLE CBD
(approximately 1 mile)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| STATION | $648,000.00 | EACH | 1.00 | $648,000.00 |
| TIES @900/MILE | $47,000.00 | MILES | 1.00 | $47,000.00 |
| REPLACE RAIL (2ND HAND CWR) | $162,000.00 | MILES | 1.00 | $162,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $857,000.00 |
| 20% DESIGN AND MANAGEMENT = | $171,400.00 |
| 20% CONTINGENCY ALLOWANCE = | $205,680.00 |
| TOTAL SEGMENT COST = | $1,234,080.00 |

# COST ESTIMATE FOR STANDARD COMMUTER RAIL SERVICE

SUMMARY

| | CONSTRUCTION COST | DESIGN AND MANAGEMENT | CONTINGENCY | TOTAL COST |
|---|---|---|---|---|
| SEGMENT 1 | 3,135,700.00 | 627,140.00 | 752,568.00 | $4,515,408.00 |
| SEGMENT 2 | 2,440,000.00 | 488,000.00 | 585,600.00 | $3,513,600.00 |
| SEGMENT 3 | 280,000.00 | 56,000.00 | 67,200.00 | $403,200.00 |
| SEGMENT 4 | 962,000.00 | 192,400.00 | 230,880.00 | $1,385,280.00 |
| SEGMENT 5 | 2,739,000.00 | 547,800.00 | 657,360.00 | $3,944,160.00 |
| SEGMENT 6 | 760,000.00 | 152,000.00 | 182,400.00 | $1,094,400.00 |
| SEGMENT 7 | 857,000.00 | 171,400.00 | 205,680.00 | $1,234,080.00 |
| | | | TOTAL | $16,090,128.00 |

Source: Parsons Brinckerhoff, May 1989.

## Table C-2

### COST ESTIMATE FOR ENHANCED COMMUTER RAIL SERVICE

SEGMENT 1 - OKLAHOMA CITY TO JUNCTION WITH BNRR
(approximately 4.5 miles)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| REMOVE RAIL | $25,000.00 | MILES | 4.50 | $112,500.00 |
| CONSTRUCT ROADBED | $50,000.00 | MILES | 4.50 | $225,000.00 |
| TRAFFIC PROTECTION | $40,000.00 | MILES | 4.50 | $180,000.00 |
| CONSTRUCT TRACK | $560,000.00 | MILES | 4.50 | $2,520,000.00 |
| STATION | $450,000.00 | EACH | 1.00 | $450,000.00 |
| CONNECTING TRK | $106.00 | TRK FT | 1,200.00 | $127,200.00 |
| TURNOUTS | $53,000.00 | EACH | 2.00 | $106,000.00 |
| CONTROL FOR TURNOUTS | $150,000.00 | EACH | 2.00 | $300,000.00 |
| NEW ROADBED | $180.00 | TRK FT | 1,200.00 | $216,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $4,236,700.00 |
| 20% DESIGN AND MANAGEMENT = | $847,340.00 |
| 20% CONTINGENCY ALLOWANCE = | $1,016,808.00 |
| TOTAL SEGMENT COST = | $6,100,848.00 |

SEGMENT 2 - JUNCTION WITH BNRR TO SAPULPA
(approximately 99.5 miles)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| TRAFFIC PROTECTION | $20,000.00 | MILES | 99.50 | $1,990,000.00 |
| STATION | $450,000.00 | EACH | 1.00 | $450,000.00 |
| 4 INCH BALLAST (50% OF TRACK) | $98,500.00 | MILES | 50.00 | $4,925,000.00 |
| TIES @ 400/MILE | $21,000.00 | MILES | 99.50 | $2,089,500.00 |
| CONTROLLED PASSING TRACK | $635,000.00 | EACH | 1.00 | $635,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $10,089,500.00 |
| 20% DESIGN AND MANAGEMENT = | $2,017,900.00 |
| 20% CONTINGENCY ALLOWANCE = | $2,421,480.00 |
| TOTAL SEGMENT COST = | $14,528,880.00 |

SEGMENT 3 - SAPULPA TO TULSA CBD
(approximately 14 miles)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| TRAFFIC PROTECTION | $20,000.00 | MILES | 14.00 | $280,000.00 |
| SKIN LIFT | $80,000.00 | MILES | 14.00 | $1,120,000.00 |
| TIES @ 400/MILE | $21,000.00 | MILES | 14.00 | $294,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $1,694,000.00 |
| 20% DESIGN AND MANAGEMENT = | $338,800.00 |
| 20% CONTINGENCY ALLOWANCE = | $406,560.00 |
| TOTAL SEGMENT COST = | $2,439,360.00 |

SEGMENT 4 - TULSA CBD
(approximately 1 mile)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| STATION | $450,000.00 | EACH | 1.00 | $450,000.00 |
| STATION TRACK | $106.00 | TRK FT | 1,000.00 | $106,000.00 |
| TURNOUTS | $53,000.00 | EACH | 2.00 | $106,000.00 |
| CONTROL FOR TURNOUTS | $150,000.00 | EACH | 2.00 | $300,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $962,000.00 |
| 20% DESIGN AND MANAGEMENT = | $192,400.00 |
| 20% CONTINGENCY ALLOWANCE = | $230,880.00 |
| TOTAL SEGMENT COST = | $1,385,280.00 |

SEGMENT 5 - TULSA TO OWASSO
(approximately 11 miles)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| REMOVE RAIL | $25,000.00 | MILES | 11.00 | $275,000.00 |
| CONSTRUCT ROADBED | $50,000.00 | MILES | 11.00 | $550,000.00 |
| TRAFFIC PROTECTION | $40,000.00 | MILES | 11.00 | $440,000.00 |
| CONSTRUCT TRACK | $560,000.00 | MILES | 11.00 | $6,160,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $7,425,000.00 |
| 20% DESIGN AND MANAGEMENT = | $1,485,000.00 |
| 20% CONTINGENCY ALLOWANCE = | $1,782,000.00 |
| TOTAL SEGMENT COST = | $10,692,000.00 |

SEGMENT 6 - OWASSO TO BARTLESVILLE
(approximately 38 miles)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| TRAFFIC PROTECTION | $20,000.00 | MILES | 38.00 | $760,000.00 |
| SKIN LIFT | $80,000.00 | MILES | 38.00 | $3,040,000.00 |
| TIES @ 400/MILE | $21,000.00 | MILES | 38.00 | $798,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $4,598,000.00 |
| 20% DESIGN AND MANAGEMENT = | $919,600.00 |
| 20% CONTINGENCY ALLOWANCE = | $1,103,520.00 |
| TOTAL SEGMENT COST = | $6,621,120.00 |

SEGMENT 7 - BARTLESVILLE CBD
(approximately 1 mile)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| STATION | $648,000.00 | EACH | 1.00 | $648,000.00 |
| REMOVAL RAIL | $25,000.00 | MILES | 1.00 | $25,000.00 |
| CONSTRUCT ROADBED | $50,000.00 | MILES | 1.00 | $50,000.00 |
| CONSTRUCT TRACK | $560,000.00 | MILES | 1.00 | $560,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $1,283,000.00 |
| 20% DESIGN AND MANAGEMENT = | $256,600.00 |
| 20% CONTINGENCY ALLOWANCE = | $307,920.00 |
| TOTAL SEGMENT COST = | $1,847,520.00 |

## COST ESTIMATE FOR STANDARD COMMUTER RAIL SERVICE

SUMMARY

| | CONSTRUCTION COST | DESIGN AND MANAGEMENT | CONTINGENCY | TOTAL COST |
|---|---|---|---|---|
| SEGMENT 1 | 4,236,700.00 | 847,340.00 | 1,016,808.00 | $6,100,848.00 |
| SEGMENT 2 | 10,089,500.00 | 2,017,900.00 | 2,421,480.00 | $14,528,880.00 |
| SEGMENT 3 | 1,694,000.00 | 338,800.00 | 406,560.00 | $2,439,360.00 |
| SEGMENT 4 | 962,000.00 | 192,400.00 | 230,880.00 | $1,385,280.00 |
| SEGMENT 5 | 7,425,000.00 | 1,485,000.00 | 1,782,000.00 | $10,692,000.00 |
| SEGMENT 6 | 4,598,000.00 | 919,600.00 | 1,103,520.00 | $6,621,120.00 |
| SEGMENT 7 | 1,283,000.00 | 256,600.00 | 307,920.00 | $1,847,520.00 |
| | | | TOTAL | $43,615,008.00 |

Source: Parsons Brinckerhoff, May 1989.

## Table C-3

### COST ESTIMATE FOR HIGH SPEED COMMUTER RAIL SERVICE

SEGMENT 1 - OKLAHOMA CITY TO JUNCTION WITH BNRR
(approximately 4.5 miles)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| REMOVE RAIL | $25,000.00 | MILES | 4.50 | $112,500.00 |
| CONSTRUCT ROADBED | $50,000.00 | MILES | 4.50 | $225,000.00 |
| TRAFFIC PROTECTION | $40,000.00 | MILES | 4.50 | $180,000.00 |
| CONSTRUCT TRACK | $560,000.00 | MILES | 4.50 | $2,520,000.00 |
| STATION | $450,000.00 | EACH | 1.00 | $450,000.00 |
| CONNECTING TRK | $106.00 | TRK FT | 1,200.00 | $127,200.00 |
| TURNOUTS | $53,000.00 | EACH | 2.00 | $106,000.00 |
| CONTROL FOR TURNOUTS | $150,000.00 | EACH | 2.00 | $300,000.00 |
| NEW ROADBED | $180.00 | TRK FT | 1,200.00 | $216,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $4,236,700.00 |
| 20% DESIGN AND MANAGEMENT = | $847,340.00 |
| 20% CONTINGENCY ALLOWANCE = | $1,016,808.00 |
| TOTAL SEGMENT COST = | $6,100,848.00 |

SEGMENT 2 - JUNCTION WITH BNRR TO SAPULPA
(approximately 99.5 miles)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| TRAFFIC PROTECTION | $20,000.00 | MILES | 99.50 | $1,990,000.00 |
| STATION | $450,000.00 | EACH | 1.00 | $450,000.00 |
| 4 INCH BALLAST (50% OF TRACK) | $98,500.00 | MILES | 50.00 | $4,925,000.00 |
| SKIN LIFT | $80,000.00 | MILES | 49.50 | $3,960,000.00 |
| TIES @ 400/MILE | $21,000.00 | MILES | 99.50 | $2,089,500.00 |
| REPLACE RAIL (2ND HAND CWR) | $162,000.00 | MILES | 8.00 | $1,296,000.00 |
| BRIDGE AND CULV. MODIFICATIONS | $50,000.00 | MILES | 99.50 | $4,975,000.00 |
| CONTROLLED PASSING TRACK | $635,000.00 | EACH | 1.00 | $635,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $20,320,500.00 |
| 20% DESIGN AND MANAGEMENT = | $4,064,100.00 |
| 20% CONTINGENCY ALLOWANCE = | $4,876,920.00 |
| TOTAL SEGMENT COST = | $29,261,520.00 |

SEGMENT 3 - SAPULPA TO TULSA CBD
(approximately 14 miles)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| TRAFFIC PROTECTION | $20,000.00 | MILES | 14.00 | $280,000.00 |
| SKIN LIFT | $80,000.00 | MILES | 14.00 | $1,120,000.00 |
| TIES @ 400/MILE | $21,000.00 | MILES | 14.00 | $294,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $1,694,000.00 |
| 20% DESIGN AND MANAGEMENT = | $338,800.00 |
| 20% CONTINGENCY ALLOWANCE = | $406,560.00 |
| TOTAL SEGMENT COST = | $2,439,360.00 |

SEGMENT 4 - TULSA CBD
(approximately 1 mile)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| STATION | $450,000.00 | EACH | 1.00 | $450,000.00 |
| STATION TRACK | $106.00 | TRK FT | 1,000.00 | $106,000.00 |
| TURNOUTS | $53,000.00 | EACH | 2.00 | $106,000.00 |
| CONTROL FOR TURNOUTS | $150,000.00 | EACH | 2.00 | $300,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $962,000.00 |
| 20% DESIGN AND MANAGEMENT = | $192,400.00 |
| 20% CONTINGENCY ALLOWANCE = | $230,880.00 |
| TOTAL SEGMENT COST = | $1,385,280.00 |

SEGMENT 5 - TULSA TO OWASSO
(approximately 11 miles)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
|---|---|---|---|---|
| REMOVE RAIL | $25,000.00 | MILES | 11.00 | $275,000.00 |
| CONSTRUCT ROADBED | $50,000.00 | MILES | 11.00 | $550,000.00 |
| TRAFFIC PROTECTION | $40,000.00 | MILES | 11.00 | $440,000.00 |
| CONSTRUCT TRACK | $560,000.00 | MILES | 11.00 | $6,160,000.00 |

| | |
|---|---|
| TOTAL CONSTRUCTION COSTS = | $7,425,000.00 |
| 20% DESIGN AND MANAGEMENT = | $1,485,000.00 |
| 20% CONTINGENCY ALLOWANCE = | $1,782,000.00 |
| TOTAL SEGMENT COST = | $10,692,000.00 |

SEGMENT 6 - OWASSO TO BARTLESVILLE
(approximately 38 miles)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
| --- | --- | --- | --- | --- |
| TRAFFIC PROTECTION | $20,000.00 | MILES | 38.00 | $760,000.00 |
| SKIN LIFT | $80,000.00 | MILES | 38.00 | $3,040,000.00 |
| TIES @ 400/MILE | $21,000.00 | MILES | 38.00 | $798,000.00 |
| REPLACE RAIL (2ND HAND CWR) | $162,000.00 | MILES | 34.00 | $5,508,000.00 |
| BRIDGE AND CULV. MODIFICATIONS | $30,000.00 | MILES | 38.00 | $1,140,000.00 |

| | |
| --- | --- |
| TOTAL CONSTRUCTION COSTS = | $11,246,000.00 |
| 20% DESIGN AND MANAGEMENT = | $2,249,200.00 |
| 20% CONTINGENCY ALLOWANCE = | $2,699,040.00 |
| TOTAL SEGMENT COST = | $16,194,240.00 |

SEGMENT 7 - BARTLESVILLE CBD
(approximately 1 mile)

| DESCRIPTION | UNIT COST | UNITS | QUANTITY | AMOUNT |
| --- | --- | --- | --- | --- |
| STATION | $648,000.00 | EACH | 1.00 | $648,000.00 |
| REMOVE RAIL | $25,000.00 | MILES | 1.00 | $25,000.00 |
| CONSTRUCT ROADBED | $50,000.00 | MILES | 1.00 | $50,000.00 |
| CONSTRUCT TRACK | $560,000.00 | MILES | 1.00 | $560,000.00 |

| | |
| --- | --- |
| TOTAL CONSTRUCTION COSTS = | $1,283,000.00 |
| 20% DESIGN AND MANAGEMENT = | $256,600.00 |
| 20% CONTINGENCY ALLOWANCE = | $307,920.00 |
| TOTAL SEGMENT COST = | $1,847,520.00 |

## COST ESTIMATE FOR HIGH SPEED COMMUTER RAIL SERVICE

SUMMARY

| | CONSTRUCTION COST | DESIGN AND MANAGEMENT | CONTINGENCY | TOTAL COST |
|---|---|---|---|---|
| SEGMENT 1 | 4,236,700.00 | 847,340.00 | 1,016,808.00 | $6,100,848.00 |
| SEGMENT 2 | 20,320,500.00 | 4,064,100.00 | 4,876,920.00 | $29,261,520.00 |
| SEGMENT 3 | 1,694,000.00 | 338,800.00 | 406,560.00 | $2,439,360.00 |
| SEGMENT 4 | 962,000.00 | 192,400.00 | 230,880.00 | $1,385,280.00 |
| SEGMENT 5 | 7,425,000.00 | 1,485,000.00 | 1,782,000.00 | $10,692,000.00 |
| SEGMENT 6 | 11,246,000.00 | 2,249,200.00 | 2,699,040.00 | $16,194,240.00 |
| SEGMENT 7 | 1,283,000.00 | 256,600.00 | 307,920.00 | $1,847,520.00 |
| | | | TOTAL | $167,920,768.00 |

Source: Parsons Brinckerhoff, May 1989.

# APPENDIX D

## DAILY OPERATING AND MAINTENANCE COST ESTIMATES

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# PRELIMINARY COSTING MODEL — COMMUTER RAIL SERVICE
## TULSA/OKLAHOMA CITY & TULSA/BARTLESVILLE

### DAILY ASSUMPTIONS

- Three crews
- One station stop
- Track upgraded for rail service
- Layover/non-revenue time factor = 125%
- 255 weekdays of service annually
- Span of service (in hours) = 12.50
- Continuous service with some layover

| Travel Parameters | Distance (mi.) One Way | Distance (mi.) Round Trip | Time (min.) One Way | Time (min.) Round Trip |
|---|---|---|---|---|
| OK City - Tulsa | 118.50 | 237.00 | 150.40 | 300.80 |
| Tulsa - Bartlesville | 50.50 | 101.00 | 70.60 | 141.20 |

### EQUIPMENT

| | |
|---|---|
| Number of Train Sets: | 3 |
| Number of Cars per Train: | 1 |
| Total Number of Cars: | 3 |
| Locomotives per Train: | 1 |
| Total Number of Locomotives: | 3 |
| Total Vehicles: | 6 |

### OPERATIONS

| | DAILY AM Peak | DAILY PM Peak | DAILY Base | DAILY TOTAL | TRAIN MILES Per Trip | TRAIN MILES TOTAL | TRAIN HOURS Per Trip | TRAIN HOURS TOTAL | TRAIN HOURS W/Layover |
|---|---|---|---|---|---|---|---|---|---|
| Daily One-Way Trips: OK/Tulsa: | 2 | 2 | 4 | 8 | 118.5 | 948.0 | 2.51 | 20.05 | 25.07 |
| Daily One-Way Trips: Tulsa/Bartlesville: | 3 | 2 | 3 | 8 | 50.5 | 404.0 | 2.51 | 9.41 | 11.77 |
| Daily Total Trips per Weekday: | 5 | 4 | 7 | 16 | | 1,352.0 | | 29.47 | 36.83 |

### OPERATIONS (Continued)

| | ANNUAL TRAIN Trips | Miles | Hours | Hours W/Layover |
|---|---|---|---|---|
| Daily One-Way Trips: OK/Tulsa: | 2,040 | 241,740 | 5,114 | 6,392 |
| Daily One-Way Trips: Tulsa/Bartlesville: | 2,040 | 103,020 | 2,400 | 3,001 |
| Daily Total Trips per Weekday: | 4,080 | 344,760 | 7,514 | 9,393 |

| | DAILY AM Peak | DAILY PM Peak | DAILY Base | DAILY TOTAL | VEHICLE MILES | VEHICLE MILES |
|---|---|---|---|---|---|---|
| Car Miles (weekday service): | 389 | 338 | 626 | 1,352 | 344,760 | 344,760 |
| Locomotive Miles: | 389 | 338 | 626 | 1,352 | 344,760 | 344,760 |
| Total Daily Vehicle Miles: | 777 | 676 | 1,251 | 2,074 | | |

## PRELIMINARY COSTING MODEL — COMMUTER RAIL SERVICE
## TULSA/OKLAHOMA CITY & TULSA/BARTLESVILLE

| STAFFING AND UNIT COSTS | Number | Hourly Rate | Burden | Daily Salary For Crew Ttl | Annual Cost |
|---|---|---|---|---|---|
| Train Crew Employees: | | | | | |
| Engineer: | | $18.99 | 1.50 | $1,154.12 * | $294,300 |
| Conductor: | | $15.83 | 1.50 | $962.07 | $245,300 |
| Asst. Conductor: | | $13.49 | 1.50 | $819.85 | $209,063 |
| Subtotal Cost: | | | | $2,936.04 | $748,690 |
| M&E Employees (serving .5/car): | 2 | $15.83 | 1.50 | $323,76 | $82,559 |
| Supervision & Administration: | 2 | $15.83 | 1.50 | $641.12 ** | $163,484 |
| Fare Collection: | 0 | (included in train crew assignments) | | | $0 |
| Security: | 0 | (included in train crew assignments) | | | $0 |
| Dispatching: | 3 | | | $450.00 | $114,750 |
| | | Daily Rate | | Daily Total | |
| Mech. Maintenance: | | | | | |
| Cars (incl. spares): | 3 | $25 | per car | $75.00 | $19,125 |
| Locomotives (incl. spares): | 3 | $50 | per loco | $150.00 | $38,250 |
| Subtotal Cost: | | | | | $57,375 |
| Maintenance of Way & Trackage Rights: (per train mile) @ .50/vehicle mile | | $1 | per train mile less dispatch | $902.00 | $230,010 |
| Fuel (gallons per vehicle mile): | | 1.63 | | 4,408 | |
| Cost per Gallon: | | $0.72 | | $3,151.38 | $803,601 |
| Insurance: ($1.50 per vehicle mile) | | | | | $1,034,280 |
| TOTAL DAILY OPERATING AND MAINTENANCE COSTS | | | | | |
| Total Estimate: | | | | | $3,234,749 |
| Average per Vehicle Mile: | | | | | $4.69 |

* (Train Hours. * Rate * 1.1)
** (Number. * Rate * Span * 1)

Source: Parsons Brinckerhoff, May 1989.

# APPENDIX E

## REFERENCES FOR ENVIRONMENTAL INVENTORY

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# References for Environmental Inventory


Archaeological Sites - Review recorded Archaeological Sites on USGS Quadrangle Maps in the office of the State Archaeologist, Oklahoma Archaeological Survey.

Floodplain Maps - FIRM Maps.

Hazardous Waste Sites - Printout of "CERCLIS" database list 8, US EPA, 10/17/88.

Indian Lands - Map, N.E. Eight Tribes, Oklahoma Indian Affairs Commission, Oklahoma City, OK. Map of restricted land, US Department of the Interior, Bureau of Indian Affairs, Shawnee Agency. Telephone conversations with the Bureau of Indian Affairs in the Anadarko Office, the Muskogee Office, the Concho Agency, the Pawnee Agency and the Shawnee Agency.

National Register Historic Sites - Historic Conservation Handbook, 1988 (Oklahoma), Published by The Oklahoma State Historic Preservation Office.

Noise Sensitive Land Uses - USGS Quadrangle Maps.

Parks/Recreation/Refuges - USGS Quadrangle Maps; City Maps.

Prime and Unique Farmlands - Soil Survey Legends for Important Farmlands, Oklahoma, USDA, SCS, July, 1985; Creek County Soil Survey, May, 1959; Lincoln County Soil Survey, January, 1970; Oklahoma County Soil Survey, February, 1969; Tulsa County Soil Survey, February, 1975; Washington County Soil Survey, November, 1988.

Slopes Over 9% - USGS Quadrangle Maps.

Superfund Sites - "Descriptions of Superfund Sites", (undated, received September 15, 1988), Waste Management Service, Oklahoma State Department of Health.

Threatened and Endangered Species - Endangered and Threatened Species of Texas and Oklahoma, 1987 (with 1988 Addendum), U.S. Fish and Wildlife Service, 1988; MEMORANDUM, To: Bald Eagle Survey Participants, From: Gary Sallee, Subject: Results, 1988 Midwinter Bald Eagle Survey, April 13, 1988.

Wetlands - "National Wetlands Inventory Maps", U.S. Fish and Wildlife Service.

## USGS Quadrangle Maps

| | |
|---|---|
| Arcadia, OK | 1966, Photoinspected 1981. |
| Bartlesville North, OK | 1971. |
| Bartlesville SE, OK | 1970. |
| Bartlesville South, OK | 1971. |
| Bellvue, OK | 1971. |
| Bristow, OK | 1973. |
| Chandler, OK | 1974. |
| Collinsville NE, OK | 1959. |
| Collinsville, OK | 1956, Photorevised 1973. |
| Davenport, OK | 1974. |
| Depew, OK | 1975. |
| Horseshoe Lake, OK | 1956, Photorevised 1962. |
| Jones, OK | 1955, Photorevised 1969 and 1975. |
| Kellyville, OK | 1972. |
| Kendrick, OK | 1975. |
| Lake Heyburn, OK | 1971. |
| Lake Sahoma, OK | 1959, Photorevised 1967. |
| Luther, OK | 1966. |
| Ramona, OK | 1972. |
| Ritts Junction, OK | 1974. |
| Sapulpa North, OK | 1956, Photorevised 1967 and 1973. |
| Sapulpa South, OK | 1958, Photorevised 1967. |
| Slick, OK | 1973. |
| Spencer, OK | 1986. |
| Sperry, OK | 1955, Photorevised 1973. |
| Stroud North, OK | 1975. |
| Stroud South, OK | 1974. |
| Vera, OK | 1959. |
| Wellston, OK | 1966. |

## Floodplain Information

### FIRM Maps

| | | |
|---|---|---|
| Creek County | 400490 | 0009A |

## USGS Map of Flood-Prone Areas

| | |
|---|---|
| Arcadia, OK | 1969, Revised 1974. |
| Bartlesville North, OK | 1973. |
| Bartlesville SE, OK | 1975. |
| Bartlesville South, OK | 1973. |
| Bellvue, OK | 1975. |
| Bristow, OK | 1980. |
| Collinsville NE, OK | 1969, Revised 1974. |
| Collinsville, OK | 1972. |
| Drumright, OK | 1973. |
| Horseshoe Lake, OK | 1972, Revised 1974. |
| Jones, OK | 1974. |
| Kellyville, OK | 1974. |
| Lake Heyburn, OK | 1973. |
| Lake Sahoma, OK | 1971. |
| Luther, OK | 1972. |
| Sapulpa North, OK | 1969, Revised 1974. |
| Sapulpa South, OK | 1974. |
| Slick, OK | 1980. |
| Spencer, OK | 1969, Revised 1974. |
| Sperry, OK | 1969, Revised 1974. |
| Vera, OK | 1973. |

## Other

Map of Flood Prone Areas Produced by Central Oklahoma Economic Development District.

City Maps

Bartlesville, OK
Collinsville, OK
Owasso, OK
Sapulpa, OK
Bristow, OK
Stroud, OK
Davenport, OK
Chandler, OK
Wellston, OK
Luther, OK
Jones, OK

## Indian Land Maps

Department of the Interior, Bureau of Indian Affairs; Shawnee Agency (Map of Restricted Indian Lands), January 1985.

U.S. Department of the Interior, Bureau of Indian Affairs; Land Resources Inventory, Indian Land Ownership Maps:

| | |
|---|---|
| Creek County | 4-12-82, sheet 3 of 3. |
| Creek County | 4-16-82, sheet 2 of 2. |
| Tulsa County | 4-26-82, sheet 2 of 2. |
| Washington County | 4-30-82, sheet 1 of 1. |

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# APPENDIX F

## TRANSIT FUNDING IN OTHER STATES

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## TRANSIT FUNDING IN OTHER STATES

State: California

State Agencies and Roles:

- CALTRANS: planning, some design services

Major Transit Systems:

- Bay Area Rapid Transit (BART)
- San Diego Metropolitan Transit (SDMT)

State Funding Sources/Mechanisms:

- Motor fuel tax
- Vehicle registration fees
- 20 percent local match
- Sales tax (1/4 cent)

Federal and Local Sources/Mechanisms:

- UMTA (Section 3,5,8,9,18)
- Local (property and sales tax)
  - — BART: $.05/$1.00 property tax, 1/2 cent sales tax
  - — SDMT: 1/3 of 1/2 cent sales tax.
- Fares

1986 Per Capita Funding: *

- $57.21

Outlook:

- Capacity expansion balanced by cost control.

* Includes fares; federal, state and local funding.

## TRANSIT FUNDING IN OTHER STATES

State: Florida

State Agencies and Roles:

- Florida Department of Transportation: ROW acquisition, planning

Major Transit Systems:

- Metropolitan Dade County Transit Administration

State Funding Sources/Mechanisms:

- State Transportation Fund (general funds/gas tax)
- Lease of state-owned transit vehicles
- Matching local funds required
- Refunds on fuel for transit systems

Federal and Local Sources/Mechanisms:

- UMTA (Section 3,4,8,9,18)
- Local (MDCT - county general fund; three mill property tax).
- Fares

1986 Per Capita Funding: *

- $14.97

Outlook:

- Ridership performance on MDCT is poor due in part to lack of additional funding ($10 million property tax cap has been reached). System expansion will depend on additional dedicated revenue sources, both local and statewide.

* Includes fares; federal, state and local funding.

## TRANSIT FUNDING IN OTHER STATES

State: Georgia

State Agencies and Roles:

- Georgia Department of Transportation: technical assistance, planning

Major Transit Systems:

- Metropolitan Atlanta Regional Transit Authority (MARTA)

State Funding Sources/Mechanisms:

- Special appropriations for studies, publicity, capital purchases

Federal and Local Sources/Mechanisms:

- UMTA (Section 3, 5, 6, 9, 18)
- Local (1 cent sales tax in MARTA service area)
- Fares (state requires 35 percent fare box recovery)

1986 Per Capita Funding: *

- $23.65

Outlook:

- System expansion through 1993 contingent on continued significant levels of federal funding.
  Secondary emphasis on developing maintenance reserve fund (MARTA).

* Includes fares; federal, state and local funding.

## TRANSIT FUNDING IN OTHER STATES

State: Illinois

State Agencies and Roles:

- Illinois Department of Transportation: fund administration, research, policy development

Major Transit Systems:

- Regional Transportation Authority: oversight agency to service boards consisting of Chicago Transit Authority, Metro Commuter Rail Division, and Pace Suburban Bus Division

State Funding Sources/Mechanisms:

- County level sales tax (1 percent Cook County; 25 percent in surrounding five counties)
- Automobile rental tax (1 percent Cook County; 25 percent in surrounding five counties — authorized but not imposed)
- General fund appropriations (up to 25 percent revenues from sales taxes/auto rental tax)
- G.O. bond issue for capital projects

Federal and Local Sources/Mechanisms:

- UMTA (Section 3, 5, 6, 9, 18)
- Fares (50 percent fare recovery required)

1986 Per Capita Funding: *

- $90.72

Outlook:

- Cost containment top priority.

* Includes fares; federal, state and local funding.

## TRANSIT FUNDING IN OTHER STATES

State: Maryland

State Agencies and Roles:

- Maryland Department of Transportation
- Baltimore Mass Transit Administration (Department of MDOT)

Major Transit Systems:

- Baltimore Mass Transit Administration

State Funding Sources/Mechanisms:

- State Transportation Fund, using:
  - — Highway user revenue
  - — Corporate income tax
  - — Motor fuel tax (2 cents/gallon)

Federal and Local Sources/Mechanisms:

- UMTA (Section 3, 5, 6, 9, 18)
- Local — none
- Fares

1986 Per Capita Funding: *

- $122.96

Outlook:

- Moderate expansion of heavy rail systems; greater emphasis on light rail development. Statewide transit needs assessment underway.

* Includes fares; federal, state and local funding.

## TRANSIT FUNDING IN OTHER STATES

State: Massachusetts

State Agencies and Roles:

- Executive Office of Transporation and Construction: planning, coordination of state transit agencies
- Massachusetts Bay Transportation Authority: operates MBTA system

Major Transit Systems:

- Massachusetts Bay Transportation Authority (state agency)

State Funding Sources/Mechanisms:

- General obligation bonds
- Local and commonwealth assessments
- Fares
- Private/public equipment lease-back agreements

Federal and Local Sources/Mechanisms:

- UMTA (Section 3, 9)
- Local (special assessments)

1986 Per Capita Funding: *

- $65.75

Outlook:

- Current emphasis on rail rehabilitation.

* Includes fares; federal, state and local funding.

## TRANSIT FUNDING IN OTHER STATES

State: New Jersey

State Agencies and Roles:

- New Jersey Transit (state's public transportation corporation): planning, construction, operations

Major Transit Systems:

- New Jersey Transit

State Funding Sources/Mechanisms:

- State appropriations (general funds, bonds, 2.5 cent increase in motor fuel tax)
- Leases/permits
- Fares (state assistance program)

Federal and Local Sources/Mechanisms:

- UMTA (Section 3, 5, 6, 9, 18)
- Local — none
- Fares

1986 Per Capita Funding: *

- $64.43

Outlook:

- Establishment of state transportation trust fund will support increased transit improvements and expansion over the next seven years.

* Includes fares; federal, state and local funding.

## TRANSIT FUNDING IN OTHER STATES

State: Oregon

State Agencies and Roles:

- Oregon Department of Transportation: planning
- Oregon Mass Transportation Financing Authority: funding

Major Transit Systems:

- Trimet (Portland)

State Funding Sources/Mechanisms:

- In lieu of payroll tax ($.006 state employees)
- Cigarette tax (1 cent per package)
- Special appropriations from general fund

Federal and Local Sources/Mechanisms:

- UMTA (Section 3,5,6,9,18)
- Local (fares, employee tax)

1986 Per Capita Funding: *

- $33.41

Outlook:

- Need to expand taxing base to reduce reliance on payroll tax.

* Includes fares; federal, state and local funding.

## TRIMET
## PORTLAND, OREGON

| | |
|---|---|
| **Enabling Legislation** | TRIMET was formed in 1969 by Portland City Council resolution under authority granted by the Oregon State Legislature. It is a special purpose district set up as a publically-owned, municipal corporation for the purpose of providing public transportation to the area. The Governing body consists of a seven-member board appointed by the Governor. The district consists of 725 square miles of the urban portions of Multnomah, Washington and Clackamas counties. |
| **System Characteristics** | TRIMET goals include:<br>o Achieve fiscal stability<br>o Increase productivity and flexibility of operations<br>o Attract and retain more public transportation customers<br>o Retain the existing diversity of service<br>o Develop new partnerships and identify advocacy groups<br><br>TRIMET provides all bus and all rail transit in the metropolitan area. |
| **Finance** | Local tax support for the agency comes from a payroll tax of six-tenths of one percent paid by employers and self-employed persons. TRIMET also receives some funding from state and federal sources. Breakdown of 1988-1989 resources includes:<br><br>o Payroll Taxes 37.5%<br>o Passenger Fares 14.3%<br>o State Operating Assistance 1.7%<br>o Federal Operating Assistance 4.0%<br>o State Capital Assistance 3.5%<br>o Federal Capital Assistance 23.1%<br>o Other 15.9% |
| **Planning** | Regional planning, corridor studies and draft EISs are done by the Metropolitan Service District.<br>Otherwise TRIMET performs transit planning in its area |
| **Construction** | TRIMET builds transit facilities in its area. |

# TRIMET continued

| | |
|---|---|
| **Operations** | TRIMET has an operations budget of $80,400,000/year. Operations statistics include:<br><br>Bus Routes 71<br>Light rail line (MAX) 1<br>Bus route miles 770<br>Weekday bus miles 75,890<br>Weekday train miles 2,453<br>Weekday platform hours 29,650<br>Annual bus miles (Millions) 17.5<br>Annual train miles (Millions) 134<br><br>Riders (FY 87)<br>**Annual**<br>Originating 35,400,000<br>Boarding 47,880,000<br>**Weekday**<br>Originating 120,300<br>Boarding 162,500 |
| **Land Use** | TRIMET has the power to acquire property by condemnation, purchase, lease, gift or voluntary grant, etc. of real and personal property located within the boundaries of the district. |

## NEW JERSEY TRANSIT
## NEW JERSEY

| | |
|---|---|
| **Enabling Legislation** | NJ TRANSIT is New Jersey's pubic transportation corporation. In 1979, NJ TRANSIT was created by the state legislature.<br><br>New Jersey's residents are shareholders in NJ TRANSIT. Residents are represented by a seven-member board of directors appointed by the governor. Four board members are appointed from the general public. Three state officials make up the remainder of the board.<br><br>To further guarantee citizen representation, two transit advisory committees, one services north Jersy and the other south, regularly advise the board on the views of riders. |
| **System Characteristics** | NJ TRANSIT is guided by the following objectives:<br>o Operate safe, reliable, properly maintained, comfortable and courteous service.<br>o Upgrade and maintain buses, trains, stations and terminals.<br>o Use good business and financial practices that reflect fiscal consciousness and cost control.<br>o Communicate efforts to improve public transportation and expand efforts to listen to and seek advice from all constituencies. |
| **Finance** | NJ TRANSIT's expenditures fall into two categories:<br>o Operating-expenses associated with the daily running of buses and trains, maintenance and administration<br>o Capital-expenses associated with the purchase of equipment and facilites.<br><br>Funding for operating expenses comes from several sources: farebox revenues from riders, state assistance, and other income generated from charter services, advertising , leases/permits, contract services and investment income.<br><br>Capital funding comes primarily through UMTA grants with local matching grants from state and regional sources. |
| **Planning** | Passenger rail planning is accomplished through NJ TRANSIT under the Board of Director's Long-Range Planning Committee in conjunction with the State Department of Transportation, the Port Authority of New York and New Jersey and numerous advising groups. |
| **Construction** | Construction for passenger rail system is accomplished through NJ TRANSIT. |

# NEW JERSEY TRANSIT continued

| | | |
|---|---|---|
| **Operations** | NJ provides both bus and rail operations as follows: | |
| | Daily Passenger Trips | 600,000 |
| | Annual Passenger Trips | 178.4 Millions |
| | Annual Bus Passenger Trips | 135.8 Millions |
| | Annual Rail Passenger Trips | 42.6 Millions |
| | NJ counties | 20 |
| | BUS OPERATIONS | |
| | Routes Operated in NJ | 181 |
| | Route Miles Operated | 73 Millions |
| | Buses Operated by NJ TRANSIT | 2,012 |
| | Carriers Subsidiized/ Under Contract | 5 |
| | P:rivate Carriers Receiving Buses | 132 |
| | Buses Leased to Private Carriers | 830 |
| | Bus Shelters Installed in NJ | 1,400 |
| | Bus Stop Signs Installed in NJ | 3,200 |
| | RAIL OPERATIONS | |
| | Counties served by 10 lines | 12 |
| | Annual Passenger Miles | 995.2 Millions |
| | Route Miles Operated | 394.1 Millions |
| | Rail Cars In Service | 609 |
| | Daily Revenue Trains Operated | 533 |
| | Locomotives Operated | 81 |
| | Rail Stations With Service | 154 |
| **Land Use** | N/A | |

## Massachusetts Bay Transportation Authority (MBTA)
## Boston, Massachusetts

| | |
|---|---|
| **Institutional Framework** | MBTA is the oldest and fifth largest public transit system in the nation. It is a transportation authority formed under Chapter 161A of the Massachusetts General Law. The governing seven-member board consists of five directors wo are appointed by the Governor, one director who is appointed with the approval of the 14 cities and towns, and one director who is appointed with the approval of the 64 cities and towns. MBTA serves a region of 1,038 square miles and a population of 2.6 million. |
| **System Characteristics** | MBTA's 1985 goals included:<br>o Expand capacity in Boston's central business district.<br>o Improve reliability and enhance safety.<br>o Stay within budget by containing costs and increasing productivitity.<br><br>For other system characteristics, see Operations. |
| **Finance** | Local support comes from fares and from the assessment of 78 cities and towns within the MBTA District who pay a share of the MBTA's yearly deficit or net cost of service. The state pays for a part of MBTA's deficit. Cash for capital and financing activities comes from federal and other sources, construction and special funds, of bonds and deferred credits. |
| **Planning** | The MBTA must comply with planning and programming requirements established by Sate and Federal Law.<br><br>At the state level, the Executive Office of Transportation and Constructio (EOTC) is responsible for the Comprehensive Program for Mass Transportation in accordance with Chapter 161A, Section 5(g) and (h) of the General Laws of the Commonwealth, as amended by Section 7 of Chapter 1140, Acts of 1973.<br><br>The statute states that the Authority's capital investment program and plans for mass transportation shall be developed in consultation a oeation with the Authority, in consultatio with the Executive Office of Communities and Development, the Metropolitan Area Planning Council, and such other agencies of the Commonwealth or the Federal Government as may be concerned with said programs and plans.<br><br>The program must include a long-range plan for the construction, reconstruction or alteration of mass transportation facilities within the Authorityh's district; a schedule for the implementation of the program; and comprehensive financial estimates of costs and revenues.<br><br>To comply with federal requirements, the MBTA, as one of the six agencies constituting the Metropolitan Planning Organizatio (MPO), cooperates with those other agencies in preparation of several required certification documents: the Unified Planning Work Program, the Transportation Plan, and the Transportation Improvement Program. |
| **Construction** | Construction for rail projects is accomplished through the MBTA. |

## Massachusetts Bay Transportation Authority (MBTA)
## Boston, Massachusetts
## (CONTINUED)

**Operations**

The MBTA provided a total of 44,116, 457 miles of service on streetcars, buses, and rapid transit during 1985. Preventat^ve maintenance capacitibleis has been reinveced and relaiblity of service upgraded. MBTA system reidership is more than 163.9 passenger trips per year.

The MBTA Statistical Profile includes:

| | |
|---|---|
| **Average Weekday Ridership (all systems)** | **600,000** |
| Basic T System (est.) | 556,600 |
| Commuter rail | 26,000 |
| **Number of Active Vehicles** | **1,786** |
| Buses | 938 |
| Streetcars (57 PCCs, 120 LRVs, total fleet | 177 |
| Rapid transit cars | 350 |
| Trackless trolleys | 50 |
| Commuter rail (43 locomotives, 168 coaches | 211 |
| Specially equipped vans | 60 |
| **Number of Stations** | **168** |
| Rapid transit | 83 |
| Commuter rail | 85 |

| | |
|---|---|
| **Number of Routes** | **175** |
| Bus | 55 |
| Rapid transit (red, orange, blue lines) | 3 |
| Streetcar (green line) | 5 |
| Trackless trolley | 4 |
| Commuter rail | 8 |
| **Number of Route Miles (one-way)** | **1,077** |
| Bus | 700 |
| Rapid transit | 46 |
| Streetcar | 35 |
| Trackless trolley | 16 |
| Commuter rail | 280 |

**Land Use**

The MBTA has the power to acquire land; to grant easements; to establish at or near its terminals parking facilities and access roads; to charge parking and other fees. The MBTA also has the power to acquire land by the use of eminent domain.

## Baltimore Mass Transit Administration (MTA)
## Baltimore, Maryland

| | |
|---|---|
| **Institutional Framework** | MTA is a department of the Maryland State Department of Transportation.<br><br>MTA's institutional framework is unique in that the general manager reports to the Maryland Secretary of Transportation and does not have a Board involved in setting policy for the administration other than the state legislature and Governor. |
| **System Characteristics** | MTA operates 900 buses and approximately 75 rail vehicles over 10 miles of grade separated guideway.<br><br>Extensions to the rail system are under construction and in planning.<br><br>A new light rail line is also begin designed by the MTA. |
| **Finance** | MTA funding is derived from the following state revenue services:<br>o Highway Users Fees, i.e. gas tax, license fees, registration fees<br>o Revenue Sharing<br>o Corporate Income Tax<br><br>MTA's current fare is a graduated fare involving five zones and a $.90 base fare. MTA has aggressively sought federal funding for both rail and bus projects. |
| **Planning** | MTA is responsible for rail planning and participates in DOT planning efforts for state transportation priorities. |
| **Construction** | MTA administers transit related construction utilizing other state DOT departments where appropriate, i.e. land acquisition. |
| **Operations** | All transit service is operated by MTA. |
| **Land Use** | N/A |

## RTA, CTA, METRA, PACE
## CHICAGO, ILLINOIS

| | |
|---|---|
| **Institutional Framework** | The Regional Transportation Authority (RTA) was created in 1974 to ensure the development of a comprehensive and coordinated mass transportation system in the six-county region of Northeastern Illinois. The fiscal collapse of the Agency led to the reorganization of the RTA by the State Legislature in 1983. All operating responsibility was decentralized under the aegis of three service boards - the Chicago Transit Authority, the Metra Commuter Rail Division and the Pace Suburban Bus Division. The RTA was reconstituted as a fiscal and policy oversight agency with strong budgetary review powers. |
| **System Characteristics** | The RTA, in conjunction with CTA, Metra, and Pace has recently evaluated its service, its market, and its capital assets. At present:<br>o Public mass transportation remains vital to the quality of life and the economic well-being of Northeastern Illinois.<br>o There are five primary mass transportation markets in the region: Central Business District-oriented, Central Business District-circulator, Non-Central Business District City, Inner Suburban, and Outer Suburban.<br>o The needs of the transit-dependent must continue to be given priority.<br>o The most viable elements of the region's deteriorating infrastructure and equipment must be renewed, unproductive service eliminated, and new service put in place to continue to meet market demand.<br><br>The RTA should strive to ensure that the region's public mass transportation is adequate to met the public's needs into the next century. From "Strategic Plan of the Regional Transportation Authority", abridged April 7, 1988.<br><br>For additional system characteristics, see "Operations". |
| **Finance** | It is the policy of the RTA to fund the budgets of the Service Boards, up to the amount in the annual Budget Ordinance.<br><br>In order to fund the budgets of the Service Boards, the RTA has available four principal sources of revenue and other financing<br>sources: (1) retailers' occupation taxes, service occupation taxes, and use taxes (collectively, "Sales Taxes"); (2) funds appropriated to the RTA by statute through the State's Public Transportation Fund; (3) funds in respect of state or federal grants, loans, or any other such funds which the RTA is authorized to apply for and receive under the Act; and (4) the proceeds of any borrowings by the RTA. |
| **Planning** | The Regional Transportation Act requires that the RTA annually prepare and adopt both a Five-Year Program and and Annual Program and Budget. The RTA also prepares a long-range plan and has recently completed a Strategic Plan of the Regional Transportation Authority. The RTA Act also required that prior to submitting its Five-Year Program, the RTA submits its proposals to various public agencies charged with responsibility for long-range or comprehensive planning for the metropolitan region. |

## RTA, CTA, METRA, PACE
## CHICAGO, ILLINOIS
## (CONTINUED)

| | |
|---|---|
| **Construction** | The total dollar amount of the RTA's five year capital program is $1,621.7 million and is catergorized as follows:<br><br>$Millions<br>Rolling stock 674.874<br>Track and structure 297.039<br>Support Facilities and Equipment 250.259<br>Signal/Electrical/Communications 133.593<br>Stations 105.824<br>Miscellaneous 67.244<br>Contingencies 92.873 |
| **Operations** | Actual provision of services is by the RTA's three service boards - CTA, Metra, and Pace.<br><br>CTA provides bus and rapid transit service generally within the City of Chicago and to 38 suburban municipalities. CTA's rail network operates 1,200 rapid transit cars on 215 route miles serving over 140 stations. CTA bus service operates 2,250 buses on a network of over 130 routes. CTA buses carry approximately 1,500,000 average weekday riders while CTA rail serves approximately 500,000 average weekday riders. CTA's 1988 operating budget is $644.8 million.<br><br>Metra provides commuter rail service connecting downtown Chicago with 68 other Chicago locations and 100 suburban communities at over 230 stations. Metra utilizes 126 diesel locomotives, 686 bi-level cars, and 209 multiple unit electrical cars. Metra operates nearly 3,500 trains per week, over 500 route miles and averages almost 260,000 weekday riders. Metra's 1988 operating budget is $266.6 million.<br><br>Pace provides fixed route bus and paratransit service throughout the suburbs and from suburban locations to the City of Chicago, serving 200 communities, including 107 commuter rail and rapid transit stations. Pace has 153 regular routes, 82 feeder routes, and 64 paratransit services. Pace carries approximately 124,000 average weekday riders and during peak periods, has 500 Pace-owned and 180 contract vehicles in use for fixed route and paratransit services. Pace's 1988 operating budget is $71.1 million. |
| **Land Use** | As part of its financial plan, RTA is seeking to broaden its financial support by emphasizing private sector funding of public mass transit stations and by promoting land/property based value capture strategies for high-density station zones and other high-density beneficiary areas. |

# BAY AREA RAPID TRANSIT DISTRICT (BART)
## Oakland, California

<table>
<tr><td>Institutional Framework</td><td colspan="4">BART is a transit district created by California State Legislation. It lies within the boundareis of Alameda, Contrac Costsa, Marin, San Francisco, and San Mateo counties. The district is governed by aboard of directors consisting of nine members elected by election districts. The board appoints and fixes the salary of a general manager who has charge (subject to the direction and control of the board) of the acquisition, construction, maintenance, and operation of the facilities of the district as well as the administration of the business affairs of the district.</td></tr>
<tr><td>System Characteristics</td><td colspan="4">The policy of BART is to:<br>o Maximize the effectiveness and efficiency of its operations and bring the system to its full potential.<br>o Maximize the return on its investments in property, rights-of-way and facilities.<br>o Expand its service area to become the operator of an integrated regional trunkline transit system which effectively serves interested counties in the Bay Area.</td></tr>
<tr><td>Finance</td><td>Revenues</td><td>Projected 87-88 ($1,000)</td><td>Financial Assistance</td><td>Projected 87-88 ($1,000)</td></tr>
<tr><td></td><td>Net Rail Revenue<br>Express Bus Revenue<br>Interest Earnings<br>Other Revenue<br>Other Operating Revenue<br>Net Operating Revenue</td><td>78,295<br>860<br>4,378<br>2,117<br>6,495<br>92,145</td><td>Property Tax Revenue<br>Sales Tax Revenue<br>TDP<br>STA, Other State Assistance<br>Debt Service Allocations<br>Capital and Other Allocatios<br>Total Financial Assistance</td><td>7,639<br>89,091<br>348<br>1,911<br>(12,568)<br>(4,708)<br>81,713</td></tr>
<tr><td>Planning</td><td colspan="4">Issues addressed in the 1987 Five-Year Plan included:<br>o Future demand projections<br>o New peak service capacity<br>o Service quality<br>o Cost effectiveness and productivity<br>o Program delivery<br>o Systems extensions<br>o Maintenance requirements<br>o Express bus effectiveness and productivity<br>o Energy contingency requirements<br>o Capital investment planning<br>o Privatization<br>o Disadvantaged business enterprise<br>o Comprehensive marketing<br>o Five-Year planning process</td></tr>
</table>

## BAY AREA RAPID TRANSIT DISTRICT (BART)
## Oakland, California

### CONTINUED

| | |
|---|---|
| **Construction** | BART's five-year capital program budget is $272, 695,000 which includes expenditures for vehicles; facilities including mainline, station access and support; train control; AFC and communications; electrification; procurements; and other categories.<br><br>Existing "fixed facilties" include 75.4 miles of mainline track, 34 stations, over 24,000 parking stalls, maintenance facilities, etc. As of June 1987, BART fleet inventory is 404 rolling stock. |
| **Operations** | Performance Data (FY 86/87):<br>o Total passengers - 56,241,000<br>o Passenger miles - 695,944,300<br>o Car miles - 30,266,600<br>o Car hours - 1,110,900<br>o Peak hour load factor averaged 1.21 for trans-bay service. System wide aveage maximum load was 0.75.<br>o Train on-time performance - 95.9% |
| **Land Use** | BART has a Station Area Development Implementation Policy with the overall goal to generating new income and increasing transit ridership through public/private sector development projects. Specific objectives include:<br>o To coordinate comprehensive planning and development around station sites.<br>o To enhance local community economic development efforts thorugh better utilization of transit and transit-owned properties.<br>o To return real property to tax rolls and to increase the community tax base.<br>o To help create new investment opportunities for the private sector which are supportive of transit.<br>o To reduce auto use and traffic congestion through the encouragement of transit-linked development. |

## METROPOLITAN ATLANTA REGIONAL TRANSIT AUTHORITY (MARTA)
## ATLANTA, GEORGIA

| | |
|---|---|
| **Institutional Framework** | Created in 1971, MARTA is a multi-county, regional transit authority serving Dekalb and Fulton counties. The Authority was elected by local referendum after a similar attempt failed in 1968.<br><br>The MARTA board is appointed by City and County elected officials. Counties which did not approve the Authority retain representation on the MARTA board. |
| **System Characteristics** | MARTA provides rail and bus service to the metropolitan area. MARTA currently operates over 750 buses and 150 rail vehicles over 20 miles of grade separated guideway. MARTA enjoys one of the finest "new start" reputations in the country. The system is continuing to be expanded, including a new line to the Airport which will open this fall. |
| **Finance** | MARTA is funded by a one cent sales tax in the counties which approved the tax. A relatively low fare (60 cents) is charged passengers. State legislation requires a 35% farebox recovery with no more than 50% of MARTA's sales tax utilized to subsidize fares. MARTA has agressively sought and been sucessful at attracting federal funds. |
| **Planning** | Transit planning is performed by MARTA. MARTA utilizes extensive marketing and public involvement programs in planning for new and revised service. |
| **Construction** | MARTA administers all transit related construction, and contracts for design engineering and construction management services. |
| **Operations** | All regional transit service, whether bus or rail, is provided by MARTA. |
| **Land Use** | N/A |

# METROPOLITAN DADE COUNTY TRANSIT ADMINISTRATION (MDTA)
## MIAMI, FLORIDA

| | |
|---|---|
| **Institutional Framework** | MDTA is a Dade County (Miami), Florida department reporting to the County Manager. The Dade County Commission is the policy board for the MDTA. The Commission is responsible for all regional services for the two million people residing in the County. The County owns and operates the airports, seaport, County Hospital system, and regional police and fire services. In addition, the County sets minimum requirements for land use planning, water and wastewater control and other public services.<br><br>The MDTA Executive Director reports to the County Manager, who as Chief Operating Officer for the County, is responsible for day to day County operations. In addition, the Executive Director staffs the Commission's Transportation Committee which must approve all potential Board items prior to Commission consideration. |
| **System Characteristics** | MDTA operates approximately 400 buses, a 1.9 mile people mover and a 20.1 mile elevated fixed guideway system with over 100 vehicles. Service is provided within one County with approximately 60 million passengers. Rail and people mover ridership averages just under 50,000 trips per day, significantly below original projections. Causes for this poor performance include:<br>o Lack of dedicated funding sources;<br>o 400 instead of 1,000 peak hour buses;<br>o Over 5,000 new downtown parking spaces;<br>o Lack of parking at stations (800 versus 21,000 planned); and<br>o High out-of-pocket costs. |
| **Finance** | MDTA is funded from the County's general fund, fares, and joint development revenue. Over $100 million in property taxes is dedicated to financing transit operations. The County has reached the state-imposed $10 million property tax cap for the past three years and raises fares to maintain operation. Over $900 million in federal revenues were utilized to build Metrorail, the people mover, and support the bus system. A $130 million bond issue, plus state gas revenue has been used to match federal grants. |
| **Planning** | All rail planning is done by MDTA. An extensive community involvement program was utilized to plan the system. The County Commission is the MPO, therefore, providing a strong link between planning and implementation. |
| **Construction** | MDTA administered the construction program for Metrorail. System design, engineering and some construction management was performd by outside consultants. |
| **Operations** | MDTA operates all transit in Dade County. |
| **Land Use** | Metro Dade County has a very aggressive Land Use Master Plan which was adopted by the Commission and is administered by the County's Planning Department. The Land Use Plan is predicated upon transit corridors with intensive development occurring around regional and sub-regional activity centers. Although revisions have been made to this plan, in general, growth has followed the corridors originally projected in the plan.<br><br>A number of excellent joint development projects and significant new downtown construction has occurred since the beginning of the Metrorail project. Although ridership has not met expectations, the benefit of meeting long-range land use planning goals is often referred to by County officials. |

# METROPOLITAN TRANSIT DEVELOPMENT BOARD (MTDB)
## SAN DIEGO, CALIFORNIA

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|---|---|
| **Institutional Framework** | MTDB was created in 1975 by passage of California Senate Bill 101. It consists of a 15 member board representing the City of San Diego, the County of San Diego, other cities within the metropolitan planning area and the public at-large. Rail transit responsibilties include:<br>o Planning and building rail transit in the San Diego metropolitan area;<br>o San Diego and Arizona Eastern Railway; and<br>o San Diego Trolley, a non-profit organization owned by MTDB.<br><br>Area of jurisdiction is about 570 square miles with a populuation of 1.56 million. |
| **System Characteristics** | MTDB goals include:<br>o Unify the region's public transit system.<br>o Provide high speed, long distance, low capital cost light rail transit (LRT).<br>o Maintain a 100% farebox recovery rate for operating costs for the San Diego Trolley, Inc.<br>o Expand and extend the trolley's LRT lines and maintenance facilities. |
| **Finance** | MTDB has depended primarily on gasoline tax money set aside by the state, state sales tax funds, federal funds, farebox revenues and selling tax benefits for its trolley cars to private companies.<br><br>In November 1987, the people in San Diego County passed a 1/2 cent sales tax allocating 1/3 for freeways, 1/3 for transit, and 1/3 for local roads and streets. |
| **Planning** | MTDB prepares the Short-Range Transit Plan, and the Five-Year Transportation Improvement Program for its area and administers claims made by local transit operators for their share of state sales tax. |
| **Construction** | MTDB is responsible for the construction of rail transit in the San Diego metropolitan area. |
| **Operations** | Rail transit operations are carried out by the San Diego Trolley, Inc. an operating subsidiary under MTDB control. Eleven regional bus routes are provided under contract to MTDB. Ridership totals 33.5 million total passengers over 14.6 million vehicle service miles in FY85. |
| **Land Use** | MTDB has acquired and held real and personal property for rail operations. |

# CALIFORNIA
# STATE ROLE SUMMARY

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| **Enabling Legislation** | California has numerous enabling legislation for the formation, powers and financing of mass transit in the state. |
| **System Characteristics** | State legislation has established a three-tier efficiency incentive program which must be met prior to receiving state funds, including 1/2% nd 1/4% sales taxes.<br>o BARTD (including AC Transit, BART, and MUNI) - 33% of operating expenses must be met by farebox revenues to receive 1/2% and 1/4% sales tax revenues.<br>o Urbanized counties - 20% of operating expenses must be met prior to receiving state funds including 1/2% and 1/4% sales tax revenues.<br>o Rural or non-urbanized counties and specialized services such as those for elderly and handicapped - the required farebox recovery rate is 10%. |
| **Finance** | California has a complex set of transit financing arrangments. Programs were initiated at the state level and are subject to varying degrees of state level oversight. The most important programs are based on local sales tax sources which are distributed on an approved formula allocation procedure and are not annually considered by the state legislature. The legislature does have an annual imvolvement in the State Transit Assistance Fund. This fund is a spillover fund from the state's share of the sales tax revenues generated from gasoline sales and subject to the discretion of the legislature. |
| **Planning** | Planning for rail systems, except for the Pennisula Commuter Service and Amtrak is done at the state level. |
| **Construction** | CALTRANS assisted in the construction management for the San Diego Trolley and some design in the Sacremento rail system. CALTRANS has a rail transit design manual, but is not actively providing rail design or construction services. |
| **Operations** | CALTRANS operates the Penninsula Commuter Services and Amtrak. However, CALTRANS does not plan to operate the Penninsula Commuter Service in 1990 and hopes to turn the services over to local govenments. |
| **Land Use** | N/A |

## FLORIDA
## STATE ROLE SUMMARY

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| **Enabling Legislation** | State Statute FS 341 defines state public transit roles as one which develops a statewide plan, a five-year program of projects and a financing plan, and also public state safety standards. The state provides local option funding sources for both highway and transit development. |
| **Goals, Policies and Objectives** | The state assists local transit systems to achieve a 20% peak hour modal split and also in achieving a 50% farebox recovery. |
| **Finance** | All state funding is direct assistance in the form of matching funds. Funding source is the state transportation fund which has utilized a combination of General Funds and State Gas Tax. Funding is limited up to 12.5% of total project cost. The department can fund 100% of transit commuter projects. |
| **Planning** | Participates through the MPO process with state district engineers entering directly, or on an ad hoc basis, sitting on the policy board. In Jacksonville, the District Engineer sits on the JTA Board of Directors. |
| **Construction** | The state can assist in ROW acquistion and play a overall minimal role in rail construction projects. |
| **Operations** | The state does not operate rail transit. Legislation allows operation of transit systems where there is no existing transit system. |
| **Land Use** | State growth management legislation supports public transportation goals. Legislation encourages both concentration of growth nodes and exactions from developments for infrastructure improvements. |

## GEORGIA
## STATE ROLE SUMMARY

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| **Enabling Legislation** | State enabling legislation provided for local option multi-county transit authority (MARTA) |
| **Goals, Policies and Objectives** | State legislation requires a 50/50 split of state sales tax between capital projects and operations. |
| **Finance** | Only rail funding provided is local sales tax permitted by state legislation. |
| **Planning** | A state oversight committee is appointed by state legislators/governor to review MARTA planning and expenditures. State also participates in MPO process. |
| **Construction** | Overall minimum role in rail construction. State provided some technical assistance in ROW and railroad negotiations. |
| **Operations** | The state has no role in operations. |
| **Land Use** | N/A |

## ILLINOIS
## STATE ROLE SUMMARY

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| **Enabling Legislation** | State statutes define the Department of Transportation's role as:<br>o Provide matching grant assistance<br>o Policy development<br>o Technical research |
| **Goals, Policies and Objectives** | State responsibility is primarily in financial oversight. The state requires a balanced budget and a 50% farebox recovery. |
| **Finance** | The state matches local capital projects and operating assistance. A state bond issue was passed to fund large capital projects. General fund revenues are also committed to transit from income taxes, sales taxes, public utility taxes, personal property replacement taxes, lottery income and federal funds. |
| **Planning** | State legislation created the Regional Transportation Authority. The state was originally directly involved in transit planning and recently reorganized as primarily a finance oversight authority. |
| **Construction** | The state does not participate in rail construction. |
| **Operations** | The state does not operate a passenger rail transit. |
| **Land Use** | N/A |

## MARYLAND
## STATE ROLE SUMMARY

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| **Enabling Legislation** | State legislation (Section 2-101) created the Department of Transportation under the Governor's office. The department is responsible for the development and maintenance of a continuing, comprehensive, and intergrated state master plan. |
| **Goals, Policies and Objectives** | Provide for efficient and economical transportation services throughout the state. State mandates a 50% farebox recovery goal. |
| **Finance** | State funds for mass transit adminstration are provided from state transportation funds, revenue sources include highway user revenues, revenue sharing, corporate income tax and motor vehicle fuel tax. |
| **Planning** | MTA does all direct rail planning and the state also participates in the MPO process. |
| **Construction** | All rail construction is administered by the state. |
| **Operations** | MTA operates all transit, both bus and rail in Baltimore. The state legislature and governor are in effect the only policy board MTA is responsible to for operating decisions. |
| **Land Use** | N/A |

## MASSACHUSETTS
## STATE ROLE SUMMARY

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| **Enabling Legislation** | Chapter 161C of the General Laws provides for the formation, powers and finance of the Executive Office of Transportation and Construction. Enabling legislation for various agencies, such as the MBTA (Chapter 161A), which are monitored by the EOTC and also provided under state enabling legislation. |
| **Goals, Policies and Objectives** | Goals, policies and objectives for passenger rail service are combined by the state with freight service because nearly 35% of railroad route mileage has daily commuter or intercity passenger service operation in addition to freight service operations.<br><br>Specific fare policy guidelines are embedded in state law such as reduced fares for elderly and students. |
| **Finance** | Massachusetts customarily does a bond every two years. Other state programs include the Rail Assistance Program, the Rail Banking Program, and the Commuter Rail Improvement Program. Local funding for the MBTA includes assessments from member cities and towns. |
| **Planning** | "Responsibility for overall coordination of transportation planning efforts rests with the Executive Office of Transportation and Construction (EOTC). The EOTC, created by Chapter 704 of the Acts of 1969, is one of ten state cabinet offices. It is headed by the Secretary of Transportation and Construction who is appointed by, and serves at the pleasure of, the Governor of the Commonwealth. Five state transportation agencies are placed within the EOTC. These are the Massachusetts Department of Public Works (MDPW), Massachusetts Aeronautics Commission (MAC), Massachusetts Bay Transportation Authority (Massport) and the Massachusetts Turnpike Authority (MTA). The statutory responsibility of EOTC with respect to these agencies is to monitor their operations and to recommend such changes in administrative organizations, procedures, and practices as may be deemed desirable. The EOTC is further reponsible for reviewing and acting on state funded budgetary and financial matters concerning these agencies. Under Chapter 1140 of the Acts of 1973, the EOTC is responsible for preparation of the MBTA Program for Mass Transportation (PMT), a state required master planning document. The EOTC is directly responsible for administering the Massachusetts Rail Assistance Program and for producing and updating the Massachusetts State Rail Plan." Massachusetts State Rail Plan, 1984. |
| **Construction** | Design and construction of rail facilities performed by state agencies under the EOTC. |
| **Operations** | Operation of passsenger rail performed by state agencies under the EOTC. |
| **Land Use** | Permits for construction within railroad R.O.W. must be obtained through the EOTC. |

## NEW JERSEY
## STATE ROLE SUMMARY

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|---|---|
| **Enabling Legislation** | The New Jersey Public Transportation Act of 1979 provided for the formation, powers and finance of NJ TRANSIT which is New Jersey's public transportation corporation. |
| **Goals, Policies and Objectives** | The 1979 Act declares the following:<br>o "The provision of efficient, coordinated, safe and responsive public transportation is an essential public purpose which promotes mobility, serves the needs of the transit dependent, fosters commerce, conserves limited energy resources, protects the environment and promotes sound land use and the revitalization of our urban centers.<br>o As a matter of public policy, it is the responsibility of the State to establish and provide for the operation and improvement of a coherent public transportation system in the most efficient and effective manner.<br>o In the development of public transportation policy and planning, participation by county and municipal governments, transit riders and concerned citizens should be encouraged.<br>o In the provision of public transportation services, it is desirable to encourage to the maximum extent feasible the participation of private enterprise and to avoid destructive competition." |
| **Finance** | State Legislation enables NJ TRANSIT to obtain revenues from the farebox, state assistance, charter sevices, advertising, leases/permits, contract services, investment income, UMTA grants and local matching grants from state and regional sources. |
| **Planning** | Passenger rail planning is accomplished through NJ TRANSIT under the Board of Director's Long-Range Planning Committee in conjunction with the State Department of Transportation, the Port Authority of New York and New Jersey and numerous advising groups. |
| **Construction** | All construction performed through NJ TRANSIT. |
| **Operations** | All operations oerformed by NJ TRANSIT. |
| **Land Use** | N/A |

## OREGON
## STATE ROLE SUMMARY

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| **Enabling Legislation** | Oregon has two basic sets of enabling legislation involving mass transit. ORS 267 is the Mass Transit Act which provides for the formation, powers, and finance of Mass Transit Districts. TRIMET was formed under the Mass Transit Act. ORS 268 is the Metropolitan Service District Act which provides for the formation, powers and finance of Metropoitan Service Districts. The Board of the Mass Transit District for Portland and Eugene districts consists of seven members appointed by the Governor. The board of a metropolitan service district consists of 12 members elected by the people. The governing body of the Metropolitan District may, at any time, order the transfer of the transit system of the transit district to the metropolitan district. |
| **Goals, Policies and Objectives** | Support public transit through enabling legislation and state funding programs. |
| **Finance** | ODOT Public Transit Division administrates state funds for rail projects. State funding programs include the In Lieu of Payroll Tax Program and the Special Transportation Fund (1¢ per package cigarette tax). Local tax support for transit comes from employee tax. |
| **Planning** | ODOT is a member of the Joint Policy Advisory Committee on Transportation which operates under the auspice of the Metropolitan Service District. JPAC assists in the preparation of the Regional Transprotgation Plan. |
| **Construction** | ODOT was involved in the highway construction of the Banfield Corridor - I-80 Corridor. ODOT is typcially not involved in rail construction. |
| **Operations** | ODOT does not operate transit systems in the state. |
| **Land Use** | State Department of Land Conservation and Development does land-use planning. However, the department only reviews city land use plans, not metro-wide transportation plans. |

# WASHINGTON
# STATE ROLE SUMMARY

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|---|---|
| **Enabling Legislation** | State legislation (RCW 47.04.081) enables the DOT to join financially or otherwise with any public agency or any county, city, or town in the state of Washington or any other state, or with the federal government or any agency thereof, or with any or all thereof for the planning, development, and establishment of urban public transportation systems in conjunction with new or existing highway facilities.<br><br>State Legislation (RCW 36.57A) permits the creation of Public Transportation Benefit Areas (PTBA) which may be multi-county.<br><br>State Legislation (RCW 35.58) enables the formation of a Metropolitan Municipal Corporation (MMC); a special unit of government governed by a council of county and city officials (e.g. Metro). |
| **Goals, Policies And Objectives** | Provide in cooperation with local governmental units and private carriers a comprehensive and balanced multimodal transportation system. This transportation system shall meet the statewide needs of safe, convenient, and efficient movement of persons and goods, and be socially, economically, and environmentally acceptable.<br><br>Place greater emphasis upon use of transit as a viable means of addressing traffic congestion and mobility problems.<br><br>Provide adequate financial support for transit systems in the state. To achieve this objective, the following guidelines are recommended:<br>o User fares should constitute as large a proportion of total cost as feasible without excluding disadvantaged persons who rely heavily upon this mode of transportation.<br>o Existing state and local revenue sources should be continued and local-option increases permitted so that each community can provide the desired level of service.<br><br>Public Transit should be defined as a local utility with the community determining priorities. |
| **Finance** | Financing for public transit systems in the State is composed from several sources which include:<br>o Local Taxes<br>o State Motor Vehicle Excise Tax (MVET) as match to Local Taxes<br>o Federal Grants<br>o Farebox Revenues<br><br>Transit districts may receive up to a 1% MVET collected in their district as matching funds to local tax revenues provided they<br>1) levy a local option transportation tax, and<br>2) submit a budget for the local option tax to the Department of Licensing.<br><br>0.3 percent MVET is allocated to capital and operating needs of the State Ferry System. |

## WASHINGTON (continued)

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| **Planning** | State participates in MPO process.<br><br>State provides technical assistance to smaller area MPO's.<br><br>State is required by law to develop and regularly update a statewide transportation plan.<br><br>State participates in long range planning process for Transit districts.<br><br>State performs planning functions for State Ferry System.<br><br>State coordinates with Amtrak on some passenger rail planning issues. |
| **Construction** | Construction of park-and-ride lots in the Metro service area have been administered by the State. Metro operates and maintains these lots.<br><br>State administers capital needs for State Ferry System.<br><br>State constructs high-occupancy vehicle lanes/facilities. |
| **Operations** | State owns and operates the State Ferry System.<br><br>State offers technical assistance to smaller transit agencies related to operations. |
| **Land Use** | N/A |

## NEW JERSEY (NJ TRANSIT, INC. , NJT RAIL OPERATIONS)
## STATE ROLE SUMMARY
## COMMUTER RAIL/AMTRAK SERVICE

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|---|---|
| **Enabling Legislation** | The New Jersey Public Transportation Act of 1979 provided for the formation, powers and finance of NJ Transit, which is New Jersey's public transportation corporation.<br><br>Created in 1979 within NJDOT, but totally separate. DOT Commissioner is chairman of NJT. Recognizes state's responsibility to provide efficient, state-wide, mass transportation service and facilities. Not subject to PUC review. |
| **Goals, Policies and Objectives** | The 1979 act set up four goals as previously reported. Formerly Rail Division in NJDOT provided subsidies under purchase of services contract. Board of directors includes State Treasurer. Also provides equipment under lease to private bus operators. NJTRO owns the rail rights of way, also operates under trackage rights on Conrail and Amtrak lines. |
| **Finance** | Issues grant anticipation notes. Fixed fares to recover 50%+ of operating costs. Used Safe Harbour Leasing extensively. Also leased 500 buses from Port Authority of NY-NJ. State bond issue for highway and rail improvements. |
| **Planning** | NJT central planning function for bus and rail. NJTRO does schedule planning. NJT develops capital program. RO does detailed design, mainly with consulting engineers. |
| **Construction** | NJTRO does CM with consultants. Extensive bridge rehabilitation program by NJTRO forces. Recently completed new rail equipment shop, extension of electrification. |
| **Operations** | All operations performed by NJ Transit. NJTRO forces:<br>o Operate trains<br>o Dispatching<br>o Equipment maintenance<br>o Maintain stations, bridges, tracks, signals<br><br>NJTRO uses Amtrak Northeast Corridor track for service between NY and Trenton. Pays Amtrak under NEC Service Agreement. Also pays Amtrak to honor NJT tickets on Amtrak trains. |
| **Land Use** | Contracting with private developer to build new station and 1,000 car parking lot - $8M facility at no cost to NJT. Developer will obtain added value in adjacent land he owns. NJT property considered "state" property. |

## NEW YORK (METROPOLITAN TRANSPORTATION AUTHORITY, INCLUDING LONG ISLAND RAILROAD AND METRO NORTH COMMUTER RR MNCR)
## STATE ROLE SUMMARY
## COMMUTER RAIL/AMTRAK SERVICE

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|---|---|
| **Enabling Legislation** | Created in 1965 under State Public Authorities Law for the continuation, development and improvement of commuter transportation in the New York Metropolitan District (NY City plus seven suburban counties). |
| **Goals, Policies and Objectives** | State legislation consolidated the former NY City Transit Authority and Triborourgh Bridge and Tunnel Authority (T&TA) into a unified regional agency with power to use surplus auto toll revenues to support and improve commuter rail and subway/bus lines. Building high level platforms for elderly and handicapped access. |
| **Finance** | MTA has power to issue bonds and notes, and to accept Federal grants. MTA collects one fourth of one percent sales tax in MTA district. Also collects one fourth of one percent Mortgage Recording Tax on all property sales in District. MTA bills member counties for cost of commuter rail station maintenance and operations. |
| **Planning** | MTA conducts broad region-wide planning studies, including strategic plan development. Commuter rail subsidies (LIRR and MNCR) do detailed planning, design, and operations planning. |
| **Construction** | LIRR and MNCR award construction contracts, use outside consultants for CM. Both railroads do their own track signal and electrical construction. State DOT handles construction of railroad grade separation projects. |
| **Operations** | Train and engine crews are LIRR and MNCR employees, part of Railroad Retirement (not Social Security). Multiple unions with jurisdiction. Some stations leased to local cities and towns for maintenance. Amtrak and Conrail pay MNCR for tracking rights to operate over MNCR tracks. |
| **Land Use** | MTA is actively marketing air rights. Also develops rental space in major stations, including Grand Central to generate added revenues. |

## MASSACHUSETTS (MBTA MASSACHUSETTS BAY TRANSPORTATION AUTHORITY)
## STATE ROLE SUMMARY
## COMMUTER RAIL/AMTRAK SERVICE

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|---|---|
| **Enabling Legislation** | Chapter 161C of the General Laws provides for the formation, powers and finance of the Executive Office of Transportation and Construction. Enabling legislation of various agencies, such as the MTBA (Chapter 161A), which are monitored by the EOTC and also provided under state enabling legislation.<br><br>Created in 1964. Expanded former MTA to include 78 cities and towns in the greater Boston area. State subsidizes a portion of operating costs. Commonwealth purchased rail rights-of-way from Penn Central, including NE corridor. |
| **System Characteristics** | Established to take over bankrupt surburban lines and to preserve commuter rail service after Old Colony (NH) abandoned and Highland Branch (B&A abandoned). Actively rebuilding and expanding commuter rail. Fare levels held low to encourage ridership. 13% increase in 1982-1985.<br><br>Specific fare policy guidelines are embedded in state law such as reduced fares for elderly and students. |
| **Finance** | Operating deficit assessed to area municpalities. State bond issue for capital improvement. Joint ticketing with subway and bus lines. |
| **Planning** | Planning and design by MBTA. Use consulting engineers for design. Chairman of MBTA is also Commonwealth Secretary of Transportation. Close coordination with bus and subway. Use bus for off-peak service. |
| **Construction** | Contracts with Amtrak to operate and maintain service and rail properties. Crews are Amtrak employees (formerly use Boston and Maine to operate "north" lines). |
| **Operations** | Reconstruction of south station, including air rights for bus terminal and parking garage. |
| **Land Use** | Design and construction of rail facilities performed by state agencies under the EOTC. CM managed by MBTA engineers. MBTA has developed extensive design manuals. |

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