

THE MEMPHIS TROLLEY SYSTEM: A TRANSPORTATION LINK AND
DEVELOPMENT TOOL

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Prepared by:

Memphis Area Transit Authority

Thomas D. Fox, Ph.D., AICP
Director of Planning & Capital Projects
Memphis Area Transit Authority
1370 Levee Road
Memphis, TN 38108
Phone: (901) 722-7160
Fax: (901) 722-7123
E-mail: tfox@matatransit.com

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ABSTRACT

The Memphis Main Street Trolley/Riverfront Loop heritage trolley is a five-mile circulator system developed and operated by the Memphis Area Transit Authority. The route forms a complete loop that serves the Central Business District (CBD) as well as adjacent areas to the north and south, and the riverfront. Service is provided with 15 restored antique trolley vehicles. The system is anchored on the north and south by intermodal transportation terminals. The trolley system was a strategic public investment designed to provide a transportation link and help spur development in downtown. Since service began in 1993, unprecedented new development has occurred in the CBD core and redevelopment has spread outward. Ridership has grown steadily and will reach one million annual riders in 2000. The system has been successful in connecting points of activity along a pedestrian mall in the core of the CBD; helping transform the South Main neighborhood into a prime location for residential development, commercial ventures and art galleries; improving access to the 20,000-seat Pyramid Arena; and making the riverfront more attractive to visitors and residents. An eastward extension to the Medical Center is being designed and long-range plans include integration of the heritage trolleys with a regional light rail system.

INTRODUCTION

The Memphis Main Street Trolley/Riverfront Loop (MST/RL) heritage trolley is a five-mile circulator system developed and operated by the Memphis Area Transit Authority. The route forms a complete loop that serves the Central Business District (CBD) as well as redeveloping areas to the north and south, and the riverfront. The system is anchored on the north and south by intermodal transportation terminals.

The system was implemented in two phases of about equal length. The Main Street segment was completed in April 1993 and the Riverfront Loop segment opened in October 1997. Service is provided seven days per week. The fare is 50 cents one-way with a lunchtime fare of 25 cents. Hours of service by day are tailored to meet varying demands. Service begins early on weekdays (6:00 a.m.) to accommodate work trips and continues late on weekends to serve late night activities (1:00 a.m. or later on Friday and Saturday).

The system is operated with a fleet of 14 antique trolley vehicles that have been purchased and restored by MATA. Eleven vehicles are operated in peak service providing about five minute headways.

The two transportation terminals facilitate several types of intermodal connections and house joint development tenants. Central Station, a historic train station renovation and mixed-use project on the south end of the MST/RL serves MATA buses, the trolley, AMTRAK and automobile park-and-ride. The project also includes 63 apartments, about

12,000 square feet of commercial space, and a police precinct. On the north, the North End Terminal provides a MATA bus, trolley and automobile park-and-ride transfer point as well as a welfare-to-work career center, day care, and police substation.

SYSTEM DEVELOPMENT

History

The Memphis CBD is situated on the east bank of the Mississippi River and is linear in shape. Its growth and decline in the 20th century followed the pattern of most cities and by the 1970s City leaders made a commitment to a public works project intended to stem the tide of decline – a pedestrian mall. A segment of Main Street about eight-tenths mile in length was converted to a pedestrian-only Mid America Mall with extensive amenities, such as brick pavers, seating areas, historic light fixtures, and landscaping. By the late 1980s it became evident that the mall would not reverse the trend of commercial businesses moving to the suburbs. And, the mall itself had created new problems in the minds of downtown workers and residents, such as:

- the mall was too long to walk
- parking was inconvenient
- the flow of people along Main Street was not large enough to support businesses along the mall

Perhaps a more significant problem was the deterioration of the mall itself. Due to unstable sub-base, the mall had become severely damaged and was in need of a major upgrade. These conditions resulted in discussions about how the mall could be improved.

It was determined that transit would play a major role in resolving many of the problems that the mall created. The transit alternative that was initially proposed was a transitway traversed by rubber-tired buses. City leaders decided that this alternative was environmentally and aesthetically incompatible with the pedestrian-oriented setting of the downtown area. A subsequent study completed in 1989 by the Hnedak Bobo Group (1) resulted in a recommendation to use electrically-powered heritage trolleys. The recommendation was accepted by MATA and the City of Memphis in 1990.

Planning, Design and Construction

Although the impetus for the project was centered around the Mid America Mall (later renamed Main Street Mall), the Hnedak Bobo Group study included an evaluation of various logical extensions to the on-mall line. Considerations in designing the system included connecting major points of trip generation such as:

- places of employment
- residences
- restaurants
- parking facilities
- hotels
- Cook Convention Center
- Pyramid Arena
- Civic Center/Government Complex
- riverfront parks

Other system considerations included integration of transportation terminals and interface with MATA's existing downtown-oriented bus system. At the time a south terminal at a renovated Central Station was envisioned and a north terminal was proposed. [Central Station was re-opened in 1999 and a new North End Terminal was completed in 1998.]

The study identified a "base" trolley line on Mid America Mall, with future extensions to:

- Pyramid Arena/Pinch District (to the north of the Mall)
- Riverfront (to the west and south)
- Medical Center (to the east)
- Mud Island (to the northwest)
- St. Joseph/St. Jude Hospitals (to the northeast)

The initial Main Street Trolley line that was constructed in 1993 included (1) the Mid America Mall segment, (2) the Pyramid Arena/Pinch District extension using N. Main Street, and (3) the portion of the Riverfront Loop segment that operated on South Main Street. An operating and maintenance facility was constructed near the north terminus of the revenue portion of the line. The line is double track except for the spur to the operations and maintenance facility that is single track. About 0.8 mile is within the pedestrian mall right-of-way and the remaining 1.7 miles is in-street sharing a lane with automobile traffic. Twenty stations were built at ten locations – generally on each side of the tracks. The average station spacing is about 1,100 feet. All stations on the Main Street segment are equipped with elevators for wheelchair access.

In 1997, the remainder of the Riverfront Loop, running roughly parallel to Main Street with connections to Main Street at Central Station and North End Terminal was opened. The Riverfront Loop is single track throughout its length and has six stations. About two miles is within railroad right-of-way and about 0.5 mile is in-street sharing a lane with automobile traffic. The average station spacing is about 1,900 feet. Stations on the Riverfront Loop provide wheelchair access via ramps. Use of railroad right-of-way was made possible by the purchase of one existing track from the Illinois Central Railroad (now CN/Illinois Central Railroad). The other existing track is used only by AMTRAK (two times per day) and is maintained by CN/Illinois Central. The land under the two tracks has been owned by the City of Memphis for many years. The Riverfront Loop track crosses the AMTRAK track at one location at the north end of the line. A signalized interlock system has been installed at this location to control trolleys traveling westbound across the AMTRAK track. Before proceeding across the track, all trolleys must get a clear signal or receive permission from the CN/Illinois Central dispatcher.

The Medical Center Rail Extension is currently in the Final Design phase. The other two extensions identified in the 1989 study will be considered in the future.

Figure 1 shows the existing MST/RL system and the planned Medical Center Rail Extension along with major attractions in the downtown area.

Vehicles

The existing fleet includes 19 restored antique trolleys – 14 of which are active and five are in various stages of restoration. The active fleet includes seven 19-seat wood-body vehicles and seven 52-seat metal-body vehicles. Two of the seven 19-seat vehicles were manufactured by the Brill Company in 1912. The other five were previously built and operated in Oporto, Portugal and date from the 1920s to 1940s. All seven 52-seat vehicles originated in Melbourne, Australia. These vehicles are believed to date from the 1920s to 1940s.

The Main Street Trolley segment of the system began with six trolleys. Since 1993 MATA has gradually expanded the trolley fleet with additional authentic trolleys as funding and vehicles became available. A total of seven vehicles were purchased and restored by MATA personnel and MATA contractors. Seven vehicles were purchased already restored from Gomaco Trolley Company. Four additional Melbourne-type vehicles have been purchased from New Orleans and one from Green Bay. These vehicles are being restored for use on the Medical Center Rail Extension, scheduled for completion in 2003.

Funding and Cost

The MST/RL system design and construction was financed with Interstate Transfer, Federal Transit Administration (FTA) Formula, and local funds. See Table 1. Memphis received an allocation of Interstate Transfer funds as compensation for a segment of Interstate 40 that was never built. The Memphis Metropolitan Planning Organization allocated 12% of the Interstate Transfer funds for transit capital projects. Approximately 69% of the cost of the Main Street Trolley was covered by these Interstate Transfer funds. About nine percent was provided from FTA Formula funds and the remainder from the City of Memphis and Tennessee Department of Transportation (TDOT). The City of Memphis and TDOT split the required non-federal match. Overmatch totaling about \$3 million was contributed by the City of Memphis and MATA.

The Riverfront Loop had a similar mix of funding with Interstate Transfer comprising the largest share (44%) but FTA Formula providing a much higher percentage than on the Main Street Trolley project (37%). The non-federal match was split between the City of Memphis and TDOT and overmatch totaling about \$154,000 was provided through value of land donated by the City of Memphis.

The total cost per mile on the Main Street Trolley phase was about \$14 million compared to about \$3.8 million on the Riverfront Loop phase. Several factors contributed to this large difference. Factors which escalated the Main Street Trolley cost in relation to the Riverfront Loop cost included:

- Extensive repairs to the Mid America Mall

- Construction of an operations and maintenance facility
- High costs for project management due to the complexity of the project
- Considerable utility relocation under Main Street and Mid America Mall

Factors which lowered the cost of the Riverfront Loop by comparison:

- Single track construction
- Use of existing rail track for about two miles of the line
- Use of existing railroad signals for about two miles of the line

SYSTEM OPERATION

The MST/RL is a strategic public investment that has helped spur unprecedented new development in the CBD core and expand redevelopment to nearby areas. At the present time the downtown area includes about 80,000 employees and 24,000 residents, and is visited by six million tourists per year.

Ridership

Annual ridership has grown steadily, as shown in Figure 2. Ridership has almost doubled from 468,115 in the first full year of operation in 1994 to 922,475 in 1999. The largest increase occurred in 1997 when the Riverfront Loop opened in October of that year. The year 2000 is expected to surpass all previous ridership totals. In the first four months of 2000, ridership was 22.5% above the same period in the previous year. New records were set for ridership in January, February, March and April. In fiscal year 1999, the MST/RL carried an average of 4.8 passengers per revenue mile – almost three times the rate for the fixed route bus system.

Ridership has increased for a variety of reasons, the most important of which is the gradual growth and diversification of development in downtown Memphis. Since 1990 residential population has expanded from less than 1,000 to over 5,000 people.

Entertainment-type development such as AutoZone Park, Peabody Place, Gibson Guitar Factory and Museum numerous restaurants, clubs and hotels, and has resulted in downtown becoming more of a destination for non-work activities. MATA has taken advantage of this growth by strategic marketing of its services and partnering with downtown development interests.

Ridership is highest in the Spring and Summer months and lowest in the Fall and Winter. Average ridership by month is shown in Figure 3. Average monthly ridership is 55,214. Monthly variations can be significant and are the result of the larger numbers of visitors in the Spring and Summer and the more favorable weather for outside activities by downtown workers and residents. May is the highest ridership month at 81,909 due in part to usage during Memphis in May events. Memphis in May is a month-long celebration that includes special events and activities centered on Tom Lee Park adjacent to the Riverfront Loop. December is historically the lowest ridership month, averaging 36,198 passengers.

Average weekly ridership was 17,740 in 1999. Ridership varies by day as shown in Figure 4. Monday-Thursday ridership is comprised mainly of downtown workers and residents who use the system on a regular basis. Friday-Sunday ridership is more dependent on the activities that occur downtown. Saturday is the highest ridership day,

with 3,887 riders in 1999, followed by Friday at 3,628. Sunday is the lowest usage day with 1,173 average riders. Monday through Thursday ridership is fairly stable but gradually increases as the week progresses, ranging between 2,030 and 2,456 daily patrons. Individual day ridership peaks generally coincide with major events in the downtown area. For example, during the Memphis in May Beale Street Music Festival on Friday May 7 through Sunday May 3, 1999, the MST/RL carried 34,479 passengers, with 16,282 riders on Saturday. Other recurring events that are highly dependent on the trolley system for movement of large numbers of people are Memphis Redbirds (Triple A) baseball games at Autozone Park, concerts and college basketball games at the Pyramid Arena, conventions, and cultural exhibits at the Cook Convention Center. MATA typically increases the number of vehicles in operation to as many as 13 for the largest events.

Market Characteristics

An extensive on-board survey of the Main Street Trolley was administered in 1994 by Harris of Indiana University (2). Although conducted before opening of the Riverfront Loop, North End Terminal and Central Station, certain conclusions remain valid based on observations of MATA staff. Key results included:

- 51% were riding for transportation-related reasons and 49% for entertainment-related reasons
- 17% “normally get around Memphis” by public transit
- 61% had “eaten at restaurants along the trolley line”; 34% had “shopped at stores along the trolley line”
- 36% had incomes over \$50,000; 14% had incomes below \$20,000

The Harris survey was conducted in late September and early October – months that have about average ridership. In the summer months, a larger proportion of riders are tourists and local people who have trip purposes that are entertainment-oriented, based on observations of MATA staff. In the winter months, riders consist mainly of downtown residents and employees traveling for work-related purposes or personal business.

The MST/RL serves several geographical submarkets within the downtown area and has assisted in accomplishing several transportation and development-related goals for these areas. The submarkets include the (1) CBD core, (2) South Main neighborhood, (3) Pyramid/Pinch area, and (4) riverfront. Since its inception, the system has been successful in fulfilling the goal of connecting points along the pedestrian mall in the core of the CBD that are generally too far to walk but too short to drive. Most of these trips are made by downtown workers traveling between offices, and riding to/from lunch. The Cook Convention Center is also located in the CBD core and generates a significant number of trolley trips by tourists traveling between downtown hotels and the convention center.

The area south of the CBD core, known as the South Main District, has begun a major transformation as a prime location for residential development as well as small restaurants and shops. Historically, South Main developed around the railroad anchored by Central Station at the south edge of the neighborhood. The initial phase of the MST/RL system provided a link to this neighborhood along South Main Street in anticipation of redevelopment of Central Station and hopes of more comprehensive

redevelopment of this area. MATA purchased Central Station in 1995 and redeveloped the buildings and property into an intermodal transportation terminal and joint use project including 63 apartments and 12,000 square feet of commercial space. The reopening of Central Station along with development of a new residential development of upscale single family homes and apartments (South Bluffs), and construction of the National Civil Rights Museum were the catalysts to spur major redevelopment of the South Main District. Numerous historic buildings are currently being converted to apartments and condominiums and the area is emerging as an arts district with opening of several galleries. The MST/RL has helped fulfill the goal of redevelopment of this area.

The area north of the CBD core, known as the Pinch District, is dominated by the 20,000-seat Pyramid Arena. St. Jude Children's Research Hospital just to the east is another major trip generator in the area. Since the opening of the Pyramid in the late 1980s, the Pinch District has experienced modest growth of restaurants and small shops, and as a result, MATA has experienced ridership growth in this area. The North End Terminal, the main transit center in the MATA system, opened in January 1998 in this area and has created additional opportunities for bus/trolley transfers by bringing more passengers to a central transfer location. The MST/RL has helped fulfill the goals of moving people efficiently to and from the Pyramid and aiding in redevelopment of the Pinch District.

The riverfront is the next emerging geographic submarket that will be developed with the aid of the MST/RL. The Riverfront Loop already serves the Tennessee Visitor Center, Tom Lee Park, and residential development in the South Main area. Plans are underway

to develop the portion of the riverfront adjacent to the CBD core, generally between Jefferson Avenue and Beale Street. A mix of restaurants, entertainment and public facilities are planned. The Riverfront Loop offers spectacular views of the Mississippi River and provides access via three stations in the immediate area.

FUTURE PLANS

MATA is completing final engineering plans for the Medical Center Rail Extension.

This project is a two-mile eastward expansion of the existing MST/RL system that will connect the CBD with the Medical Center district. This project is the last segment of the downtown rail circulation system as well as the first segment of a regional light rail line. The Medical Center Rail Extension has been designed to link the two largest employment centers in the region and serve increased trip demand generated by new or proposed downtown developments. Ridership on the Medical Center Rail Extension is expected to be 2,100 per day in the year of opening increasing to 4,200 by 2020.

The tracks will be constructed within the existing right-of-way of Madison Avenue, generally in the inside travel lanes. Rail vehicles will share a travel lane with automobile traffic for most of the project length, similar to the operating environment that currently exists on the “off-Mall” portion of Main Street. Two separate bridges will be constructed to provide grade separation over major roadways. Six new stations are planned with five situated in the middle of the street.

FTA has recommended a Full Funding Grant Agreement (FFGA) for this project with 80% of the project cost to be provided by Section 5309 New Start funds. Negotiations on the FFGA are being completed at this time. Total cost of the project is estimated at \$69 million. The project is scheduled for completion in 2003.

The extension is being designed to accommodate modern light rail vehicles but vintage trolleys will be utilized until a proposed light rail transit line is implemented and a fleet of modern vehicles is acquired. The long range Regional Transit Plan includes light rail in three corridors by the year 2020. Year 2020 ridership projections for the individual corridors are 34,300 for the east corridor, 21,200 for the south corridor, and 6,900 for the north corridor. Each recommended corridor connects to the MST/RL and downtown transportation terminals with the intent of eventually mixing heritage and modern rail vehicles on Main Street, the Riverfront and Madison Avenue, and providing intermodal connections at the terminals. A Major Investment Study is currently underway for the top priority corridor. Results of the Major Investment Study and a financial plan will be the primary basis for a public discussion about commitments that would permit the light rail program to be implemented.

REFERENCES

- (1) Hnedak Bobo Group. Reconstructed Mid America Mall. Memphis Area Transit Authority, Memphis, TN, 1989.
- (2) R. Harris. Vintage Trolley Study. Indiana University, Bloomington, IN. 1994.

TABLE 1

SUMMARY OF FUNDING AND COSTS

Funding Category		Main Street Trolley	Riverfront Loop
FTA – Interstate Transfer	\$	23,992,401	4,127,717
FTA – Formula		3,023,635	3,534,718
State – Tennessee Dept. of Transportation		2,494,931	806,050
City – City of Memphis		3,981,251	945,000
MATA		1,344,854	0
Private		50,000	15,375
TOTAL		34,887,072	9,428,860

Cost Category		Main Street Trolley	Riverfront Loop
Construction	\$	26,571,366	6,638,877
Trolleys		2,194,854	1,550,000
Utility Relocation		2,143,107	692,161
Architect/Engineer Design		2,186,214	547,822
Construction Management		1,476,211	(1)
MATA Administration		315,320	0
TOTAL		34,887,072	9,428,860

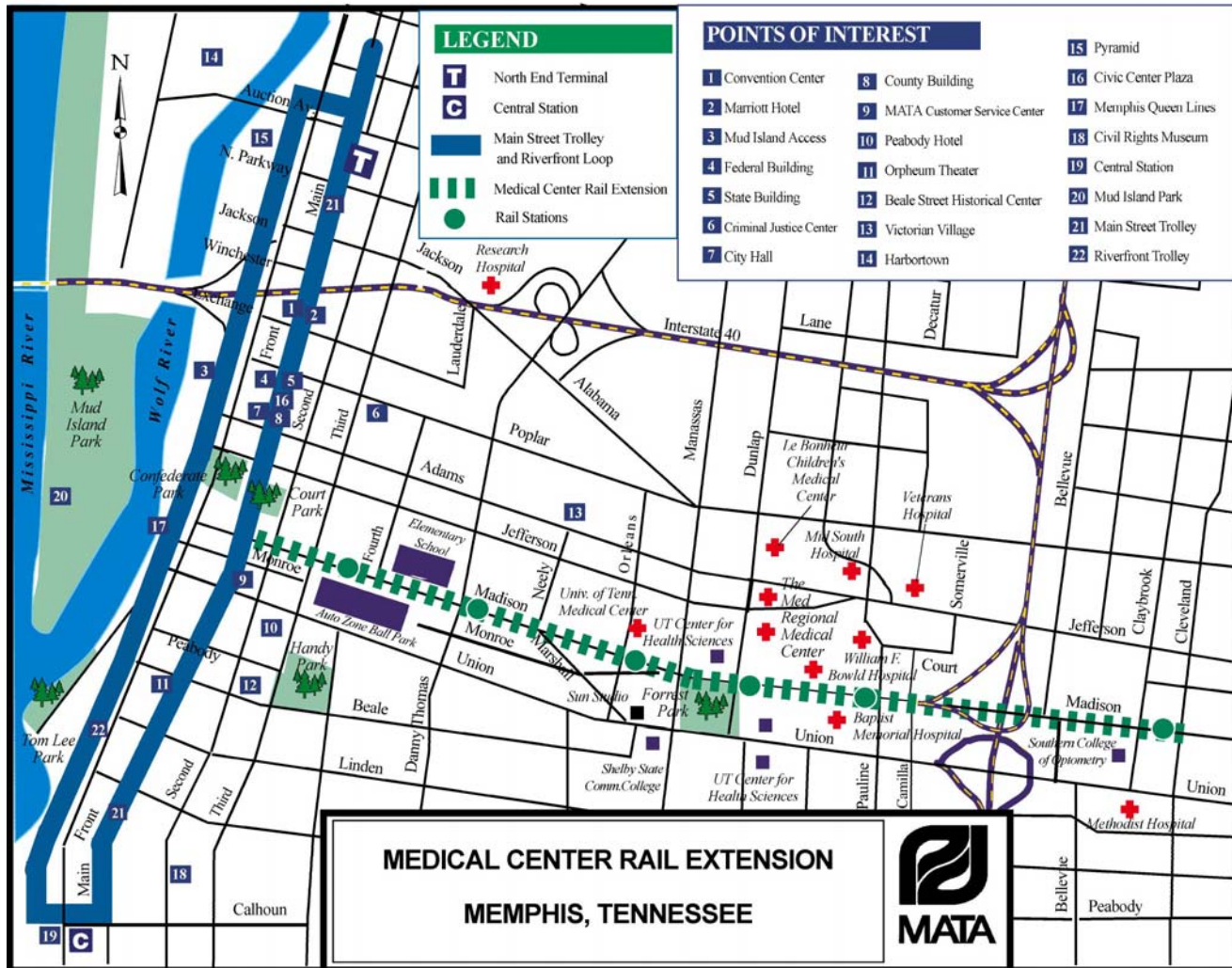


FIGURE 1

EXISTING AND PROPOSED RAIL TROLLEY SYSTEM

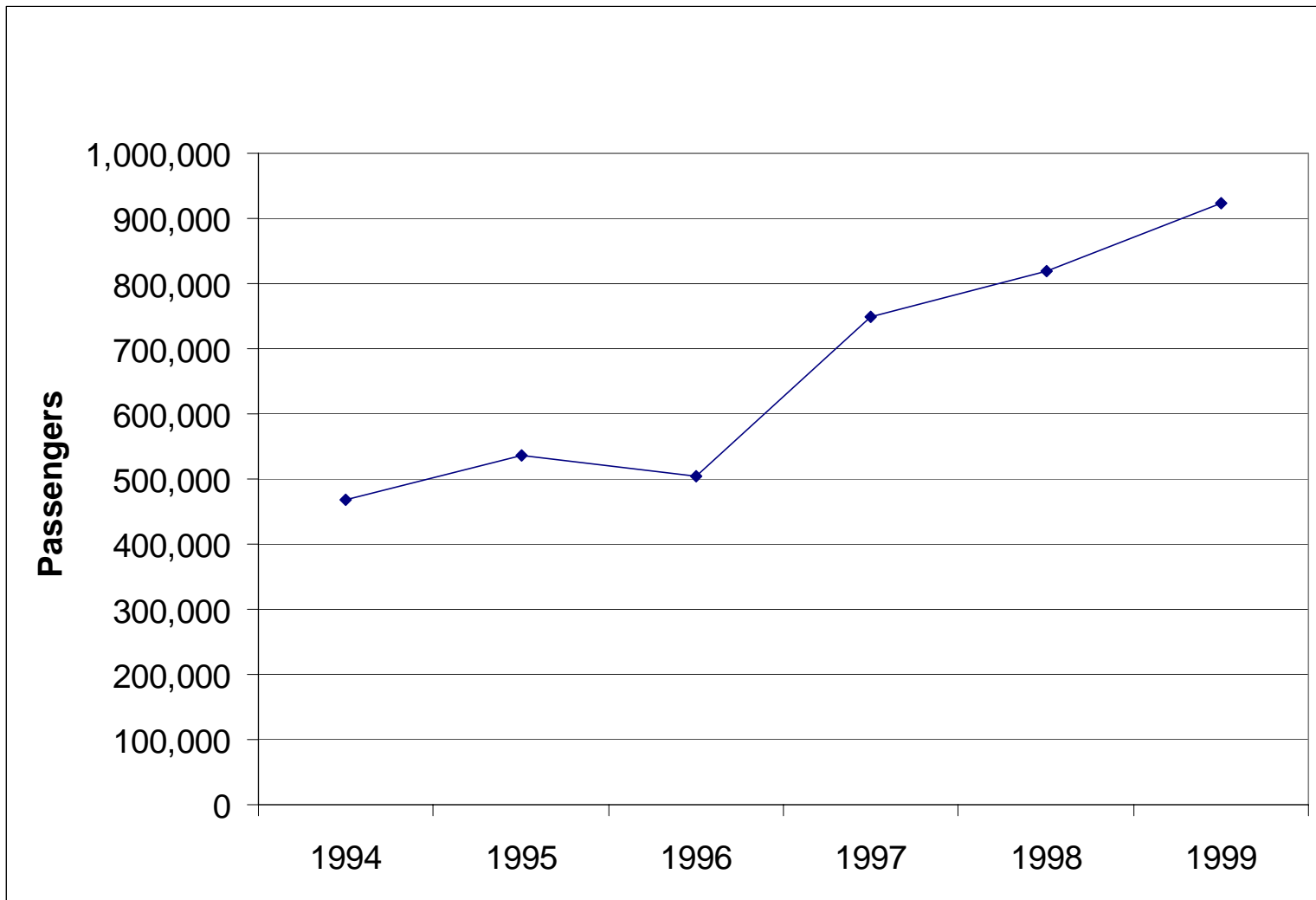


FIGURE 2

ANNUAL RIDERSHIP, 1994-1999

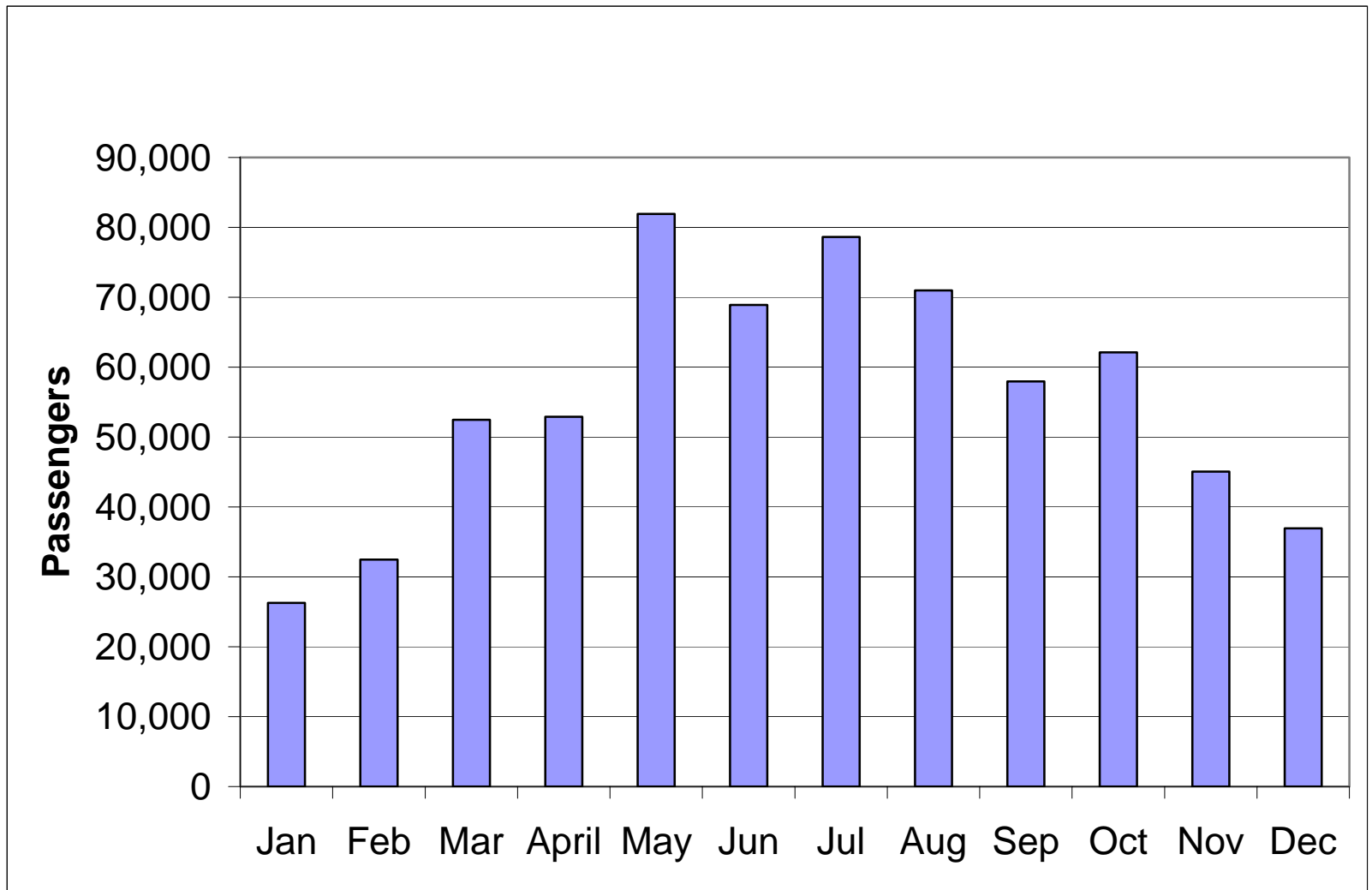


FIGURE 3

ANNUAL RIDERSHIP BY MONTH, 1994-1999

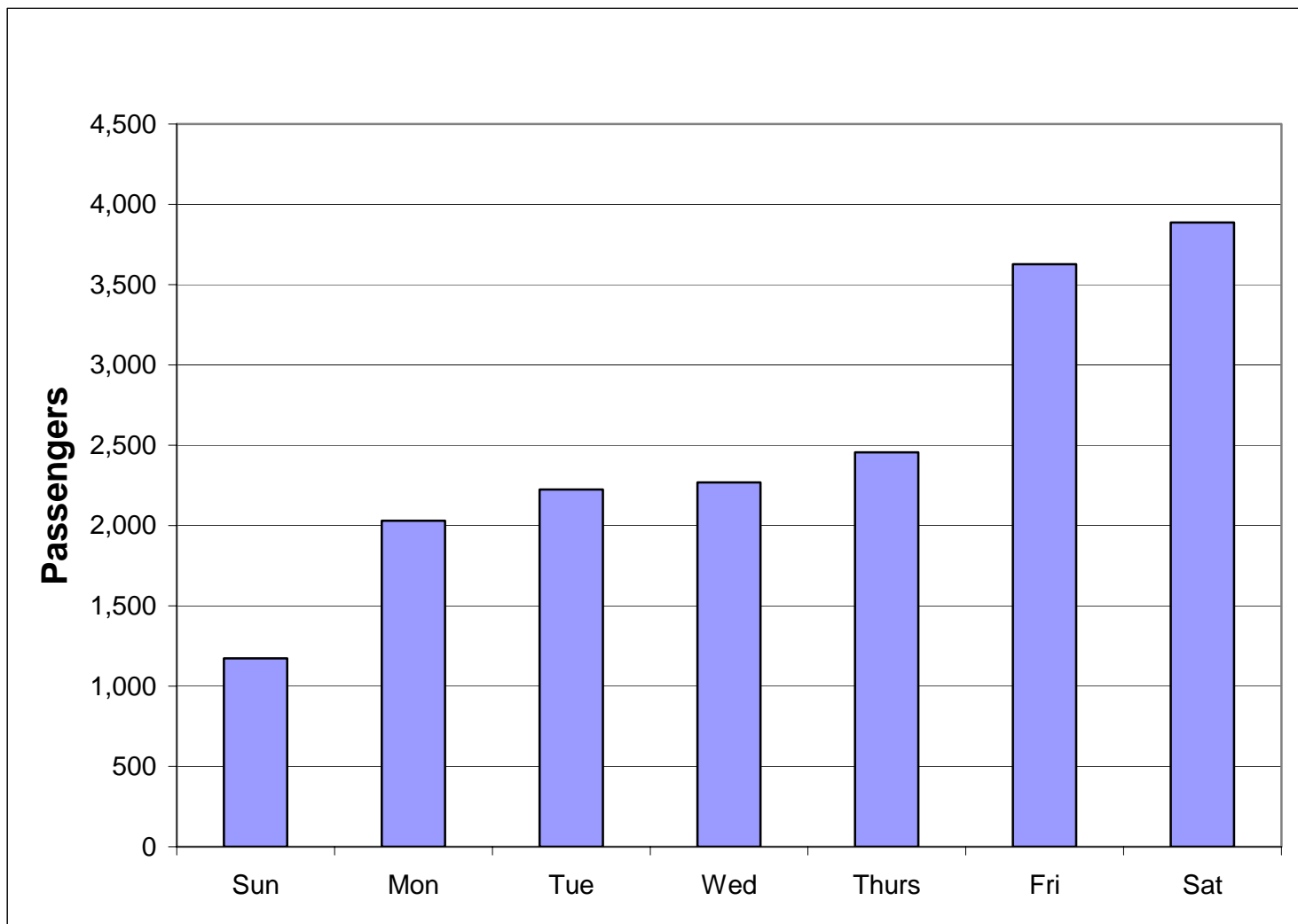


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