

# Seattle Vintage Trolley Operations

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The Seattle Waterfront Streetcar currently operates along a 2-mi (3.2-km) route through the city's central waterfront and Pioneer Square historical district. The Waterfront Streetcar uses a former freight line of standard-gauge track running north-south along the central waterfront and then proceeding east-west on new rail to Seattle's International District, where it links with the southern portal of the city's new downtown transit tunnel. Development of the initial 1.6-mi (2.6-km) leg of the system cost \$3.6 million. A 0.4-mi (640-m) extension in 1990 required new track and special engineering at a cost of \$6.5 million. The system operates five double-ended Melbourne Class W-2 streetcars dating from 1924 with up to three cars running at one time. The cars are electrically powered through overhead lines, and each can carry a total of 93 seated and standing passengers. The initial leg of the system entered operation in May 1982 and was extended in 1990 as part of a comprehensive downtown Seattle transit project. In 1991 the system recorded a ridership of 174,000 fares (during 6 months of operation) and generated revenues of \$130,000 against operating costs of \$863,000. Conceived in 1974 as an easily implemented tourist amenity, the system's development quickly encountered a series of political, regulatory, financial, and technical obstacles. Among these were obtaining permissions for use of a former freight line from multiple owners and contract users; locating suitable rolling stock; upgrading the route; soliciting financial participation from local taxpayers; and overcoming the skepticism of local and federal transportation planners. Although ridership has declined from a peak of 278,000 fares in 1983, the system is deemed a success. Use of the streetcar has suffered to a degree from the failure of the new downtown transportation system to reach planned operating capacity. Market research shows that streetcar use would benefit from active and sustained promotion. Developing vintage rail systems is probably never as easy as it seems at first blush, but the results can provide an attractive visitors' amenity and useful component in a comprehensive transit circulation system.

The Seattle Waterfront Streetcar began operation on May 29, 1982, and ranks as one of the United States' first experiments with creating and operating a vintage rail system. Initially intended to link visitor attractions along Seattle's central waterfront, the original 1.6-mi (2.6-km) line was extended by 0.4 mi (640 m) in 1990 and integrated into a comprehensive downtown transit system the central feature of which is a new crosstown transit tunnel (Figure 1).

It required 8 years to move the streetcar from a deceptively simple idea to an operating system. Along the way, the concept encountered a daunting succession of political, bureaucratic, financial, and engineering obstacles, and its development costs ballooned from a few hundred thousand dollars to nearly \$10 million for the extended system. Despite this, the streetcar has become a popular fixture and currently serves some 200,000 riders annually. Many Seattle citizens would sooner chop down the Space Needle than scrap the streetcars.

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## GEOGRAPHICAL AND HISTORICAL CONTEXT

The Seattle Waterfront Streetcar service occupies a unique niche in the history of both Seattle's central waterfront and its transit services. Because trends and investments in waterfront development and transit planning will exert a major influence on the streetcar service's future role as a transportation amenity, they are reviewed briefly here to aid the reader.

### Evolution of Seattle's Central Waterfront

Seattle's central waterfront stretches approximately 1.5 mi (2.4 km) along the eastern shore of Elliott Bay. It features a series of oblique piers originally designed to accommodate the steamers and ferries that were the principal vessels for the Pacific and Puget Sound prior to the 1960s. These piers were once served by a planked roadway built for rail and wagon traffic over tide flats. Most of the downtown piers and the appropriately named Railroad Avenue were built by private railroad companies that vied with each other for lucrative and exclusive public right-of-way concessions. These routes were used primarily for freight after the 1906 opening of a rail tunnel from the foot of Virginia Street to Union Station on the southern edge of the downtown business district (National Railroad Passenger Corporation [Amtrak] passenger service to Seattle currently terminates at the adjacent King Street Station).

When the Port of Seattle was organized as a public port district in 1911, many of the downtown piers and Railroad Avenue were turned over to public ownership. The railroads retained their rights-of-way as the port and city government filled in the shoreline with material from inland regrades and constructed present-day Alaskan Way for automobile traffic. An elevated double-deck viaduct was added in the 1950s as part of U.S.-99. This viaduct straddles the remaining waterfront rail lines and defines the western boundary of downtown Seattle, which rises to the east up a steep ridge.

The Port of Seattle's early commitment to container shipping technology had a profound impact on the character of the central waterfront. The construction of large truck-container piers south of Yesler Way diverted maritime activity away from the central waterfront's piers, and railroad traffic declined accordingly, except for north-south through-traffic beneath the Alaskan Way viaduct. Many piers were abandoned, and city planners began to shift priorities for the area from maritime to housing and entertainment uses. This transition was slowed by passage of the Washington State Shorelines Protection Act in the early 1970s, which emphasizes preservation of maritime commercial uses. But the economics of modern shipping has all but rendered the central waterfront obsolete for such purposes.



FIGURE 1 Axonometric map of downtown Seattle showing Waterfront Streetcar route and related transit facilities. (© 1990, Pocket Concierge Publishing).

As maritime commerce and employment shrank during the 1970s and 1980s, tourism activity increased, spurred by private development of new shopping arcades in pier sheds and the Waterfront Place neighborhood, and public investments in the Seattle Aquarium, Waterfront Park, Myrtle Edwards Park, and the nearby Pike Place Market and Pioneer Square historical districts. This trend is expected to continue in the 1990s with the port of Seattle's development of a major trade center, marina, and hotel complex adjacent to its headquarters at Pier 66.

### Evolution of Seattle's Transit Planning and Services

Seattle's transit services began with development of private street railways in the late 1800s. These lines were often ancillary to private real estate or utility enterprises and followed no predetermined plan. Seattle's first attempt to adopt a comprehensive land use and transportation plan, crafted by Olmsted protégé Virgil Bogue, was frustrated by voters in 1912. The electorate was more receptive to public ownership of key utilities and in 1919 approved acquisition of private tracks and rolling stock to form the Seattle Municipal Street Railway. As in other American cities, the rise of the automobile doomed tracked trolleys in Seattle. The last of the lines was discontinued in 1941 in favor of diesel buses and trackless trolleys operated by the reorganized Seattle Transit System.

Comprehensive transit planning continued to languish until the late 1960s, when rampant suburban growth spurred development of a visionary plan for metropolitan heavy rail transit as part of a countywide "Forward Thrust" package of bond issues submitted to voters in 1968. Everything passed except the transit plan and a scaled-back version fared no better at the ballot box in 1970. The events of 1912 and 1919 seemed to repeat themselves, however, when county voters approved acquisition of private bus lines and the Seattle Transit System by the Municipality of Metropolitan Seattle, a countywide water quality utility formed in the 1950s.

The newly created Metro Transit immediately embarked on a series of ambitious service improvements and long-range planning. Its most significant capital investment to date is the downtown Seattle transit project, which features a transit tunnel running beneath the central business district between a northern terminal at the Washington State Trade and Convention Center and a southern terminal in the International District. This facility features three large stations along its 1.3-mi route and is linked by exclusive busways to Interstates 5 and 90.

The tunnel opened in 1990 and is currently served by dual-mode buses that convert from diesel to electric power when underground. Rails were installed in anticipation of future conversion to light rail service, and Metro Transit is developing a new comprehensive transit plan, which may include both light and heavy rail components for submission to county voters as early as November 1992.

### GENESIS AND DEVELOPMENT OF THE WATERFRONT STREETCAR

The origin of the Seattle Waterfront Streetcar had nothing to do directly with the plans for either the central waterfront or

metropolitan transit services in which it would later figure so prominently. Rather, it grew out of the enthusiasm of a local butcher, Robert Hively, who happened to own two Brill Master Unit streetcars salvaged from Yakima Valley in eastern Washington. Mr. Hively approached the author in January 1974 with the idea of operating these cars on switching tracks beneath the Alaskan Way Viaduct.

As a newly elected member of the Seattle City Council, the author naively believed that this should be a simple proposition. Take two vintage streetcars, secure a right-of-way on existing waterfront tracks, and recruit a handful of retired transit operators as motormen and—voilà!—a streetcar system in a few months at the cost of a few thousand dollars. Events quickly derailed this pleasant fantasy.

At that same time, Seattle Mayor Wes Uhlman and Councilmember Bruce Chapman were advocating a trolley line down First Avenue to link Pike Place Market on the north with Pioneer Square. Seattle, it should be noted, was a national leader in creating and financing preservation of historical districts, and a vintage trolley link between its two main attractions, which effectively bracket the downtown core, seemed to be a natural complement. When the First Avenue proposal proved to be costly (as a result of utility relocation and other necessary capital outlays), the waterfront line became the preferred route, but it was not without its own problems, fiscal and otherwise.

First, Hively's cars failed to meet FRA safety standards, which applied because the tracks the cars would run on were part of the transcontinental rail system. Estimates revealed that upgrading each car could cost \$60,000.

The rail line itself had a tangled ownership dating back to the railway "wars" of Seattle's early history. Approvals for its use were required from Union Pacific, Milwaukee, and Burlington Northern, which actually operated the line and raised a host of technical objections to the idea. Additionally, individual pier owners had to waive their long-unused rights to service off the main line.

Finally, the railroad workers union had to approve an exception to the standard labor rules that required a three-person crew for any engines operating on interstate railways, even a trolley. After indicating an initial interest in a special arrangement for the streetcar line, the union decided to go by the book.

Despite Mayor Uhlman's public support for the streetcar concept, his planning staff decided that the line would be prohibitively expensive and irrelevant to the larger transit schemes then being developed by Metro Transit. As a newly elected member of the City Council, the author was oblivious to these bureaucratic maneuvers and blithely enlisted the support of U.S. Senators Warren Magnuson and Henry Jackson, who then ranked among the most powerful members of Congress. They in turn prevailed upon Burlington Northern to take a more flexible approach toward the notion. This support effectively switched the staff onto a dead-end spur, and the streetcar line got a political green light. (It should be noted that the city's planning staff was reorganized shortly after a new mayor, Charles Royer, took office in 1978.)

Burlington Northern officials, led by a regional vice president, Richard A. Beulke, suggested using the railroad's western-most running-tracks, which could be legally disengaged from the transcontinental system and federal regula-



tion. This also cut the Gordian knot of union jurisdiction, putting the more flexible transit workers union in the "driver's seat" rather than the railroad workers union. Unfortunately, it did nothing to untangle the welter of historical rail rights-of-way dating back to the old Railroad Avenue and it took 2 years to obtain all of the necessary permissions.

As these negotiations progressed, the author took up the problem of finding suitable rolling stock, specifically standard-gauge, double-ended trams powered with 600 volts and built some 50 years ago. A national request for proposals elicited only two bids: one from Robert Hively and a lower bid from Paul Class, based in Glenwood, Oregon, who undertook a worldwide search for appropriate streetcars.

These were ultimately found in Melbourne, Australia. The author crossed the Pacific to examine these cars prior to purchase, which was fortunate because officials there had reserved inoperable cars for Seattle in the mistaken belief that the city was only building a museum display. Upon learning that Seattle meant to run the cars, they graciously gave the city the pick of their rolling stock. To date, Seattle has purchased a total of five Melbourne Class W-2 streetcars (Figure 2). Each car cost \$18,000 (\$5,000 for the car and \$13,000 for shipping). Compare this with the \$150,000-plus cost of a standard diesel coach or the \$1 million-plus cost of a modern light rail car!

Although the cost of the streetcars proved a pleasant surprise, estimates for line improvements ballooned into the millions of dollars. At the same time, jurisdictional disputes arose between the city government and Metro Transit over financial and operating responsibilities. Newly adopted rules for handicapped access also imposed new costs in designing stations and reconfiguring rolling stock, but these also led to the first fully accessible surface rail system in the nation.

Matters were further complicated by the skepticism of the UMTA, to whom Seattle looked for about one-third of the \$3 million construction budget (Senators Magnuson and Jackson again helped to overcome this resistance). With persis-

tence, each of these obstacles was overcome, but on the eve of commencing construction in 1981, the city council balked at approving the local funding.

In an abrupt change of heart, the council demanded that as the streetcars' "primary beneficiaries," the downtown and waterfront business communities should shoulder the burden of local funding. The business and property owners rallied at a meeting on January 11, 1981, and gave their overwhelming endorsement (by a 72 percent majority) to a local improvement district to raise \$1.2 million for construction through special tax assessments. This in turn required amendment of state law governing such tax districts during that year's session of the legislature. Even with this support, completing the system required enormous private assistance and volunteer labor from every stratum of the community. Even Bruce Nordstrom, principal in the fashion retail chain, pitched in to help paint the first streetcars for their inaugural run.

That came on May 29, 1982, and 3,000 citizens lined the route for the Waterfront Streetcar's first trip. The line was an instant success with tourists, waterfront businesses, shoppers, employees, and even city and Metro Transit bureaucrats. The journey from Bob Hively's simple idea to a functioning system had taken 8 years, cost more than \$3 million, and spanned the Pacific Ocean from Melbourne to Seattle—all for a 20-min streetcar ride along 1.5 mi of waterfront (Figure 3).

## PHYSICAL FEATURES OF WATERFRONT STREETCAR SYSTEM

### Original Line

The initial route of the Seattle Waterfront Streetcar extended 1.6 mi (2.6 km) from Broad Street on the north to Main Street on the south. The system uses a single line of track located between Alaskan Way, a four-lane arterial, on the west and

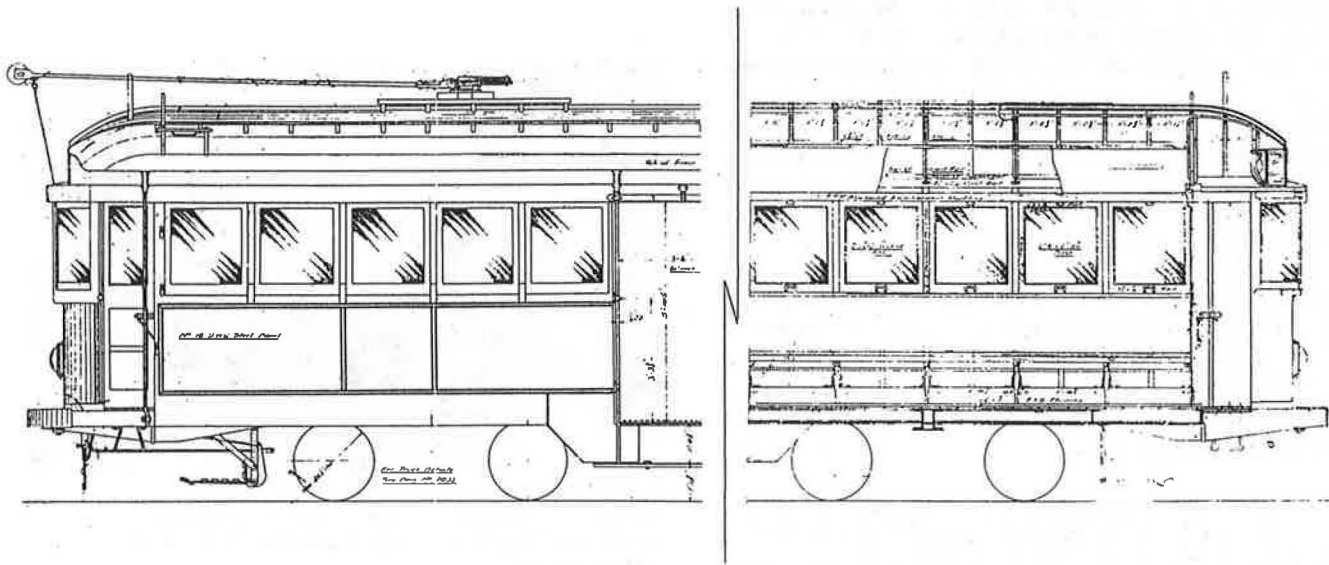
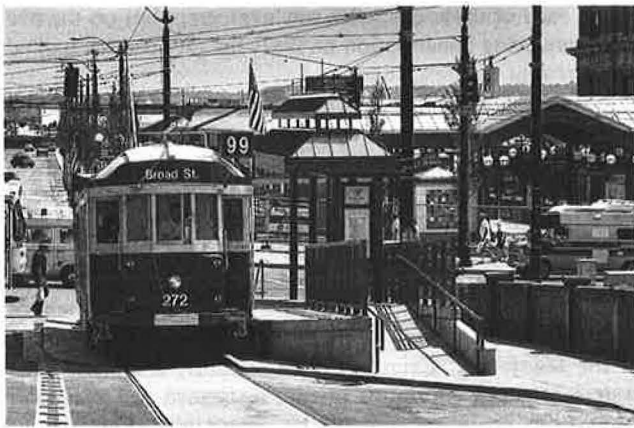


FIGURE 2 Schematic drawings of the Melbourne Class W-2 streetcar.



**FIGURE 3** Melbourne Class W-2 streetcar in operation along Seattle's central waterfront.

the Alaskan Way Viaduct on the east. One short passing track was constructed just south of Pike Street.

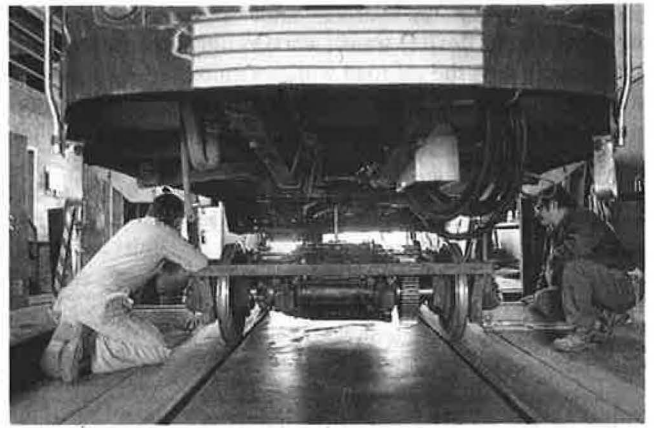
The northern terminus is 400 ft north of Broad Street and Pier 70, which marks the northernmost limit of the central waterfront and has been remodeled as a shopping and restaurant arcade. This terminus lies at the entrance to Myrtle Edwards Park, a popular shoreline greensward that continues another mile to the north. The streetcar barn for storage and maintenance is also north of Broad Street (Figure 4).

Following the line south, there are five "carstops" or stations spaced approximately four city blocks apart along the route: Vine Street, Bell Street, Pike Street, University Street, and Madison Street. Each carstop features a raised, handicapped-accessible, concrete platform with a steel and glass pergola shelter and benches (Figure 5).

The interim carstops correspond to major activity centers along the waterfront:

- Vine Street serves the Edgewater Inn, a large convention hotel on Pier 67.
- Bell Street serves the port of Seattle's headquarters at Pier 66, a site slated for major redevelopment by 1995.
- Pike Street serves the Seattle Aquarium and Omnidome Theatre on Pier 59. This station is also linked via a "hillclimb" system of stairs and elevators to the Pike Place Market, a landmark farmers market and tourist hub perched on the ridge top to the east.
- University Street serves Waterfront Park, a large, passive viewpoint that forms a crescent between Piers 59 and 57 and a converted pier shed retail arcade on Pier 57.
- Madison Street serves the Pier 52 terminal of the Washington State Ferry System, which provides transportation across Puget Sound for thousands of commuters and visitors each day. Madison Street also serves the new Waterfront Place complex of new and restored condominiums, apartments, offices, and retailers on the east.

The original southern terminal for the line was Main Street at the western edge of the Pioneer Square Historical District and adjacent to the Washington Street Boat Landing, a small



**FIGURE 4** Seattle Waterfront Streetcar maintenance facility.

public day-moorage for pleasure boats. Main Street also lies about five blocks north of the Kingdome, King County's sports and exhibition stadium.

Several design features of the system deserve mention:

- The tracks are bonded to limit wandering currents that might affect railroad switching systems and underground utilities.
- Grade crossing signals were added for cross streets north of Bell Street because of heavy truck use and limited visibility in this area.
- The Melbourne cars measure 48 ft (14.4 m) in length and 8 ft (2.4 m) in width and weigh 16 tons each. A motorman station is located at each end, and the cars are partitioned into three discrete passenger saloons for up to 52 seated riders and 41 standing riders. The saloons feature upholstered longitudinal benches and latitudinal benches crafted from Tasmanian mahogany. The cars are accessed via sliding doors on the western side behind the motorman station. Although dat-



**FIGURE 5** Waterfront Streetcar at one of the fully handicapped-accessible carstops featuring steel and glass pergola shelters.

ing as far back as 1924, the Melbourne cars did not require major upgrading. Primary improvements included addition of a radio communication system, public address system, and warning whistles to each car.

Construction of the original system, including acquisition of the first three streetcars and grade crossing signals, cost \$3.6 million in 1982. Of this, \$1 million was provided by UMTA through Metro Transit; \$1 million was provided by the city of Seattle; \$1.2 million was raised by the local improvement district tax assessment; \$370,000 for signalization was provided by the Federal Arterial Safety Board; and the balance was donated by Burlington Northern Railroad and other private benefactors.

### 1990 Extension

Although initially scorned as little more than a toy by transportation planners, the Waterfront Streetcar was made an integral component in development of Metro's downtown Seattle transit project (DSTP) during the late 1980s. The DSTP faced two primary hurdles: how to expedite commuter and crosstown routes through Seattle's narrow downtown core (which is pinched to as few as seven blocks between Interstate 5 and the waterfront) and how to increase internal circulation via transit feeder services.

After much debate, a north-south transit tunnel beneath Third Avenue was adopted as the best solution for commuter and through services. Metro then turned to two "vintage" systems to supplement the existing "Ride Free" downtown zone within which a rider may travel via any coach at no charge. The Alweg Monorail, an artifact of the 1962 Seattle World's Fair, provided a link to Seattle Center, the former fairgrounds and now the city's principal performing arts complex that lies 1 mi north of downtown. The monorail's southern terminus was integrated into the new Westlake Mall shopping arcade, which, in turn, opens on to the Westlake Station of the transit tunnel.

The Waterfront Streetcar offered a second link to the waterfront that lies four blocks west and down a steep ridge from the tunnel. In 1990, the streetcar line was extended eastward on Main Street through the heart of Pioneer Square and then southward on Fifth Avenue to terminate at the International District portal of the tunnel. Two carstops were added at Occidental Park in Pioneer Square and at the International District terminus, and two additional Melbourne cars were acquired and modified for service.

Construction through Pioneer Square required stabilization of the subterranean areaways (the famous "Underground Seattle" catacombs left over from turn-of-the-century landfilling) and laying track on the Main Street automobile bridge over the Burlington Northern tracks leading to the downtown rail tunnel.

The extension required fabrication of new track, which was performed in Luxembourg. At street crossings, hard rubber tracks are used out of consideration to bicyclists.

These special engineering solutions raised the cost of the 0.4-mi (640-m) extension to \$6.5 million—nearly twice the

cost of the original line. This cost was borne almost entirely by Metro Transit as part of the DSTP budget. The extended line entered full operation on June 23, 1990, and the entire DSTP system was inaugurated the following September.

### PERFORMANCE AND OPERATING EXPERIENCE

The system operates 12 hr per day year-round with a minimum of two cars with 30-min headways. One car is added during peak times and the summer, reducing headways to 20 min. Each car is manned by a motorman and conductor.

Between May 1982 and this writing, the system had experienced no major accidents or breakdowns. Liability claims over the past 8 years total \$300—including a \$100 claim for a pair of eyeglasses broken during an emergency stop.

The streetcar (like the monorail) is not subject to the downtown "Ride Free" zone. Metro charges its standard one-zone fare (currently 75 cents) and issues a transfer that allows each rider to board any Metro vehicle, including the streetcar, at no charge for 1 hour.

The streetcar's first full year of operation in 1983 registered its best ridership to date with 277,801 fares. Novelty and a strong tourism season played an obvious role in this initial success. Ridership declined to 232,000 fares over the next 3 years, rose to 242,000 fares in 1987, and then declined anew to 201,000 fares in 1989. Allowing for the system's shutdown for a full quarter during its extension, this ridership level was maintained during 1990. Total ridership in 1991 registered a further drop to 174,000 fares, but the system operated for only 6 months because of storm sewer work along the waterfront. Thus the extension appears to be reviving ridership to earlier levels.

Table 1 compares streetcar and total Metro Transit ridership between 1982 and 1991. Causes for these ridership trends are difficult to pinpoint. It should be noted that overall Metro ridership declined steadily from 1982 to 1988. Further, all of downtown Seattle was disrupted by a major public and private building boom (including construction of the DSTP) during the late 1980s, which discouraged tourists, shoppers, and employees from circulating through the district.

Streetcar ridership no doubt suffers from the failure of the DSTP to achieve its full service level because of mechanical problems and delivery delays for its dual-mode coaches. The transit tunnel is also closed on Sundays, a prime tourism day when riders might be expected to use the tunnel-streetcar link. Additionally, marketing research shows that streetcar ridership is very responsive to promotion, but promotion has been sporadic at best.

Farebox revenue in 1991 totaled \$129,600 against operating costs of \$862,000. Table 2 breaks revenues and costs down per passenger, hour, and mile. The revenue shortfall is made up from a variety of sources, including advertising sales and an UMTA operating grant of \$200,000 per year. It should be noted that the streetcars' operating costs are partially offset by elimination of conventional coach service along the central waterfront.

**TABLE 1 Comparison of Waterfront Streetcar and Metro Transit Ridership and Revenue**

Year	Streetcar Ridership	Streetcar Ridership % Change from Previous Year	Transit System Ridership % Change from Previous Year	Streetcar Hours	Streetcar Revenue	Streetcar Miles
1991*	174,000	12%	0.5%	12,400	\$129,600	47,500
1990	154,886**	-23%	4.2%	9,128	\$108,003	N/A
1989	201,531	-12%	4.1%	5,784	\$100,303	"
1988	228,375	-6%	0.8%	6,269	\$112,036	"
1987	242,596	4%	-3.5%	5,840	\$121,089	"
1986	232,194	0%	-2.2%	5,897	\$116,864	"
1985	232,058	-2%	-2.1%	5,833	\$120,359	"
1984	237,350	-15%	5.0%	N/A	\$123,790	"
1983	277,801	14%	-1.6%	"	\$145,896	"
1982	244,179			"	N/A	"

\*1991 Estimates based on Year-to-Date through November 1991

\*\* Waterfront Streetcar was not in service for most of the first quarter. Bus service was substituted, for which service hours data are available but not passenger trips data.

**TABLE 2 Comparison of Waterfront Streetcar Operating Costs and Revenue**

1991 Projected Total Streetcar Operating Expenditures = \$862,930 ***		
	1991 Total Oper. Costs	1991* Farebox Revenue
per Hour	\$69.59	\$10.45
per Mile	\$18.17	\$2.73
per Passenger	\$4.96	\$0.74

\*1991 Estimates based on Year-to-Date through November 1991

\*\*\* Metro 1992 Budget. Includes Salaries, benefits, materials, supplies, and services.

## CONCLUSIONS AND EXPECTATIONS

Vintage transit systems are necessarily unique propositions wherever they are undertaken. This means that critical factors of popularity, political support, potential use and funding, and physical characteristics will vary dramatically with locale. Thus it is difficult if not impossible to fashion a general prescription out of any single city's experience. This said, at least a few helpful tips can be gleaned from Seattle's experience with its Waterfront Streetcar.

First, do not assume that re-creating or simulating an older system is as simple as it may sound. Reviving an older transit technology can be just as daunting as pioneering a new approach. Adapting older machinery to a modern transportation context presents its own set of special engineering and operational problems. Be especially alert to the layers of legal and regulatory arrangements in which older commercial rail lines may be entangled.

Second, although integration of a vintage system into a new transit system is a self-evident virtue, it creates problems as

well as opportunities. The danger, as Seattle has experienced so far, is that the vintage component may be dragged down by shortcomings of the larger system.

Third, unlike supernatural baseball fields, the formula, "build it and they will come," does not guarantee ridership for vintage rail. Aggressive and ongoing promotion is needed to generate passengers and farebox revenue.

The author believes that the Seattle Waterfront Streetcar faces a bright future. Its ridership will benefit as the bugs are worked out of the total downtown Seattle transit project, and use can be expanded through targeted promotion (e.g., as a shuttle between outlying parking and the Kingdome for major sports events).

Foremost, the author is gratified by the outpouring of public sentiment in favor of the streetcar. Like other famous Seattle "follies," such as the Space Needle and the monorail, the streetcar has become a beloved fixture of the city's landscape and in her citizenry's hearts. A steep grade had to be climbed in taking the Waterfront Streetcar from idea to reality, but it was worth it.