

As Fast as a Speeding Bullet: Rebuilding the Norristown High-Speed Line

RONALD DEGRAW

The Norristown High-Speed Line of the Southeastern Pennsylvania Transportation Authority, formerly the Philadelphia & Western Railway, is a 13.5-mi high-speed, grade-separated, high-platform light rail line that opened in 1907 but had fallen on hard times in recent years. Its rolling stock, although revolutionary at the time of its construction 60 years earlier, was in growing need of replacement, and virtually every aspect of the little commuter line required replacement or rebuilding. Less than 10 years ago, the decision was made to rebuild the entire line, and nearly \$160 million has been expended or committed to once again make the Norristown High-Speed Line the showpiece of light rail lines. The rebuilding of the line includes new cars, a complete reconstruction of the maintenance shops, renewal of the substations, a new signal system, a new terminal on one end and a renovated terminal on the other end, new pedestrian bridges and some new highway bridges, improvements to other bridges, and major track improvements.

The Southeastern Pennsylvania Transportation Authority (SEPTA) Norristown High-Speed Line began service in 1907 as the Philadelphia and Western (P&W) Railway. It had been incorporated 5 years earlier as a steam railroad with grandiose plans to become a major competitor of the mighty Pennsylvania Railroad. When it finally opened on May 22, 1907, it was a mere 11 mi long. Its eastern terminus was 5 miles from Philadelphia's City Hall, via a connection with the newly opened Market Street elevated railway, and its western terminus at Strafford was in the middle of a field, the exact location chosen principally because an existing farmhouse could be cheaply turned into the terminal station. During the course of its 11 mi, the line managed to avoid every single town along Philadelphia's prestigious Main Line.

Its eastern terminus was at 69th Street Terminal, which was in Upper Darby, just west of the city limits. Sharing the terminal with P&W were four rail routes of the Philadelphia & West Chester Traction Company, the Market Street subway-elevated line, and a long streetcar line operated by Philadelphia Rapid Transit Company.

Although P&W's electric interurban railway operated with a third rail and had all high-level platforms, no highway crossings, and gentle curves and grades, for some reason its management saw fit to purchase a fleet of 22 wooden passenger cars with a top speed of 44 mph.

The poor little P&W, vastly overshadowed by the huge and powerful Pennsylvania Railroad's four-track speedway, was almost immediately in danger of financial failure.

It struggled along for 5 years and was then redeemed by a branch from Villanova Junction to Norristown, opened Au-

gust 26, 1912 (Figure 1). Although this branch had more curves than the original main line, it, too, was completely grade separated with high-level platforms, built to be a speedway but encumbered with a 44-mph fleet.

Norristown was a substantial-sized suburban city and was the county seat of Montgomery County. The Lehigh Valley Transit Company at the same time was building southward toward Norristown, upgrading and relocating much of its Allentown to Lansdale right-of-way. High-speed cars of the Liberty Bell Limited route, as it was called, began operating the 55 mi from Allentown through Norristown to the 69th Street Terminal on December 12, 1912. The Norristown extension and the connection with the Liberty Bell cars was just the remedy that P&W needed for financial stability. It prospered well until the Great Depression.

With the Depression came a new management headed by Thomas Conway, Jr., who had made a name for himself rebuilding interurbans such as the Chicago, Aurora & Elgin, and the Cincinnati & Lake Erie.

Conway immediately ordered a fleet of 10 radically different cars from the J. G. Brill Company. The resulting "bullet" cars, which went into service in November 1931, were the first aerodynamically designed railroad cars in the world and the first built entirely of aluminum. They were capable of 85 mph.

Conway vastly improved P&W's track and superelevated all curves by as much as 8 in., creating a 70-mph speedway for his new "bullet" cars that reduced the running time from Norristown from 24 min to 17 min in one schedule change. Eleven steel passenger cars purchased during the 1920s, but which had the same 44 mph impediment as the old wooden cars, were rebuilt to match the speed of the "bullet" cars.

Conway was forced out in 1946 when control of P&W was acquired by the neighboring Philadelphia Suburban Transportation Company, better known as Red Arrow Lines. Red Arrow's management continued to run P&W as a prestige, high-speed operation, although P&W as a corporate entity officially ceased to exist when it was merged into Red Arrow on January 1, 1954.

The Liberty Bell Limited route was abandoned in 1951 and the Strafford branch in 1956, but otherwise the little interurban line soldiered on with the incredible "bullet" cars providing the bulk of the service.

SEPTA acquired Red Arrow Lines on January 29, 1970, and continued to operate it separately from its larger system, the old Philadelphia Transportation Company. In 1971, the Norristown line's schedule was speeded up and it was boasted that it was now "the fastest suburban electric railway in the world," with the fastest peak hour trains making the 13.5-mi Norristown to 69th Street run in 19 min.

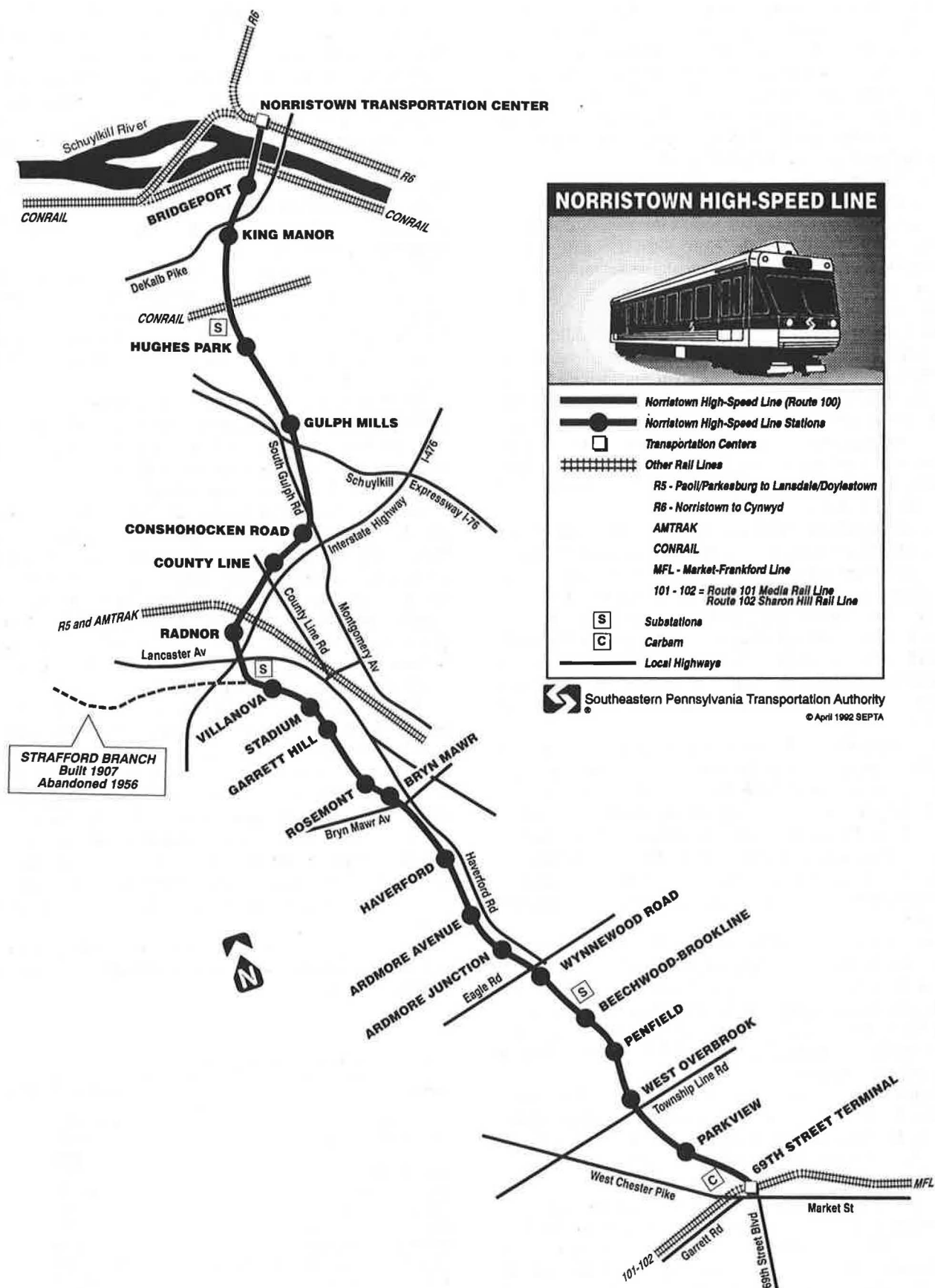


FIGURE 1 Norristown high-speed line.

SEPTA began ordering new equipment for its other electric lines. New light rail cars arrived in 1981 and 1982 to replace all of the older cars on the city's five subway-surface routes and on Red Arrow's Media and Sharon Hill lines. New Broad Street subway cars arrived in 1982, and the entire trackless trolley fleet was replaced with new vehicles in 1979. A total of 232 new Silverliner cars for the regional commuter railroad lines had arrived in 1974 through 1976.

But there were no cars on order for the Norristown line, despite the fact that the bullet cars were older than many of the electric vehicles that had been replaced. The principal reason seemed to be that the Norristown cars had received reasonably good maintenance over the years and were operating with fewer breakdowns and problems than the other fleets despite their age.

But age was beginning to catch up with the "bullets" and the older 160-series cars. Finally in 1983 the manager of SEPTA's suburban system succeeded in convincing everyone that the Norristown Line had become a tired, wornout railroad that needed to be completely rebuilt if it were to remain viable. Not only were the cars nearing the end of their lives, but so was much of the track, the substations, the signal system, the bridges, the shops, both of the terminals, and some of the stations.

The most pressing need was for new rolling stock, and SEPTA's own staff wrote the specifications for the new cars. The need for new cars became even more urgent after a series of collisions in 1985 and 1986 considerably reduced the fleet size. The last collision, when a 160-series car ran into the 69th Street Terminal waiting room, resulted in closing the entire railroad for about 6 weeks and offering only partial rail service for another 2 months. Buses were substituted for the rail cars but took about twice as long to travel between 69th Street and Norristown.

Ridership fell from its normal 9,000 trips per day to a low of 2,800 during the bus substitution. Nearly 6 years later, daily ridership hovers around 7,000. P&W's reverse-peak ridership, which had grown quickly during the 1960s and 1970s, continued to expand during the 1980s. It was primarily the prevailing-direction commuters with other options who deserted the line. By the late 1980s, the rail line was carrying more reverse-direction commuters than it was traditional prevailing-direction commuters.

Seven two-car sets of Chicago Transit Authority elevated cars built in the early 1950s began operation on the Norristown line in December 1986 and were followed in 1990 by five single-unit standard-gauge Market-Frankford subway-elevated cars. The last of the old cars was retired from passenger service in 1990 with the remarkable "bullets" falling a year short of their 60th anniversary.

Twenty-six new cars costing \$55 million were ordered from Asea and the National Railroad Passenger Corporation (Amtrak) in 1987 but have been delayed after problems at Amtrak's Beech Grove assembly plant. Meanwhile Asea merged with Brown Boveri to become A.B.B. Traction. A.B.B. is now using Morrison-Knudsen in Hornell, New York, instead of Amtrak to assemble the cars. The first car arrived at 69th Street on May 22, 1991, far behind schedule and is still undergoing testing. It has still not operated in revenue service. The other 25 cars are now finally under construction and will begin arriving later in 1992.

The new cars have been designated as the N-5 cars, because they are the fifth series of new cars to operate on the line. The cars will have a stainless steel body and will be 65 ft long and 9 ft 10 in. wide, seating 60 passengers. They will continue a P&W tradition of railcar innovation. The new cars will feature the first three-phase alternating current (AC) drive to be used in a production fleet in the United States. Each truck will be driven by its own DC-AC inverter with two 208 hp motors per truck. The high horsepower will allow the cars to maintain 70 mph on the several 2.5 percent grades on the line. The normal running speed of the car will be 70 mph, with a top speed of 80 mph.

These specially designed interurban cars should be a match for the old bullet cars, and it is SEPTA's intention to operate a public timetable that gets passengers from Norristown to the 69th Street Terminal just as fast as a speeding bullet used to.

In addition to new cars, most other aspects of the railroad are being rebuilt (Table 1).

The Norristown cars are still being maintained in the original 1907 car barn just outside 69th Street. The structure, which is basically sound, will be completely rebuilt, with a new roof and floor. The overhaul of the structure will begin after the new fleet of cars is in service.

The Norristown High-Speed Line has three substations, Beechwood, Villanova, and Hughes Park. The first two date back to 1919, when the railroad ceased manufacturing its own power, and the Hughes Park facility replaced a Norristown substation in the mid-1950s. All three are being completely rebuilt with solid-state equipment replacing the old rotary generators. The result is that the previous 5,200-kW output is being replaced by a more reliable 8,400-kW output. The substations are nearing completion.

The original substation buildings have been retained, and the two 1919 buildings have been handsomely renovated.

P&W originally used two- and three-position semaphore signals. These were converted to three-aspect block signals in the early 1930s but have received no major overhaul since then. An entirely new signal system now being installed will use a cab-signal system with overspeed control. Such a system would have prevented most of the collisions that have occurred in the railroad's history. The system will authorize operation of six different speeds: 0, 15, 30, 45, 55, and 70 mph.

A Vetag system will permit train operators to remotely control interlockings used regularly, including terminals and turnback switches.

TABLE 1 Modernization Program

Project	Approximate Cost (\$)
New rail cars	54,800,000
Shop modifications	21,300,000
Renewal of substations	8,900,000
New signal system	28,800,000
Highway bridges	3,900,000
Pedestrian bridges	1,700,000
Schuylkill River bridge	3,000,000
69th Street Terminal	14,800,000
Norristown Transportation Center	11,700,000
Track Improvements	10,000,000
Total	158,900,000

Most of the bridges date back to the line's opening, and several were in need of major renovations. The bridge over the former Ardmore trolley line at Ardmore Junction was completely rebuilt, and others have been renovated. Five pedestrian bridges have been replaced with new concrete structures.

Major efforts were devoted to improving both terminals on the line. 69th Street Terminal, which opened in 1907, was completely renovated at a cost of nearly \$15 million. The Great Hall was restored to its original grandeur, including restoration of the skylight that had been painted over during World War II so it would not provide a bombing target. The rebuilding of 69th Street Terminal was a far greater effort than just P&W's portion of the building.

At the other end of the line, nearly \$12 million was spent to construct a completely new Norristown Transportation Center with a bus terminal on the ground floor and an elevated train terminal and second track. The new structure was more than a block short of the previous terminal, and the unused elevated structure was demolished. SEPTA's regional rail station at DeKalb Street in Norristown is also tied into the new Norristown Transportation Center. The new facility is the only suburban transportation center in North America that combines regional rail commuter trains, high-speed light rail, and bus service.

Much of the track has been renewed since SEPTA took over Red Arrow Lines in 1970, with the old 85-lb bolted rail being replaced by new 115-lb continuous welded rail. Most of the third-rail has also been replaced with new 150-lb rail. Unfortunately not all of the track will have been renewed by the time the new cars arrive, and renewal of all the super-elevation also remains to be done.

Several stations still need to be rebuilt, and some parking lots need to be improved or expanded.

Ideally the rebuilding of the Norristown High-Speed Line would have been coordinated to coincide with the new car

delivery. Parts of it were begun as capital funds became available, and a few improvements have still not been funded because of the lack of capital.

Part of the Norristown High-Speed Line covers territory that is served by two other SEPTA regional rail commuter lines. Despite this, the Norristown line is considered a valuable transportation asset in the Philadelphia region, carrying large numbers of reverse commuters to destinations not properly served by the regional rail lines and intersecting with numerous bus and rail routes at its two terminals and at other points. To some, transferring at 69th Street Terminal to the Market-Frankford subway-elevated is an unpleasant trip to be avoided. To others, however, the numerous stations on the subway-elevated offer more convenient delivery than do the three downtown Philadelphia stations of the regional rail system.

With a fleet of new air-conditioned cars and other major improvements, the Norristown line's ridership is expected to increase substantially over its old daily figure of 9,000. Possible future extensions of the line near the northern end would further boost ridership.

With a transit system the size of SEPTA's, there are always many demands on the relatively limited capital funds that are available. The investment of about \$160 million in rebuilding the old P&W, however, demonstrates a major commitment on SEPTA's part to once again operate one of the most impressive suburban electric railways in the nation. Trains will again speed from Norristown to 69th Street in 21 or 22 min, down significantly from the 35-min running time of a few years ago.

The new vehicles will be among the most modern interurban cars in the world, worthy successors to the famous bullet cars. An extension of the line to King of Prussia and perhaps farther west is under discussion, and the future looks bright for the little railroad once nicknamed the "Pig & Whistle."