



# BULLETIN

Volume 65, Number 12 | December 2022

## Fiscal Cliff for MTA Approaching

The Metropolitan Transportation Authority (MTA) would need to raise its fares by nearly 30% to avoid a looming “fiscal cliff” and return to a pre-pandemic financial equilibrium, State Comptroller Tom DiNapoli charged in a new report.

A pair of 4% fare increases scheduled for 2023 and 2025 – along with \$100 million in unspecified savings and a \$915 million annual debt service plan proposed by the MTA – are not enough to bring the authority back to its 2019-level farebox revenue.

To achieve that, DiNapoli’s report suggests, 19% in additional fare hikes would be necessary – leaving strap-hangers to pay more than \$3.50 per ride on the subway or bus. The fare has stood at \$2.75 per swipe since 2015, and officials have been loath to consider raising it, especially in the pandemic era.

The MTA is facing a looming post-pandemic fiscal crisis in the coming years: authority executives have for months

been sounding the alarm that with stagnant ridership, and federal pandemic relief funds expected to run out, the agency will not be able to plug a multi-billion dollar deficit without new dedicated funding.

Ridership collapsed on subways and buses at the start of the pandemic, and operations at the MTA – which is more reliant on farebox revenue than many other transit systems across the nation – have since then been heavily bolstered by billions of dollars in federal aid. The nearly \$16 billion in largesse from Washington is expected to run out by 2026, but weekday ridership has stagnated at about 60–65% of pre-pandemic levels in a phenomenon agency brass blame on the rise of working from home.

MTA Chair Janno Lieber and other authority execs have been lobbying heavily for new dedicated revenue streams to plug the gap, but finances remain up in the air. Should the MTA head over the cliff, the authority may have to hike fares, slash service, or lay off employees.

In 2019, fare revenue composed 42.1% of the MTA’s total revenue, DiNapoli said, but today it makes up just 24.5%. The agency projects fare revenue to reach 32.2% *(continued on page 3)*



## Electric Railroaders Association, Inc.

Founded August 15, 1934 by E.J. Quinby  
P.O. Box 3323,  
New York, NY 10163  
<https://erausa.org>

## Editorial Staff

### Editor-in-Chief

Jeff Erlitz

### Associate Editor

Subutay Musluoglu

### Circulation Managers

Robert Colorafi (Electronic)  
David Ross (Print)

### Contact

[erausa.org/contact](https://erausa.org/contact)

### Subscriptions

The *Bulletin* is published monthly and sent free to all ERA members.

### Back Issues

PDFs of previous issues can be downloaded at  
[erausa.org/bulletin](https://erausa.org/bulletin)

## In This Issue

Worldwide Electric Railway, Metro and Tramway Openings	3
Rail News in Review	4
MARTA'S First Rail Fleet	17
Book Review	20
North American Transit Openings in 2022	21
Travels with Jack May	22

## Meeting

Our next Zoom Meeting is on Friday, December 16, 2022 at 7:30 PM.

## Presenting This Month: David Wilson (# 5595)

This month's Zoom presentation by David Wilson is

## Cover Photo

**Looking almost due north towards the south end of Baltimore's Guilford Avenue Elevated, Baltimore Transit Company semi-convertible 5575 (J. G. Brill, 1914) is descending the ramp and is approaching East Lexington Street in April of 1943. Operating on the 1-Gilmor Street/Fulton Avenue route, it will turn right on East Fayette Street, head west across town to Gilmor Street and then back up north to Lanvale Street and Fulton Avenue before terminating at the Park Terminal car barn near Druid Hill Park. Reminiscent of Public Service of New Jersey's Jersey City elevated, the Guilford Avenue elevated had three stations up on the structure at Pleasant, Centre and Madison Streets and was two thirds of a mile in length. It extended from south of Chase Street to north of Lexington Street. Built by the Lake Roland Elevated Railway Company and opened on May 3, 1893, it was abandoned January 1, 1950. At that point, the #8-Towson/Catonsville line, the only route on the structure, was diverted to street running on Greenmount Avenue and Hillen Street.** Marjory Collins (Office of War Information) photo via Library of Congress

"Hudson Waterfront Redeemed." David's show will trace the redemption, reinvention and rebirth of rail services bringing passengers to, under, and along the Hudson River waterfront following decades of decline.

Public agencies and private service providers, in cooperation with real estate developers, have created and implemented a new vision for the Hudson River waterfront, especially in Jersey City, as well as implementing new combinations of services to connect New Jersey communities with downtown and midtown Manhattan.

We will learn about the process of consolidation, coordination, and revitalization of the various previously separate and independent rail transportation services, the formation of PATH, NJ Transit, and NY Waterway, and how they have contributed to the repurposing and revitalization of Jersey City, Hoboken, Weehawken, Newark and the surrounding area.

David Wilson has been riding, observing, documenting, and loving railroads and public transit for nearly 60 years. He began touring transit systems in his teens, including his first visit to New York, Hoboken, and Newark when he was 17. He has since made numerous visits to Hoboken and surrounding communities. He received a Bachelor of Business Administration from Kent State University, and a Masters of Urban Planning and Policy from University of Illinois at Chicago, each with a focus on transportation.

In 2015 David retired from his 48-year career in transportation management, having worked in marketing for four railroads, and finished his career as a bus route planner for Chicago Transit Authority. He has since authored a book and various articles on transportation history in Chicago and gave numerous presentations on various aspects of transportation history and operations.

## How to Join Our Zoom Meeting

A Zoom registration button will be posted on [www.erausa.org](https://www.erausa.org) about five days before David's presentation. You can sign in at 7:15 PM. The show begins at 7:30 PM. If you have any problems, email Bob Newhouser at [bnnyc1955@aol.com](mailto:bnnyc1955@aol.com), or on the night of the meeting, text or call Bob at 917-482-4235.

## Donations

The ERA Board of Directors express their deepest appreciation for these member donations in October 2022.

**\$1000 and Above**

Lewis Hitch, Walter Keevil

**\$500 to \$999**

Irwin Markowitz

**\$200 to \$499**

Eric Bohlert, Sidney Keyles, Charles Long, Dale Rothenberger, Victor Spector

**\$100 to \$199**

Louis Alvarez, Chen Chao-Hwa, Richard Cotton, Patrick Curran, Lawrence DeToma, Robert Fried, Randy Glucksman, Josh Howard, Carl Jackson, Mark Kavanagh, Jeffrey Mann, Donald Mele, Robert Midgley, Michael Miller, Bart Nadeau, John Pesuit, John Schumann

**\$50 to \$99**

Glen Bottoms, William Christensen, Bradley Clarke, Robert Cuniglio, Raymond DeGroote, Michael DeLillo, Nicholas Finck, Dennis Fischer, Alvin Goldstein, Larry Gould, James

Harris, Russell Jackson, Stephen Klabish, Robert Levin, Joel Lubenau, Jack May, Tom O'Neill, Vsevolod Popov, Kenneth Riebold, Sanders Saltzman, Stuart Seidel, Abraham Shiff, John Spychalski, John Urbanski, Julien Wolfe, Robert Wright

**Up to \$49**

Thomas Appell, James Baker, Charles Bogart, Philip Burton, Michael Carlucci, William Closs, Neal Cohen, Ronald Drucker, Dominick Fallucci, Mark Feinman, John Fellin, Alexander Goldstein, James Koryta, Efrem Krischer, David Kronheim, Jerome Landesman, Dennis Linsky, Carl Margolies., George Metz, John Neff, Robert Newhouser, David Newman, Thomas Norwood, Goerge O'Lear, Olaf Olson., David Pirmann, James Prezorski, Philip Rosen, Steven Rosenberg, Peter Samson, William Sass, Thomas Scheffer, Lawrence Sell, Donald Simon, Edwar Skuchas, Gabriel Soler, Daniel Spitzer, Donald Spivack, Morris Stampfer, Peter Stein, Byron Stutzman, Mark Walbrun, Ronald Wasem, Barry Zuckerman

*ERA is a 501(c)(3) tax exempt corporation. Your donations are fully tax deductible and can be made either with your membership renewal or using our donation form on our website: [www.erausa.org/donate](http://www.erausa.org/donate). Your donation helps to maintain ERA's 88-year long tradition of traction education and entertainment!*

**Worldwide Electric Railway, Metro and Tramway Openings in November**

Date	Country	City	Segment	Distance (miles)	Rail/Metro/Tram
11/1	Czech Republic	Olomouc	Lines 3 & 5: Trnkova to U Kaplicky	0.7	T
11/5	Turkey	Gaziantep	Gaziray: Baspinar to Taslica	14.9	R
11/10	China	Nantong	Line 1: Pingchao to Zhenxing Lu	24.4	M
11/13	Singapore	Singapore	TEL: Caldecott to Gardens by the Bay	8.2	M
11/15	U.S.A.	Washington DC	Silver Line Phase 2: Wiehle/Reston East to Ashburn	11.1	M
11/18	China	Tianjin	Line 10: Yutai to Yudongcheng	13.0	M
11/21	Norway	Bergen	Line 2: Bystasjonen to Fyllingsdalen	5.0	T
11/26	Italy	Milano	M4: Linate Aeroporto to Dateo	3.3	M
11/28	China	Shenzhen	Line 6B: Guangming to SIAT Line 12: Zuopatai East to Waterlands Resort East	4.0 25.2	M M
11/29	"	Guangzhou/Foshan	Nanhai New Transit: Sanshanxinchengbei to Linyuedong	3.0	T

**URBAN RAIL NEWS WEBSITE, NOVEMBER 30**

of its income by 2026; the most optimistic predictions by consulting firm McKinsey project ridership to rebound to 88% of pre-pandemic levels by that year.

DiNapoli suggests that while the authority should continue searching for inefficiencies to eliminate and save money, ultimately the breadth of the budget hole is too massive for savings alone to address. He says that state and city lawmakers, along with the MTA itself, should seriously consider new funding streams.

New revenue streams would, if anything, bring the MTA more in line with other transit systems around the country.

The MTA relies more heavily on farebox revenue than the transit authorities in Chicago, Boston, Philadelphia, and Washington DC, DiNapoli found.

Only 45% of the MTA's 2019 subsidies came from dedicated sales and payroll taxes, compared to 92% for the transit authority in Chicago, 75% for Boston and Philadelphia, and a solid 100% for the nation's capital. Much of the MTA's subsidy comes instead from more volatile real estate transaction taxes, as well as tolls left over after going toward bridge and tunnel operations.

[AMNY](#), November 29



# Rail News in Review

## New York Metropolitan Area

### NEW YORK CITY TRANSIT (NYCT)

#### Holiday Train Returns

On Sunday, November 27, the New York Transit Museum resumed operating its Holiday Train for the first time since 2019. As has been the custom, it will operate on four consecutive Sundays, between 10:00 AM and 6:00 PM. This year, the subsequent dates are December 4, 11 and 18.

New this year is the use of post-war SMEC equipment on the IRT Division. Eight R-33 and two R-36 cars, in five different paint schemes, is operating on the Broadway-Seventh Avenue Line between Chambers Street and 137th Street-City College. The consist is 9069-9068+9010-9011+9308+9307+9586-9587+9016-9017.

Northbound trips leave Chambers Street at 10:00 AM, 12:04 PM, 2:04 PM and 4:04 PM. Southbound trips leave 137th Street at 11:00 AM, 1:00 PM, 3:00 PM and 5:00 PM.



**The Holiday Train, with R-33 9017 (St. Louis Car, 1963) leading, is seen passing through Cortlandt Street/WTC southbound making its relay move to South Ferry Loop on its second round trip of the day on December 2.** Johnny Li photo

On that first day of operation, the train operated on the local tracks making all local stops. Due to recurring delays, however, starting the following Sunday the train will still operate on the local tracks but will make only the express stops.

Northbound, the train relays on Track M north of 137th Street. Southbound, after discharging riders at Chambers Street, the train relays at South Ferry Loop.

#### Long-Term Track Outages

Starting on Monday, November 14 and continuing until

Monday, December 19, Track A6 (northbound center track) from the south end of Dyckman Street **A** to north of the station is out of service for track work, conduit installation and traction power cable work. Also included in this work area are two double crossovers, between Tracks A5 and A6 (both middle tracks) just north of the station and between Tracks A4 and A6.

During this work period there is a 10 mph slow-speed order in effect for northbound **A** trains north of the station. That slow-speed order adds two minutes to the scheduled running time between Dyckman Street and 207th Street stations.

This work is being performed by the joint venture of TC Electric LLC and J-Track LLC under Capital Program contract S-32156. This contract is for repairs to the damage due to superstorm Sandy and extends from just south of the Dyckman Street station to 207th Street station.

Track C3/4, the middle track of the IND Concourse Line, has been out of service since July 5 for a whole host of Capital Program work. It was due to have ended Monday, December 5 but this work has now been extended to the end of the year.

The same joint venture of TC Electric LLC and J-Track LLC is doing this work, under contract C-48704.

#### R-211T Testing Begins

For you Night Owls who ride the subway on weeknights, keep your eyes open if you are on the BMT or IND Divisions between 10:00 PM and 5:00 AM from Tuesday, December 6 to Tuesday, December 20.

During those hours, the recently-delivered five-car set of R-211T (open gangway) cars will be testing clearances on various lines.

## LONG ISLAND RAIL ROAD (LIRR)

#### Great Neck Pocket Track Completed

Over the weekend of November 19-20 the last piece of work that needed to be done for this project was accomplished. This was the surfacing and lining of the Main Track between Neck 1 and Neck 3 Interlockings.

This project involved the extension of the existing Pocket Track east of Great Neck station so that it would accommodate two 12-car trains instead of just one. The eastward trailing point switch at the existing end of the Pocket Track (Neck 2) was removed over the weekend of November 5-6 and replaced with a full crossover, facing eastward from the Main Track (on the north side of the right-of-way) to the extended Pocket Track (on the south side of the right-of-way).

The Pocket Track was extended about 1,450 feet east and a new crossover, facing eastward from the Pocket Track to

the Main Track, was installed, at Neck 3 Interlocking. The extended Pocket Track now ends only about 200 feet west of the East Shore Road undergraduate bridge, which is immediately west of the Manhasset Viaduct.

NJ TRANSIT (NJT)

## Newest Heritage Unit Enters Service

NJT placed its latest heritage locomotive into revenue service, GP40PH-2 4101, which has been painted in New Jersey Department of Transportation colors. Locomotive 4101 was one of the original 13 steam heat-equipped passenger locomotives operated by the Central Railroad of New Jersey.

Built in October of 1968 by the Electro-Motive Division of General Motors, it wore the Department of Transportation scheme from about 1979 until the commuter agency created its own identity in the early 1980s. Originally classified as a GP40P, it and its stablemates were rebuilt with head-end power by Conrail in the early 1990s.

The locomotive debuted at NJT's Family Day on October 1. Painting and lettering were complete but some mechanical items still needed attention, plus the application of the reflective frame stripe.

Friday, November 4 was first day that 4101 operated in revenue service. It was doubleheaded (second unit) with MNR 4904 for the morning on trains #871 (Hoboken-Hackettstown via Morristown ) and #1074 (Hackettstown-Hoboken via Boonton).

In Hoboken the 4104 was cut off and the 4101 operated on train #853 (Hoboken–Mount Olive via Morristown) for its first solo run. It finished on train #858 (Mount Olive to Hoboken) and #1643 (Hoboken to Spring Valley).



**Train #853 is seen departing from Newark Broad Street Station on Track 1 (center track) on November 4.** Rich Wisneski photo

It then overnighted in Woodbine Yard, then ran on Saturday in Pascack Valley service. Since then, it has been working trains based out of Hoboken.

The 4101 is the fourth NJT heritage scheme locomotive.

joining sister 4109 in Central Railroad of New Jersey colors; ALP45-DP dual-mode 4519 wrapped for Erie Lackawanna; and ALP46A electric 4636 wrapped for the Pennsylvania Railroad. RAILFAN & RAILROAD, NOVEMBER 18

# Other US Systems

## BOSTON

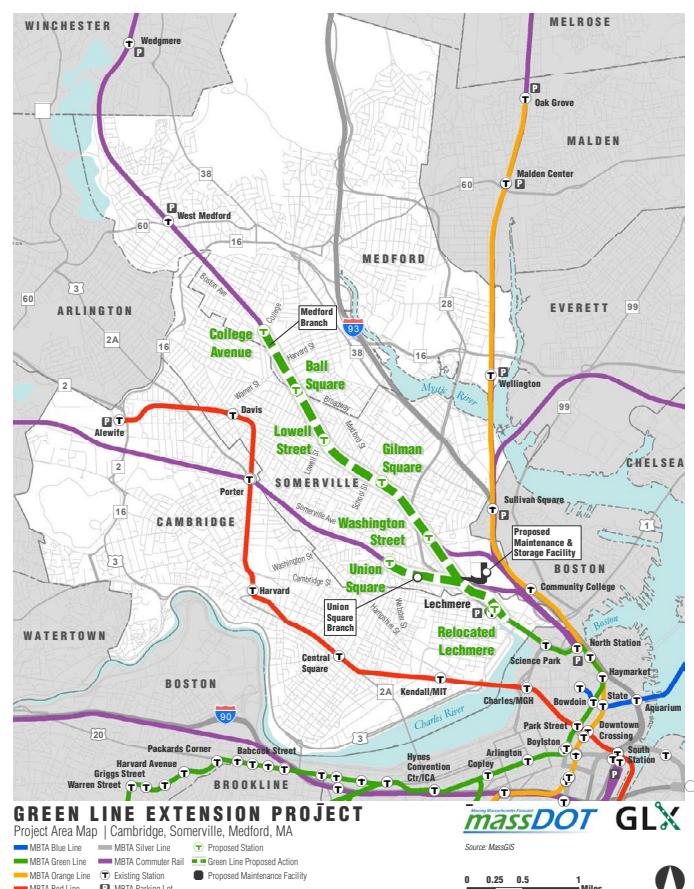
## **Green Line Extension Set to Open**

After repeated delays, the opening of the Massachusetts Bay transportation Authority's (MBTA) Green Line Extension's Medford Branch has an assigned date.

During the MBTA Board of Directors meeting on November 17, outgoing General Manager Steve Poftak told members the announcement was “one we have been eagerly awaiting to show you for years.”

Poftak said the new branch of the Green Line, with five new stations, will open at the start of service on December 12.

He said the MBTA has tested the line with a full, simulated schedule.



## **Map of the Green Line Extension**

The Medford Branch was originally expected to open in late summer and was pushed back to late November, in part



because of required work on the line's power systems and in part because some resources were refocused in response to the Federal Transit Administration's Safety Management Inspection directives.

Another part of the Green Line Extension, servicing Union Square and the relocated Lechmere Station, began operating in March. That service was paused less than five months later for four weeks overlapping with the summer's Orange Line shutdown.

Earlier this month, Poftak announced his plans to step down from his role on January 3, two days before the new governor will take office.

WCVB.COM, November 17

### **Report Says MBTA Should Electrify**

A new report makes the case for transforming part of Boston's commuter rail network into a regional network that would be electrified, have frequent all-day service, and extend to New Hampshire.

"Modernizing the Lowell Line," a new report from advocacy group TransitMatters, lays out the advantages of updating the MBTA's fifth-busiest commuter rail line and its second-busiest feeding North Station.

The project would cost roughly \$340 million, including \$90 million to electrify the line and \$250 million to update stations and provide high platform level boarding, the report found.

A cost estimate for the suggested extension to Manchester, New Hampshire was not included, the report said, as it would involve factors such as track restoration and possible right-of-way expansion.

The entire line from North Station to Lowell should be electrified, the report stated. Electrification allows for significantly faster end-to-end trip times.

For example, the Lowell Line connects North Station with Lowell in 46 minutes, which is roughly the same time it took non-stop trains to make the trip when the line first opened in the 1830s, the report said.

Modern operations using electric multiple units, or EMUs, high track standards and level boarding at all stations could reduce the end-to-end trip time to 31 minutes, the report stated.

This would all be part of the shift to a regional rail system and would include more frequent, all-day service more akin to rapid transit.

TransitMatters also makes a pitch for mode-neutral fare integration, where buses, subways and trains would charge matching fares within the same zone to maximize ridership.

The report envisions two scenarios: an early investment one with just electrification and high platforms, but no further expansion and with 30-minute frequency per branch.

A higher-investment scenario would increase frequency to 15-minutes per branch and would include service to New Hampshire.

Restoring passenger service to Nashua and Manchester, one of New England's largest job centers, has long been a priority for rail advocates and the Manchester Chamber of Commerce, the report stated.

The report also suggests adding new stations at UMass Lowell and Tufts University, where the new Medford branch of the Green Line Extension opens next month.

The existing Lowell Line's straight trajectory would allow EMUs — if they were to replace existing diesel-powered trains — to achieve very high speeds, the report said.

EMUs could travel 80 mph south of Winchester, and 100 mph north of Winchester. Speeds would be slower between North Station and Lowell, at an average of 49 mph, due to terminal speed limits around the station.

Overall, an average speed of 55 mph between Boston and Manchester is feasible. A trip from Boston to Manchester with fast-moving EMUs would take a little over an hour, the report said.

A presentation given at a June Board of Directors meeting indicated the T is exploring a hybrid approach to electrifying the commuter rail to reduce cost and accelerate delivery.

According to the presentation, overhead catenary lines would charge battery-electric trains while moving so they can move offline in tunnels and over bridges, where the T deemed it was too expensive to install wiring.

The T estimated the shift from diesel- to electric-powered trains, which would include installing catenary across the system, would take until 2032, when the existing fleet's lifespan expires.

BOSTON HERALD VIA MASS TRANSIT, November 21

---

## **DENVER**

### **R Line Service Restored**

The Denver Regional Transportation District (RTD) restored full service on the R Line starting at approximately 4 AM on November 29. R Line service was impacted by a derailment that occurred in Aurora on September 21.

Restoring full service to the affected four-mile stretch of the R Line corridor from Aurora Metro Center to the 13th Avenue Station required a redesign of the intersection at Sable Boulevard and Exposition Avenue, removal of a damaged support pole and adjustment of the overhead catenary system.

RTD has been collaborating with city of Aurora officials regarding the intersection's train-traffic interface and with the Colorado Public Utilities Commission (CPUC) as part of the safety certification process in alignment with the federally required Public Transportation Agency Safety Plan (PTASP).

Pursuant to the agency's corrective action plan, which was submitted to and approved by the CPUC on November 16, the following safety improvements have been completed:

- All work related to the train-traffic interface at the intersection of Sable Boulevard and Exposition Avenue, meaning that light rail trains must stop prior to proceeding through the intersection;
- The speed to approach the curve at Sable Boulevard and Exposition Avenue has been reduced from 35 to 25 mph, with the appropriate signage placed on the right-of-way;



- The relocation of a radar sign of approximately 100 feet farther north to allow more advance warning and increased visibility.

Since the derailment in September, RTD has conducted supplemental training for all light rail operators, targeting speed adherence across the entire light rail system.

Test trains have been operating through the R Line four-mile segment since November 27, familiarizing supervisors, trainers and operators with the speed reduction and the stop-and-proceed requirement.

RTD will have additional signage in place no later than December 31 to advise operators of the curve at Sable Boulevard and Exposition Avenue.

[MASS TRANSIT](#), November 29

## LOS ANGELES

### Artesia Light Rail Project?

Less than a month ago, President Joe Biden spoke from a Metro rail construction site in Los Angeles, saying he fully expects members of the U.S. Congress to put in requests for a chunk of the \$1 trillion infrastructure law.

Last week, Representative Linda Sanchez, D-Norwalk, took him up on his offer.

Sanchez, a 10-term congresswoman, wrote a detailed letter to Secretary of Transportation Pete Buttigieg, asking for funding to build a major north-south light rail line that would link Union Station in Downtown Los Angeles with smaller, mostly minority-majority cities in southeast Los Angeles County.

The proposed LA Metro line, dubbed the West Santa Ana Branch Corridor project, gets its confusing name from an old right-of-way still available and once used by the now-defunct Pacific Electric Santa Ana route in Los Angeles County. The combination light rail and subway line would connect Los Angeles with the suburbs of Artesia, Cerritos, Bellflower, Paramount, Downey, South Gate, Cudahy, Bell, Huntington Park, Vernon and unincorporated Florence-Graham, running roughly between the 110 and 5 freeways.

In her letter dated October 25, Sanchez asked that the 19.3-mile light rail project get funds from the Department of Transportation's Capital Investment Grants program in the fiscal year 2024. The letter was co-signed by Representatives Karen Bass (D-Los Angeles), Lucille Roybal-Allard (D-Boyle Heights), Grace Napolitano (D-El Monte), Judy Chu (D-Pasadena), and Nanette Diaz Barragán (D-Los Angeles.)

One of the requests – a relatively modest one – asks for \$50 million to kick off the project, enough to cover preliminary engineering, environmental reviews and other early needs for a project of this magnitude. Undoubtedly, Sanchez will shoot higher to squeeze funding out of the Bipartisan Infrastructure Law, signed by Biden on November 15, 2021, which funds roads, bridges and rail projects.

The West Santa Ana Branch was approved by the LA

Metro Board in January. But the board approved a preferred route – a 14.8-mile phase one segment that would run from the Artesia/Cerritos area, slanting northwest over the 105 Freeway, zigzagging east and west of the 710 Freeway and ending at the Slauson Avenue A Line (Blue) Station in the Florence-Firestone area.

Riders would have to disembark and transfer to the A Line to go north into downtown Los Angeles. The first segment could break ground next year but will not be completed until 2033.

A 4.5-mile second phase would take the West Santa Ana Branch line into the Arts District, Little Tokyo and Union Station, providing a one seat ride to downtown. The second phase has a completion range in the years 2041-2043.

The projected cost of the project is about \$9.1 billion. Metro, which has four tax measures in play generating money from sales taxes for capital projects, including rail lines proposed or under construction, has identified about \$4 billion for this project. But Metro needs other sources to close the funding gap.

The move for federal dollars has already gained some momentum, though grants are dribbled out slowly and often over several years. In late February, the Federal Transit Administration (FTA) approved Metro's request to place the project in the Capital Investment Grants (CIG) pipeline. And on April 22, 2021, the Metro board named the West Santa Ana Branch Transit Corridor Project as the agency's No. 1 candidate for the federal CIG Program.

By getting the first bit of funding, it would position the project on the White House's radar, Hahn said.

Cities along the corridor have already begun planning transit-oriented developments, such as homes, apartments, condos and retail centers. Also, the project fits with Biden's Justice40 Initiative to advance environmental justice and create economic opportunities in disadvantaged communities, Sanchez said in her letter.

Metro reported that 44% of the residents along the corridor live below the poverty line.

[WHITTIER DAILY NEWS VIA MASS TRANSIT](#), November 8

## SAN FRANCISCO

### BART Extension Tunneling Method Approved

The Santa Clara Valley Transportation Authority (VTA) Board of Directors were presented with the results of an independent review panel that examined if the authority's single bore tunnel design for the second phase of a planned rail line into San Jose and Santa Clara was the right approach. In short, the panel confirmed it was.

The independent panel consisted of tunneling experts, led by the American Public Transportation Association (APTA). The panel's work was presented at the VTA Board Meeting on November 3 and shows Santa Clara VTA's cutting edge tunneling methodology along with some of the proposed design innovations is deemed to be feasible, appropriate, safe and efficient.

APTA was engaged to coordinate an independent review



of the project's tunneling method as part of a design review request from Santa Clara VTA Board member and San Jose Mayor Sam Liccardo, approved in May by the VTA Board of Directors. The findings of a previous independent comparative analysis of both tunneling methods in 2017 helped lead to the single bore approach and current concept.



**An example of one of the stations using the single-bore method, Downtown San José.** Santa Clara Valley Transportation Authority rendering

Single bore tunnels are increasingly being utilized for transit projects in Europe and Asia, with recent projects in Spain, France, Dubai and the Netherlands.

This single bore approach by VTA to build the six-mile BART extension will save construction time, reduce the station footprint and property needs, increase the potential for transit-oriented development, reduce disruption to city streets, neighborhoods and businesses. The approach reduces many of the environmental impacts occurring during construction. In addition to losing the aforementioned benefits, changing to a twin bore tunnel project would cause significant schedule delays and cost increases.

The study included review of trade-offs between the single bore and twin bore designs related to safety, passenger experience, cost, and schedule. It was informed by extensive project documents and past studies, recent global tunneling projects, and a key proposed innovation from Kiewit Shea Traylor, the joint venture contractor for the tunnel and trackwork.

This peer review provided VTA with expert advice, confirmation of industry best practices, and a recommendation from highly experienced and respected transit professionals. [MASS TRANSIT](#), November 9

### Central Subway Opens

The long-awaited Central Subway had a "soft" opening on Saturday, November 19. The service operates weekends only between the 4th & Brannan and Chinatown-Rose Pak stations. There are two intermediate stops, at Yerba Buena/Moscone and Union Square/Market Street. The shuttle service runs every 12 minutes from 8:00 AM to midnight.

The Central Subway forms the second phase of Muni's T

Third Street Line project, which started with the construction of a 5.1-mile line along 3rd Street which opened in April 2007.



**Chinatown-Rose Pak station on opening day.** Peter Straus photo



**S200 2023 (Siemens, 2017) at Union Square-Market Street station on opening day, November 19.** Peter Straus photo

Through T-Third Street service from Sunnydale is scheduled to start on January 7.

---

## WASHINGTON DC

### Silver Line Phase 2 Opens

The wait is over for transit users in the Washington, D.C., region: The 11.4-mile Silver Line extension officially began service on November 15. The line includes six new stations and a new rail maintenance facility.

Washington Metropolitan Area Transit Authority (WMATA) representatives were joined by U.S. Department of Transportation Secretary Pete Buttigieg and other federal, state and local officials for an opening ceremony at Washington Dulles International Airport Station.

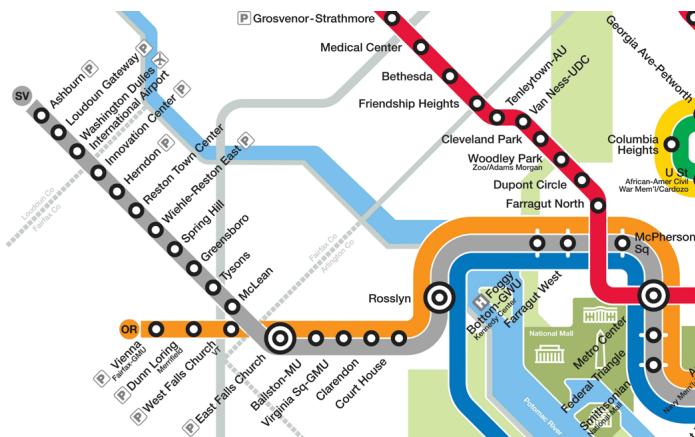
The Silver Line is one of the largest capital construction projects in the United States and will provide high-quality,



high-capacity transit service between the Dulles corridor and downtown D.C.; expand the reach of the existing regional rail system; offer a viable alternative to automobile travel and support future development.

WMATA reports the approximately 500 people in attendance at the grand opening event were greeted at the six new rail stations and commemorative pennants were distributed on opening day. The first Silver Line passenger train left Ashburn Station at approximately 2 PM, headed eastbound to Downtown Largo Station in Prince George's County, Maryland. Phase 2's six new stations are:

- Ashburn
- Loudoun Gateway
- Washington Dulles International Airport
- Innovation Center
- Herndon
- Reston Town Center



**Silver Line Phase 2 extended service to Ashburn from the Phase 1 terminal at Wiehle-Reston East, which opened July, 2014.** WMATA map

With the Silver Line Extension opening, Metrorail now serves 97 stations on a 128-mile system in Virginia, Maryland and the District of Columbia.

[MASS TRANSIT](#), November 16

### Blue Line Reopens South of National Airport

WMATA reopened six Metrorail stations south of Reagan National Airport on Sunday, November 6, after an extended closure for work associated with the new infill Potomac Yard Station and the Yellow Line Tunnel and Bridge project.

Blue Line trains will serve the six stations – Braddock Road, King Street-Old Town, Eisenhower Avenue, Huntington, Van Dorn Street and Franconia-Springfield – while long-term work continues to rehabilitate the Yellow Line Tunnel and Bridge.

WMATA is also making progress on the Yellow Line Tunnel and Bridge Rehabilitation Project, which began during the closure. The Yellow Line will remain suspended through May 2023 while these critical tunnel and bridge repairs continue. Instead, the reopened stations will be served by additional Blue Line service. Trains will run every 15 minutes between Franconia-Springfield and Largo on the Blue Line, with Blue

Plus service operating every 15 minutes between Huntington and New Carrollton.

The eight-week closure, which began September 10, allowed WMATA's project teams to relocate 2,000 feet of existing tracks and connect to the new tracks through the new Potomac Yard Station. Additional work included the installation and testing of traction power and automatic train control systems. Major construction is now complete, as well as train testing, which involved running test trains without passengers throughout the station.



**Franconia-Springfield after reopening.** WMATA photo

As the Potomac Yard Station gets closer to the end line, more work is needed prior to opening in 2023. Crews continue working to complete construction of the east retaining wall, paving the access roads, installing interior features at the station, such as modern fare gates, fare machines and the station manager kiosk.

[MASS TRANSIT](#), November 7

## International

### BERGEN

#### Second Bybanen Line Opens

Revenue services on Bergen's second light rail line began on November 21, following a ceremonial opening three days before and two days of free travel.

The five-mile Line 2 to Fyllingsdalen in the southwest of the city was inaugurated by Transport Minister Jon-Ivar Nygård with a ribbon-cutting at the new terminus. He was accompanied by Vestland county mayor Jon Askeland and the acting mayor of Bergen Linn Kristin Engø.

Bybanen Line 1 between Bergen Byparken and Bergen Lufthavn was opened in stages between 2010 and 2017, and has supported significant urban development and housing construction with traffic reaching 75,000 passengers/day.

Line 2 starts an interchange with Line 1 at Bystasjonen near the city's railway terminus and loops around the eastern side of the Store Lungegårdsvann lake in order to serve Haukeland sjukehus. The hospital stop, which is expected to be the



busiest on the line with 7,000 users/day, is located inside the  $\frac{3}{4}$ -mile Årstadtunnelen between Fløen and Kronstad.

The line then passes under Line 1 at Kronstad, and heads southwest to Fyllingsdalen, passing through the 1.8-mile Løvstakken tunnel between Kristianborg and the terminus. Built by Swiss company Marti Tunnelbau, this has one bore for trams running at up to 43 mph and a second bore for bicycle traffic.



**Variobahn 203 (Stadler, 2009) at the new Haukeland sjukehus stop.**

Metro Report International photo

Ridership on Line 2 is projected to reach 40,000 passengers per day by 2040.

Services on the two lines are operated using a fleet of 28 Stadler Variobahns delivered in 2009–10, 2013 and 2015; the original five section trams were lengthened to seven sections from 2016.

Bergen Kommune has started public consultation over the route of a proposed northern extension of the Bybanen network to Åsane. This is intended to inform the planning process, with a view to the city council taking a final decision on the project in early 2023.

[METRO REPORT INTERNATIONAL](#), November 21

## BERLIN

### Type JK Cars Unveiled

The first small-profile Type JK metro trainset for the Berlin U-Bahn network has been unveiled at Stadler's Velten plant northwest of the capital.

Operator BVG finalised a €3 billion framework contract with Stadler in March 2020 for the supply of up to 1,500 vehicles, with a firm order for an initial build of 376. These will be supplied in two variants: small-profile Type JK cars for U-Bahn lines 1 to 4 and large-profile Type J for lines 5 to 9.

The initial order covers 140 small-profile vehicles formed of 17 four-car and 36 two-car units, plus 236 large-profile

vehicles formed as 33 four-car and 52 two-car sets. BVG typically operates eight-car trains on its smaller profile lines and six-car trains on the larger routes.



**Type JK 6001 (Stadler, 2022) at the Velten plant.** Stadler photo

The JK vehicles have 7 ft-10½ in wide bodies. A 54 ft-8 in long two-car set will be able to carry up to 142 passengers including 28 seated, while a 169 ft-3 in long four-car set will have capacity for 310 including 88 seated. Each vehicle will have three axles motored, with a 1A"Bo" configuration; the 90 kW traction motors will give a continuous rating of 540 kW for the two-car sets and 1,080 kW for the longer units.

Commissioning of the first pre-series train began in October. Following the completion of test running, it is expected to be handed over to BVG in the spring of 2023. The production trainsets are due to be delivered from the beginning of 2024.

[METRO REPORT INTERNATIONAL](#), November 25

## HAMBURG

### CBTC for U-Bahn lines U2 and U4

Hamburger Hochbahn has awarded a contract to Siemens Mobility for the installation of communications-based train control on the cross-city route shared by U-Bahn lines U2 and U4.

Under a project branded as U-Bahn100, as it will deliver 100-second headways, Siemens Mobility will supply and install its Trainguard MT CBTC technology on the whole of U4 and the section of U2 between Christuskirche and Mümmelmannsberg. The two routes share the cross-city core between Jungfernstieg and Billstedt via Hauptbahnhof Nord, which is the busiest section of the city's metro network. CBTC will also be installed on the U4 extension to Horner Geest which is now under construction for opening by the end of 2026.

The introduction of moving block and automatic train operation to GoA2 is expected to increase line capacity by more than 20 percent, as well as improving punctuality



and reliability. Switching to ATO will also reduce energy consumption and improve passenger comfort through smoother acceleration and braking.



**DT5 trainsets operating on lines U2 and U4 pass at Rauches Haus on the shared section of the cross-city route.** Christoph Müller photo

The Trainguard MT lineside equipment will be interfaced with the six existing Sicas ECC interlockings controlling the two lines. Siemens Mobility will also supply the onboard equipment to be fitted to 163 DT5 trainsets, starting with a pre-series batch of six trains to be modified at the operator's workshops in Hamburg during 2023. Series conversion will be undertaken at Alstom's Salzgitter plant where the trains were assembled, with the program expected to run from 2024 until the autumn of 2027.

Total cost of the project is estimated at around €200 million, and the city government is reportedly seeking a contribution from the federal government. Completion is anticipated by the end of 2029.

[METRO REPORT INTERNATIONAL](#), November 11

## HELSINKI

### New EMUs Ordered

Stadler has signed an agreement with the VR Group to supply 20 single-decker FLIRT electric multiple units (EMU) in Finland.

The four-car trains will have 356 seats and capacity for a total of 796 passengers.

With a maximum speed of 100 mph, they will be used for regional services around Helsinki and the Tampere region, but can also be used as intercity trains in the future if needed.

In addition to the supply of spare parts, the contract also includes options for 50 additional multiple units and a full-service extension.

The new trains will support the VR Group in its mission to provide more sustainable rail operations across Finland. This is because their electric drive, lightweight aluminum construction and latest converter technology will

significantly reduce energy consumption.

The trains also use propane as a coolant and oil-free air compressors, and the majority of their materials can be recycled at the end of the vehicles' service lives.

Stadler has extensive experience in the manufacture of rolling stock for challenging climatic conditions. Over 80 FLIRT vehicles are already in service in Finland, where the model is proving its suitability for severe winter conditions.

Alike to these vehicles, the new trains are being adapted for the Nordic climate. Equipment includes large snow plows and efficient air-conditioning technology featuring underfloor heating in the vestibules.



**Stadler FLIRT for Finland's VR Group.** Stadler rendering

Special heat insulation and well-sealed traction compartments will also be included to ensure the protection of the drive technology.

Delivery of the first vehicle is scheduled for spring 2026. [RAILWAY-NEWS](#), November 29

## IRELAND

### Battery-EMUs Ordered

Ireland's Minister for Transport Eamon Ryan has secured approval for Iarnród Éireann (IÉ) to order 90 new battery-electric cars from Alstom in the next few weeks.

These units will be delivered in 2026 to improve Ireland's rail transport capacity. This is part of a ten-year agreement with Alstom to replace and expand IÉ's DART fleet.

In particular, the new units will help expand the DART system in the Greater Dublin Area and Eastern region to advance the DART+ Program.

This program will significantly increase the number of people that can access the frequent, high-capacity rail service, as the number of people living within two thirds of a mile of a DART station will grow from 250,000 at present to 600,000 in future.

The train order will consist of 18 modern five-car battery-electric multiple units (BEMUs), funded by the



Department of Transport through the National Transport Authority (NTA), at a cost of around €179 million.

This is in addition to 95 new electric and battery-electric DART trains that are due to enter service in 2025.

The BEMUs will be able to operate using overhead catenary or battery-power to maximize their flexibility and use while decarbonizing the railway.

[RAILWAY-NEWS](#), November 30

## LAUSANNE

### New Trams Ordered

Stadler will supply Transports publics de la région lausannoise (tl) 10 TRAMLINK trams.

The contract also includes the supply of spare parts and related tools.

The fully accessible trams will operate on the new tram line between Lausanne and Renens in Switzerland.

The high-capacity, low-floor multi-articulated trams are characterized by a real axle truck that guarantees a quiet and comfortable ride and maximum seating capacity over the trucks.

The trams' light, high-strength stainless steel structure meets high structural requirements without compromising on weight and provides the best possible protection for passengers and drivers, while optimum driver visibility and front design ensures maximum safety in busy urban environments.



**Lausanne's new TRAMLINK.** Stadler rendering

Each Lausanne tram is approximately 147 feet-8 inches long and eight feet-eight inches wide and can carry a maximum of 316 people. Eight double-leaf doors per side, each with sliding steps, ensure the fast flow of passengers.

Internally, the acoustic and thermal insulation of the new trams and their air-conditioning systems improve passenger comfort.

This contract brings the total number of Swiss tramway operators that have chosen Stadler's TRAMLINK model to six.

The vehicles have been in operation in Lugano since 2021 and will soon start operating in the canton of Aargau, Basel and Bern.

This will be the first standard gauge TRAMLINK in Switzerland.

[RAILWAY-NEWS](#), November 21

## LIBEREC

### Tatra T3 Trams Overhauled

Three trams from the Liberec fleet are now undergoing a major overhaul at the Škoda production site in Martinov, Ostrava in the Czech Republic as part of a tender for the repair of six T3 units.

The work will include repairs to the cabinets and electrical parts of the vehicles, as well as a complete renovation of the interiors, including the driver cabins.

This overhaul will allow the trams to maintain their capabilities for the next 15 years.

Throughout the process, the trams will undergo several repair procedures such as the repair of vehicle skeletons affected by corrosion. This requires removal of the outer cladding, windows, door systems and interior elements.

Repairing these units will increase safety and reliability while saving financial resources, compared to replacing the vehicles.

The total contract for the overhaul of six T3 trams is valued at 46 million CZK (€1.9 million).

The Škoda production site in Martinov, Ostrava is currently working on several orders for the Czech and foreign markets, such as a contract to repair 80 trams for Gothenburg, Sweden.

[RAILWAY-NEWS](#), November 11



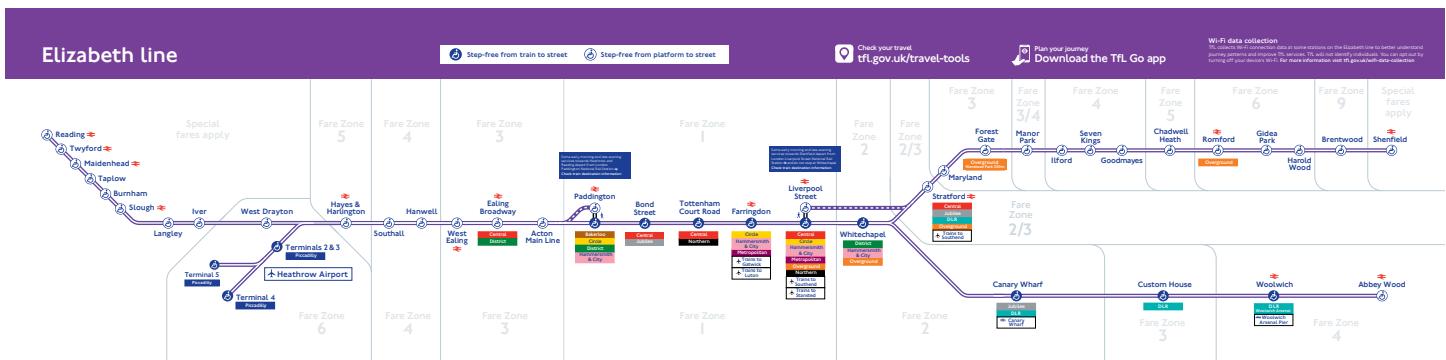
**T3M.04 63 (ČKD-Tatra, 1986)** is seen in the depot during the E.R.A.'s tour of the Czech Republic, May 22, 2003. This car had been converted from a T3SUCS in 1996, Jeff Erlitz photo

## LONDON

### Through Services Inaugurated on Elizabeth Line

Elizabeth Line passenger services began running through onto existing Network Rail routes east and west of central London on November 6 as the Crossrail Program nears completion.

Trains from Reading and Heathrow Airport can now run through to Abbey Wood via central London using a



**Map of the Elizabeth Line with through running now established.** TfL Map

connection from the Great Western Main Line's Relief lines west of Paddington station. In the east, services from Shenfield are now using a tunnel portal at Pudding Mill Lane west of Stratford to reach Whitechapel, where there is a deep-level junction with the branch from Abbey Wood. For now, services from Shenfield will turn back at Paddington.

The Elizabeth Line had been operated in three sections since the opening of the cross-London tunnels on May 24, with trains from Heathrow and Reading terminating at Paddington's main line platforms, cross-London trains running east from Paddington's Elizabeth Line platforms to Abbey Wood, and trains from Shenfield terminating at Liverpool Street station's main line platforms.



**A TfL Class 345 train set on the Elizabeth Line at West Ealing station.**

Rail Business UK photo

The changes from November 6 mean the frequency of services in the central section between Paddington and Whitechapel has increased from 12 trains per hour to up to 22 trains per hour in the peaks and 16 trains per hour off-peak.

Transport for London says that a “small number” of services will not run into the tunnels and so some passengers may still need to change at Paddington or Liverpool Street main line stations.

TfL says that the through running of services from the east and west sections into the central section of the line “is a complex process” because Elizabeth Line trains will now “be fully intertwined with national rail infrastructure.” TfL is

“working closely with Network Rail, Great Western Railway and other stakeholders” to ensure the main line routes are as reliable as possible to provide resilience and reliability for the cross-city core.

The final timetable with a peak service of 24 trains per hour on the core section is expected to be in place by May 2023.

[RAIL BUSINESS UK](#), November 6

## MILANO

### New Cars Ordered for the Metro

Hitachi Rail has been awarded a €368 million framework agreement to supply 46 trainsets to Milano operator ATM, of which an order for 21 trains has already been exercised, worth €168 million. To run on Line 1, the first trains are due to enter service in spring 2024.

Each train will be 349 feet long, formed of six aluminium-bodied cars and with a maximum speed of 56 mph. They will feature a surveillance system providing real time video to the control room to improve security onboard. The train's lower noise levels will also help to provide a more comfortable passenger experience. The external surfaces have been designed to be especially resistant to vandalism.



**New Metro car for Milano.** Hitachi Rail rendering

The design is also intended to offer a high degree of recyclability for when the trains reach the end of their lives.



The fleet will be manufactured at Hitachi Rail plants in Napoli and Reggio Calabria.

ATM previously ordered 72 Leonardo-branded metro trains from Hitachi Rail in 2012-18 for use on lines 1 and 2.

[METRO REPORT INTERNATIONAL](#), November 8

## Metro Line 4 Opens

The initial 3.5-mile eastern section of metro Line M4 in Milano opened between Linate Airport and Dateo on November 26.

The opening ceremony for the city's fifth metro line was held at 12:30 PM by Giuseppe Sala, Mayor of Milano and Deputy Prime Minister of Italy, and Minister of Infrastructure & Transport Matteo Salvini. Celebrations included free travel for residents over the weekend.

When complete M4 will connect Linate Airport in the east with San Cristoforo railway station in the southwest, serving 21 stations over 9.3 route-miles.



Linate Aeroporto station, the east terminal of the metro M4 line.

Metro Report International photo

The six-station initial section is not yet connected to the rest of the metro network, though interchange is provided with suburban trains at Forlanini.



Milano's new M4 metro. ATM map

The line is being built under a design, build and maintain contract awarded to a consortium led by Webuild.

The civil works contractor said its technical know-how had been put to work during boring of the tunnels, which was completed in September 2020. Artistic and historic monuments including the Verziere Column and a medieval wall on Via Francesco Sforza have been temporarily relocated for protection, and are to be reinstated in their original places after cleaning and restoration.

The line will be operated by 47 four-car trainsets supplied by Hitachi Rail Italy; the first was delivered in July 2019. The Class 4400 trains are 164 feet long and have a capacity of 600 passengers. They have a maximum speed of 50 mph, powered by a 750 v DC third rail supply.

As with Line M5 which opened in stages from 2013, M4 is fully automated.

The next section to open will be the one-mile section from Dateo to San Babila in June 2023, with the 4.8-mile San Babila – San Cristoforo section to follow in October 2024.

In March of this year, the infrastructure ministry confirmed funding worth €420 million to support construction of a 1.9-mile two-station extension east from Linate Airport to Segrate, where an interchange will be provided with the Milano – Verona high speed line. Completion is planned for 2026.

[METRO REPORT INTERNATIONAL](#), November 28

## PARIS

### Line 9 Signal Upgrade Tested

Paris transport operator RATP has started test running with the OCTYS train control system being installed on Line 9.

The OCTYS interoperability specifications (Open Control of Trains, Interchangeable & Integrated System) was developed to ensure compatibility between the ATO systems deployed on the capital's various metro lines.

Line 9 is being equipped with OCTYS VB 2, which is also deployed on Line 5. Installation work began in 2015, and is





due to be fully commissioned by August 2023.

To facilitate the test running with OCTYS VB2, Sunday services have been partially suspended on sections of Line 9, which marked its centenary with a celebration over the weekend of November 6-7.

[METRO REPORT INTERNATIONAL](#), November 9

## PRAHA (PRAGUE)

### Equipment Donated to Kharkiv, Ukraine

At the end of September, Praha's transport company DPP (Dopravní podnik hlavního města Prahy) made arrangements to donate 20 tram cars to Kharkiv in Ukraine. So far, 16 cars have been sent.



**T6 8731 (ČKD-Tatra, 1997)** being loaded onto a flatbed trailer at the Hostivický depo on November 16. DPP Photo

The table below describes what cars were donated and when they were shipped out:

Date Shipped	Car	Type	Built
10/20	8658	T6A5	1995
	8744	T6A5	1997
	8748	T6A5	1997
	?	T6A5	?
11/3	8679	T6A5	1995
	8704	T6A5	1996
	8711	T6A5	1996
	8747	T6A5	1997
11/16	8637	T6A5	1995
	8670	T6A5	1995
	8716	T6A5	1996
	8731	T6A5	1997

11/30	7262	T3SUCS	1989
	8611	T6A5	1995
	8682	T6A5	1996
	8739	T6A5	1997

According to the Centre for Transport Strategies in Kyiv, Ukraine, the final four cars are to be the older T3SUCS types.  
[DPP FACEBOOK PAGE](#), NOVEMBER 30

### Tatra T3 Celebrates 60 Years of Service

On November 20, DPP held a tramway parade to commemorate 60 years of service for the T3 tram, built by ČKD-Tatra. According to Wikipedia, there are still 426 T3 cars operating in Praha.

The festivities kicked off at the Na Knížecí tram stop in the Prague 5 district, near the Tatra Smíchov factory where the T3 was originally born.

The celebrations began at 2:00 PM, with the nine T3 vehicles on display for observers to photograph. A procession of vehicles then began at approximately 2:30 PM in the direction of the city center.

The parade route brought the vehicles from Anděl to Újezd and Malostranské náměstí, across the Mánesův bridge to the National Theater, Lazarská, Wenceslas Square and Náměstí Republiky in the city center, and into the Prague 7 district at Strossmayerovo náměstí, Letenské náměstí, and Špejchar.

The parade lasted about one hour, with vehicles arriving at the Špejchar tram loop at approximately 3:30 PM.

Historic vehicles included in the procession of Tatra T3 trams included the oldest model in the world, produced in 1962, a 1964 redesign that dominated Prague's rails over the next three decades and models from 1989 that date back to the Velvet Revolution.

Newer models that participated in the tram parade include the T3 Coupé sightseeing tram and modernized versions from 1996, 2000, and 2007.

In order of appearance, the nine T3 trams included:

Number	Type	Built
6102	T3	1962
6340	T3	1964
7292	T3SUCS	1989
8084	T3M	1976
5602	T3	1964
8080	T3M2-DVC	1998
8285	T3R.PLF	2017
8565	T3R.P	1982
5573	T3R.P	1973

Notes:

8084: 1981 ex T3 6960

5602: 1989 ex 6400; sightseeing car painted blue/cream

8565: 2008 ex T3SU 7006

5573: T3 Coupé sightseeing car with panoramic windows,



painted white/blue; 2018 ex 8497, 2006 ex T3 6916  
[EXPATS.CZ WEBSITE](#), November 21



**View west on the Mánesův Most (Manes Bridge) of T3 6102, in its original configuration, leading the parade.** Mors Studios via YouTube

## TORONTO

### **Ontario Line South Package Contract Awarded**

Ontario Transit Group, a team led by Ferrovial Construction Canada Inc., VINCI Construction Grands Projets, has been awarded the design, build and finance contract for the Ontario Line Southern Civil Stations and Tunnel (South Civil) package by Infrastructure Ontario and Metrolinx.

Ontario Transit Group was named the preferred proponent of the package in September. The fixed-price contract is for C\$6 billion (US\$4.44 billion), which includes C\$5.5 billion (US\$4.07 billion) for capital costs and C\$500 million (US\$369.67 million) for financing and transaction costs.

Scope of work for the Ontario Line South Civil design-build-finance package includes:

- A 3.7-mile tunnel and associated tunneling works from Exhibition to Don Yard portal (west of the Don River);
- Groundworks required to build the tunnels and stations, utility and conduit works to prepare for the Ontario Line Rolling Stock, Systems, Operations and Maintenance (RSSOM) mechanical and electrical systems and guideway structures and facilities to prepare for the track structure to be installed by the RSSOM contractor;
- Seven stations, including: One above-ground station to be integrated with the existing GO Transit Exhibition Station, Two underground stations to be integrated with the existing TTC Osgoode and Queen subway stations, Four new underground stations (King/Bathurst, Queen/Spadina, Moss Park, Corktown)

The Ontario Line is a 15-station, 9.7-mile rail line that will stretch across Toronto and will be built using a mix of above ground and below ground rail infrastructure. The new line will provide more than 40 connections to other bus, streetcar,

light-rail transit and regional rail services.

The team will begin mobilizing its design and construction crews, with major works to commence in early 2023. The South Civil contract is anticipated to be completed in 2030.

The Ontario Line project is being delivered through various P3, progressive, design-build and traditional procurement contracts, which are all being staged accordingly for their successful delivery.

[MASS TRANSIT](#), November 10

### **Second Ontario Line Contract Awarded**

Infrastructure Ontario and Metrolinx have awarded a C\$9 billion (US\$6.76 billion) contract to the Connect 6ix team to design, build, finance, operate and maintain the Ontario Line Rolling Stock, Systems, Operations and Maintenance (RSSOM) package.

This is the second of two staged procurement packages awarded for the Ontario Line with Ontario Transit Group securing a C\$6 billion (US\$4.44 billion) package to deliver the rail project's tunnel, seven stations and other rail infrastructure.

Connect 6ix was selected as the RSSOM package preferred proponent in September 2022.

The Connect 6ix team includes:

- Applicant Lead: Plenary Americas, Hitachi Rail, Webuild Group (Salini Impregilo Canada Holding Inc.), Transdev Canada Inc.;
- Design Team: Hitachi Rail, IBI Group Professional Services (Canada) Inc.;
- Construction Team: Hitachi Rail, Webuild Group (Astaldi Canada Design & Construction Inc. and Salini Impregilo Civil Works Inc.), NGE Contracting Inc.;
- Operations, Maintenance and Rehabilitation Team: Hitachi Rail, Transdev Canada Inc.;
- Financial Advisors: National Bank Financial Inc., Sumitomo Mitsui Banking Corporation.

Hitachi Rail explains the trains will feature the latest technology and include onboard Wi-Fi, digital passenger information screens, charging points, dedicated bicycle spaces, double wheelchair areas, continuous, connected carriages, doors that open in sync with platform edge doors and regenerative braking. The trains will be powered by electricity and travel at speeds upwards of 80 kph (approximately 50 mph).

### **Two RFQs issued for northern segment**

In addition to awarding the RSSOM contract to Connect 6ix, two Request for Qualifications (RFQs) were issued for the northern segment of the Ontario Line that will support the building of underground stations and tunnels underneath Pape Avenue between the Gerrard portal and the Don Valley bridge and the construction of three kilometers (1.9 miles) of elevated tracks in Thorncliffe Park and Flemingdon Park.

[MASS TRANSIT](#), November 18



# The End of the Beginning – MARTA’s First Rail Fleet – Car 509 Donated to the Southeastern Railway Museum in Atlanta

By Paul Grether

## Metropolitan Atlanta Rapid Transit Authority (MARTA) Rail Start-up and the first Vehicles

MARTA is a creature of the 1970s. The history of the establishment of the authority and the planning and financing of the construction of the rail system is a story worthy of a separate book effort.

The construction of “Phase A” of the rail system was started in 1975. Phase A would include the segment of the East Line to open from the Georgia State Station to the Avondale Station. This segment was chosen because it allowed for the construction of the new yard and shop facilities at Avondale, served all three MARTA jurisdictions (Atlanta, DeKalb and Fulton Counties) and served an initial commuter market between Decatur and downtown Atlanta. To hit the scheduled late-1978 rail revenue service target date bids would have to be opened in early 1976 for the rapid transit vehicles.



A MARTA CQ310 (number unknown) in the SFB plant in Raismes, France, date unknown. An MF 77 type car for the Paris Métro is under final assembly on the adjacent track. MARTA photo, Paul Grether collection

The state of the rapid transit market in the 1970s was dynamic as a result of the introduction of new federal funding. There were new builders entering and challenging the historic post-war carbuilders. Pullman-Standard, St. Louis Car Company and Budd Company were the traditional suppliers to the industry. The new influx of federal funding into the development of new rapid transit systems in the U.S.A. along with federal policy favoring defense contractors caused other competing suppliers to enter the market such as Boeing-Vertol, Rohr Industries, Garrett and Grumman. Rohr supplied the first generation of cars for the BART system and the Washington, DC WMATA Metro system. The

introduction of defense contractors along with new foreign carbuilders entering the small U.S. market for rail transit vehicles would eventually lead to all three of the remaining legacy builders to exit the market. The MARTA contract would prove another step in that direction.



**MARTA CQ310 car #101 is prepared for loading into the ship that will sail from Belgium to the Port of Savannah, Georgia sometime in 1978.**  
MARTA photo, Paul Grether collection

MARTA developed a technical specification for the new cars. The procurement was identified by its contract number, CQ310. In the engineering-dominated MARTA at the time, this set the precedent for future car classes to be referenced by their contract number. (*Editor’s Note: This has been the method of subway car equipment identification in New York since the inception of the IND*) The specifications were heavily influenced by the experimental State of the Art Cars (SOAC) that were built in 1972 with federal funding to advance rapid transit vehicle technology. SOAC features incorporated in the MARTA specification included acoustic design (including the infamous carpeted interiors), cushioned seats, chopper DC propulsion controls, air conditioning, airbag-based secondary suspensions and forced ventilation DC traction motors. A major change from the BART and WMATA vehicles was that MARTA specified an air-based, rather than hydraulic-based braking system. Additionally, the friction brakes were of a more traditional tread brake shoe type based on recommendations from vehicle engineers at New York City Transit Authority. MARTA also allowed for an aluminum carbody or stainless steel.

The WMATA cars were being built by Rohr at the Thrall Car Manufacturing Company in Winder, Georgia. Due to the braking system changes and requirements for chopper control, the Rohr vehicle for WMATA could not be bid



as-is, since it used hydraulic braking and cam-control. Additionally, Rohr had significant technical difficulties with the early BART and WMATA fleets. Despite lobbying by northeast Georgia elected officials of MARTA, Rohr did not enter a bid, closed their Winder facility and exited the carbuilding business. Pullman-Standard was interested in bidding their R-46 rapid transit platform that had been developed for the New York City Transit Authority but it also did not meet the MARTA specification. Pullman unsuccessfully lobbied MARTA to change the specification to support the R-46 configuration. Similarly the specification requirements and risk allocation in the contract around late deliveries caused St. Louis Car and Budd not to bid.



**MARTA CQ310 married pair 105-106 leads a westbound test train out of the Avondale station yard lead towards Decatur, Georgia during pre-revenue testing sometime in 1979.** MARTA photo, Paul Grether collection

MARTA ultimately received two bids for the 100-car base order, one from General-Electric (G.E.) for a vehicle to be designed and built in their Erie, Pennsylvania facility and one from Société Franco-Belge for a vehicle to be built in their plant in Raismes, France, near the Belgian border. G.E. was finishing the "Arrow II" order for the Erie-Lackawanna/New Jersey Department of Transportation (DOT) commuter lines and the M-2 cars for the New Haven Line of the New York MTA/Connecticut DOT and was looking for additional transit orders. In March of 1976 Pullman-Standard asked MARTA for a last-minute four-month delay in bid-opening which the MARTA board denied citing the delay it would cause to the planned 1978 opening of the rail system (which would actually get delayed to June 1979 anyway.)

Société Franco-Belge entered a bid of \$52.4 million. The G.E. bid was over \$15 million higher. This was for the 100-car base order of 40 married pairs ("A" and "B" cars)/80 cars, 20 autonomous "C" cars, spare parts, and commissioning (MARTA would later negotiate an additional 10 married-pair option/20 cars). UMTA approved the award of the contract to Société Franco-Belge by MARTA.

### Société Franco-Belge (SFB)

Until the early 1980s SFB was France's largest carbuilder, supplying thousands of vehicles per year to the French National Railways (SNCF) and the Paris Metro system (RATP). Tracing predecessor companies back to the 1880s, SFB had been a builder of steam locomotives up to modern long-distance coaches for the French market and overseas sales. It had a relationship with the English firm Beyer, Peacock & Company for assembly of their steam locomotive designs until the 1950s. Société Franco-Belge wanted to enter the U.S. market, given future orders pending from Baltimore, Miami, Washington, Cleveland and others. Inflationary pressures, mismanagement at SFB as well as a communist labor organizing/strike effort forced SFB into bankruptcy during the construction of the MARTA CQ310 order. With no bailout from the French government, SFB briefly reorganized as Soferval (Société ferroviaire du Valenciennes) which completed the MARTA order. Continued problems led to a takeover by Alstom, who continues to build equipment at the Raismes facility today.

The industrial design of the MARTA rail fleet was by Sundberg-Ferrar (S-F), a Detroit-based design firm. S-F had established a niche practice with transit vehicle designs in the 1970s. Their designs included the Illinois Central Railroad Highliners, Chicago Transit Authority 2400s, New York City transit Authority's original slant-ended R-40s, New York MTA's M1 and M1A "Metropolitans" for the Long Island Rail Road and Penn Central Metropolitan Region lines, BART cars, WMATA Metrorail cars and the DART light rail vehicles. S-F gave the MARTA cars a treatment similar to other orders but with a distinctive MARTA three-color (light orange, dark orange and blue) large horizontal stripe logo on the end fiberglass bonnet. The bonded windows on the sides and ends of the cars were given black masking and an overall unique streamlined appearance incorporating side/end destination signs and twin headlights and quadruple red marker lights. The design was intended to create an image specific to Atlanta and was successful in making the cars iconic.



**The Southeastern Railway Museum shop switcher is moving #509 into display position shortly after unloading on November 16, 2022.** Nick Henderson photo

Included in the base 100 cars ordered by MARTA in the CQ310 contract were "singles" with a cab at both ends and no



shared equipment with other cars, unlike the married-pair configuration. This was following a recommendation by consultants, including the late Robert Korach (E.R.A. #573), who had experience in single-unit rapid transit operation in Cleveland and at PATCO in Philadelphia. The concept was for lower cost off-peak operation. In practice this was not implemented by MARTA due to the labor of switching consist lengths for different times of the day and the risk of “gapping” a single car away from third rail. MARTA unitized the C-cars into “shotgun-wedding” pairs (versus married-pairs) starting with 501 with 502. Car 509 was unitized with 510. The unitized cabs were taken out of service and disabled and certain M.U. connections were hardwired around the couplers, similar to the New York R-62A fleet.

### 509

509 is an autonomous C-car designed to be operated as a single car. It was built by SFB in 1980 and was soon “unitized” as a pair with 510 and had one of its cabs deactivated. The 20 SFB C-cars were the only CQ310 and CQ311 cars that were not redesigned and rebuilt by Alstom in Hornell, New York in the early 2000s. As such it was not upgraded to AC propulsion and retained its original as-built configuration. 509 was removed from service in 2007 after enough CQ310/CQ311 rebuilt cars had entered service. After removal from service 509/510 were stored at Avondale. The CQ310 C-cars were part of a MARTA lease/leaseback transaction and as such the cars were collateralized and could not leave the property for scrapping. In 2011 the American Public Transportation

Association (APTA) announced that their 2017 triennial Expo would be held in Atlanta. The MARTA Deputy General Manager, Richard Krisak (retired) had 509/510 cosmetically restored for a series of displays of MARTA historic vehicles during the Expo with a plan to eventually donate the cars to the Southeastern Railway Museum. Car 509 was donated by MARTA to the Southeastern Railway Museum and transported from Avondale to the museum on November 16, 2022.

509 is the first “modern” era rapid transit car to be preserved. The Western Railway Museum in Solano County California is also developing a significant exhibit on the history of BART featuring three of the early BART car types. One pair of the original WMATA 1000-series Rohr cars remains on the property but their future preservation status is unclear.

### Southeastern Railway Museum

The Southeastern Railway Museum (SRM) is the official Georgia Transportation History Museum. The collection includes an early MARTA faregate array, the MARTA historic bus collection, a 1947 Georgia Power trackless trolley, a 1988 GMC RTS bus that served as the first express bus for Cobb Community Transit, a 1980 Westinghouse C-100 automated people mover vehicle from the Atlanta airport and many other transit exhibits. 509 will be displayed alongside these historic transit artifacts.

A video of the delivery of 509 to SRM can be watched here: <https://youtu.be/q75rgV2kzxM>

MARTA CQ310 C-car 509 Specifications	
Power	550vDC to 900vDC [750vDC nominal] through overrunning 3rd rail
Height	11ft 10in/floor 44in ATOR
Width	10ft 6in
Length	C-car 74ft 4in over couplers (A/B cars are 75ft)
Body	Aluminum (Alusuisse/Swiss Aluminum Ltd.)
Propulsion	Regenerative Chopper (Garrett/AiResearch) – Regen is automatic based on receptiveness (<850vDC) of third rail (line voltage)
Traction motors	4x DC per car 120KW continuous, forced ventilation (Garrett/AiResearch)
Trucks	Articulated inboard bearing (Rockwell)
Truck wheelbase	87in
Braking	Blended dynamic/regenerative with friction assist at low speed (100% friction with dynamic failure)
Friction brakes	Tread brake shoes, air (WABCO)
Brake rates	Full service: 3.0 mi/hr/sec – emergency: 3.5 mi/hr/sec



Weight	78,000 lbs (A/B cars are 76,000 lbs)
Seating	64 seats (C-car)/128 full/235 crush
Max operating speed	70 mph (75 mph max speed)
Signal	Automatic Train Control (ATC) – Dual audio frequency track circuits with speed commands (General Railway Signal) with Automatic Train Operation (ATO) feature
Acceleration	3.0 mi/hr/sec (full propulsion)
Suspension	Primary: spring - secondary: air
Wheels	34in diameter with AAR 1:20 profile
Doors	3 per side bi-parting electric with obstruction sensors
HVAC	Two 9-ton units per car for air conditioning, heating through resistance coils and baseboard heaters
Master controller	Integrated deadman with infinite propulsion and braking (no detents)

## Book Review

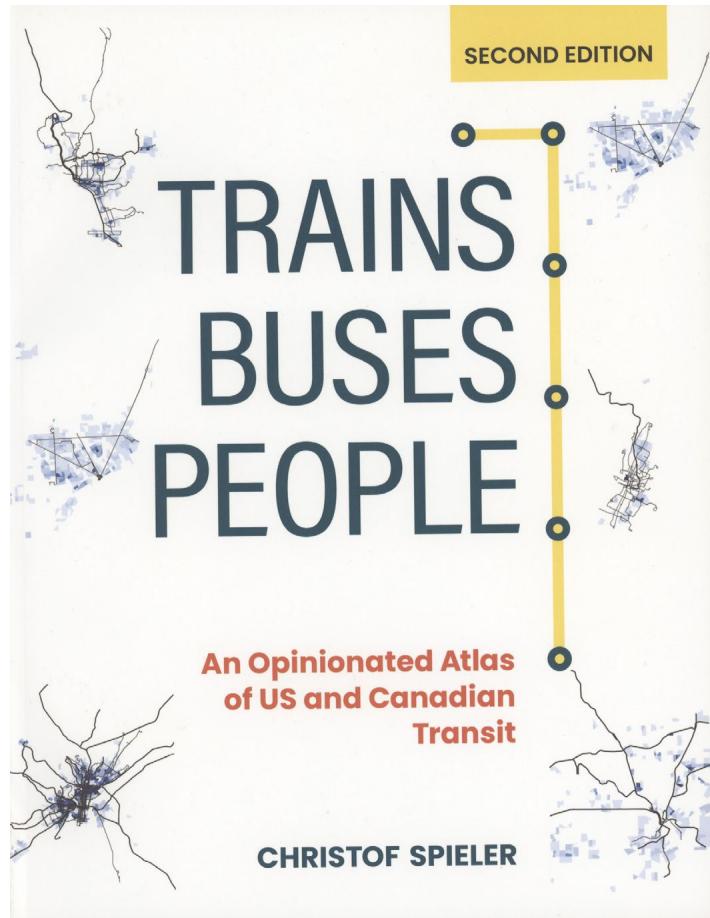
By Paul Grether

**Trains, Buses, People: An Opinionated Atlas of US and Canadian Transit (Second Edition)** by Christof Spieler, published in 2021 by Island Press, softcover, 328 pages, illustrated with index.

The second updated and expanded edition of “Trains, Buses, People” starts with Spieler’s description of how public transportation in the United States (and some Canadian examples for certain topics) works. This includes a brief history of the industry and detailed descriptions of the funding, governance, modes, stations, networks, etc. This section is not too technical, and includes enough examples and statistics to explain transit principles.

The majority of the Atlas is a region-by-region detailed description of transit systems. These descriptions include maps, details on the history of the major investments in public transportation and statistics. Spieler peppers in his informed observations and his opinions of the systems. This frequently includes upcoming investment decisions and shorter-term operational changes that could be made to improve services. The atlas is “opinionated.” The opinions are insightful.

While the reader may not always agree with his characterizations of the various systems, the factual underpinnings are well researched and stimulate critical thinking. The atlas will appeal to those with more than a passing interest in public transportation and city planning, transportation policy, recent history of transit systems and advocacy.





# North American Transit Project Openings Scheduled for 2022

By Randy Glucksman

Fifteen projects were proposed for completion this year including eight holdovers from previous years. At publication time, eight of the projects were completed, two were still pending completion this month and five were deferred to future years.

Date	Agency	City	Type	Line	Details	Notes
March 21	Massachusetts Bay Transportation Authority	Boston, Mass.	LR	Green Union Square Branch	Lechmere to Union Square, 0.9 miles, 1 station	From 2021
May 20	Valley Metro Rail	Tempe, Ariz.	SC	Tempe Streetcar	Marina Heights/Rio Salado Parkway to Dorsey Lane, 3 miles, 14 stations	From 2021
August 21	Southeastern Pennsylvania Transportation Authority	Philadelphia, Pa.	CR	Media/Wawa	Extension from Elwyn to Wawa Station, 3.5 miles, 1 station	From 2021
September 29	Long Island Rail Road	Nassau County, N.Y.	CR	Main Line	Third Track-Floral Park to Hicksville, 9.8 miles	
October 6	Long Island Rail Road	Elmont, N.Y.	CR	Main Line	Elmont-UBS Arena Station (Track 3-Westbound platform)	
October 7	Los Angeles County MTA	Los Angeles, Calif.	LR	K Line-Crenshaw/LAX Transit Corridor	Crenshaw/Expo to Westchester/Veterans, 8.5 miles, 7 stations	From 2020
November 15	Washington Metropolitan Area Transit Authority	Washington, D.C.	HR	Silver Line Phase 2	Wiehle Avenue to Ashburn, 11.4 miles, 6 stations	From 2018
November 19	San Francisco Municipal Transit Agency	San Francisco, Calif.	LR	Central Subway (T-Third Line) Phase 2	4th-Brannan to Chinatown-Rose Pak, 1.7 miles, 3 stations	From 2018
December 12	Massachusetts Bay Transportation Authority	Boston, Mass.	LR	Green - Medford Branch	Lechmere to College Ave. Medford, 3.4 miles, 5 stations	From 2021
Mid-December	Long Island Rail Road	New York, N.Y.	CR	Grand Central Madison (East Side Access)	Harold Interlocking to Grand Central Terminal, 3.75 miles	

Legend	
CR	Commuter Rail
HR	Heavy Rail
LR	Light Rail
SC	Streetcar



# Travels with Jack May

## Britain and the Baltics — Part X

By Jack May (*Photographs by the author*)

### Saturday, August 19 (continued)

As mentioned earlier, Richard and I decided to ride the 9:40 AM Manx Electric Railway (MER) trip from Derby Castle, the second of the day for the tramway (the 8:40 preceded it), as far as Laxey, where we would transfer to the Snaefell Mountain Railway, which is the subject of this section of the report. I'll go into detail about the MER in part XI, but will mention now that this attractive tramway is  $17\frac{3}{4}$  miles long, with its first major stop being Laxey (seven miles from Derby Castle), our initial destination. It took us a half hour to make the trip, which gave us exactly five minutes to transfer to the Snaefell's first cog tram of the day, which left at 10:15 AM and took us up the mountain. Unlike the MER, which uses trolley poles for current collection, the rack railway uses bow collectors. Both operate at 550v DC, but their gauges are different: 3 feet for the MER and 3 feet 6 inches for the Snaefell. After a few slides, we boarded car No. 5 for the ride up the mountain.



**Manx Electric Railway closed saloon car 20 and its open trailer at Derby Castle just prior to its 9:40 AM departure for Ramsey. The kiosk for the sale of tickets is to the right and the horse railway is hidden beyond the rear. No. 20 was built by G. F. Milnes in 1899.**

Snaefell Summit is 2,034 feet above sea level and the line climbs from its connection with the MER at Laxey on mostly Fell system rack rail for some five miles over gradients that are as steep as 1 in 12 (8+ percent).\* Built in 1895, the railway was acquired almost immediately by the MER. It has but one intermediate stop, Bungalow, the former location of a hotel, not too far from the top. Operating only from April to early November, its overhead is dismantled every year to avoid destruction by winter icing. Running time is a half hour, and because cars are scheduled to make a connection with the MER, layovers at the summit consume 25 minutes, which, of course, in good weather means that passengers have time

to take a short hike and enjoy the surrounding panorama. When it's totally clear, it is said that six "kingdoms" can be seen from the observation point up a path from the station (Isle of Man, England, Wales, Scotland, Ireland and Heaven).



**Ramsey-bound Manx Electric Railway car 20 is about to leave Laxey, after having deposited many of its passengers, most of whom who have boarded Snaefell Mountain car 5, which is shown alongside sister unit No. 6. Car 5 was the first tram of the morning to begin climbing to Snaefell Summit, and left about two minutes later. These cars were also built by G. F. Milnes, as part of an order for the six identical units that have served the line from the first day of service in 1895 to the present.**

\*When I first read the history of the tramway I found out that the rack railway employs the Fell center rail system, and that it was surveyed by the son of John Barracough Fell, who invented the propulsion and braking system. The name of the mountain is Snaefell. Hmm. Could there be a connection? As it turns out, no. Snaefell is Norse (Norwegian), meaning Snow Mountain. I guess that coincidences are more common than most people think. (The Vikings settled on the Isle of Man in the 9th century, and the Brits and Scots didn't take over until the 13th.)

We boarded car 5 for the 10:15 AM trip, one of six G. F. Milnes built for the electric railway (only 5, No. 1, 2 and 4-6 survive as No. 3 was destroyed in an accident in 2016). The line is scenic, but once we gained some altitude we became enveloped in clouds, more like a cold foggy mist, which somewhat reduced the pleasure of the trip. The wind was very strong and I was glad I brought a jacket on this August day (warm at sea level). With little to do at the top because of being socked in, I positioned myself where I could get a well-lit photo of the 5 if I were lucky enough to witness the wind chasing some of the clouds away. Indeed, the gods were with me, as for about 15 seconds the sun shone brightly on



the scene and I hurriedly snapped away. I had considered walking down to Bungalow for a photo of our tram slinking down the mountainside before boarding it for the return trip (it would take less than 30 minutes to accomplish that), but with the mist preventing scenic views, I demurred (next time).



**As car 5 climbed the mountain the big wheel came into view. Also known as Lady Isabella, the Laxey Wheel was built into the hillside in 1864. The waterwheel, which still operates, has a 72' 6" diameter, is 6 feet wide and achieves approximately 3 revolutions per minute. It was built to service the Great Laxey Mines.**



**A placid view through the windows of our tram as it headed up to Snaefell Summit.**

A sign at the station indicated the tram would be leaving at 10:35 AM (rather than the advertised 10:40 AM), and I didn't find out why until I arrived back in the U. S. We had a much lighter passenger load coming down, as many of the outbound riders stayed up on the mountain, probably hiking despite the cold. I still got a major kick from the ride (this was the third time in over 50 years that I had ridden the railway) and made a mental point of looking for the tree line, the place where nature decrees that tall trees and lush forests must disappear in favor of grasses and shrubs, and later

scrub and rock, as I do whenever I ride over lines that climb tall mountains. While not an exact demarcation, the change is less gradual than one would imagine.



**(Above and below) Snaefell Summit, the end of the line, the top of the island. Two views of either side of car 5. Only the blind need ask their neighbors the terminal's altitude. The brief period of sunlight allowed for the lower photo.**



Richard and I thoroughly enjoyed riding in 1895-built equipment navigating steep grades through beautiful surroundings, but did not realize how close we came to not having that opportunity. Just two weeks earlier, on August 4, car No. 2 lost its brakes when its bow collector momentarily lost contact with the overhead wire. The crew was unable to stop the loaded tram using its emergency braking system, but finally got it to come to a halt safely by employing the manual Fell brake—19th century technology. The powers that be immediately lowered the speed limit (that's why we left the summit five minutes early) and instituted a regimen of extra diligence, while inaugurating a comprehensive review. The outcome of the evaluation resulted in a declaration that the line's operation was unsafe and it was totally shut down on September 25, a good six weeks before the end of the season. So we survived a bullet—or maybe the bullet just arrived too late—the line's closure had been fortuitously



delayed and we didn't even know it. Apparently the problems have now been ironed out and with new procedures having been designed during the fall and winter, the Snaefell Mountain tramway reopened on schedule on Good Friday, March 30, 2018.



**She'll be coming round the mountain when she comes. With half-hour headways and a long layover at the summit, three cars are needed to hold down Snaefell service. We're about to pass No. 1, which had left Laxey at 11:15, on our downward trek. Note that the double-track railway runs right-handed. We slipped by No. 6, the 10:45 from Laxey, a minute or two after we departed the summit.**



**Manx Electric saloon No. 2, having just completed a short turn to Laxey, has run around its trailer and heads for the station to pick up passengers for its return trip to Derby Castle. Yes, the Great Laxey Mine Railway was operating steam trains today.**

Once back at Laxey, we had some time to take additional photos and explore the area. While the MER mostly runs every half hour from Derby Castle to Laxey, service runs through to Ramsey only hourly during the high season. Thus we had a half hour before we needed to board our next tram. I must mention that there is a dual-gauge track siding that connects the Snaefell and the MER (I should have taken a photo of it). Apparently when a Snaefell tram has to undergo major maintenance, its 3' 6"-gauge trucks are changed out for narrower three-foot MER "accommodation bogies" at

that point, which allows the car to be hauled to the shops at Derby Castle, where the work is performed.



**(Above and below) Two scenes of the 19-inch gauge Great Laxey Mine Railway. Originally built in 1827 to serve the Laxey lead and zinc mine, and first employing human and animal motive power, the company shifted to mechanical locomotion using steam in 1887. (The great wheel shown at the beginning of this chapter was built in 1864.) The mine closed in 1929 and its two locomotives were scrapped in 1935. The 0-4-0 at the tunnel portal in the upper photo is one of two replicas of the original steam engines, even to the detail of builder's plates. Named Ant and Bee, they were built by Great Northern Steam Ltd. for the reopening of the line as a tourist attraction in 2004. The tunnel runs under the Manx Electric Railway and the A2 highway. The Wasp, a 48-volt battery-powered electric locomotive, was one of a group of 4-wheelers built by the Clayton Traction Equipment Company in 1973 for use in tunneling projects. It was acquired and rebuilt by Alan Keef Ltd. and delivered to the property in 2009. The passenger car is one of two built by Keef that were delivered in 2004 and 2007. Each single-truck unit contains one long longitudinal bench seating 10 passengers.**



During the interval we saw a sign directing visitors to a mine train, and we followed it. Because of time constraints we were unable to ride it, as we had to get back to Laxey station in time for the MER's 12:10 PM departure for Ramsey. But we did get the photos displayed in this column.

The story continues in chapter XI.