
TRACKS OF THE NEW YORK CITY SUBWAY
2021
DITMAS AV
B
Peter Dougherty

Dedication & Thank-yous

This edition is dedicated to the legion of MTA employees who kept the system running during the COVID-19 Pandemic, to the memory of those MTA workers who lost their lives to the virus, and to hero train operator Garrett Goble, who died in the March 27, 2020 fire at 110th Street, after ensuring his passengers made it to safety.

And of course, and as always, to my loving wife, Arwen, who's been with me every step of the way, and who is the greatest inspiration a man could ever have.

First printing, October 2020

About the author...

I am originally from Canada. I'm an avid ham radio operator (W2IRT), and although I enjoy international travel, my wife will certainly agree that I spend far too much time railfanning on vacation. We have lived in northeast New Jersey since 2005.

Corrections, revisions or additions are always greatly welcome.

NYCTRACKBOOK@GMAIL.COM
WWW.NYCTRACKBOOK.COM
www.facebook.com/nyctrackbook

Front cover: Southbound Brighton Express approaching Newkirk Ave. *Photo by Anthony Maimone © 2019*

See page xlvi for more information on the cover photo contest and this year's winning entry.

Rear Cover: Main Street-bound Flushing Line train at 111th St. *Photo by Trevor Jensen © 2016.*

I would like to express my heartfelt appreciation to the many contributors whose technical and background assistance have continued to make this book a success. I would like to give special recognition to the following individuals for going above and beyond.

Dave Pirmann	Steve Kreisler
Mark Feinman	Herbert Klaus
Steve Lowenthal	Ed "C.B." Burgess
John Urbanski	Michael Calcagno
Joe Korman	Bernard Greenberg
Peter T. Daniels	Bruce Crawford
Tony Mirabella	J. Alan Septimus
Robert Marrero	Richard E. Green
Peggy Darlington	Alex LaBianca
Constantine Steffan	Sam Wong
Robert Carroll	Shaul Picker

Special thanks to Brendan M. Lynch and *"RidetheCTrain"* for helping out above and beyond the call, along with several contributors who have wished to remain anonymous.

YouTube videos and other URL destinations linked to in the Interactive PDF version of this book are the sole properties of their respective copyright holders.

Introduction

WELCOME TO THE 2021 EDITION OF *TRACKS OF THE NEW YORK CITY SUBWAY.*

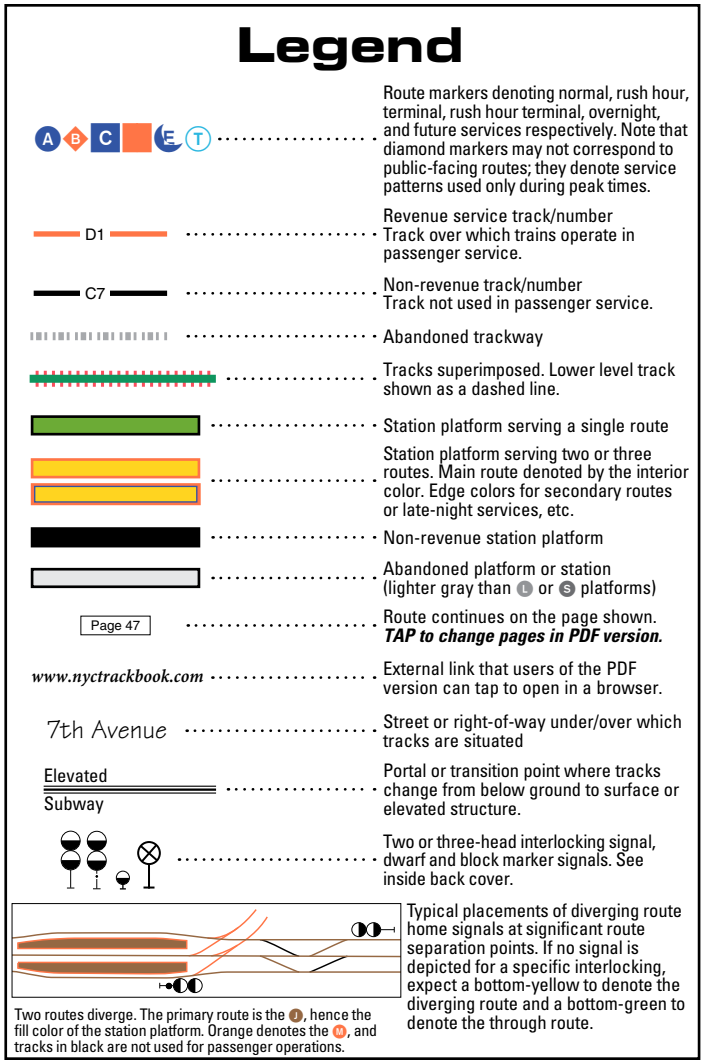
As the title implies, this is a book of track maps of the New York City subway system. Its goal is to help the reader understand that seemingly incomprehensible maze of tunnels, signals, rail, and switches. Every track is depicted along with their respective track numbers, many route diverging home signals, radio frequencies, and much more. You will also find drawings of tracks long gone, and of tracks yet to be built. Historical notes have been added pertaining to remnants of old track placements.

Information presented here is based on what anyone can see looking out the window of a train, by observation on a platform, from street level, or using online mapping resources. Right-of-way placement is based upon personal observation or by using public maps and transit-related websites.

Please note that the main map section is not to scale. If you see any mistakes or have any comments on the book, please e-mail the author at the address shown on the inside front cover.

Route markers shown at every station are for convenience, but may not reflect every train service that stops at each station at all times.

While some readers may decide to use this book as an unofficial training supplement, please keep in mind that it is *not* a substitute for official MTA New York City Transit study materials, nor is it sanctioned by the MTA. For those dedicated professionals who keep New York's subways running, you have this author's sincerest appreciation.



Introduction

In the summer of 1995 an old New York subway track map from 1940 was scanned into an ancient computer, stitched together, and uploaded to the Internet as a way of giving some information to the online railfan community, then essentially in its infancy. Personal observations and frequent corrections followed, and a huge outpouring of support ensued.

During this process I was often asked if these maps could be assembled as a book, so I assembled the maps together, spiral bound them and *Tracks of the New York City Subway* was thus born in 1997. The original book was only 24 pages, and did not contain signal info, an introduction, yards or track numbers. Just the mainline tracks, stations and route markers, and a few notes.

What you are holding is the result of more than 25 years' work and countless hours of riding the system, verifying information, designing, and editing. I cannot say a big enough THANK YOU to all who have made this ongoing work a reality. I hope you enjoy using it as much as I have preparing it.

BASIC SYSTEM DETAILS

Many of the terms used in this book assume some basic knowledge of railroading, and at least a passing familiarity with the NYC transit system. Since the audience for this work stretches across the globe, it might help to describe the system in more general terms for those who have never ridden it.

New York City encompasses 5 *boroughs*, four of which are served by the MTA New York City Transit subway network. These boroughs are Manhattan, Queens, Brooklyn, the Bronx, and Staten Island. Staten Island has its own railway but it is not part of the subway system as such.

The system runs 24 hours a day, 365 days a year, carrying in excess of 5 million passengers daily to and from 472 stations, over roughly 691 miles of mainline track and across almost two thousand track switches. Although it's called the subway, not all of the system is below ground. In fact, outside of Manhattan, a good number of lines are on elevated steel trestles (*els*) running down the center of streets or, in a few cases, on their own private rights-of-way.

CONSTRUCTION METHODS

Most of New York's subway lines were built in the first half of the 20th century. They generally run directly beneath the surface and follow the contours of the served street or avenue for some distance. In the early years, tunnels were built using the *cut-and-cover* construction method. This process involves digging up the street, installing a large trench, covering it back up again, and fitting said trench with tracks, signals, platforms, trains, and (hopefully) passengers. New lines and extensions, including the Flushing Line and Second Avenue, are now built using deep-bore tunneling methods.

Several lines cross the East River by tube tunnels, and their approaches were bored through earth and beneath the river bed by *sandhogs*. However, the 63rd Street Tunnels were made from steel tubes that were floated by barge into position, sunk, and connected. IRT construction generally tended to be one level below the street, but IND stations often had a mezzanine level containing fare controls above the tracks. In fact, much of the city-built IND was over-engineered, with numerous turn-back and layup tracks, so-called *flying junctions* and multi-level stations.

Introduction

WHAT THE PUBLIC MAP COLORS REPRESENT

Routes are referred to by a circled number or letter, but also by the primary north-south avenues in Manhattan beneath which they run, and in Brooklyn (unofficially), by their historical route names. On public maps the color of these circles denotes the trunk line served. Red numbers refer to the West Side Broadway/Seventh Avenue Lines (1 2 3). Green numbers are the Lexington Avenue routes on the East Side (4 5 6), blue is for Eighth Avenue (A C E), yellow denotes Broadway (N Q R W), and orange is for Sixth Avenue, a.k.a Avenue of the Americas (B D F M). Grey is for the Canarsie Line across 14th Street (L); light-green is for the Brooklyn-Queens Crosstown Line (G)—it's the only main line that doesn't go into Manhattan at all—purple is for the 34th St/ Hudson Yards to Flushing, Queens line (7), and brown is for Nassau St. and Brooklyn's Broadway (J Z) elevated lines.

Unlike most other major urban transit systems, the NYC Subway uses more than two tracks in many places, allowing both local and express trains to run simultaneously. Since the system runs around the clock, there aren't any scheduled down times for heavy maintenance. Construction projects that force the closure of stations or entire lines are scheduled for times when the least inconvenience to passengers will likely occur (usually at night and on weekends), although some full-time closures and reroutes do occur for major works projects such as station or tunnel rehabilitation. Service on one line can be routed over another, or local trains can be switched to the adjacent express tracks bypassing stations in one direction. This arrangement is also a boon to normal daily operations. Lately, the MTA has implemented what they call FasTrack repairs, where an entire stretch of line is shut down every night for a week, between 10pm and 5am, so crews can work continuously and traction current can be shut off. Some maintenance can also be done during the day without serious disruption. Paid access is by a plastic magnetically encoded fare card called a MetroCard, or a new contactless payment system called OMNY, which stands for One Metro New York. Weekly and monthly unlimited-ride MetroCards are also available for frequent travelers. This is a flat fare (not zoned or distance-dependent), and one free subway-to-bus transfer is permitted per fare paid. MetroCards are available 24 hours a day at all stations either by vending machines or from clerks in the stations, and from many neighborhood retailers. Public maps are available at no charge from any subway railroad clerk, online, and from the MTA.

PAST AND PRESENT

The 100th anniversary of the New York City Subway occurred on October 27, 2004. After only four years of construction, the first section of the subway opened from City Hall to 145th Street. There are many excellent books on the history, politics, and building of the subway that will give the reader a thorough grounding in how the network came to be. This work focuses on the current state of the system and future extensions or modifications, and it's the author's intention to keep this reference work as accurate as possible. Certain historical track plans are also included where they detail more extensive layouts that once existed or connected to still-existing lines but I have no intention of making this a historical reference work.

Changes

If this is your first purchase of *Tracks of the New York City Subway*, please note that like the system itself, this book is an ongoing work in progress and will change year to year.

THE APOCALYPSE THAT WAS

The transit system was devastated by the Covid-19 pandemic. In addition to the many lives lost or changed forever, a very real financial crisis befell the system, the effects of which still were not completely known as this edition went to press. Ridership (i.e. revenue) plummeted, and the MTA is requesting $Billions in bailouts from the federal government to help make up the shortfall. Most capital construction has ground to a halt, and some of the 2020–2024 Capital Plan's ambitious proposals will undoubtedly either be cancelled outright, postponed for years, or scaled back. Stay tuned.

THE L-POCALYPSE THAT WASN'T

Tunnels carrying L trains between Manhattan and Brooklyn that were badly damaged during Superstorm Sandy in 2012 were finally fixed and returned to service in April 2020.

Initially a long-term closure was planned that would have involved the demolition and rebuilding of the crumbling concrete benchwall beside the tracks that carried power and signaling cables. Under the new plan, the benchwalls were sealed with fiber-reinforced polymers and can still be used as emergency walkways if needed, and all new cables were suspended on tunnel wall ducts.

At the First Avenue station, new elevators were added and a new entrance was opened at the east end of the platform in November 2019, with stairways leading to 14th Street and Avenue A. At Bedford Avenue, a new elevator, widened stairways, and more turnstiles will be in service in 2021.

EAST SIDE ACCESS

The East Side Access project, which will bring the LIRR into Grand Central, is going strong, with a hoped-for completion in 2022. All tunneling has been completed. Tracks are in place, platforms have been built, and the station work at Grand Central is in full swing. The new eight-track terminal will consist of two new upper and lower levels, each with four tracks and two island platforms. LIRR tracks will be roughly 200 feet below the surface, and well below the existing tracks.

A tunnel section consisting of two upper level and two lower level tracks (and four platforms) will be situated below the west side of Park Avenue, and an identical section under the east side. These two sections will be connected by the mezzanine level. Tail tracks, for storage layups, will continue south to 39th Street. Three tracks on the Queens side will connect to the LIRR, with a fourth joining the Sunnyside Yard loop, and to storage and maintenance facilities.

TIMES SQUARE–GRAND CENTRAL SHUTTLE

Reconfiguration continues on the IRT shuttle between Times Square and Grand Central. The old configuration featured three isolated tracks along what was originally a four-track connection between the upper part of the Broadway Line and the lower part of the Lexington Avenue Line. The Times Square platforms are staggered, there are hundreds of columns, and everything is cramped. When this reconfiguration is complete, Track 3 will be abandoned, the

Changes

Times Square platform will be extended, widened, and moved further east (employee facilities will be located at the western end), and there will be one giant island platform with far fewer columns. Track 1 will stay as it is now and connect only to the southbound Lexington Avenue Line via Track 1S. Track 4 will likewise stay as it is now, and only connect to the northbound Broadway Line, but the metal bridge that currently covers the track for passenger access to Track 4 will be removed. There is no provision for a crossover between the tracks. ADA accessibility will be provided, lighting improved, and both tracks will accommodate six-car trains. Improved signaling should also help speed up service. The old and new track plans are shown on Page 71.

ELEVATOR REPLACEMENT

The elevator replacement program at certain deep stations in Manhattan continues. 168th St. was was reopened in December 2019 after a year-long closure to replace its lifts, and 181st St. A was finished earlier this year (that station remained open during the repairs). 191st St. 1 and 190th St. A, will have their elevators replaced, but the stations will remain open until work finishes in 2021. However since 181st St. 1 is only accessible via one elevator bank, this station will be closed for one year, between March 2021 and March 2022.

CBTC ON QUEENS BLVD.

CBTC signaling is being rolled out from Union Turnpike in Queens, west to 50th St./Eighth Avenue and 47–50 Sts./Sixth Avenue in Manhattan. See. P. *xvi* for details on CBTC. Because the required onboard technologies necessary to operate with CBTC wayside infrastructure can't be installed on older R46 cars, it was necessary to swap that fleet with the R160s based out of Coney Island. This was accomplished in early 2020, making Jamaica Yard an all-R160 facility.

R211 CARS ON THE WAY NEXT YEAR

Beginning in 2021, the retirement of those R46s will begin as new R211 railcars start getting delivered. The last 50 R42s were retired this past year. The R32s were originally supposed to go with them, but yet another fault in the trouble-plagued R179 fleet necessitated the 1964 Brightliners remain on the rails into October, 2020.

To facilitate the acceptance of the new R211s, the presently-unused Third Avenue Yard in Brooklyn is being revived with all new tracks and shop facilities and is expected to open in 2021. This yard was a former maintenance-of-way facility west of the 9th Avenue station in Brooklyn and was once part of the South Brooklyn Railway. New railcars arriving via car float from NJ arrive via the tracks depicted on P. 42 of this book, and already pass through the Third Ave. Yard, so this was a logical place to situate the new facility. NOTE: funding for this project may now be delayed.

OMNY — ONE METRO NEW YORK

OMNY contactless payment terminals are being installed in every station and on all NYC Transit buses. These should be in place by the end of 2020, allowing passengers to pay for their rides using contactless credit cards, mobile devices, and eventually by dedicated NFC payment cards once MetroCards are finally phased out in mid-2023.

Changes

RUTGERS TUNNELS

The Rutgers Tunnels, which carry F service across the East River, are the last of the tubes to require post-Sandy rehabilitation work. The project began in Sept. 2020, and will last for about 20 weeks. When this project starts, look for closures of the tubes (and the York St. and East Broadway stations) at night and on weekends as tunnel, electrical, pump, track, and signal infrastructure is upgraded and hardened against future flooding problems. Cell phone and WiFi signal coverage will also be added as part of the signaling upgrade.

LAST-MINUTE CHANGES

As mentioned earlier, when this book was being readied for press almost all MTA capital works projects had been stopped due to funding shortfalls. Descriptions of many of these projects were already chronicled in the text, and rather than rip out and re-edit parts of the entire introduction and a dozen or more map pages, these proposals will be left in with the caveat that projected completion dates are not yet known, and some of the ambitious projects (like CBTC expansion) may not resume for a long time. New car orders are on hold, so the R211 arrival date will undoubtedly be impacted by this funding crisis, and the R262 procurement is on hold indefinitely.

MAP MAKER MICHAEL HERTZ DIES

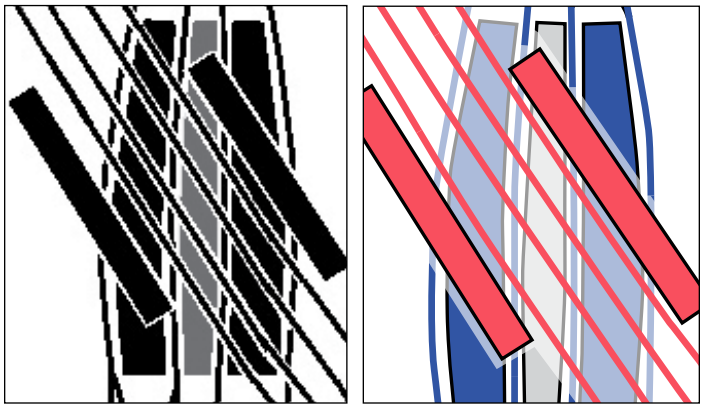
In 1979, Michael Hertz and his company designed the current public map of the NYC subway system, replacing the artistic but less-useful Massimo Vignelli map from 1972. Mr. Hertz died on Feb. 26, 2020, but his map will endure for years to come.

Many longtime readers will notice some significant changes have been made to the maps in this book. After 22 years of black and white bitmatted images, everything was updated to smooth "vector" color drawings.

Bitmapped images (like photographs) are made of pixels and can be quite difficult to change. Vector drawings are made of math and can be manipulated easily and look smooth even when zoomed in at 2400%, so even the finest details are clear when viewing the interactive PDF version.

Stations and tracks have been highlighted with colors representative of the revenue service lines that run on them. Several pages that have minor color elements in the PDF version remain in B&W in the printed version to save on printing costs. Two new map pages were added, and the page flow for southern Brooklyn, and Manhattan south of Canal Street was modified slightly.

A bitmapped rendering of 59th St. on the left, and the new vector version at right. The bitmapped version took about 6 days to get right. The vector image took about 30 minutes and can be modified in seconds if needed.



What's in a name

Today's subway uses 23 different route designations. Some are numbered and some use letters. Additionally, there are free transfers available in many locations between lettered and numbered routes, but this has not always been the case. Prior to June 1, 1940, NYC had three completely separate subway systems. There was the Interborough Rapid Transit (IRT), which ushered in New York's first* subway trains on October 27, 1904; there was also the Brooklyn-Manhattan Transportation Company (BMT, previously known as the Brooklyn Rapid Transit Company, or BRT) and the IND, the city-run Independent Subway System that opened in 1932.

UNIFICATION

After June 1, 1940 all that changed. Enter the era of ***Unification***. Although it was now officially just one transit system, the terms IRT, BMT, and IND remained in use. Today those former IRT lines are numbered 1–7, and former IND and BMT lines use letter designators. In this book the terms A-, B1-, and B2-Divisions will be used interchangeably with IRT, BMT, and IND respectively.

IRT (A-Division) cars and tunnels were built with smaller dimensions than the later BMT and IND systems (B1 and B2). IRT's cars are shorter and about 18" narrower than IND/BMT equipment; the trip arms are on the opposite side, and the IRT's tunnel clearances are considerably tighter. Consequently, B-Division equipment cannot operate over A-Division tracks, and all work equipment must be built to A-Division standards (or use retired IRT cars). A-Division equipment *can* operate on B-Division tracks, although not in passenger service. However, IND and BMT clearances are identical and there are numerous interconnections between the B1 and B2 divisions. Note that no parts of the subway system share track with any main-line railroad.

CHRYSTIE STREET

Although specifications of B-Division equipment allowed for operation on either IND or BMT territory, it wasn't until November 26, 1967 that the line between these two divisions was blurred forever. Two earlier connections between the divisions had opened—the first between Church Avenue and Ditmas Avenue (on today's F in Brooklyn) opened in October 1954, and a short connection from the 60th Street tunnel to the Queens Boulevard Line (on the R train today) in December of 1955. But the nature and scope of IND–BMT operations changed irrevocably with the opening of the Chrystie Street connection, the closing of the Nassau Street Loop, and the realignment of tracks leading to the Manhattan Bridge.**

The Second Avenue Line and the 63rd Street Tunnels are considered IND territory, but the connection between the Broadway Line north of 57th Street/Seventh Avenue and the Lexington Avenue/63rd Street station remains BMT territory until the curves to/from Second Avenue.

**The first-ever subway in New York was the fabled Beach Pneumatic subway, which ran under Broadway from Murray to Warren Streets, between 1870 and 1872. After this experimental tunnel closed it was sealed off until discovered by workers building the Broadway BRT Line almost 40 years later. Unfortunately, no traces of this tunnel or the ornate station and car remain today.*

*** There is a detailed map on P. 20 showing the pre-Chrystie Street layout. This connection allowed the IND's Sixth and Eighth Avenue Lines to operate over the north side of the Manhattan Bridge and into former BMT Southern Division territory. A new connection was also built from Broadway-Lafayette to Essex Street through which M trains currently operate.*

Integration

DIVISION A & B INTERCONNECTION

There are four physical connections between the IRT and the B-Division. As stated, train width and the placement of the train stop valves preclude operation of B-Division cars on A-Division tracks; however, IRT equipment *does* occasionally operate on B-Division tracks, namely when A-Division cars are being moved to B-Division yards for service, for work trains, and also for the occasional museum train special. The four connection points between divisions are:

1. From the northbound 1, just north of 207th St., there is a flyover ramp (Track C) to the 207th St. Yard.
2. From 5 Track in Concourse Yard there's a flyover ramp that leads to the southbound 4 near the Kingsbridge Road station.
3. A diamond crossover between the 7 and N W on the upper level of Queensboro Plaza. This is the only connection from the 7 to the rest of the system.
4. A connection between the L near the Livonia Avenue station and the 3 Junius St. station. This connection also leads to Linden Yard, and the LIRR's Bay Ridge Branch (operated by the New York and Atlantic Railway). This connection is not third-rail powered.

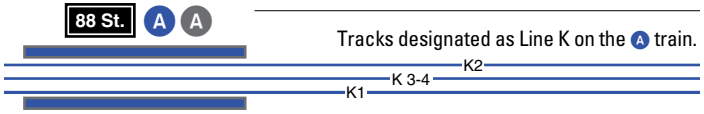
TRACK NUMBERING

Tracks number differently between the A- and B-Divisions, but are the same in Divisions B1 and B2. IRT tracks are identified by either a number or a single letter. The typical IRT numbering scheme is as follows: 1 Track is the southbound local; 2 Track is the southbound express, 3 Track is the northbound express and 4 Track is the northbound local. In locations where there are only three tracks on a mainline the middle track is often just simply called M Track. Where locals and expresses split off, there is no standardization in numbering.

There is also a second track numbering scheme (signal track numbers) still in place on the IRT that conflicts with the information presented above. This format will be described in the section on stationing (also known as chaining) codes. Signal track numbers are no longer used operationally.

B-Division tracks number a little differently. Each track is identified by letter or letters followed by a number; for example A1 or BJ2. The letter is the line identifier and the number is the actual track number. On the B-Division, 1 Track is typically the southbound local, 3 Track is the southbound express, 4 Track is the northbound express and 2 Track is the northbound local (see the image below, and pages xxxiv–xxxv for a complete description). Center tracks will typically be numbered 5 or higher.

A1 Track refers to track number one on Line A, but Line A is ***not*** what passengers know as the A train. Each line, dating back to the earliest elevated lines, had a designation for internal use. Even small existing sections of long-gone elevated lines remain numbered true to their original form. For example, a short stretch of track on the A from Grant Avenue to Lefferts Boulevard bears the Line K designation—that of the Fulton Street Elevated, and Line P, the old Canarsie designator, can still be found in Linden Yard and its connecting tracks.



Track designations

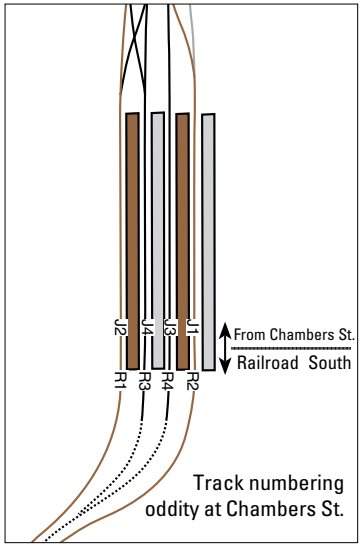
When there is a single middle track it's usually even-numbered heading north and odd-numbered southbound (i.e. K3-4, as shown on the previous page). An exception to this is the Sea Beach N Line, which is now signaled and designated E4 track in *both* directions between Eighth Avenue and Kings Highway.

There are some interesting anomalies in line lettering: both the IND and the BMT have lines designated 'A' through 'F,' and the BMT itself actually has two Line 'A's! On the IND, look for two stub ends, both with the A1 and A2 designations; the first is at the IND's World Trade Center station and the second is the Court Street stub—now the Transit Museum in Brooklyn. Under the never-realized second phase of the IND (described later on) these two stubs would have been connected by a new tunnel under the East River.

NORTH, SOUTH; EAST, WEST

Your map shows the IRT running up and down the west side, beneath Seventh Avenue and Broadway (the 1 2 3 trains). If you were to get on at 34th Street and travel up to 42nd Street/Times Square you would be going northbound, right? Good. Now, suppose you change to the Flushing Line; you ride the 7 from Times Square—at Seventh Avenue and 42nd Street—to *Fifth* Avenue and 42nd Street. You would now be going eastbound, right? Nope! You would *still* be going northbound! Okay…what if you take a J train from Essex Street to Marcy Avenue, crossing the East River on the Williamsburg Bridge? That *must* be eastbound, right? Wrong. That's ***south***bound! So, what gives?

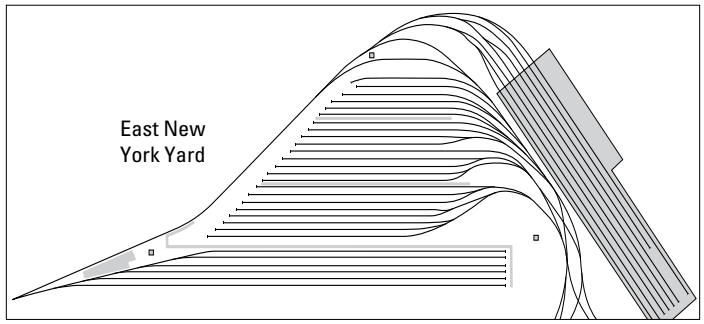
Simple. As far as New York City Transit is concerned, ***there is no east or west in the subway system***. Everything is either ***railroad north*** or ***railroad south***. Generally speaking, on the IRT and IND, compass west is railroad south, and compass east is railroad north. But what about that J? How can an "eastbound" train be going south, when compass *west* is supposed to be south? It's because this is former BMT Eastern Division territory, and the BMT defined north as heading towards its zero-point near Chambers Street (on today's J Z lines) in lower Manhattan—again, see the section on chaining codes—and south as heading away from Chambers Street. Thus, a J train leaving Manhattan for Archer Avenue is heading BMT-south. Things get interesting at the Chambers Street station itself. Here, when your compass is pointing north leaving Fulton Street, you are also proceeding railroad-north. However, once you enter the platform at Chambers, you're now going railroad-south. There's really an easy way to think about it, though. Remember that odd track numbers are southbound and even numbers northbound. That's how you can tell J1 track heading north from Chambers Street is really heading south! On the Canarsie L Line, Eighth Avenue in Manhattan is the north end of the line and Rockaway Parkway in Brooklyn is at the south end.



Routes not built

YARDS AND INTERLOCKINGS

Detailed track maps for every yard and most major interlockings in the system have now been included. These drawings are fairly close to scale and the detail is accurate to within the last few years, and checked against online mapping resources. Corrections or additions are always welcome, especially with regard to internal areas of the car barns and shops. Due to the varying sizes of these yards, the scale is somewhat cramped—especially Coney Island and Concourse. The thumbnail sketches of the yards on the main map pages are obviously not at the same scale as the maps themselves and are just shown for placement purposes.



Fun Fact: Nelson Bond's 1941 science fiction story ***Magic City*** presents a post-apocalyptic future where tribes of people still exist throughout the country. A couple of healers from California decide to walk to what they believe is the Magic City where they can learn the workings of the human body. When they finally reach the Magic City they find two tribes of people living underground; one calls themselves the "Be-Empties" and the other the "Eye-arties."Read those two terms very slowly. Should this ever get made into a motion picture, it would most likely be an INDie production, one would guess.

ROUTES NOT BUILT

As plans were being drawn up for the original IND system, even more ambitious plans for a second phase of that very system were also being readied.

Phase II of the IND subway system included the Second Avenue Line as well as some lesser known routes that were never built. The Second Avenue subway was intended to replace the Third Avenue elevated, which was demolished in 1955. It actually had some construction done before the project was halted. The other mainline, the South Fourth Street subway, had only a hint of construction completed. The main part of this line was to connect with the stub end tracks at Second Avenue and Houston Street on the F train (the roof of the East Broadway station of the F train has room for the Worth Street line to cross it), a dead end connection via Worth Street from just north of the E terminal at World Trade Center, and a tunnel from the Second Avenue Line also around Houston St. This would have been a total of three new East River tunnels with six tracks connecting Manhattan with Williamsburg, in Brooklyn.

There were at least two separate plans for connections to the east of the current Crosstown G Line. There, a massive six track–four platform station (much like Hoyt-Schermerhorn) was built into the roof of the Broadway station. This was to be the main transfer point for converging trains. South Fourth Street was intended to be a major interchange when the "second phase" of the IND subway was first proposed. Unfortunately, the Great Depression ground that project to a permanent halt. Descriptions of the two biggest plans for the second phase of the IND follow.

Routes not built

PLAN 1

This had a two level maze of connecting tracks between Havemeyer Street and Varet Street along South Fourth Street, Beaver and Bushwick.

One pair of tracks would have turned under Myrtle Ave., while the other two pairs would have been a four-track line under Stuyvesant Avenue feeding into Utica Avenue. In the roof of the Fulton St. Utica Avenue station, at the (railroad) south end you can see the structure of the unused Utica Avenue subway.

In addition, the middle track of the Bedford-Nostrand station of the Crosstown Line would have continued on Lafayette to Stanhope St., where it turns slightly to the north to meet the line on Myrtle Avenue also forming a 4-track line.

PLAN 2

This was much more complex and if built, would have presented some interesting services. The same six tracks would have met at Havemeyer Street (the South 4th St. station complex mentioned above). Two more would have ended at a third level of the Broadway Station of the Crosstown. These eight tracks would have split again into:

- 4 tracks on Flushing Ave. to Horace Harding Blvd.
- 4 tracks along Broadway, Brooklyn
- 4 tracks along Utica Avenue

Details and maps of these never-built lines are available at ***nycsubway.org/ind/indsecond.html,*** from Joe Korman's website, located at ***www.thejoekorner.com***, ***en.wikipedia.org/wiki/Proposed_expansion_of_the_New_York_City_Subway*** and at ***nyctransitforums.com/topic/49022-unexplored-nyc-the-subway-files.***

OTHER UNBUILT PARTS OF THE IND

The 1929 schematic of the IND had a number of other interesting lines:

- Six-track Second Avenue Line north of 61st Street.
- Concourse Line extended via 205th St. to Baychester Avenue and Boston Road.
- Second Avenue Line taking over the White Plains and Pelham lines of the IRT.
- *No* 63rd Street Tunnel, but a 61st Street Line from Sixth Avenue to Second Avenue northbound.
- Extension of the Liberty Avenue Subway to Springfield Boulevard.
- Connection from 78th Street on the Jamaica Line, via Fresh Pond Road, Central Avenue, and the Long Island Rail Road to the Rockaways (the Winfield Spur, described below).
- An extension to the IND line from Utica Avenue and the IRT Flatbush line to Nostrand and Voorhees.

In addition to these lines, there were several provisions for IND expansion along the Queens Boulevard Line. Most notable is the terminal station for a never-built line to the Rockaways on the upper level at Roosevelt Avenue. This built-but-never-used "station," consisting of two trackways and an island platform, is located east of the fare control area. Ramps from this upper level to the local tracks of the existing Queens Blvd. line can clearly be seen if you're looking out the end window of a local train. There are also tunnel bellmouths for tracks not built east of the 63rd Drive station and on either side of the Woodhaven Boulevard station. Details are on P. 51.

Signaling

Trains must have authority to move on or occupy a track. In the case of the NYC Subway, outside of yards, this is granted by valid signal indication. There are currently two distinctly different signaling schemes used in the system. The most prevalent scheme uses fixed blocks and trainstops, and has been used for well over a century. Fixed block signaling is safe, but it's also outdated, prone to component failure, and limits train throughput. A new, modern signaling method called CBTC uses *virtual* blocks and is described later.

An ***Absolute block*** is defined as a section of track in which a train is not permitted to enter while it is occupied by another train. In practice, one train may be authorized to move in both directions and is protected by blocking devices and instructions to crews even if the track is normally only signaled in one direction. This practice is common for shuttle operations in temporary work zones.

BLOCKS AND INTERLOCKINGS

In order to understand the basics of the signaling system, it's essential to understand the concept of a ***block***.

In areas without switches or crossings-at-grade, each track is divided into sections called blocks that are electrically isolated from each other using insulated joints in the rails. Authority to enter and occupy each block is governed by a signal, and protected by an automatic trainstop†. When the leading wheels of a train cross one of these insulated joints into a block, they cause an electric current to flow between the two running rails (the steel wheels and axle act as a short circuit), which drops the signal from a permissive indication to danger, or in layman's terms, it changes from green to red.

An ***interlocking*** exists at switches or crossings where routes could potentially conflict, and access is similarly governed by signal indication and protected by an automatic trainstop, but with some significant differences. An interlocking is an arrangement of switches and signals set up in such a way that when one route is set up through it, all other conflicting movements are prevented. Mechanical interlocking machines such as the one shown on page xviii, and electro-mechanical relays are still in use on the B2-Division, but have been modernized with newer equipment elsewhere. But even these improvements are still prone to increasingly-frequent failures.

INTERLOCKING AND HOME SIGNALS

An interlocking signal is, logically enough, a fixed signal within an interlocking and is unaffected by the condition of the track leading to it or after it. A *home signal* is defined as an interlocking signal at the entrance to a route or block to govern trains entering or using that route or block.

The most important distinction to remember between an interlocking signal and an automatic block signal is that an interlocking signal can be forced to show a stop indication while an automatic cannot. In fact, the normal indication for an interlocking signal is stop, whereas the default indication of an automatic block signal is permissive. An interlocking signal will only clear when a route has been established and the track is vacant. Interlocking signals, therefore, are the only signals that can govern diverging routes. Certain approach signals can also be forced to show a stop indication.

Interlocking signals are controlled by a tower operator setting a route manually, or by the train operator selecting

Signaling

a route from a punchbox located beside the cab window. Interlocking signals generally consist of two sets of aspects* while automatic block signals have one.

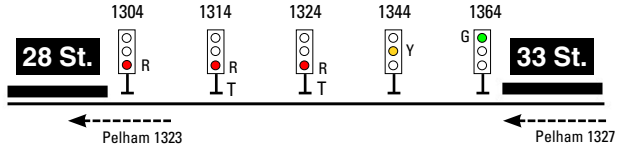
Track occupancy in the block ahead is shown by the upper set of aspects (the block portion), and route selection is indicated by the lower set (the route portion). For example, a signal showing green over green means proceed on the main route; green over yellow means proceed on the diverging route and yellow over yellow means proceed on the diverging route prepared to stop at the next signal. Red-over-red means stop and stay. Please refer to the color pages at the back of the book for a guide to the most common signal indications found on the system today.

AUTOMATIC BLOCK SIGNALS

Most wayside signals fall into the automatic block signal variety. These are three-aspect* signal heads with a green light on top, yellow in the center and red on the bottom (they can also be mounted horizontally), and like their interlocking counterparts, movement authorities are enforced by automatic trainstops†. But unlike interlocking signals, these signals are not controlled manually; instead, they reflect the occupancy state of the track ahead automatically. It is important to understand that an automatic signal cannot be set to danger (red) by either a tower or the Rail Control Center. If an automatic signal is red, then either one of the next two blocks ahead is occupied, or there is a broken rail or some other malfunction in the circuitry.

To understand how it all works, please refer to the illustration below. In this example, Lexington Avenue 6 Local trains are travelling from right to left, southbound from 33rd Street to 28th Street. There are five signals governing that stretch of track. In this example there are no interlocking or other controlled signals; just five simple automatic signals.

The first train leaves 33rd Street on permissive automatic signal 1364, displaying a proceed indication. After entering the block controlled by signal 1364, that signal goes red. The trip arm stays down as long as the train is still in its block (or else the train would trip itself).



Automatic block signaling between 33rd Street and 28th Street on the southbound Lexington Avenue local track. The "T" symbols represent train stop arms set in the tripping position. Dashed arrows indicate trains and their direction of travel.

** A signal's "aspect" is its position, form, and color. That is to say, the color of the light or lights of a signal and how they are arranged. A signal's "indication" is the information conveyed by the aspects. For example, fictitious signal A1-123/X-22's aspects are green-over-yellow; its indication is "proceed on the diverging route." Signals are usually called by their numbers and bottom (route-governing) aspects rather than by a formal name. In the above example, "22 ball is showing a bottom-yellow." Not A1-123/X-22 is green-over-yellow.*

*†A **trip arm,** or **automatic trainstop**, is a T-shaped arm located beside the rails, operating in conjunction with a signal. This arm is located to the right of the running rails on the A-Division and to the left of the running rails on B-Division. When a signal goes red and the preceding train clears the block, the arm rises; when it's green or yellow, the arm is down. This device functions by contacting a valve on the undercarriage of the lead car of an approaching train that has accidentally passed a red signal. It opens the air brake line, thus applying the train's emergency brakes. Trip arms by the wayside are painted bright yellow, and trip cocks on cars are painted white. This way, should a train get tripped at a stop signal, there will be a tell-tale smudge of the yellow paint on the white valve. Busted!*

Signaling

The first train then passes signal 1344, turning it red. At the same time, the end of Pelham 1323 has cleared the block controlled by signal 1364 (the first one it encountered). 1364 stays red, but the trip arm goes up. As with 1364, above, 1344's trip arm stays down until 1344's block is vacated.

Now Pelham 1323 enters the next block, governed by signal 1324. That signal goes red and its arm stays down. 1344 stays red and its trip arm goes up after the end of the train passes it. Signal 1364 is still red and the trip arm is up when the next train, Pelham 1327, arrives at 33rd Street; it must stop and stay. Pelham 1323 passes signal 1314, which goes red, arm down. 1324 is red (arm up after just being vacated), as is 1344. But now, signal 1364 goes yellow. The following train, Pelham 1327, could accept that signal but would have to stop in the tunnel at the next signal, 1344. The train operator would likely stay put in the station with doors open.

Finally, Pelham 1323 enters 28th Street on signal 1304. It goes red, arm down. 1314 is red, arm up, 1324 is red, arm up, 1344 is yellow, and 1364 is green, thus allowing Pelham 1327 to depart 33rd Street. This is the state shown in the previous illustration. What must be understood is that a train has two full fixed blocks of protection behind it, plus a yellow light behind that. Any train passing one of the two red signals (with the tripping arm up) would have its brakes applied in emergency. The simplified illustration below gives a better summary of how automatic and interlocking signals function.

KEYING-BY

It is *technically* possible to pass a red automatic signal whose trip arm is up without getting tripped by the automatic train stop. If proceeding slowly enough past a red **automatic** signal, the leading set of wheels will occupy the next block and allow the trip arm to lower—remember the trip arm must be down in a block that a train is occupying or it would trip itself.

This process is called ***Keying-by***, and is dangerous since the last line of protection is being bypassed. Keying-by has been responsible for several serious accidents, and a fatal crash north of Hoyt Street in 1970 made keying-by unauthorized

Fixed blocks and automatic signals protecting a train on Z1 Track.

Local and express tracks (Z1 and Z3) signaled in one direction only (southbound).The single-head (automatic) signals will show a permissive indication if the blocks they govern are unoccupied. If an interlocking signal is red, the automatic before it will be yellow. Here the local track is lined across to the express track, and the routes in grey are locked out. The interlocking signal on Z1 Tk. would be permissive, with its top head green (meaning the next signal is green) and bottom head yellow—the route portion—showing diverging. The Z3 homeball would be an absolute stop (red/red). The interlocking machine prevents the Z3 interlocking signal from going permissive even though the next automatic is green.

Signaling

without direct permission from Command Center. Trains keying-by must be absolutely certain of their surroundings and the occupancy of the block ahead. Even if the track ahead of a red automatic is seen to be clear, permission must be obtained in order to key-by it.

TIMING SIGNALS

If a train must be speed restricted on a downgrade or ahead of a curve, the time it takes to safely negotiate that section of track is calculated and applied to the signal(s) ahead of it by what are known as timing signals or grade time signals.

A train approaching a timed section will first encounter a fixed entry sign, typically a GT, D GT, or T as shown on page 112, by which point the train must be traveling no faster than the indicated maximum speed. The following signal, if it's a *one-shot*, will display a red-over-lunar white aspect and will trip the train if it's too fast; otherwise it will clear if the track ahead is vacant. One-shot means the train will have one chance to get the speed right, or else risk being tripped.

In the case of a *two-shot*, the first signal it will face after the entrance to the timed zone will be a yellow-over-S (or D) or yellow-over-numeric ('20') indicating the maximum allowable speed in MPH. This signal will *not* trip a train that's overspeed, but the next one, which will be red, will. Multiple successive double-shot timers are common and allow for different speeds at each one. Like the one-shot, the final signal in the two-shot sequence will clear if the block ahead is vacant and the timers have been satisfied. A yellow-over-D signal approach at the allowable speed, expecting a diverging route at the end of the block.

With the latest emphasis on safely speeding up the system, a new pilot program for countdown timer aspects at select locations was implemented that will count down the time left on an approaching grade timer. Once it reaches zero, then the stop arm will drop and the signal will clear. As a result, approaching train operators will know when a timer will clear rather than pre-emptively slowing down or stopping to ensure the train doesn't get tripped.

SPECIAL-PURPOSE SIGNALS

As mentioned earlier, a double red signal means stop and stay. If a double red also has a third, yellow aspect on the bottom, it becomes a ***call-on*** signal. Once a call-on is displayed, a train operator may press a lever near the signal that will cause the trip arm to lower and permit the train to pass the signal. This is similar to keying-by an automatic signal except that permission from command center isn't needed since the train is operating on a valid signal indication. Extreme caution must be used in this situation; the train operator must be able to stop within half the range of vision, be on the lookout for the track ahead being occupied or for a broken rail, or any other obstruction within the block. There are also some automatic signal key-bys allowed as well.

Three yellow aspects denotes a yard indication signal, which is used in place of a call-on to permit a slow speed movement past the signal without the need for stopping the train. This will frequently govern multiple diverging routes on one signal head, and is often used to denote that a route is set from the main line into a yard. On encountering three yellows a train may "*proceed with caution, prepared to stop within half the range of vision expecting to find track occupied.*"

Signaling

Gap Filler signals are unique to three IRT stations: the disused Old South Ferry loop, Union Square, and the Times Square Shuttle—the latter to disappear with the upcoming Shuttle rebuild. When illuminated, they indicate that moveable platforms (gap-fillers) are extended, which allow passengers to walk safely over the gap formed between a train's side doors and curved platform faces. When this signal is extinguished it advises the train operator that the platforms have retracted and it's safe to proceed.

Wheel detectors are essentially a refinement of the grade timing signals described earlier. If you recall, grade-timed signals calculate the time needed to run through an area at a prescribed speed. Wheel detectors actually determine the speed of the train's wheels and will trip the train if it's too fast. In a WD section there is a lunar signal with a WD plate showing the maximum allowable speed. The lunar light has three possible indications. Off means the detector is not activated and a train may safely move through the area at the maximum allowable speed. On means the detector is active and the operator must approach at or below the restricted speed for the entire length of the controlled block. Flashing indicates the train is too fast and in imminent risk of being tripped.

CBTC signaling is being rolled out throughout the system, and a flashing green signal indication advises train operators that their train is operating automatically under Communications Based Train Control. Under traditional fixed-block signaling technology, train spacing is pre-determined by the length of the fixed block and its wayside signals. Again referring to the drawing on page *xiv*, you will see how trains have two blocks of protection behind them. Maximum speeds are determined, and under normal conditions, everything moves as it should. But suppose the train on Z1 Track is moving slowly due to delays ahead. The length of the fixed blocks (including the protection blocks) will hold following trains back at a much greater distance than is required for safe movement. This in turn restricts the line's capacity and creates even more delays.

Now imagine if block lengths weren't determined by the position of traditional wayside signals with stop arms. A train following the one shown would normally get a yellow at Z1-842 and get stuck in the tunnel at 830 waiting for the train ahead to clear. This is where CBTC's advantages shine.

Instead of fixed location signals and train stops there are transponders—RFID-based waypoints at fixed locations along the length of a route, and these provide precise location information to hardware mounted in a train car as it passes each one. Controllers in each train then send this position information, speed, and identification to a wayside zone controller, which in turn is connected by a fiber optic network to other zone controllers, relay rooms, and ultimately to the Rail Control Center. The wayside zone controllers also broadcast that information to other trains. The speed and position of a train determines the needed safety buffer around it; how close can a following train get to it, and how close it can get to a preceding train. In the above example, a following train could safely move closer to the train shown in fixed block 814.

Of course, there is no need for fixed block signals in CBTC, and they otherwise wouldn't be present if it wasn't for the need for non-equipped trains to operate in CBTC territory (they are restricted to 25 MPH). Broadcasts from the train contain real-time positive train identification to the Rail Control Center, so it's a simple matter to crunch the data and send it to things like smartphone apps and countdown clocks in stations. Where routes diverge, positive train identification and automatic control of interlocking appliances also speeds up traffic. This is similar to the system of Automatic Train Supervision (ATS) currently in use on the mainline IRT lines, but goes far beyond, where trains operating under CBTC authority could be fully automated. If it weren't for labor and safety requirements that are necessary in New York, CBTC trains could run without operators or conductors.

In many locations within the NYC transit system where fixed block signaling is still in use, track is signaled in one direction only. CBTC track is not directionally dependent, and theoretically, trains could run in either direction on any track. And because each train knows the position and speed of every other train, there would still be a safety buffer surrounding each train. While that is not a planned use at this time, tracks upgraded for CBTC operation are conventionally signaled in both directions. And while it would be advantageous and cost effective to do away with the fixed block system entirely, work trains and older equipment require the legacy equipment to stay in place—at least for now. One more added benefit is that without the 1930s era electro-mechanical relays, maintenance becomes somewhat trivial since there's very little that can fail—and what there is can be fixed quickly and easily.

CBTC HISTORY

Conventional block signaling has been around for well over a century, and the technology is both proven and reliable. It was absolutely state-of-the-art when the subway opened in 1904 and has generally performed well ever since. And while the original IRT and BRT/BMT signals were upgraded over the years, the relatively-new IND signals that were installed in the early 1930s are still mostly in operation on those routes over 85 years later. The equipment was robust, the cabling and relays reliable, and the train operators were well versed in the technology. Trains accelerated more quickly, speed limits were generally higher, and despite a lack of money to upgrade or even repair the system, it mostly worked well. But as time progressed even that robust IND system started to have increasingly more breakdowns, and accidents become more frequent, many as a result of keying-by signals.

But any system is only as strong as its weakest link, and a very weak link came to the forefront on August 28, 1991 at the IRT Union Square station. A speeding express train, lined for a diverging route and operated by a motorman who fell asleep at the controls after a night of heavy drinking, got tripped at a red signal. But his 10-car train was going so fast that the trip arms weren't enough; 50 MPH worth of momentum carried it forward through the crossover and into the tunnel support columns, killing five and injuring

A fascinating in-depth read on the subject of signaling:
The Atlantic magazine, Nov. 2015: ***https://www.theatlantic.com/technology/archive/2015/11/why-dont-we-know-where-all-the-trains-are/415152/***

The full MTA Capital Plan for 2020–2024 can be found at:
https://tinyurl.com/yxdx9oxn (shortened link from the MTA's Website).

CBTC

roughly 200 passengers. And although that operator served ten years in prison, minor and major incidents continued, many as a result of rule violations. Combined with trippers that couldn't stop a train safely before colliding with the train in front of it, the NYCTA decided the only way to get a handle on this was to decrease speed limits, reduce acceleration, require stopping before switching tracks, and similar policies. And while this did improve safety, it did so at the expense of service and customer satisfaction.

As ridership continued to grow in the 1990s, especially after the introduction of the free-transfer MetroCard in 1997, NYC Transit began to look at new ways of getting more out of what was nearly one hundred year old infrastructure. Fixed-block signaling was correctly identified as a hard limit to increasing train throughput and new designs were sought that would eliminate this bottleneck, while at the same time setting an open standard that would not lock the MTA into vendor-specific technology. At the time, there simply wasn't an available off-the-shelf solution that would work well with the existing system, and that would allow it to stay running 24/7 while it was implemented.

It was initially believed that the capital expenditures necessary to re-signal hundreds of miles of track would necessitate this be done over several decades. It was important, therefore, that NYC Transit select hardware and software that would allow cars with one manufacturer's onboard equipment to work seamlessly with cars from another's—and for everything to work with the wayside infrastructure. Line 14 of the Paris Metro was selected as the model on which the NYC system would be based. That fully-automated, driverless line opened in 1998 using similar technology to what ultimately ended up in New York. The Canarsie L Line was chosen as the first to be converted to this new technology since the line is self-contained and its track system wasn't overly complex. CBTC carborne equipment was fitted to 212 R143 cars, and after some initial growing pains it proved to be a success. New R160 cars have CBTC hardware installed.

With the success of the Canarsie Line, the next line to be converted was the system's only other standalone line, the 7. Siemens and Thales Consortium installed that system, and it went into service during 2019. Siemens Trainguard® MT, the CBTC system chosen by the MTA, is a scalable technology that can operate in varying levels of automation from semi-automatic, which NYC uses, to driverless and unattended. The Eighth Ave. project will be the first to use axle counters instead of track circuits.

Queens Blvd., from west of Union Turnpike to 50th St./Eighth Avenue and 47–50th Sts./Sixth Avenue is now being converted. After Queens Blvd., Eighth Ave. between 59th St. and High St., and the F between Church Ave. and W. 8th St. will follow. Six more lines have been targeted for conversion:

- Queens Blvd. East E F, from Union Turnpike to both 179th St. and Parsons/Archer
- Crosstown G from Court Square to Hoyt-Schermerhorn
- Fulton St. A C from Jay Street to Euclid Avenue
- Astoria N W from Ditmars Blvd. to 57th St/7th Avenue
- 63rd Street F from Queensbridge to 57th St./6th Avenue
- Lexington Avenue 4 5 6 from 149th St. to Nevins St.

Ultra Wideband

ULTRA WIDEBAND

With these projects well underway or in planning it was time to take another look at ways of improving this rapidly maturing technology. As mentioned earlier, zone controllers are connected via fiber optic links. There are two big problems with this. First, when installing CBTC hardware those fiber lines need to be physically mounted along the right of way. Doing that means frequent line closures, especially nights and weekends. Second, the data links are fairly slow speed; the standard was 10/100 Mbps, which was 1980s technology.

In 2018, the MTA conducted what it called the Genius Transit Challenge as a way to reward new designs in technology that could improve subway signaling, reliability, and safety. One of the winners of this challenge, Robert James, came up with a way of interlinking the wayside controllers using Ultra Wideband radio transmissions, rather than fiber optic cables. UWB works by using low power pulses that span several GHz using Direct Sequence Digital Spread Spectrum technology, enabling secure and very high speed data throughput.

UWB is not a signaling system in itself, but rather a way to speed up the CBTC data communication. In this case, the ultra-precise location and speed information collected by the UWB network will be relayed to the CBTC system, which in turn allows tighter spacing and more frequent service. UWB transmitters would be installed on each car, and wayside units would be located roughly every 50 to 100 metres along the right of way. The small UWB transmitters draw only two Watts of power, and are mounted in existing wayside tunnel lighting fixtures, meaning they can be added easily to new lighting projects or powered trackside features. Exterior units can be powered by solar cells, and portable devices would be battery powered.

The technology is neither new, nor specific to the rail industry thus deployment costs will be minimal. In fact, UWB technology is even starting to migrate into consumer electronics. Although it has a shorter range than WiFi or Bluetooth, it's extremely location aware and can pinpoint objects within as little as one inch resolution. As a result, UWB has the ability to improve track worker safety significantly. By equipping crews and work zone entry points with battery powered UWB devices, the workers and train crews will know when a train is approaching an active work zone. Another benefit (?) of UWB would be that it would allow cell phone use in tunnels, and could even tell if a smartphone or tablet—or somebody holding one—falls onto the trackbed.

UWB was tested for several months in 2019, and the results are currently being evaluated by the MTA. San Diego-based Piper Networks tested their technology on the Flushing Line, and Massachusetts-based Humatics tested theirs on the Canarsie Line. The system went through earlier proof-of-concept testing on the Culver CBTC test track.

The U.S. Federal Transit Administration has published a 195 page in-depth look at CBTC signaling that goes into tremendous technical detail. ***transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_REPORT_No._0045.pdf***.

An in-depth examination of UWB technology published in Metro Magazine on Nov. 16, 2016 by Robert James: ***https://tinyurl.com/yyyj7ov2***

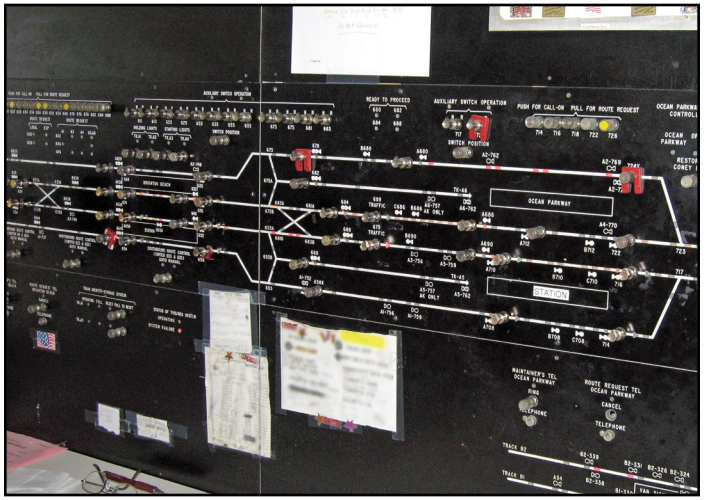
UWB use in consumer electronics: ***businessinsider.com/uwb-explained-samsung-galaxy-note-ultra-apple-iphone-features-airdrop-2020-8***

Control

Until CBTC and virtual blocks are implemented system-wide, master towers and smaller-scale local, satellite, auxiliary towers, and dispatchers' consoles will continue to regulate train movements across the system.

Towers and master towers are located at strategic places throughout the system, and each facility "sees" a portion of track. As described earlier, operators in these towers can set up routes for approaching trains, and follow their progress on a large display or model board, where each occupied block is represented by a light. As these lights progress across a board, so go the trains.

Jamaica Yard interlocking machine. Switches are controlled by the upper levers (normal to the left, reversed to the right), and signals by the lower controls. Red signal levers can be swung left or right of center, which would correspond to signals X-L60 or X-R60 being permissive in the case of lever 60. Facing straight down, both signals would be red. Black signal levers are either permissive (right) or normal (red). Here switches 23, 29 & 31 are reversed, all signals are at danger (red).



NX/UR-style model board in Coney Island Tower. Here we see the layup and relay interlocking between Ocean Parkway and Brighton Beach Blvd. Operators select routes by pressing the buttons along a track for the route entry and exit points (i.e. where the route starts and where it ends). The route is automatically selected by the apparatus—switches are lined, signal aspects illuminated and conflicting routes are set to danger (red).

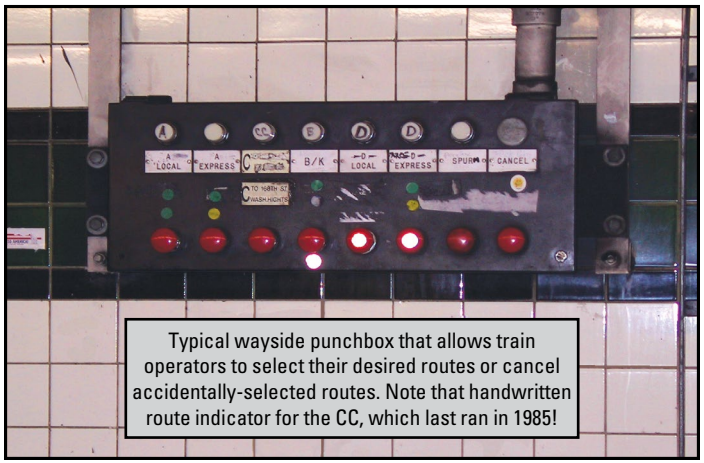
Three types of interlocking control are in use today. The oldest, still found primarily on the IND, are interlocking machines such as the "Model 14" machine pictured at left. These machines have levers that are physically interlocked with one another (hence the name) to prevent an unsafe lineup from being set. The machine is set up so that when a lever is in position allowing movement across one route, other levers on the machine are locked out and can't be lined to allow a dangerous conflicting movement.

A second form of control is the NX/UR style, such as that pictured above. In this style of machine the operator just sets

the entry and exit points, and the machine and its controlled apparatus automatically lines the switches, lights the signals, and blocks conflicting routes. The third system is computer-controlled, but functions the same as the aforementioned NX/UR entry-exit method.

FLEETING AND AUTOMATIC OPERATION

Tower Operators also have the option of putting certain interlockings in the *fleet* position, meaning that until a route is cancelled, all approaching trains are routed through on certain pre-assigned routes. This mode can also be used when a remote tower is shut down. Interlockings can also be set up in automatic mode, whereby whatever a train operator "punches" into the wayside route selection boxes—correct or incorrect—is the lineup he or she will receive.



Typical wayside punchbox that allows train operators to select their desired routes or cancel accidentally-selected routes. Note that handwritten route indicator for the CC, which last ran in 1985!

COMMAND AND CONTROL

So far we have discussed the physical method by which signals and switches are set, but not the reasons behind who sets what when and where. The Rail Control Center in Manhattan can see the IRT East- and West-Side Lines plus the Canarsie and Flushing Lines, and will eventually control the entire system once CBTC is in place everywhere. Once fully implemented, it will have direct control of everything. Until then, local tower and master tower operators must make the actual control inputs to route trains as required.

Typically, trains are in contact with "control" (the Rail Control Center) by radio. Assuming everything is running normally, train operators will punch in their route requests and tower operators will give them their lineups based on their punches, or they will be entered automatically.

Now let's say a train breaks down. The train operator will contact the RCC by radio and advise them of the problem, where the train is located and what actions are being taken. Command will then instruct the appropriate tower accordingly. In the case of a brief delay that action might be as simple as to turn on holding lights to keep following trains from leaving a station only to get stuck between stations. If it's obvious the train is going nowhere fast and the track ahead is blocked, local or master tower operators who are listening to the radio traffic might anticipate the command center's next moves and begin rerouting by either the local or express or short-turning trains. If the delay begins to affect the entire line, the tower may be told to send trains from one line over another. In some cases, command may call up a terminal and have them drop *x* number of trains.

Towers

Experienced tower operators will sometimes see what is happening by reading the board or listening to the radio and make the decision to reroute locally without being told to do so by command. More often than not this is accepted form.

In most cases, all discussions of these measures can be heard over the dispatch radio. With a bit of practice, it's easy to understand these moves and potentially avoid delays by looking for connections on nearby routes that are not affected by whatever problem is occurring.

TOWERS AND MASTERS

In ages past, towers were local to the interlockings they controlled and many were needed to keep any given line running. As control methods improved, these local towers were closed and amalgamated into larger master towers that control multiple locations. The Rail Control Center now directly controls the Lexington and West-Side IRT Lines, plus the two CBTC-equipped lines, but IRT master towers are still staffed and can provide control if needed. On the B-Division, master towers are common, and most of the individual local towers have been dismantled. Smaller IND interlockings are still equipped with local towers that can be staffed if needed, but these are normally left in automatic mode.

In addition to local and master towers there are also satellite and auxiliary towers, which are in a sense a third level down from a master and are now becoming increasingly rare. Satellite towers are used to reduce the burden of the main tower during high traffic periods (this was in the days before master towers). Take for instance the Broadway BMT. Normally the whole stretch from 60th Street/Lexington Avenue to Whitehall Street is controlled by City Hall Master. Auxiliary control panels are located at Whitehall Street and at 57th Street. These are mini lever type machines that are used for locally controlling train movements. When the auxiliary control panel is not in use, the interlocking is controlled remotely from the main control panel in the master tower.

For example, during rush hours a tower operator could be assigned to Whitehall Street to help turn trains on the middle track and to monitor traffic through the Montague Tunnel. This frees up City Hall Master to concentrate on bridge traffic and trains further up the line. Any moves at Whitehall Street would be made locally, and likewise at 57th Street if it was also in operation. When one or both these locations is unattended, control reverts to City Hall Master, who would then have to make all the moves on Broadway.

Satellite towers are different from the local towers that controlled independent interlockings. If these locations were unattended, no one had control of the interlocking (it would have been left fleeted for normal traffic). A tower operator would have to be sent to the location to make any required moves (i.e. turning work trains or bad-order trains, etc).

Something interesting happened as the result of tower consolidation. Towers at smaller interlockings were usually fairly small with only a few levers needed to control signals and switches. This would typically result in single-digit or low two-digit lever and signal numbers (such as X-2). As these small towers were eliminated, higher-order numbers began to appear (X-200, X-640, etc). As the Rail Control Center begins to see more and more lines in real-time there would still be many instances of duplicated signal numbers and

Towers

hence some confusion could exist. One solution chosen was to include the line letter in the signal's ID. A typical West End homeball would now be X-D224, a Canarsie signal might be X-Q584, and on the Concourse Line, X-C416 is a typical example. However, this nomenclature was causing confusion, and as a result, as new signals come into service they will go back to the X-200 format instead of X-C200, etc. On Queens Blvd, the replacement signals at Continental and Roosevelt are now four digits: X-1234, etc.

With the advent of CBTC control, Automatic Train Supervision and direct control by the RCC, active but unstaffed maintainers' panels have replaced local and even master towers at many interlockings. Only two master towers associated with the Flushing Line are still in regular operation on the A-Division, with everything else controlled by the Rail Control Center.

Lever style electro-mechanical interlocking machine at 30th St. on the Eighth Avenue Line. Similar to the US&S Model 14 board, here the top levers move the switches and the bottom levers control signals. The red cans over a lever are lock-outs.

A-Division—Controlled directly by the Rail Control Center (RCC). Master towers can also see and control their former territories if needed.
B1-Division—Exclusively controlled by master towers.
B2-Division—Mixture of local and master towers.
L 7 lines—CBTC control from RCC.
***While considered a BMT Tower due to its location (and use of the B1 radio frequency), QBP also control sections of IND routes such as the Queens Plaza complex and 63rd St. Line.**

Div	Master Tower	Div	Master Tower
A	240th St.	B1	Queensboro Plaza *
A	Unionport Yard	B1	City Hall
A	Westchester Yard	B1	DeKalb Avenue
A	149th St. (Mott Ave.)	B1	38th St. (Murphy)
A	Times Square	B1	Stillwell Avenue
A	Grand Central	B1	Coney Island Yard
A	Nevins St.	B1	Essex St.
A	Utica Avenue	B1	East New York
A	111th St.	B2	207th St.
A	Corona Yard	B2	59th St.
A	34th St. relay room	B2	Liberty Ave. Junction
		B2	96th St. (Second Avenue)
		B2	34th St. (Sixth Ave.)
		B2	Bedford Park
		B2	Church Avenue
		B2	Forest Hills (Continental)
		B2	Rockaway Park
		B2	Parsons Boulevard
		B2	World Trade Center

Towers

Line	Interlocking	Associated with:
Flushing	Queensboro Plaza	111 St.
Flushing	33 St.	111 St.
Flushing	74 St.	111 St.
Flushing	111 St.	111 St.
Flushing	Willets Point	111 St.
Flushing	Main Street	111 St.
Lenox/WPR	149 St.	149 St. (Mott Ave.)
Lenox/WPR	Jackson Ave.	149 St. (Mott Ave.)
Jerome Ave.	138 St.	149 St. (Mott Ave.)
Jerome Ave.	149 St.	149 St. (Mott Ave.)
Jerome Ave.	167 St.	149 St. (Mott Ave.)
WPR	239 St. Yard	239 St. Yard
Broadway	137 St.	240 St.
Broadway	168 St.	240 St.
Broadway	Dyckman St.	240 St.
Broadway	211 St.	240 St.
Broadway	215 St.	240 St.
Broadway	240 St. Yd/242 Stn.	240 St.
Flushing	34 St. Hudson Yards	34 St.
Flushing	Times Square	34 St.
Flushing	First Avenue	34 St.
Flushing	Hunters Point	34 St.
Flushing	Corona Yard RR. A	Corona Yard
Flushing	Corona Yard RR. B	Corona Yard
Lexington Ave.	Grand Central	Grand Central
Lexington Ave.	59 St.	Grand Central
Lexington Ave.	86 St.	Grand Central
Lexington Ave.	125 St.	Grand Central
Lexington Ave.	Brooklyn Bridge	Grand Central
Lexington Ave.	14 St.	Grand Central
Lenox Ave.	110 St.	148 St. – Lenox Ave.
Lenox Ave.	142 St. Junction	148 St. – Lenox Ave.
Lenox Ave.	Lenox Avenue Yard	148 St. – Lenox Ave.
Eastern Pkwy	Junius St.	Livonia Yard
Eastern Pkwy	New Lots Avenue	Livonia Yard
Eastern Pkwy	Livonia Yard	Livonia Yard
Jerome Ave.	Burnside Avenue	Mosholu (Jerome)
Jerome Ave.	Kingsbridge	Mosholu (Jerome)
Jerome Ave.	Jerome Yard	Mosholu (Jerome)
Jerome Ave.	Woodlawn	Mosholu (Jerome)
Eastern Pkwy	Borough Hall	Nevins St.
Eastern Pkwy	Nevins St.	Nevins St.
Clark St.	Wall St.	Nevins St.
Lexington Ave.	Bowling Green	Nevins St.
Broadway	South Ferry Loop switches	Nevins St.
Broadway	72 St.	Times Square
Broadway	96 St.	Times Sq. or 96 St.
7th Ave.	Times Square	Times Square
7th Ave.	14 St.	Times Square
7th Ave.	Chambers St.	Times Square
7th Ave.	South Ferry Terminal	Times Square
Broadway	103 St.	Times Sq. or 96 St.
WPR	E. 180 St. South	Unionport
WPR	E. 180 St. and Yard	Unionport
WPR	Bronx Park East	Unionport
WPR	239 St. yard leads and 241 St.	Unionport
WPR	Unionport Yard	Unionport
Dyre Ave.	Morris Park	Unionport
Dyre Ave.	Dyre Avenue	Unionport
Nostrand Ave.	President St.	Utica Avenue
Nostrand Ave.	Church St.	Utica Avenue
Nostrand Ave.	Flatbush Avenue	Utica Avenue
Eastern Pkwy	Brooklyn Museum	Utica Avenue
Eastern Pkwy	Nostrand Avenue	Utica Avenue
Eastern Pkwy	Utica Avenue	Utica Avenue
Pelham	Third Avenue	Westchester Yard
Pelham	Hunts Point Avenue	Westchester Yard
Pelham	E. 177 St.	Westchester Yard
Pelham	Westchester Sq.	Westchester Yard
Pelham	Pelham Bay Park	Westchester Yard
Pelham	Westchester Yard	Westchester Yard

Towers

Division	Line	Interlocking	Control
IND (B2)	Eighth Ave.	168 St.	207 St. Yard
IND (B2)	Eighth Ave.	174 St. Yard	207 St. Yard
IND (B2)	Eighth Ave.	181 St.	207 St. Yard
IND (B2)	Eighth Ave.	200 St.	207 St. Yard
IND (B2)	Eighth Ave.	207 St. terminal	207 St. Yard
IND (B2)	Eighth Ave.	207 Yard Towers A & B	207 St. Yard
BMT (B1)	West End	Fifth Avenue (SBK)	38 St. (Murphy)
BMT (B1)	West End	Ninth Avenue	38 St. (Murphy)
BMT (B1)	West End	62 St.	38 St. (Murphy)
BMT (B1)	Sea Beach	Sixth Avenue (8th Ave.)	38 St. (Murphy)
BMT (B1)	Fourth Ave.	36 St.	38 St. (Murphy)
BMT (B1)	Fourth Ave.	38 St. Yard	38 St. (Murphy)
BMT (B1)	Fourth Ave.	59 St.	38 St. (Murphy)
BMT (B1)	Fourth Ave.	86 St.	38 St. (Murphy)
BMT (B1)	Fourth Ave.	95 St.	38 St. (Murphy)
IND (B2)	Eighth Ave.	59 St.	59 St.
IND (B2)	Eighth Ave.	72 St.	59 St.
IND (B2)	Eighth Ave.	81 St.	59 St.
IND (B2)	Eighth Ave.	125 St.	59 St.
IND (B2)	Eighth Ave.	135 St.	59 St.
IND (B2)	Eighth Ave.	145 St.	59 St.
IND (B2)	Second Ave.	72 St.	96 St.
IND (B2)	Second Ave.	96 St.	96 St.
IND (B2)	Sixth Ave.	34 St.	34 St. Master ‡
IND (B2)	6th & 8th Aves.	West 4th St.	34 St. Master ‡
IND (B2)	Concourse	161 St.	Bedford Park
IND (B2)	Concourse	167 St.	Bedford Park
IND (B2)	Concourse	Tremont Ave.	Bedford Park
IND (B2)	Concourse	Bedford Park Blvd.	Bedford Park
IND (B2)	Concourse	205 St.	Bedford Park

Division	Line	Interlocking	Control
IND (B2)	Culver	Ditmas Avenue	Church Ave.
IND (B2)	Culver	Kings Highway	Church Ave.
IND (B2)	Prospect Pk.	Church Avenue & Yard	Church Ave.
IND (B2)	Prospect Pk.	Fourth Avenue	Church Ave.
BMT (B1)	Broadway	57 St.	City Hall
BMT (B1)	Broadway	34 St.	City Hall
BMT (B1)	Broadway	Prince St.	City Hall
BMT (B1)	Broadway	City Hall	City Hall
BMT (B1)	Broadway	Whitehall St.	City Hall
BMT (B1)	Astoria	59 St./Lexington Ave.	City Hall
BMT (B1)	Brighton	Kings Highway	CIY Master
BMT (B1)	Brighton	Brighton Beach	CIY Master
BMT (B1)	Brighton	Ocean Parkway	CIY Master
BMT (B1)	West End	Bay Parkway	CIY Master
BMT (B1)	West End	Bay 50th St.	CIY Master
BMT (B1)	Sea Beach	Kings Highway	CIY Master
BMT (B1)	Sea Beach	Coney Island Yard	CIY Yard
BMT (B1)	Sea Beach	Stillwell Ave & Yard	CIY Yard
IND (B2)	Concourse	Concourse Yard	Concourse Yd.
IND (B2)	Queens Blvd	71–Continental Ave.	Continental
IND (B2)	Queens Blvd	Roosevelt Avenue	Continental/RR
IND (B2)	Queens Blvd	Union Turnpike	Continental/RR
IND (B2)	Culver	Culver Yard	Culver Yd./CIY
BMT (B1)	Broadway	Lawrence St.	DeKalb Ave.
BMT (B1)	Brighton	DeKalb Avenue	DeKalb Ave.
BMT (B1)	Brighton	Prospect Park	DeKalb Ave.
BMT (B1)	Fourth Ave.	Pacific St.	DeKalb Ave.
BMT (B1)	Franklin Shuttle	Park Place	DeKalb Ave.
BMT (B1)	Jamaica	Marcy Avenue	East NY
BMT (B1)	Jamaica	Myrtle Avenue	East NY

Towers

Division	Line	Interlocking	Control
BMT (B1)	Jamaica	Eastern Parkway	East NY
BMT (B1)	Jamaica	Broadway Junction	East NY
BMT (B1)	Jamaica	ENY Yard leads	East NY
BMT (B1)	Jamaica	Crescent St.	East NY
BMT (B1)	Jamaica	111 St.	East NY
BMT (B1)	Jamaica	121 St.	East NY
BMT (B1)	Jamaica	Parsons/Archer L/L J Z	East NY
BMT (B1)	Myrtle Ave.	Metropolitan Avenue	East NY
BMT (B1)	Canarsie	Linden Yd Connection	East NY
IND (B2)	Houston	Delancey-Essex	Essex St.
IND (B2)	Houston	Second Avenue	Essex St.
IND (B2)	Houston	B'way-Lafayette	Essex St.
BMT (B1)	Jamaica	Broad St.	Essex St.
BMT (B1)	Jamaica	Chambers St.	Essex St.
BMT (B1)	Jamaica	Canal St.	Essex St.
BMT (B1)	Jamaica	Essex St.	Essex St.
IND (B2)	Pspect Pk.	Bergen St.	Jay St.
IND (B2)	Pspect Pk.	Jay St. MetroTech	Jay St.
IND (B2)	Rockaway	Howard Beach	Liberty Jct.
IND (B2)	Rockaway	Broad Channel	Liberty Jct.
IND (B2)	Liberty Ave.	Liberty Ave. Junction	Liberty Jct.
IND (B2)	Liberty Ave.	Lefferts Avenue	Liberty Jct.
IND (B2)	Queens Blvd	Van Wyck Blvd.	Parsons Blvd
IND (B2)	Queens Blvd	Parsons Blvd F	Parsons Blvd
IND (B2)	Archer Ave.	Jamaica-Van Wyck	Parsons Blvd
IND (B2)	Archer Ave.	Parsons/Archer U/L E	Parsons Blvd
IND (B2)	Crosstown	Court Square	QBP
IND (B2)	63 St.	Lexington Avenue/63 St.	QBP
IND (B2)	63 St.	FDR Drive (Roosevelt Is.)	QBP
IND (B2)	63 St.	21 St.	QBP & Local

Division	Line	Interlocking	Control
BMT (B1)	Astoria	11 St. & QBP station	QBP
BMT (B1)	Astoria	Beebe Avenue	QBP
BMT (B1)	Astoria	Ditmars Blvd.	QBP
IND (B2)	Queens Blvd	36 St.	QBP
IND (B2)	Queens Blvd	Lexington Avenue/53 St.	QBP & 5 Ave. RR
IND (B2)	Queens Blvd	Fifth Avenue/53 St.	QBP & Local RR
IND (B2)	Queens Blvd	Queens Plaza	QBP & Local RR
BMT (B1)	Canarsie	Rockaway Parkway	RCC + 8 Ave. †
BMT (B1)	Canarsie	Canarsie Yard	RCC + 8 Ave. †
BMT (B1)	Canarsie	Broadway Junction	RCC + 8 Ave. †
BMT (B1)	Canarsie	Atlantic Avenue	RCC + 8 Ave. †
BMT (B1)	Canarsie	Livonia Avenue	RCC + 8 Ave. †
BMT (B1)	Canarsie	Eighth Avenue	RCC + 8 Ave. †
BMT (B1)	Canarsie	Third Avenue	RCC + 8 Ave. †
BMT (B1)	Canarsie	Bedford Avenue	RCC + 8 Ave. †
BMT (B1)	Canarsie	Myrtle Avenue	RCC + 8 Ave. †
IND (B2)	Rockaway	Hammels Wye	Rockaway Park
IND (B2)	Rockaway	Rockaway Park	Rockaway Park
IND (B2)	Eighth Ave.	WTC	WTC
IND (B2)	Eighth Ave.	Chambers St.	WTC
IND (B2)	Eighth Ave.	Canal St.	WTC
IND (B2)	Eighth Ave.	42 St. (North)	Local ‡
IND (B2)	Eighth Ave.	30 St.	Local ‡
IND (B2)	Sixth Ave.	50 St. (47–50 St.)	Local ‡
IND (B2)	Queens Blvd	Jamaica Yard	Local
IND (B2)	Crosstown	Nostrand Avenue	Local
IND (B2)	Crosstown	Nassau Ave.	Local
IND (B2)	Rockaway	Mott Avenue	Local
IND (B2)	Queens Blvd	169–179 St.	Local 179 St.
IND (B2)	Fulton St.	Pitkin Yard	Local

Countdown Clocks

Division	Line	Interlocking	Control
IND (B2)	Fulton St.	Euclid Avenue	Local
IND (B2)	Fulton St.	Broadway Jct.	Local
IND (B2)	Fulton St.	Utica Avenue	Local
IND (B2)	Fulton St.	Lafayette Avenue	Local
IND (B2)	Fulton St.	Hoyt-Schermerhorn	Local
IND (B2)	Fulton St.	Court St. (Transit Museum)	Local
IND (B2)	Essex	York St.	Local

Abbreviations used in these tables:

WPR	*White Plains Road*	*QBP*	*Queensboro Plaza*
WTC	*World Trade Center*	*RCC*	*Rail Control Center*
RR	*Relay Room*	*U/L & L/L*	*Upper/Lower Level*

† Canarsie Line is operating under CBTC. The Rail Control Center has jurisdiction over the line and makes all control inputs under normal circumstances. Panels at 8th Avenue, and Rockaway Parkway can see all interlockings. Maintainers' panels in relay rooms at Eighth Avenue, Third Avenue, Bedford Avenue, and Myrtle Avenue can locally control those four interlockings, and East NY Master Tower can see Broadway Junction, Atlantic Avenue and Livonia Avenue.

‡ The new 34th St. Master Tower controls the Sixth Avenue line from south of 42nd St. to south of West 4th. 47-50th St. will be added. 42nd and 30th St Eighth Ave. interlockings are expected to be added to 59th St. Master Tower as part of CBTC resignaling.

Church Avenue Master Tower now controls Kings Highway on the Culver Line following signal modernization and the closure of the local tower in Sept. 2020.

BIBLIOGRAPHY

NYCTA Form 880, revised, November, 1967
The Subway, Stan Fischler © 1997, H&M Productions
Under the Sidewalks of New York, second revised edition, Brian J. Cudahy ©1995, Fordham University Press.
722 Miles, Clifton Hood, © Simon & Schuster, 1993
Tracks of New York, Vol. 3, © Alan Paul Kahn & Jack May, 1974
Official Guide to all DCE Maintenance Shops & Facilities, New York City Transit Div. of Car Equipment, NYCTA
Power section excerpts by Bernard Greenberg, © 1999–2000
Tower section details by Alex LaBianca & "*RideTheCTrain.*"

Countdown clocks are now operating in all stations. These digital message boards display the expected arrival time of the next few trains (and whether they'll be local or express) and can also play audio messages and relay emergency-related bulletins to passengers. Countdown clocks on the A-Division lines relay train position and timing information gleaned from ATS signaling computers located in the Rail Control Center. Where legacy signal technology is in use on the B-Division, a different system was used that has the added bonus of adding free customer WiFi to stations. This technology uses beacon transmitters on the front and rear cars of every B-Division train, and WiFi sensors and at the entry and exit point of every station, which then relay the data to the MTA's computers. Details can be found at:*www.piper.ly/blog/2016/09/07/piper-powers-up-nyc-subway-countdown-clocks/*

IRT-style countdown clock at Longwood Avenue.

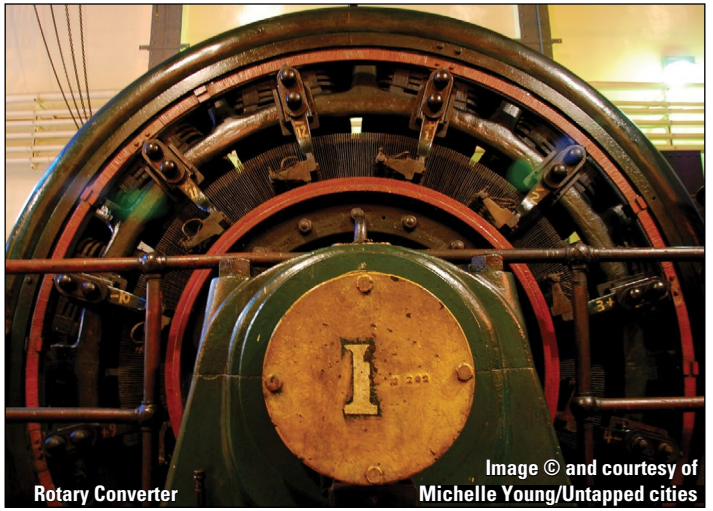
Power

Historically, the IRT and BRT/BMT generated their own power in several coal-fired steam turbine plants around the city.

GENERATION

AC (Alternating Current) is preferable to DC (Direct Current) for generation and distribution because power loss in transmission lines—which translates to fuel and money lost—decreases significantly with higher voltages and until very recently, only AC could be transformed between voltages efficiently. Thus, electric traction power in New York for most of the twentieth century was generated at the three "subway" powerhouses (Kent Avenue, Brooklyn for the BMT, and West 59th St. and East 74th St. for the IRT) and distributed at approximately 11,000VAC/25 Hertz throughout the city via oil-filled cables to several dozen widely-scattered substations near the subway. In these substations, the power would be reduced by transformer to (approximately) 400 volts AC, and then converted to (nominally) 600 volts DC for the third rail. This last step was accomplished with rotary converters.

These converter substations were mysterious-looking buildings, frequently adorned with elaborate architectural frills designed to help them fit into neighborhoods, but vexingly bereft of windows, floors, or other signs of human habitation. If you could stand on your toes and look into the front grating-door (on hot summer days when it might be open) you would see what looked for all the world like a power station, with railed galleries, overhead hanging travelling cranes, huge Titanic-era "mad scientist lab" bare-metal *touch-this-and-you-die* knife switches, meters, and lamp-clusters on vertical black panelboards ringing a vast, dimly-lit open space enclosing huge rotating "generators" (but oddly no turbines nor boilers to turn them). These spinning contraptions were not generators at all but rotary converters, and were used to convert AC to DC.



Rotary Converter

Image © and courtesy of Michelle Young/Untapped cities

Being a large, complex, and expensive rotating machine, a rotary converter is worn by use, and is best preserved by not running it at all when it's not needed. Each substation thus required a small staff to start and stop individual converters around rush-hours—a nontrivial operation—as well as to perform regular maintenance to keep those moving parts in good operating condition and otherwise maintain the elaborate array of auxiliary apparatus such as backup batteries, motor-generators to charge them, starting and lubrication equipment, etc. All of this was quite costly to operate.

Power

Rotary converters were phased out in 1999 and the entire system is now running with modern solid-state rectifiers at each of its 215 substations. Note that the original city-run IND did not elect to generate its own power. From the beginning it purchased electricity from ConEd, which delivered high-voltage AC at 60 cycles (by then—as it is now—the prevailing frequency) to the substations. Today, all the system's power is purchased from the New York Power Authority and delivered at levels of between 11,000 and 27,000 Volts AC.

3RD-RAIL POWER DISTRIBUTION

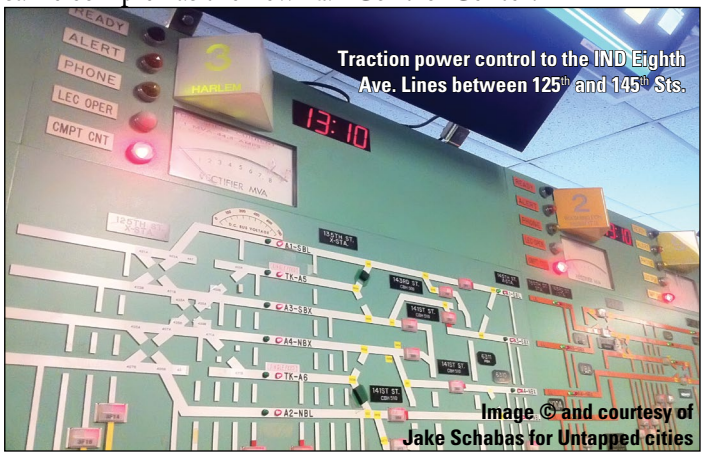
Throughout this history of power generation or acquisition, the DC distribution system has remained largely untouched. From the converter station, propulsion current travels over short distances—a few blocks, at most—to the right-of-way, and into one of about 350 trackside facilities known as a circuit breaker house. The therein-housed circuit breakers are not fuses, but huge switches, remotely controlled from the substation, and are capable of interrupting a DC current of several thousand amperes. This control is necessary for disconnecting the substation from the third rail when needed.

Station lighting and signal power are taken locally from the nearest AC mains supplies. But unlike lighting, the signal system is frequency-sensitive. Until recently, ConEd had maintained a dedicated source of 25 Hz power to feed the IRT and BMT divisions. ConEd finally discontinued this feed, and they have been cutting in frequency converters that take the 60 cycle power off the grid and turn it into 25 Hz to feed back into each signal main section.

AC is used for signals, station and tunnel lights, ventilation and various line equipment, while DC operates trains, water pumps, emergency lighting, and other auxiliary equipment.

POWER CONTROL

Just as track occupancy is controlled by towers and the Rail Control Center, the supply of traction power to the third rail is also regulated. Feeds from different rectifier stations supply power to specific sections of each line and must be monitored carefully. Voltage levels must be within rigid parameters, current draw needs to be monitored and fault conditions need to be observed. Breaks, called ***section gaps***, isolate portions of the system so that a power fault to one section doesn't take the entire network down with it. These and a myriad of other concerns led to the requirement of a full-time power control center. This is located on the west side of Manhattan in the same complex as the new Rail Control Center.



Traction power control to the IND Eighth Ave. Lines between 125th and 145th Sts.

Image © and courtesy of Jake Schabas for Untapped cities

Power

One of the key duties of the power control center is not just maintaining third-rail power, but being able to shut it off as needed since lives are stake. Whether the reason for power-off is construction, a track fire, or a *12-9* (person under a train), removal and re-application of the traction current must be carefully orchestrated.

Typically, these are the steps for a power-off emergency situation: A train operator or other official radios a request to command for power off or someone pulls the handle inside a wayside box (identified by a blue light located beside the track). In the case of a wayside box, it automatically removes power for a brief time to all tracks in the vicinity, but will re-energize them without warning! In the case of a radio request for power-off, the tower operator will stop all movements in the area and then notify the desk superintendent at the Rail Control Center. The desk superintendent will then call the System Operator, relaying the power-off request, and the name and rank of the person requesting it. ONLY the System Operator can remove the current, and he/she will do so by pulling and locking out the appropriate breakers. The System Operator will then notify the desk superintendent that power has been removed, who will then relay that information back to the requester.

During this time, the desk superintendent will likely have to reroute nearby trains (if possible) and hold others. The superintendent must also note if any trains are stuck between stations due to the power-off condition, and if necessary, dispatch emergency personnel to *that* train to rescue or just reassure passengers stuck in the dark that all is well and things will be back to normal soon. Once the emergency situation has been resolved the power can be re-applied, but again, only in a very specific way. In the case just described, ONLY the same person (or person of higher rank) that requested power-off can ask for its reinstatement. He or she will ascertain that all personnel are off the tracks, and will relay that information to an MTA supervisor. That supervisor will in turn call the desk superintendent, who will tell the System Operator that power can be re-applied. The System Operator closes the appropriate breakers and power is restored. The System Operator then informs the desk superintendent that power has been restored and the information works its way back down the chain in the same way it did when power was removed.

MIND THE GAP!

DC Traction power is delivered to train motors by means of spring loaded shoes, or paddles, which slide along the top of the third rail. This rail is positively charged, and current return is accomplished through the steel running rails. An insulated cover board is suspended above the rail for added safety.

Contact rails follow the contour of the tracks and can be situated on either side of the train, since each *bogie*, or *truck*, has a shoe on each side. It is critical, therefore, to understand that **even if only ONE paddle is in contact with the third rail, ALL paddles on the entire train will be energized**!

At crossovers and between substation feeds, it is necessary to break the third rail. Normally this isn't a problem, since long trains traveling quickly enough will either bridge the gap at switches or will coast through larger section gaps with momentum. In older trains, the overhead lights would momentarily go out as individual cars crossed a gap. It was always fun to watch the progress of the train over the gap by

Power

NYC Subway Power Control Center, located in Midtown Manhattan

looking into the cars ahead and behind, and watch the "rolling blackout" move from car to car. But, like almost everything else fun in the subway, modern carborne equipment makes these outages a memory. The gaps, however, are still in the rail network, and it's possible that a short, slow-moving piece of equipment might get stuck between sections. In addition to being terribly embarrassing, the problem of getting stuck in the gap has a somewhat dangerous solution. If all the train's paddles are off the contact rails in a gap, there's obviously no way that it can move ahead under its own power. In cases like this, a special jumper cable is used. In accordance with Rule 2.49, one trained employee connects the jumper cable to a shoe (obviously not one on the leading bogie) and another employee connects the distant end of the cable to the third rail in the intended direction of motion. Once the train is energized in this fashion, and the air has built back up, the operator takes one point of power (i.e. puts the controller in "switching"), and moves the leading shoe of the train back onto the third rail. The controller is then placed in the OFF position, and once the train has stopped the jumper is first removed from the contact rail, and then from the shoe.

CAPACITY

One of the biggest advantages of the new CBTC signaling system is that it will allow more trains to run on a line, but there's downside to this. Electricity. It's not just that more train service will use more power, but rather the existing substation capacity and power cables would be unable to handle the extra load. More substations and circuit breaker houses will need to be built, and under the new Capital Plan six existing substations and 11 CBHs will be upgraded to supply higher current loads, and new low-resistance third rails will replace older contact rail. Cables will be beefed up as well, since more current draw requires heavier cables.

Radio System

RADIO SYSTEM

If you bring a scanner or programmable VHF radio with you, you will be able to monitor train and dispatcher radio transmissions. Are you being rerouted up the express tracks? Is there a sick passenger in the train ahead of you? Why is your train stopped for so long at the station? Hear it here first—but **do not divulge anything you hear** to anybody else—and use an earphone/headphone, too! Not just as a common courtesy, but it's required by MTA regulations to listen to any kind of radio privately so you don't disturb others.

Mainline communications are generally repeatered* on the B1, B2 and A Division Rail Control Center (Command) channels. Traffic on the yard channel is in simplex mode, meaning everybody transmits and receives on the same frequency, without the use of a repeater. Range is limited and you may only be able to hear one side of the conversation. Communications in Canarsie, Fresh Pond, Livonia, and Jerome Yards uses the output of the repeater in simplex mode, which the MTA calls "Train-to-Train" mode.

All the frequencies you will need to program are listed in the chart at right, along with the CTCSS or DCS codes if your radio is so equipped. You will only need to program the dispatcher-to-train frequencies (outputs); the repeater inputs are listed here for convenience but everything sent on the inputs will be heard on the output. Only the most important subway frequencies are listed here. Some low-use low-power yard channels are not listed due to space considerations. If you suspect one of these is in use, search the railway frequency band (the 97 AAR radio channels between about 160 MHz and 162 MHz), and you will likely find what you need.

Radio channel usage generally follows the pre-unification track plans (but not always). Old BMT territory uses BMT frequencies, and where BMT meets IND, the channels change at that point (at the nearest station). Interestingly, the Flushing Line still uses the BMT frequency, dating back to the dual-contract operation between the two systems in the early 1920s.

** More accurately, they are using remote bases, but for the purpose of this discussion, they act similar to a repater. Repeaters re-transmit weak signals from portable radios with enough power that other trains and the dispatcher can hear them.*

RADIO FREQUENCIES

DIVISION / USAGE	OUTPUT	INPUT	CTCSS
A Division (IRT) CMD	**161.190**	158.880	127.3
A Division Train-to-Train	**161.190**	Simplex	127.3
A Division Yard	**160.845**	Simplex	127.3
B1 Division (BMT) CMD	**161.505**	158.775	127.3
B1 Train-to-Train	**161.505**	Simplex	127.3
B1 Yard Channel	**160.845**	Simplex	127.3
B2 Division (IND) CMD	**161.565**	158.805	127.3
B2 Train-to-Train	**161.565**	Simplex	127.3
B2 Yard Channel	**160.845**	Simplex	127.3
Signals (VHF)	156.105	Simplex	None
Signals (UHF) & M.O.W.	470.4875	Simplex	123.0
Power Section	470.3875	473.3875	None

* Operations frequencies are shown in bold, and to keep things simple, use CTCSS of 127.3 for monitoring both command and train to train channels.

Radio System

NYPD TRANSIT POLICE RADIO SYSTEM

In years past, the Transit Police Department was a separate agency, not part of the New York Police Department. Due to the costs involved, wayside radio equipment was never changed when that department re-integrated into the NYPD in 1995. Consequently the Transit Bureau kept using the old Transit PD frequencies in the VHF railroad band for decades.

The NYPD's main radio system operates in the UHF T-band, in the 470–485 MHz range, thus radios from the old Transit Bureau's system were unable to communicate with radios on the main system, since commercial two-way radios at that time were not able to operate on both VHF and UHF.

In 2016 the old VHF police frequencies were retired and Transit Bureau PD cops were issued new UHF radios, so now the NYPD Transit Bureau officers can finally communicate with their local precinct counterparts and potentially other city agencies as required. NYPD radio jargon is a little more difficult to understand than what you'll hear on TA operations channels but details are readily available from numerous sources online. The table at right contains all the new frequencies and digital squelch codes, but the radios will also likely have additional frequencies not listed here, including the citywide Special Operations Division channel, precincts within the current borough (and other boroughs), the five simplex tactical frequencies, etc.

There is no direct prohibition against monitoring NYPD transmissions with a hand-held radio; however, it might get you some unwanted attention, thus discretion and an earphone are strongly advised. It *is* unlawful to use a scanner in a vehicle in New York State unless you're a licensed amateur radio operator, and even then, not to receive police frequencies. Although the radio systems are narrowbanded, they remain analog and unencrypted, thus can still be monitored by most UHF-capable scanners. A new secure radio system for the NYPD is in the planning stages that will no longer be monitorable on scanners. It's still a few years away, however.

Normal two-way radio communications systems don't usually work below ground; subway and transit police radio systems utilize Radiax (a kind of "leaky coax" cable) and multiple transmitters to ensure their signals carry where needed.

NYPD TRANSIT BUREAU FREQUENCIES

AREA (DIVISION)	FREQUENCY	DCS
Manhattan South (Division 1)	471.0875 MHz	025
Manhattan North & Bronx (Div. 2)	482.8625 MHz	047
Queens & Eastern B'klyn (Division 3)	470.9125 MHz	032
Brooklyn West & South (Division 4)	470.9625 MHz	047

FIRST RESPONDER SUBWAY FREQUENCIES

AGENCY	FREQUENCY	CTCSS
FDNY Subway Rep't F1	460.575	127.3
FDNY Subway Rep't F2	460.625	91.5
FDNY EMS Subway	478.0125	85.4

Chaining Codes

To identify precise locations, the MTA uses a series of letters and numbers on signals, and a means of measuring distance called chaining, or stationing. A chaining code number is a distance measured in hundreds of feet.

Each signal has a number plate which identifies the signal, the track it serves, and its distance from a ZERO POINT. A typical BMT or IND sign looks much like this:

This means 36,900 feet from origin on Line A, Track 3. If a precise distance measurement is required, it might be shown as 243+56, meaning 24,356 feet from zero.

IND CHAINING CODES

LINE	NAME	FROM	TO	ZERO
A	Eighth Avenue	207th Street	Euclid Avenue	IND
B	Sixth Avenue	Coney Island	57th St/6th Ave.	IND
B	Sixth Avenue	Manhattan Bridge	59th St/8th Ave.	IND
C	Concourse	135th Street	205th Street	IND
D	Jamaica	50th Street-8th Ave.	179th Street	IND
DA	Archer Extension	Van Wyck Blvd.	Archer-Parsons	IND
GD	Connection from	BMT	IND line	IND
E	Crosstown	Queens Plaza	Bergen Street	IND
F	Rockaways	Rockaway Blvd.	Rock. Park	LIRR
K	Liberty Avenue	Grant Avenue	Lefferts Blvd.	*BMT-E
S	Second Avenue	BMT Line G	96th St.	IND
T	63rd Street	57th St. & 6th Ave.	Queensbridge	IND

*Line K was the old BMT Fulton Street elevated line.

NOTE: The Rockaway zero-point is in Long Island City via the Lower Montauk Branch, where the old Rockaway Beach Branch diverged from the Long Island Rail Road.

IND-Zero is a theoretical point in New York Bay at the intersection of the extension of the West Fourth Street station and the NY–NJ state line in the Bay. The distance from zero is measured from there to West 4th. That distance is the chaining point of the station from zero. All other points increase from there northbound and decrease southbound along the line.

BMT CHAINING CODES

LINE	NAME	FROM	TO	ZERO
A	B'way-Brighton	57thSt. & 7th Ave.	Coney Island	BMT-S
B	Montague St. Tunnel	DeKalb Avenue	Canal Street	BMT-S
C	Culver Line *(aban.)*	Ditmas Avenue	Coney Island	BMT-S (IND B)
D	West End	36th Street	Coney Island	BMT-S
E	Sea Beach	59th Street	Coney Island	BMT-S
F	Fourth Avenue	Pacific Street	95th Street	BMT-S
G	Astoria	57th Street	Astoria	BMT-N
H	Manhattan Bridge South Side Tracks		(See below)	BMT-J
J	Nassau St-Jamaica	Chambers	Parsons	BMT-J
K	Fulton St. (*Aban.*)	Park Row	Hudson St.	BMT-E (IND K)
L	Lexington Av B'klyn	*Abandoned*		BMT-E
M	Myrtle Avenue	Metropolitan Ave.	Broadway	BMT-E
N	Fifth Ave. Brooklyn	*Abandoned*		BMT-E
O	Franklin Shuttle	Prospect Park	Fulton Street	BMT-E
P*	Canarsie *(Aban)*	Broadway Jct.	Rock. Pkwy	BMT-P
Q	14th Street East	Eighth Avenue	Rock. Pkwy	BMT-Q
R	Nassau Street	Broad Street	Line B	BMT-S

Note: Bits of line C still exist at Ninth Avenue, going through the abandoned lower level. This is not a full, comprehensive list of chaining codes and zero-points. Please visit *https://en.wikipedia.org/wiki/New_York_City_Subway_chaining* for the complete list.

KEY TO BMT ZERO LOCATIONS:

BMT-N: 57th Street and Seventh Avenue.
- BMT-N Chaining values increase from zero towards Astoria and 71st-Continental.

BMT-S: 57th Street and Seventh Avenue.
- BMT-S: Chaining values increase from zero towards Coney Island.

BMT-E and **BMT-J**: These zero-points are located at the intersection of the center line of the Brooklyn Bridge and the Chambers Street station.
- BMT-E: was via the Brooklyn Bridge and the now abandoned network of el lines in Brooklyn. The Myrtle Avenue line and the Franklin Shuttle are chained via lines no longer in existence.
- BMT-J Chaining values increase along the Broadway elevated towards Jamaica.

BMT-P: Pitkin and Van Sinderen Avenue where the Canarsie Line diverged from the Fulton Street Elevated. Line P designations retired in 2003, EXCEPT for the Linden Yard and its connections.

BMT-Q: 14th St./Sixth Avenue. The Canarsie Line originally terminated at Sixth Avenue and the zero-point was originally there. When the line was extended west to Eighth Avenue, the chaining numbers increased to the west with a "W" following the signal number. QW was retired upon Line Q re-stationing in 2008 and 14th St./Eighth Avenue is the new zero for BMT-Q.

Chaining Codes

MANHATTAN BRIDGE NOTE

Prior to the IND and BMT merging operations in November 1967, all tracks over the Manhattan Bridge were operated by the BMT Southern Division. The two south-side tracks (from the Nassau Street loop) were Line H and the two north-side tracks (from Broadway) were Line A. Line A started at 57th Street in Manhattan and continued into Brooklyn as the Brighton Line.

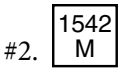
After the connection, however, there was a slight problem: The IND & BMT each had a Line A—the IND's Eighth Avenue Line and the BMT's Broadway–Brighton Line. When the Chrystie Street connection opened, a change in line designations was therefore required. That change takes place on the north-side bridge tracks. Today, everything on the Manhattan side is designated Line B (the IND Sixth Avenue designator), and everything on the Brooklyn side of the demarcation point is Line A (the BMT Brighton designator). The exact point at which the line letters change is 243+26, but the line stationing itself (BMT to IND) changes in the Chrystie St. Cut at 212+30.

BMT Line A is still the Broadway Line (north of Prince Street), but where express tracks A3 & A4 dive down and turn under Canal Street from Broadway—at the Broadway-Canal Street station—they renumber to H1 and H2 respectively. Line H ends just north of DeKalb Avenue and denotes the south-side Manhattan Bridge tracks.

IRT TRACK NUMBERING AND CHAINING

IRT signal signage and track numbering are slightly different from those in use on the IND and BMT lines.

A typical IRT sign looks like this:
Meaning: Line M, 15,400 feet from zero, Track #2.



On the IRT the **signal track numbers** are odd NORTHBOUND, even SOUTHBOUND with 1 and 2 being the express tracks. These track numbers are found on signal plates and are no longer used by Rapid Transit Operations, by the track department, the signal department, or in common daily usage. Track numbers commonly used today are numbered 1,2,3,4 from west to east. As with the B-Division, each line is associated with a lettered name.

IRT CHAINING CODES

LINE	NAME	FROM	TO	ZERO
B	Broadway	Times Square	96th Street	IRT-1
BB	Broadway	96th Street	242nd Street	IRT-2
C	Corona Flushing	Times Square	Main Street	IRT-7
CC	Corona Flushing	Times Square	34th St./11th Ave.	IRT-7
D	Nostrand Avenue	Franklin Avenue	Flatbush Ave.	IRT-3
E	Eastern Parkway	Boro Hall	New Lots Ave.	IRT-3
F	Lenox-Bronx Park	96th Street	Bronx Park	IRT-2
J	Jerome Avenue	125th St.& Lexington	Woodlawn	IRT-4
K	Clark St. Tunnel	Chambers Street	Boro Hall	IRT-5
L	Lexington Avenue	Grand Central Tml.	125th Street	IRT-4
M	Manhattan–Brooklyn	Brooklyn Bridge	Boro Hall	IRT-3
MM	Manhattan Mainline	Brooklyn Bridge	Times Square	IRT-1
MV	South Ferry Loop	Rector Street	Rector Street	IRT-2
P	Pelham	125th St.& Lexington	Pelham Bay Pk.	IRT-4
T	Third Ave. el *(Aban.)*	149th Street	Gun Hill Road	IRT-6
V	Seventh Avenue	Times Square	Rector Street	IRT-5
W	White Plains Road	177th Street	East 241st Street	IRT-2
Y	Dyre Avenue Line	East 180th Street	Dyre Avenue	IRT-8

KEY TO ZERO LOCATIONS:
IRT-1 Brooklyn Bridge station
IRT-2 Broadway at 97th Street
IRT-3 Brooklyn Bridge station
IRT-4 Park Avenue at 38th Street
IRT-5 Broadway at 44th Street
IRT-6 *(Aban)*. IRT el Station at South Ferry
IRT-7 West end of Flushing Line Times Sq.
IRT-8 Original zero of NYW&B Railway at Oak Point Yard in the Bronx.

Abandoned Stations

No discussion of the New York City Subway would be complete without reference to abandoned stations and tracks. Despite what TV show writers want you to think, abandoned stations don't, in fact, lurk under every corner of the city. Many are simply disused platforms in plain sight, like those at Chambers Street on the J Z. Others, like the beautiful IRT City Hall station, have seen trains—but no passengers—for decades, and are often in plain sight if you're looking hard enough out the window.

STATION LENGTHENING

When the original IRT opened on October 27, 1904, its route started at the City Hall station, went north to Grand Central, west along 42nd Street to the newly-renamed Times Square, then north along Broadway to 145th Street. It was a four track system even then, local and express. While express trains were always 10 cars long, local trains—and stations—were only five cars long. In the mid-1940s it was decided to make all trains 10 cars, local and express; a move which necessitated the lengthening of every local platform. In several instances these new, longer stations were too close together, or in the case of City Hall, too difficult to extend. 18th Street was too close to 14th Street Union Square; Worth Street was too close to Brooklyn Bridge, and 91st Street was too close to 96th Street. Thus the decision was made to close a handful of stations permanently. Station entrances were removed and paved over and platforms allowed to fall into disrepair. These ghosts of subways past are still visible through the front and side windows of passing local trains.

One of two lower level platforms at City Hall station on the Broadway BMT lines, comprising City Hall Yard. Here an R46 train awaits the call to afternoon rush hour service on BM track. These platforms have never operated in revenue service.

City Hall station deserves special mention, as it is easily the most spectacular station in the entire subway system. While its high vaulted-arch ceilings and chandeliers made it a beautiful place to catch a train, the reality was that the City Hall station was never really important in terms of the number of passengers served. As well, the face of the platform is heavily curved. Original IRT cars had vestibules and end doors from which passengers boarded and alighted; ends of these cars mated nicely with the platform face. Side doors soon became the norm, however, with large gaps between the doors and platform face (as there still are at Union Square). Because of this, plus the fact that City Hall is a short walk from the Brooklyn Bridge station, the sad decision to close City Hall was also made. Riders are allowed to remain on 6 trains at Brooklyn Bridge so you can still ride around the loop and view this long-forgotten gem.

Abandoned Stations

GONE BUT NOT FORGOTTEN

Of course, there are the true abandoned, secluded stations; once used daily, now hidden from sight and mind of all but the most ardent transit buffs. These include a lower level at Ninth Avenue in Brooklyn, and the lower level of Bergen Street on the F G, and the lower level at 42nd St. and Eighth Ave. Also included in this category are the long-since-demolished platforms at Chambers (J Z) and Myrtle (on what is today's D), and a few stations that were built but never connected, such as Roosevelt Avenue, S. 4th St., Utica Avenue, BMT City Hall lower-level, and Nevins Street.

There are also a few disused stretches of tunnel including the old Nassau Street Loop and Manhattan Bridge connections, the trackway for 2-Track of the Times Square Shuttle, two short stubs under Seventh Avenue north of 57th Street, trackways south of 36th St. in Brooklyn, above Roosevelt Avenue and East 63rd Drive in Queens. These are shown on the main map pages later on.

CHANGES ON THE FLY

As discussed earlier, there are several "roughed-in" stations for lines not built (mostly on the IND) plus a couple of stations where plans changed in the middle of construction—namely Nevins St. on the IRT in Brooklyn and the lower level of the BMT's City Hall station. In the case of the BMT, plans originally called for local trains to terminate on the upper level of City Hall, and have the expresses continue through the lower level and then on south to lower Manhattan and through the Montague Tunnel to Brooklyn. Midway through construction it was decided to reroute the expresses to Brooklyn via the Manhattan Bridge, run the locals down a ramp at the south end of City Hall, and use the lower level for storage. There are currently three tracks at "City Hall Yard," B3, BM and B4; the latter generally unused except for the occasional work train. It was through this station area (under Broadway, between Murray and Warren Streets) that Alfred Beach's pneumatic subway ran almost a half century earlier. One interesting footnote about the southbound lower level platform of 42nd St. on the Eighth Avenue Line. For years it was speculated that this mostly-redundant station was put in place to block any westward expansion of the IRT Flushing Line, but no hard evidence was ever presented proving this to be the case. Recently the MTA put some fairly comprehensive drawings on their website showing a sub-surface profile of the area relating to the westward extension of the 7. Two tail tracks extended west from Times Square and down at

Abandoned lower level platform at 42nd St. and 8th Avenue. Gates were used for extra fare control in use for Racetrack Special trains to Aqueduct. The westward extension of the 7 line bisected this platform in 2009.

Abandoned Stations

an angle that might have made it possible for the Flushing Line to run across the Hudson. When Mayor Hylan was building the IND he had a vested interest in blocking the private subway companies' lines (IRT and BMT), and you can now clearly see how the placement of this oddball platform perfectly blocked any such expansion west. The new extension's tunnels have now bisected this platform.

A comprehensive list of New York's disused or abandoned subway stations is maintained by Joe Brennan at ***www.columbia.edu/~brennan/abandoned***. This list includes details of where the stations are located, a brief synopsis of their history, and if they can be seen by the public from a legally-accessible location (i.e. in plain sight, as a train passes through them, etc). There are also photo essays taken at disused stations available on the Internet. Visit ***http://www.nycsubway.org/abandsta.html***. Of course, this author strongly cautions readers not to venture into forbidden areas! It's illegal, dangerous, and could cost you your life.

STATION CLOSURES

As major capital works proceed, certain stations are closed over a period of several months. Since these closures are for a relatively short duration they are generally not shown in this book. Longer line and station closures that will extend over a year or more are documented here.

STATIONS CLOSED TEMPORARILY

- 181st St. Saint Nicholas Avenue 1 (Mar. 2021–Mar. 2022)

PARTIAL LIST OF ABANDONED STATIONS

- Bowling Green shuttle platform (IRT- 4 5)
- South Ferry outer and inner loop platforms (IRT- 1 5)
- City Hall (IRT- 6)
- Brooklyn Bridge south end (IRT- 4 5) & side platforms (6)
- Side platforms at 241st St., 242nd St., Woodlawn, and Pelham Bay Pk.
- East 180th St. former NYW&B platforms (IRT- 2 5)
- 14th Street side platforms (IRT- 6)
- 91st Street and 96th Street side platforms (IRT- 1)
- Worth Street and 18th Street (IRT 6)
- Bowery and Canal St. Queens-bound (BMT- J Z)
- Chambers Street outer and center platforms (BMT- J Z)
- Essex Street trolley terminal (BMT- J Z M)
- City Hall lower level (BMT- R W)
- Short portion of N/B Atlantic Av. middle plat. over Snediker (L)
- 42nd Street lower level (IND- A C E). Now bisected by 7 tunnel.
- 59th Street center platform (IND- A B C D) Now a passageway
- Lexington Avenue/60th Street (N R W)
- Nevins Street lower level (never used) (IRT- 2 3 4 5)
- Myrtle Avenue (Upper level, elevated — BMT- J Z M)
- Myrtle Avenue (Subway, BMT- B Q Masstransiscope)
- DeKalb Avenue south end (BMT)
- Ninth Avenue lower level (BMT- D)
- South Fourth Street provision (partly built—IND)
- Utica Avenue provision (partly built—IND)
- Court Street (Transit Museum)
- Hoyt-Schermerhorn Sts. outer local platforms (IND- A C G)
- Bergen Street lower level on express tracks (IND - F G)
- Roosevelt Avenue terminal station (Never used) (E F M R)
- Bleecker Street north end of northbound platform (IRT-6)

Audible Signals

TRAIN WHISTLE / HORN SIGNALS

Rule 3.61 horn/whistle signals are as follows. NOTE: Except in the case of emergency or when personnel are on the tracks, train horns are not to be sounded outside, between 9:00pm and 6:00 am. Long and short whistle blasts are identified by the symbols — and • respectively.

3.61(a)	—	Apply brakes immediately. STOP
3.61(b)	——	Sounded when passing caution lights or flags to warn flagger of approaching train
3.61(c)	••	Answer to any signal
3.61(d)	•••	Road Car Inspector to respond to the train
3.61(e)	—•	Signal Maintainer to respond to the train
3.61(f)	—•—•	Train crew needs (Police) assistance.
3.61(g)	••••	Train request to tower or signalman for signal or route.

3.61(h) Succession of Short Sounds: A warning to persons on or near the trackway or when a train is operating against the normal direction of traffic, when a train is making an irregular move, or bypassing stations when entering or leaving.

TRAIN BUZZER SIGNALS

Rule 3.62 train buzzer signals are as follows. Long and short sounds are identified by the symbols — and • respectively. Each sound should be distinct, with intensity and duration proportionate to the signal being conveyed.

3.62(a)	—	STOP.
3.62(b)	——	PROCEED on signal clearance.
3.62(c)	••	Answer to any signal.
3.62(d)	•••	Signal for T/O to sound horn for a Road Car Inspector.
3.62(e)	—•—•	Signal for T/O to sound train horn for police assistance.
3.62(f)	•••••	Signal for Conductor to come to T/O's cab.

3.62(g) These same signals must be used by a Conductor when stationed on the front end of a train, by reason of the Train Operator (T/O) operating from some other car.

3.62(h) Unnecessary sounding of the buzzer is forbidden.

WARNING: Conductors must NOT pass buzzer signals with the side doors open unless the emergency brake valve is opened.

TOWER EMERGENCY HORN OR WHISTLE SIGNALS

3.60(a)	—	All trains within the interlocking limits come to an immediate STOP.
3.60(b)	••	Trains within the interlocking limits may proceed after observing that the trackway is clear and that switches and signals are properly set for the move.
3.60(c)	•••	Road Car Inspector to contact the tower.
3.60(d)	—•	Signal Maintainer to respond to the tower.

Rolling Stock

ROLLING STOCK BASICS

Since the introduction of the R1 series cars at the dawn of the IND, rolling stock classes have been designated with an R prefix and a number corresponding to a contract number. There are three different length cars in use today. A-Division cars are approximately 51' long by 8.6' wide and feature 3 doors per side. B-Division uses both 60' and 75' cars, each with 4 doors per side.

R32 AND R42

The 60' R32s were the longest serving cars in modern times. They entered service in 1964, and were "retired" in April 2020. 136 of them were unretired in July after problems with the R179 fleet caused that class to be pulled from the rails and they were assigned to East New York Yard for service on the Jamaica Line. R32s were manufactured by the Budd Company in Philadelphia, rebuilt in the late 80s by Morrison-Knudson (M-K) and were the first all-stainless-steel cars to be introduced to the NYC Subway.

The R42s were built by St. Louis Car Builders in 1969 and rebuilt by M-K in 1988. Most had been retired starting in 2007, but 50 were kept in service at East New York Yard until December 2019. Like the R32s, they were 60' long by 10' wide. Several were retained for work service.

R44

Built 1971 by the St. Louis Car Company (and rebuilt in 1990 by the NYCTA and Morrison-Knudson), these were the first 75' long cars. All were retired in 2010, but 61 modified R44s are still in operation on the Staten Island Railway.

R46

754 R46s were built by Pullman Standard in 1975 and rebuilt by M-K in the late-80s. 750 remain in service. Like the R44s, these 75' x10' cars are configured in an ABBA arrangement, with A-cars being even-numbered and having operating cabs. After a rocky start in the late-70s the R46s are a staple of the B-Division, but will be retired as R211s arrive.

R62 AND R62A

A total of 1,139 R62 and R62As were built by two separate vendors (Kawasaki and Bombardier, respectively) in 1983 and 1984, and were the first all-stainless-steel IRT cars. These will eventually be replaced by the new R262 cars.

R68 AND R68A

These were the last of the 75' cars built for the NYC Subway. 425 R68s were built in Paris by Westinghouse Amrail and ANF Industrie in 1986 and 200 more nearly-identical R68As were built by Kawasaki in 1988. They are married in 4-car ABBA sets. Two specially-equipped trains of R68s are used on the Franklin Shuttle and are run as single cars.

R142 AND R142A

Like the R62 and R68, the R142 contracts were awarded to two different vendors in 1999; in this case, Bombardier for 1,030 R142s and Kawasaki for 600 R142As. These cars feature recorded announcements, computer-controlled strip maps, AC propulsion motors, and electronic braking. They are married into 5-car sets in ABBBA configuration but can be assembled into 4, 6, 9 or 11 car trains as needed.

Rolling Stock

R143
This class of 212 60' B-Division cars was built by Kawasaki starting in 2001 and are based on the IRT's R142As. The R143 was the first car class to have CBTC equipment built in. All R143s are currently based out of East New York Yard and are running on the L.

R160A AND R160B
These cars are similar in appearance and operation to the R143s. Like the 143s, they are narrower than earlier B-Division cars at 9.77' wide, have better messaging systems and strip maps than the R142-series IRT cars, and allows for instant route changes with messages adapting to the new route. The R160A order was further split into two classes—R160A-1 and A-2. The A-1 cars are configured in 4-car sets in ABBA configuration and run exclusively on the BMT Eastern Division to supplement the R143s. The remaining A-2 series are set up in 5-car ABBBA sets to run on the rest of the B-Division. 64 R160A-1s had CBTC hardware installed, and 1486 more will be similarly converted for Queens Blvd. CBTC operation.

R179
300 R179 cars were ordered from Bombardier in March, 2012 and were intended to replace the remaining R32s and R42s. Production problems delayed the order for two years, and when the first of the cars arrived they suffered problems that further delayed acceptance. An additional 18 were added to the contract as compensation for the late deliveries, and were delivered before the end of 2019. These are arranged as 188 cars in four-car sets, and 130 cars as five-car sets.

R188
380 existing R142A cars were upgraded to R188 specifications (CBTC equipment was added) and 126 new R188 cars were ordered and delivered by mid-2015 for a total of 506 cars, or 11 trainsets, for exclusive use on the Flushing Line. These new cars (and the conversions) were built by Kawasaki in Yonkers and are visually indistinguishable from the R142As on which they were based. They are coupled in ACBBA-ABBBCA configuration.

R211
This future class of 60' cars will be split into 3 sub-classes: R211A, R211S, and R211T, a new style 10-car open gangway train. The R211 will feature wider doors, Wi-Fi and USB chargers, customer information displays, security cameras, LED headlights, and a blue front face with a destination sign. The anticipated order will be for 1175 cars, or 1612 with all future options exercised, mostly depending on the success of the open gangway R211T prototype. R211A and R211T cars will be CBTC equipped. The R211S variant will have FRA-mandated features added and will replace the current fleet of modified R44s in use on the Staten Island Railway.

R262
Under the 2020–2024 Capital plan, a base order of 504 R262 cars will begin replacing the current R62/62As, and 1364 will be ordered in total if all options are exercised. They will all be CBTC equipped, built to higher crash worthiness standards, and will allow for an 8-10% increase in passenger loads thanks to the open gangway design. The contract is expected to be awarded in early 2021, and cars should start arriving in 2024.

Car/Yard Assignments

	A-Division							B-Division							
Car Type	**Livonia**	**239 St.**	**240 St.**	**Jerome**	**E. 180**	**Pelham**	**Corona**	**CIY**	**Concourse**	**East N.Y.**	**207 St.**	**Pitkin**	**Jamaica**	**SIR**	**TOTALS**
R44 SIR														61[*1]	**61**
R46								396				354[*2]			**750**[*2]
R62	315														**315**
R62A	27		365			430	2[*2]								**824**[*2]
R68								157	268						**425**
R68A								200							**200**
R142		410[*4]		205	410										**1025**[*4]
R142A				220											**220**
R143										212					**212**
R160A										372			630		**1002**
R160B								90					570		**660**
R179										96	92	130			**318**
R188							506								**506**
R32 (ret) [*5]										134[*5]					**134**[*5]
Totals	**342**	**410**	**365**	**425**	**410**	**430**	**508**	**843**	**268**	**814**	**92**	**484**	**1200**	**61**	**6652**[*3]

This matrix reflects the state of the fleet as of October, 2020. Note that Pelham Yard is the internal designation for Westchester Yard and CIY stands for Coney Island Yard. All R42s were retired in December 2019, but 10 were retained for garbage train service out of 38th St. Yard as of July 2020.

*1 — There were originally 64 Staten Island R44s. Car #402 was scrapped after a 2008 derailment. Car #466 was retired and stripped for parts in 2015, and #399 was likewise retired and stripped for parts in 2017.
*2 — Totals include four R46s removed from service following a derailment at 14th St. and Eighth Avenue in 2020, and two R62As from Corona that were converted to work service as refuse collectors.
*3 — Includes the Staten Island Railway fleet.
*4 — Five car set 6346–6350 was retired due to fire damage from March 2020.
*5 — Remaining R32s on the roster were retired in April 2020, but were pressed back into service in July following an R179 drawbar failure that resulted in the entire R179 fleet being taken out of service. To make up for the shortfall this caused, numerous sets of R160A and 160Bs were temporarily transferred from Jamaica to Pitkin for Eighth Avenue service.

Car/Yard Assignments

For the most part, rolling stock associated with a particular line is supplied by just one yard. Some yards serve only that one line; other, larger yards serve two, three or even four different lines. On the A-Division the 2 and 5 share yards, where cars from either line operate out of either 239th St. or East 180th Street. On Eighth Avenue, all the 75' R46 cars assigned to A service operate from Pitkin and the 60' R179s operate from either Pitkin or 207th St.

The tables at right show the number of trains needed for service on each line for both morning and afternoon rush hours, and the yard(s) at which the equipment is based. This information is accurate as of **October 2020**. Individual yard pages show the number of cars from each class that are assigned to each line.

CURRENT TRAIN LENGTHS

- IRT mainline: 510' (10 × 51' long cars).
- IRT 7: 565' (11 × 51' long cars).
- IND/BMT (excluding M): 600' (8 × 75' or 10 × 60' cars).
- IND C: 8 × 60' cars; platforms are 660' long.*
- IND G: 4 × 75' cars, but platforms are 660' long.
- BMT Eastern Division J M Z L: 480' (8×60' cars).**
- TS-GCT shuttle: One 3-car and one 4-car train of 51' cars***
- Rockaway Park Shuttle: Three trains of 4 × 75' cars.
- Franklin Shuttle: 150'. Two trains of 2 × 75' cars.

** C consists include a mix of shorter 8-car 60' R179 trains, and full-length 8-car 75' R46s.*

*** No 75' cars permitted on the Eastern Div. due to tight curves.*

**** After reconfiguration in 2022, the Shuttle will use two 6-car trains based out of Livonia Yard, with two spares.*

Line	AM Rush	PM Rush	Yard
1	31	31	240th St.
2	36	35	239th St. *4
3	26	26	Livonia
4	35	33	Jerome
5	35	36	E. 180th *5
6	37	37	Pelham
7	38	36	Corona
S	2	2	Livonia *1

*1 — Times Square Shuttle
*2 — Rockaway Shuttle
*3 — Franklin Shuttle
*4 — Shares with E. 180th St. Yard
*5 — Shares with 239th St. Yard
*6 — Layups at Pitkin and 207th St.
*7 — Layups at Canarsie (L) and Fresh Pond (M) Yards but all are based out of East New York.

Line	AM Rush	PM Rush	Yard
A	38	40	Pitkin *6
B	25	23	Coney Island
C	18	17	207th St. *6
D	29	28	Concourse
E	26	26	Jamaica
F	45	46	Jamaica
G	13	13	Coney Island
J Z	20	19	East NY
L	24	24	East NY *7
M	24	23	East NY *7
N W	33	33	Coney Island
Q	21	22	Coney Island
R	31	31	Jamaica
S	2	2	Coney Island *3
S	3	3	Pitkin *2

60 VS 75 FOOT CARS

Beginning with the R44s, the NYCTA bought into the notion that a 600 foot long train of eight 75 foot long cars could hold more passengers than a 600 foot long train of ten 60 foot cars due to the need for fewer couplers and the wasted space between cars. While this may be true, the benefit of carrying more passengers in a longer car is outweighed by having eight fewer doors open at each platform. This results in longer dwell times in each station, which translates into delays. In addition, each R32 car has an operating cab at one end and a conductor's cab on the opposite side (on the

Work Equipment

other end of the car), which results in the 4 doors on each side being offset by a few feet. Since standing passengers tend to congregate at the doors rather than the spaces in between, this offset door configuration means a more even passenger distribution within every car, which allows for greater crush loading aboard each train.

C-DIVISION

Keeping the system running 24 hours a day takes a fleet of locomotives and non-revenue cars that most passengers will rarely see, and this equipment is assigned to the C-Division. Since work equipment must operate on both A- and B-Division tracks it must be built to IRT specifications. There are far more classes of work equipment than described in this brief section, and they're covered in depth online.

MOVING TRASH AROUND

A small fleet of refuse collector trains runs throughout the system gathering garbage from wheeled dumpsters that are stored in the black metal containers on each platform. Full bins are loaded on specially-rigged flat cars, and swapped out for empties. Trash is normally offloaded at one of the refuse platforms located in 207th St., 239th St., 36–38th St., and Corona Yards. These trains are usually powered by one of 18 R127 or R134 class cars built by Kawasaki on the R62/R62A chassis, and two crew rider cars (typically R32s or old R33WF redbirds). Their scheduled station stops are made between passenger runs during off-peak hours, usually evenings and overnight. A video of typical refuse train operation can be found here: ***https://youtu.be/uZPOwUk-DbE***

THE SCOURGE OF AUTUMN

When wet leaves fall on the tracks, train braking action is reduced. Conventional railway locomotives are equipped with sanders which, as the name implies, release sand on the rails to increase adhesion. Since subway equipment isn't equipped with sanders, the MTA uses rail adhesion trains. Between October 15 and December 15, these trains run nightly across at-grade rights of way during the fall and apply a rail adhesion gel to the tracks. NYC Transit has three gel trains. One on the A-Division, stored at Unionport Yard, and two on the B-Division; one stored at Pitkin and the other at Coney Island. While operating, the trains run at approximately 15 MPH and spread the gel evenly on the tracks (not on switches, however) whenever the temperature is above freezing.

The consist based at Coney Island Yard operates on the Brighton and Sea Beach Lines, and the Franklin Shuttle. The Pitkin-based train operates on the Rockaway Line, from Liberty Junction to Howard Beach, and the Unionport train runs on the Dyre Avenue Line.

PUMP TRAINS

Superstorm Sandy reinforced the need for another specialized fleet—pump trains. Each of these five trainsets consists of a pump, three hose reach cars, and a flat car; all of these are pushed from behind by a diesel locomotive. The pump car has three 1500 gpm pumps fitted, which are attached to pipes and fire hoses in the following cars. Water is then pumped up onto street level and into storm drains. Three of these trains use purpose-built Kawasaki R65 pump cars, which, like the R127/R134 garbage trains, are based on the R62/R62A

passenger car design. The other two trainsets are using the former "new tech" IRT R110A cars as reach cars with pumps on a flat car in front. These trains are stored in the 38th St., Jamaica, 207th St., Westchester, and Stillwell Yards.

TRACK GEOMETRY AND RAIL GRINDING

Track geometry trains routinely examine the rails to determine if there are any flaws such as micro-cracks, stress fractures, broken rails, or deformities caused by train car wheels that might have damage like flat spots. Using cameras, lasers, thermal imaging, ultrasonic, and other equipment, the operators can isolate faults, issue speed restrictions, and order repairs. All four of these cars are diesel propelled.

Once damage has been identified, and if it's minor in nature, the rail grinder is brought in to remove the top few millimeters of steel and return the railhead to like-new condition. In more serious cases, the rail may need to be replaced.

CONTINUOUS WELDED RAIL TRAINS

Traditionally most rail used on the system came in 39 foot lengths (weighing 100 lbs. per yard), and each section would be bolted together. Bolted rail is slowly being replaced by continuous welded rail (CWR). Ten 39' segments are welded together at the Linden Iron Shop, and up to eight of these 390' strings are loaded on one of three 8-car CWR trains and moved to the work location. Rail is somewhat flexible left-to-right so it navigates curves remarkably easily! Robotic machines (called *critters*) help remove the old rail and lay the new. New rail is then exothermically joined to the existing rail, forming a seamless ribbon of steel that is far less susceptible to wear damage.

THIS SUCKS

The MTA is aggressively combatting the source of litter-related track fires using vaccuum trains to remove accumulated litter and steel dust from the trackbed. There are currently three Vaktrak consists in the system, with one more to be purchased with funds from the 2020-2024 Capital Plan. These three-car trains are built by NEU in France and pushed by diesel locomotives as they move around the system after rush hours. One car has the vaccuum motor, one car is a filter and one stores the debris, which is offloaded at various points around the system. There are also two bag trains consisting of a locomotive, flat cars for hauling trash bags and a crew rider car. One is based at Coney Island and the other at Westchester Yard.

THIS BLOWS

Ten snow thrower cars are staged throughout the system whenever a major winter storm is forecast. Two are stored at Westchester Yard (staged out of Unionport Yard), four at Pitkin, two at 38th Street, and two in Coney Island Yard. A snowthrower consist is made up of a thrower at each end (one facing in each direction) with two locomotives in the middle and maybe a rider car. These can throw snow up to 200 feet, and clear 3,000 tons of snow per hour. There are also jet blowers (an actual jet engine blowing onto the tracks) for use in yards and out in the Rockaways. And to combat another serious cold-weather problem, diesel powered de-icer trains scrape accumulated ice off the third rail and apply a biodegradable de-icing gel to prevent further build up. In the worst storms, extra rider cars are added to potentially rescue passengers stuck in stations after service is suspended.

Photo Contest

Each year the front and back covers are graced with winning photos submitted by readers, and the contest is open to everyone. The rules are fairly simple. First, you must hold the copyright to the photographs you submit. Second, the quality of the photographs must be high since they will be printed at 300 dpi, and cropped to fit the cover space. Low resolution is fine for the initial submission, but if you're selected as a finalist or the ultimate winner, I will need the image in a high-resolution format, and it will have to be *at least* 5–10MB in size. Entries must be digital files only. 72 dpi images cannot be reproduced cleanly in print, nor can they be upsized cleanly, even though they may look great on screen. Quality matters here.

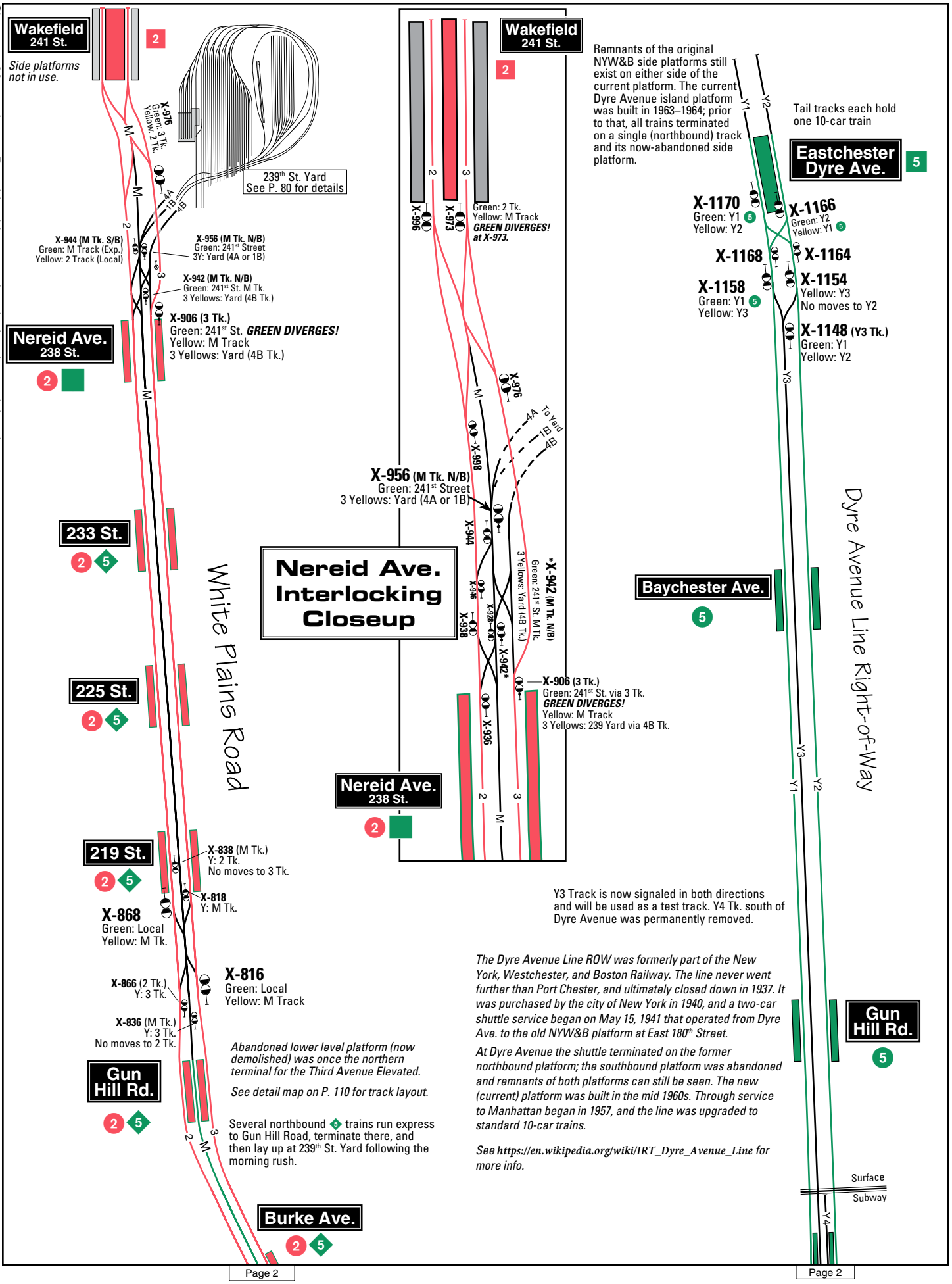
Submit your best pictures to ***nyctrackbook@gmail.com*** with the words **PHOTO CONTEST** in the subject line. The contest ends at 11:59pm NYC time on October 15, and the winning entry will be chosen within a few days after that.

Two winners will be selected every year; one front cover and one back cover. Winners will receive a free copy of the edition with their winning picture on the cover, a photographically-reproduced cover suitable for framing, and of course full photo credit and a short blurb about you and your winning entry.

What I'm looking for is a good representation of tracks, signals, and trains combined into one image, or a picture so impressive and representative of the subway that non-railfans will think "*wow*" when they see it. Preference will go to driver's-eye and track-level views. Photographs showing equipment now retired from service or landmarks that no longer exist won't be considered; your picture must reflect the system as it is around the time of publication. You may submit as many images as you like, so get your creative energies flowing!

THIS YEAR'S WINNER

Due to the Covid-19 pandemic it would not have been right to ask people to risk their health (and the safety of those around them) just to take pictures for this contest. As a result, a previous submission made by Anthony Maimone for the 2020 edition was selected as this year's winner. It is hoped that the contest will resume for the 2022 edition. That determination will be made by June 2021 and will be announced on ***nyctrackbook.com*** and on the book's Facebook page. Anthony works for New York City Transit, and his work has graced these covers many times in past years.



Page 1

Page 1

Several northbound 5 trains run express to Gun Hill Road, terminate there, and then layup in the 239th St. Yard following the morning rush.

Burke Ave. 2 5

Allerton Ave. 2 5

Pelham Parkway 5

Dyre Avenue Line Right-of-Way

Subway Surface

Morris Park 5

When required, S/B 2 trains can take the scenic route to E. 180th St., via B Tk. as shown below, in red.

White Plains Road

Pelham Parkway 2 5

The last of the system's old-style IRT signals were removed from the Dyre Ave. Line in September 2017.

X-1030 & X-1026
Green: Y1
Yellow: Y2

X-1012
Yellow: Y3
Yellow+ID Board: Y4
No moves to Y1 N/B.

X-1022
Green: Y2 5
Yellow: Y3
Yellow+ID Board: Y4 Tk.

Unionport Yard
See P. 87 for layout

X-738

X-B744
G: 2 Tk.
Y: B Lead 2 5

X-704
G: 2 Tk.
Y: M Tk.

X-712
G: M Tk.
Y: 3 Tk. 2 5
No moves to 2 Tk.

X-668
Green: B Tk.
Yellow: Yard Tks. 11–16

Green: Y1 Tk. 5
3 Yellows: Yard

X-460

X-654
Green: B Tk.
3 Yellows: Yard Tks. 4–10

X-438

Green: 3 Tk.
Yellow: 2 Tk.

X-470
G: 3 Tk. 241st St. 2 5
Y: Y2 Tk. Dyre Ave. Line 5
3 Yellows: Yard (22 Tk.)

X-441
Green: B Tk.
Yellow: M Tk.

X-414 (M Tk. S/B)
Green: M Tk.
3 Yellows: Yard (Y1A Tk.)

X-404 (2 Tk.)
Green: 2 Tk.
Yellow: M Tk.
3Y: Yard 4 Tk.

X-436 (3 Tk. S/B)
Yellow: M Tk.
3 Yellows: Yard (Y1A Tk.)

X-416 (M Tk. N/B)
Green: M Tk.
3 Yellows: Yard (B Tk.)

X-412 (M Tk.)
Green: M Track
Yellow: 3 T k.
3 Yellows: 2 Tk.

X-434
Green: 3 Track
Yellow: M Track

X-402
Green: 2 Tk.
3 Yellows: B Tk.
GREEN DIVERGES!

E. 180th St. Yard
See P. 86 for layout

E. 180th St. Closeup.

Bronx Park East 2 5

X-566 (Y2 Tk.)
Green: Y2 Tk.
Yellow: Yard

Elevated Surface

X-B744
Green: 2 Tk. 2 5
Yellow: B Lead

X-712
Yellow: 3 Track

X-470
Green: 241st St. 2 5
Yellow: Dyre Ave. Line 5
3 Yellows: Unionport Yard

To E. 180th St. Yard

X-434 (N/B on 3 Tk.)
Green: 3 Tk.
Yellow: M Tk.

E. 180 St. 2 5 5 5

X-412 (N/B on M Tk.)
Green: M Tk.
Yellow: 3 Tk. Local 5
3 Yellows: 2 Tk.

X-348 (2 Tk.)
G: 2 Tk. Local
Y: M Tk. Express

X-356 (M Tk.)
G: M Tk. Exp.
Y: 2 Tk. Local

See diagram at left for signal placement and indications.

Old NYW&B E.180th Street platforms were abandoned in 1957. A track connection from this stub-end track once existed with what is now the Amtrak Northeast Corridor.

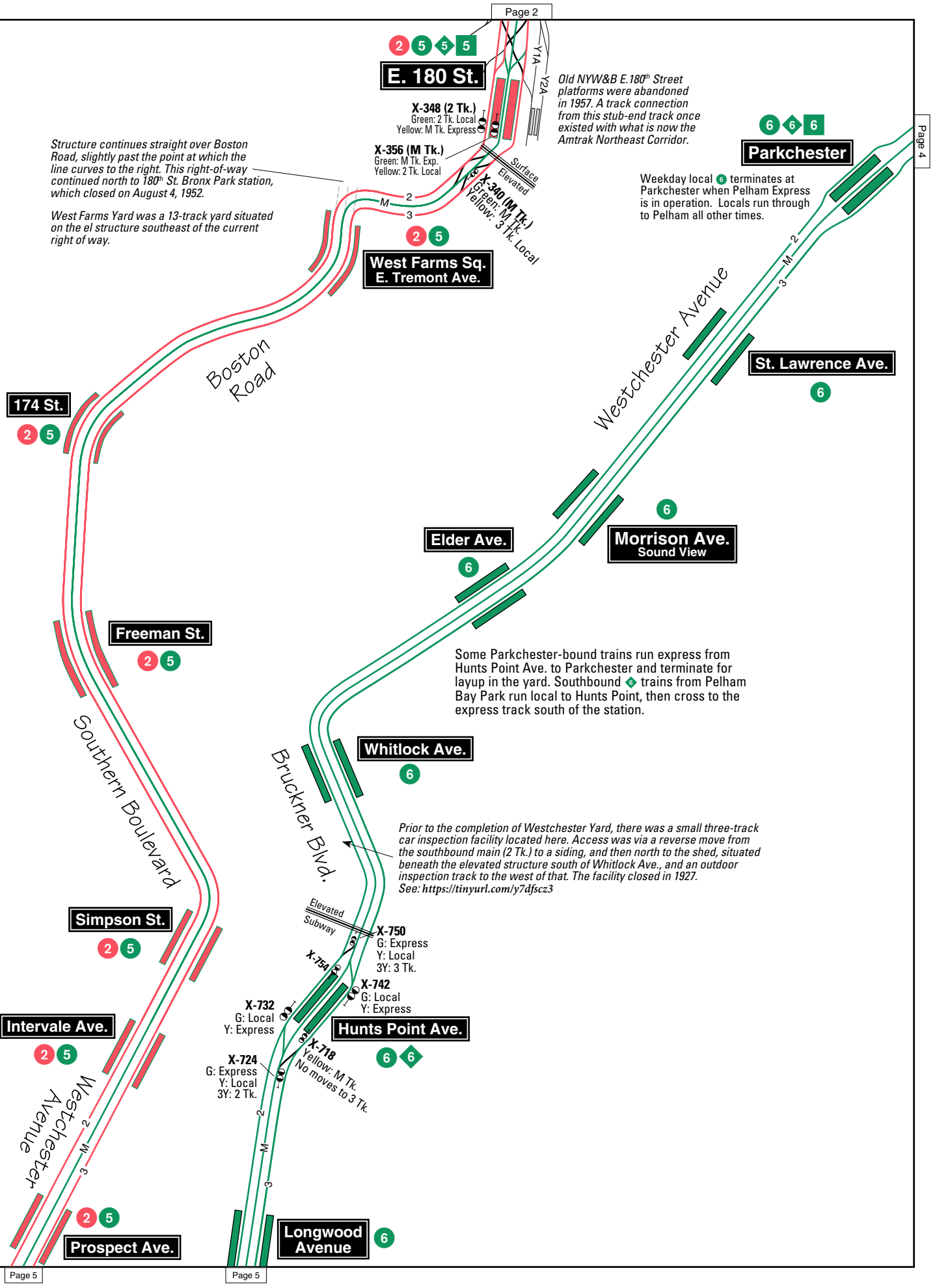
Unionport Yard tracks number 19–37 from west to east. Track 22 connects to the Dyre Avenue Line, and similar to southbound moves on the B lead through E. 180th St. Yard, northbound 5 trains may be operated in revenue service through 22 Tk. if needed.

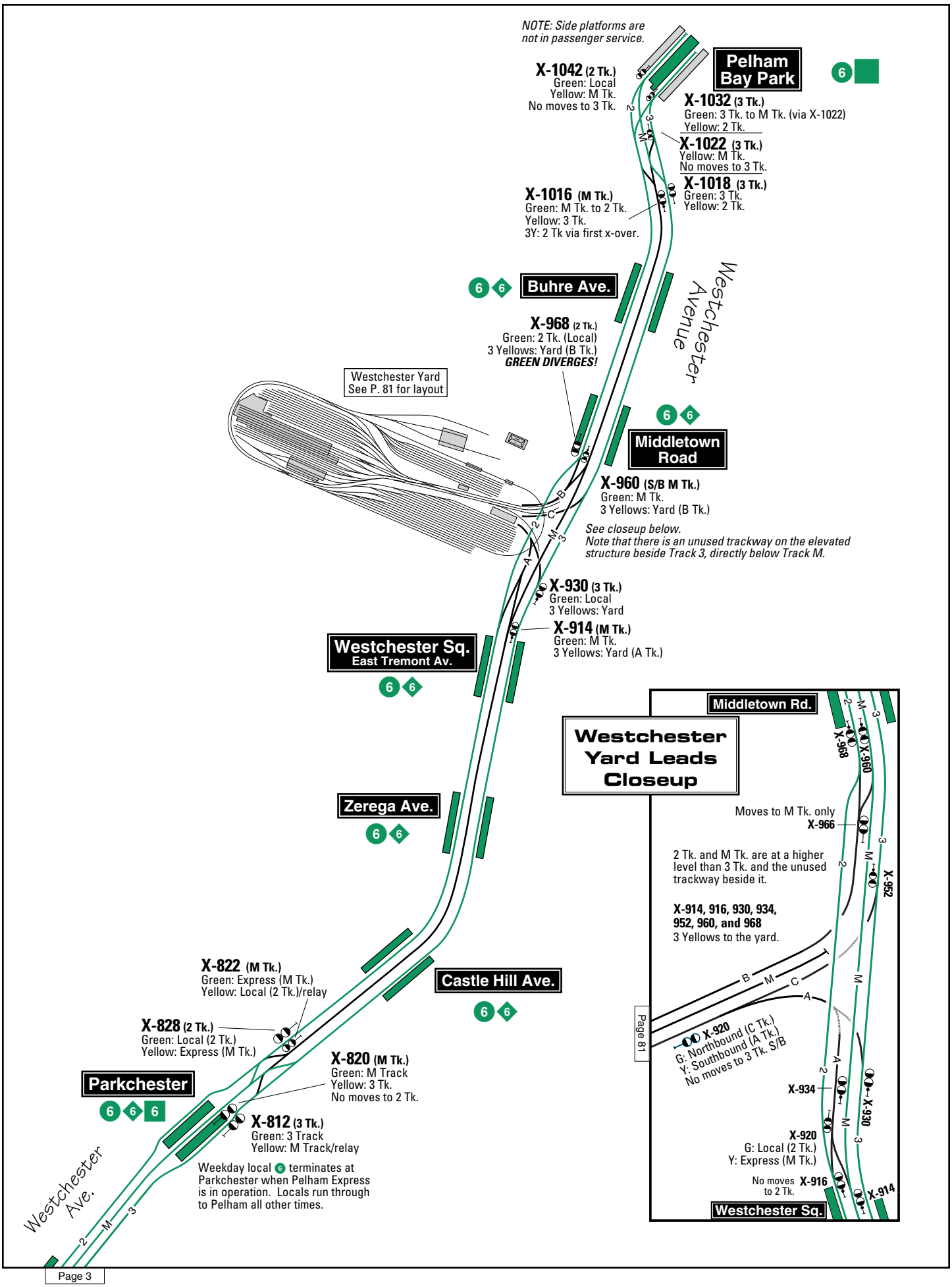
Track 27 extends into a paved area beyond the bumpers at the north end of the yard. This short extension is not electrified.

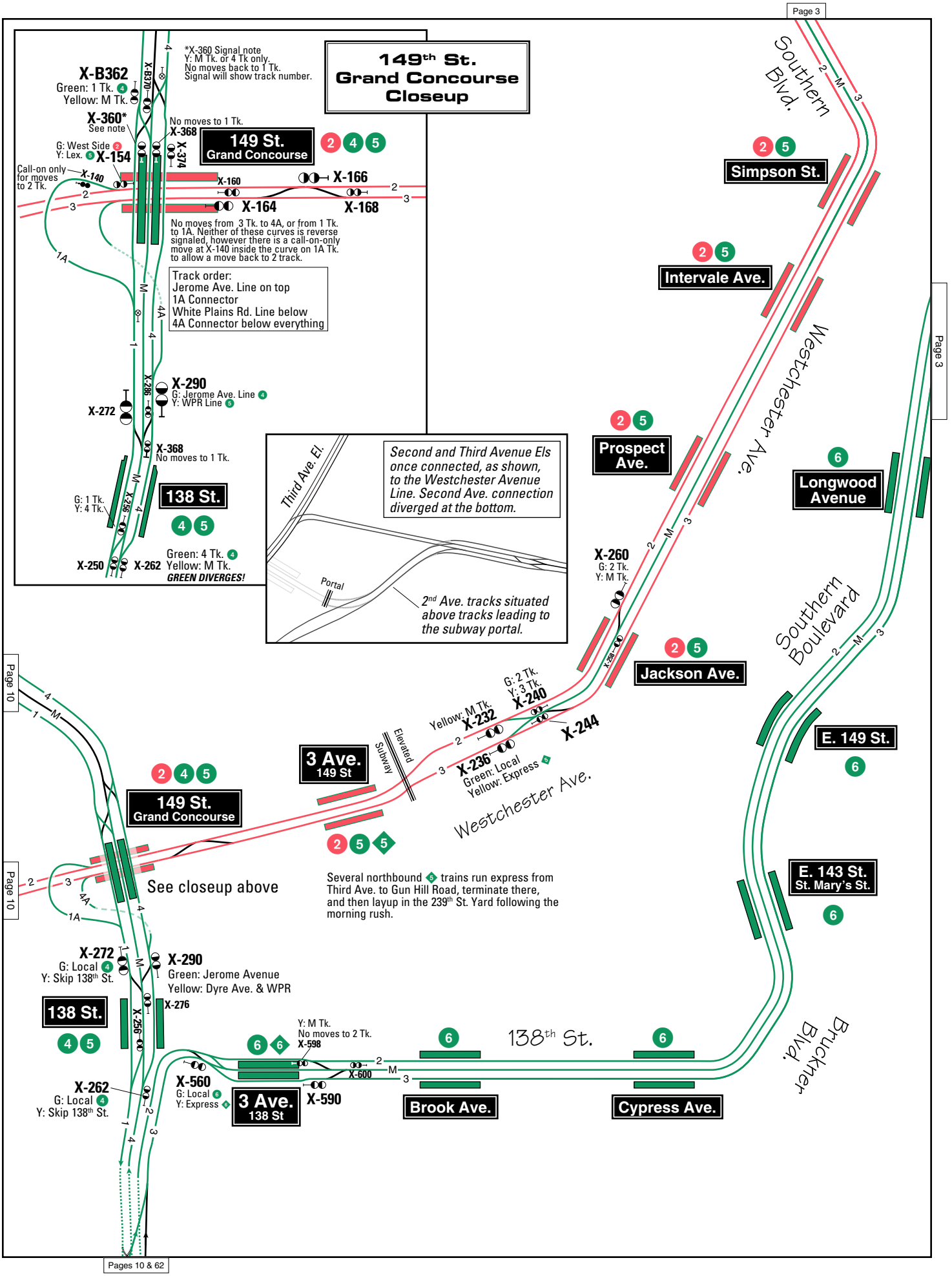
Unionport Yard and yard leads are shown exaggerated in both size and placement in this drawing for clarity purposes. See Pages 86 and 87 for to-scale details.

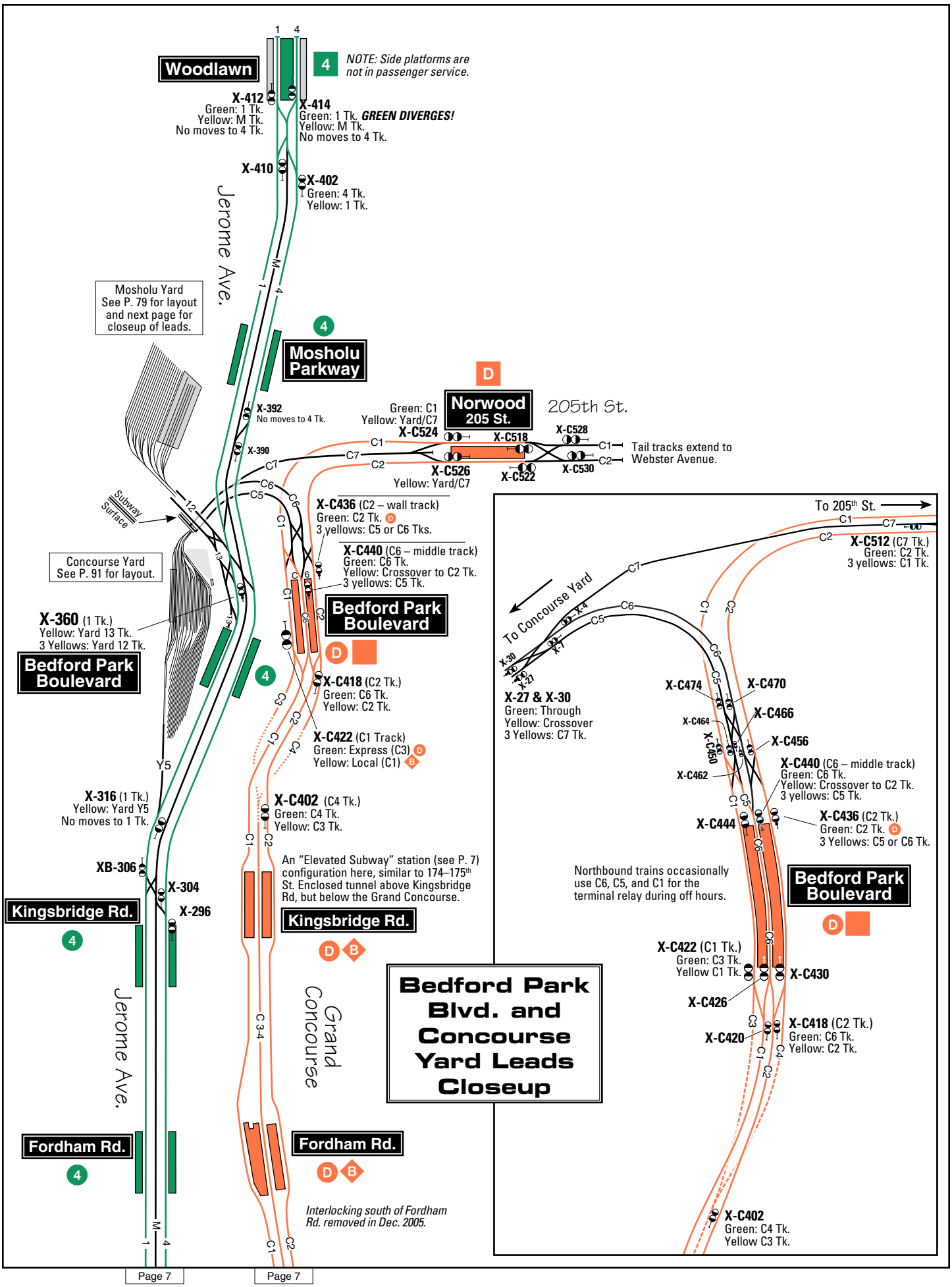
Unionport Yard
See P. 87 for layout

Page 3

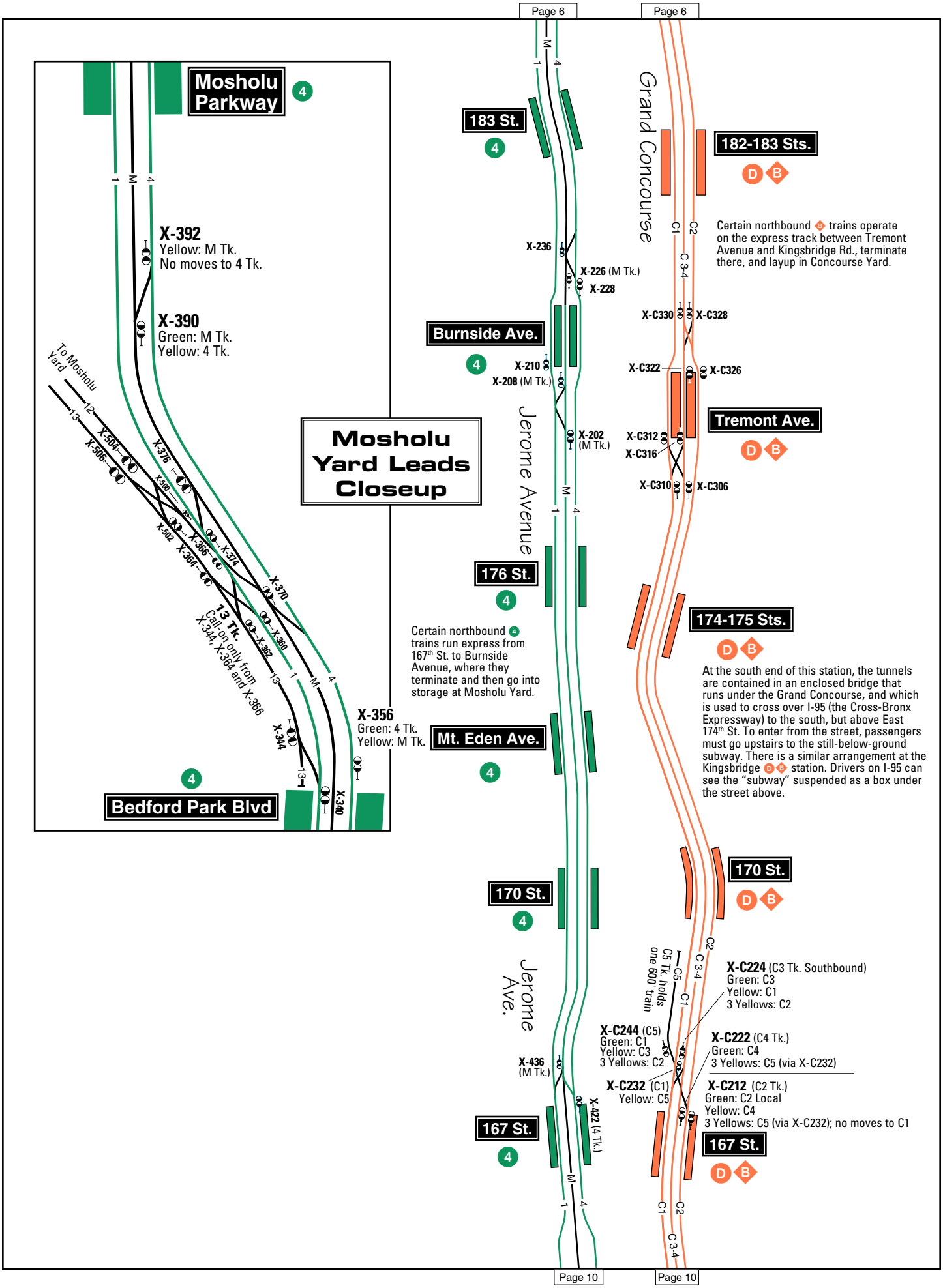


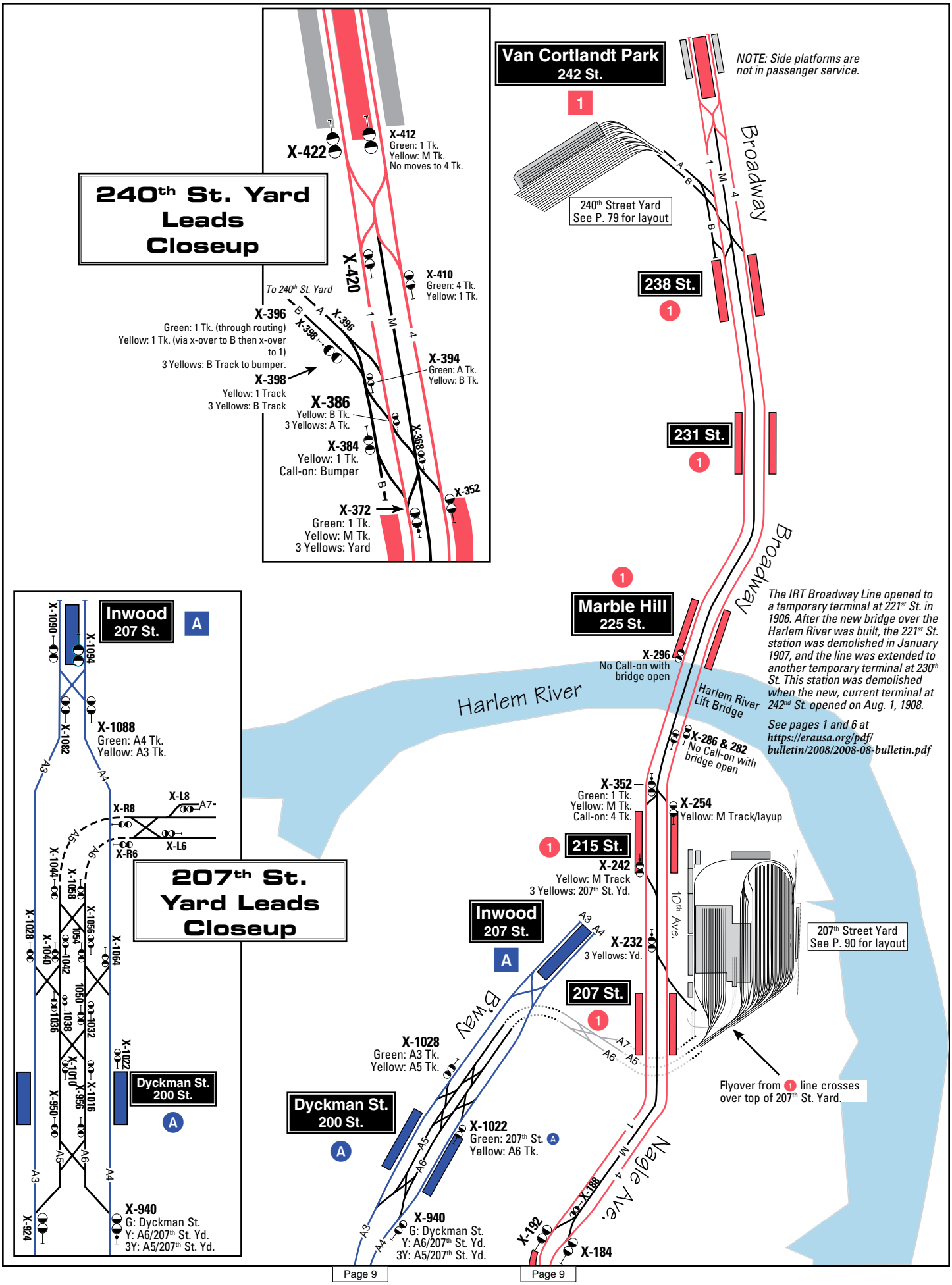




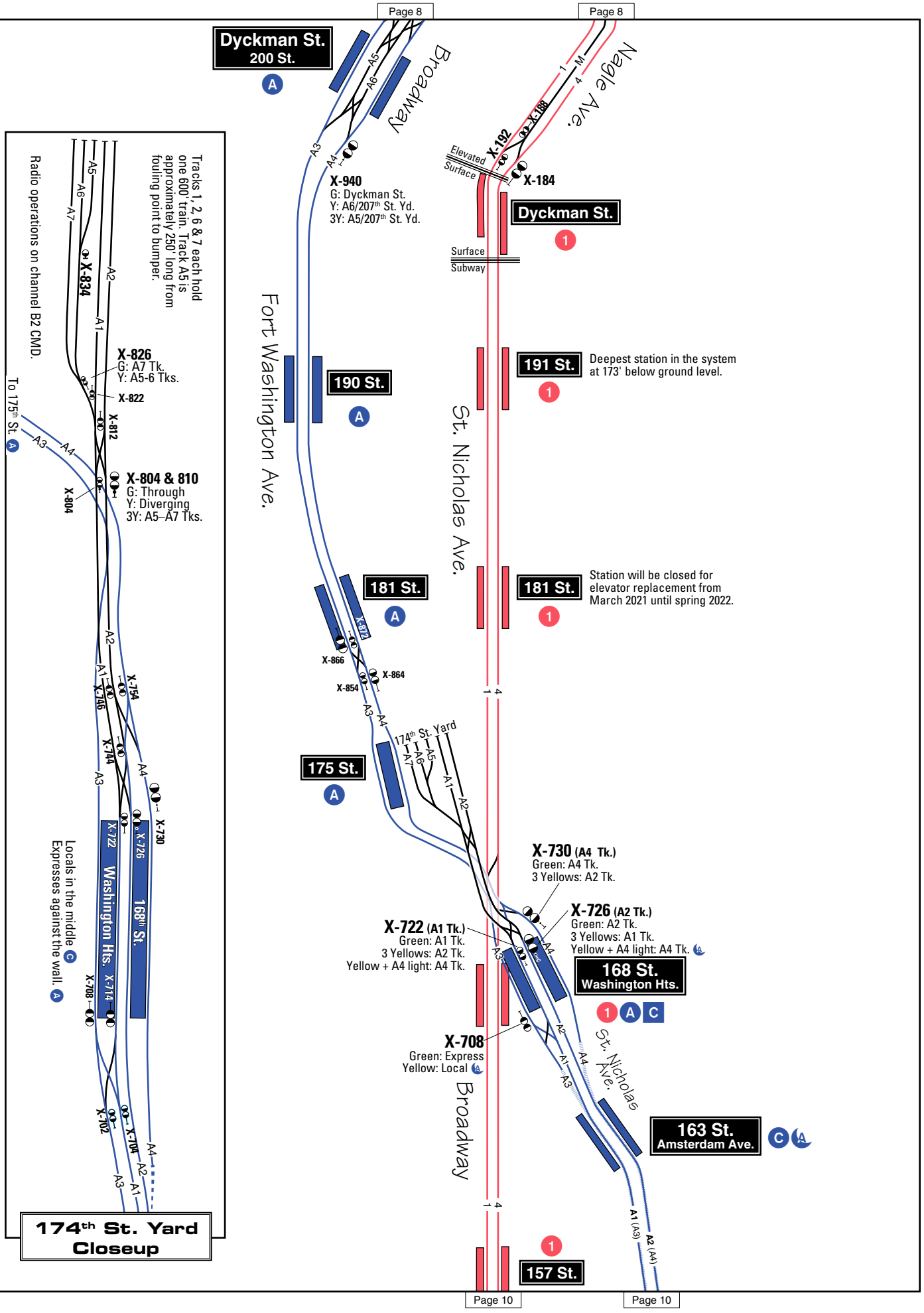


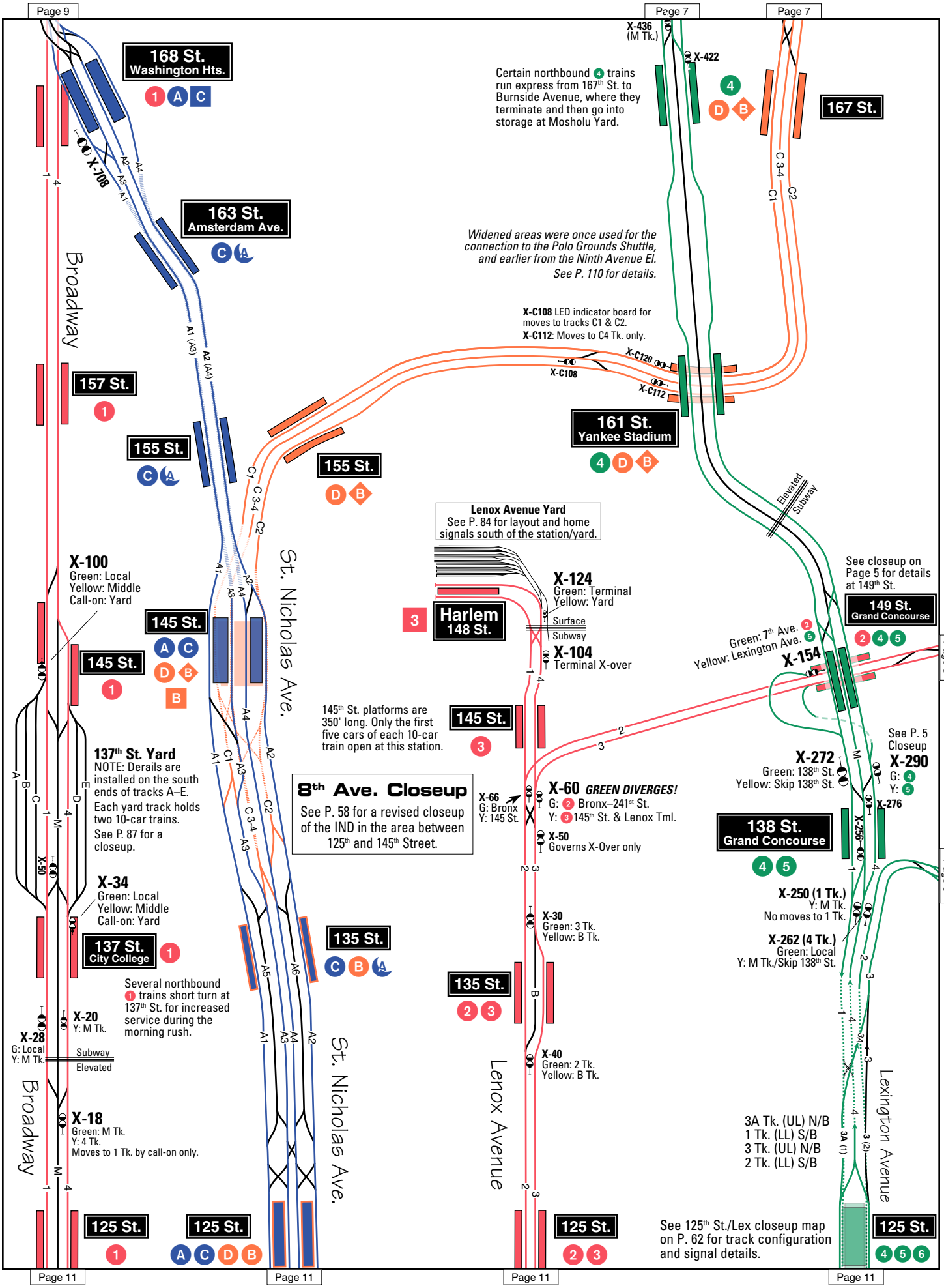
Page 7

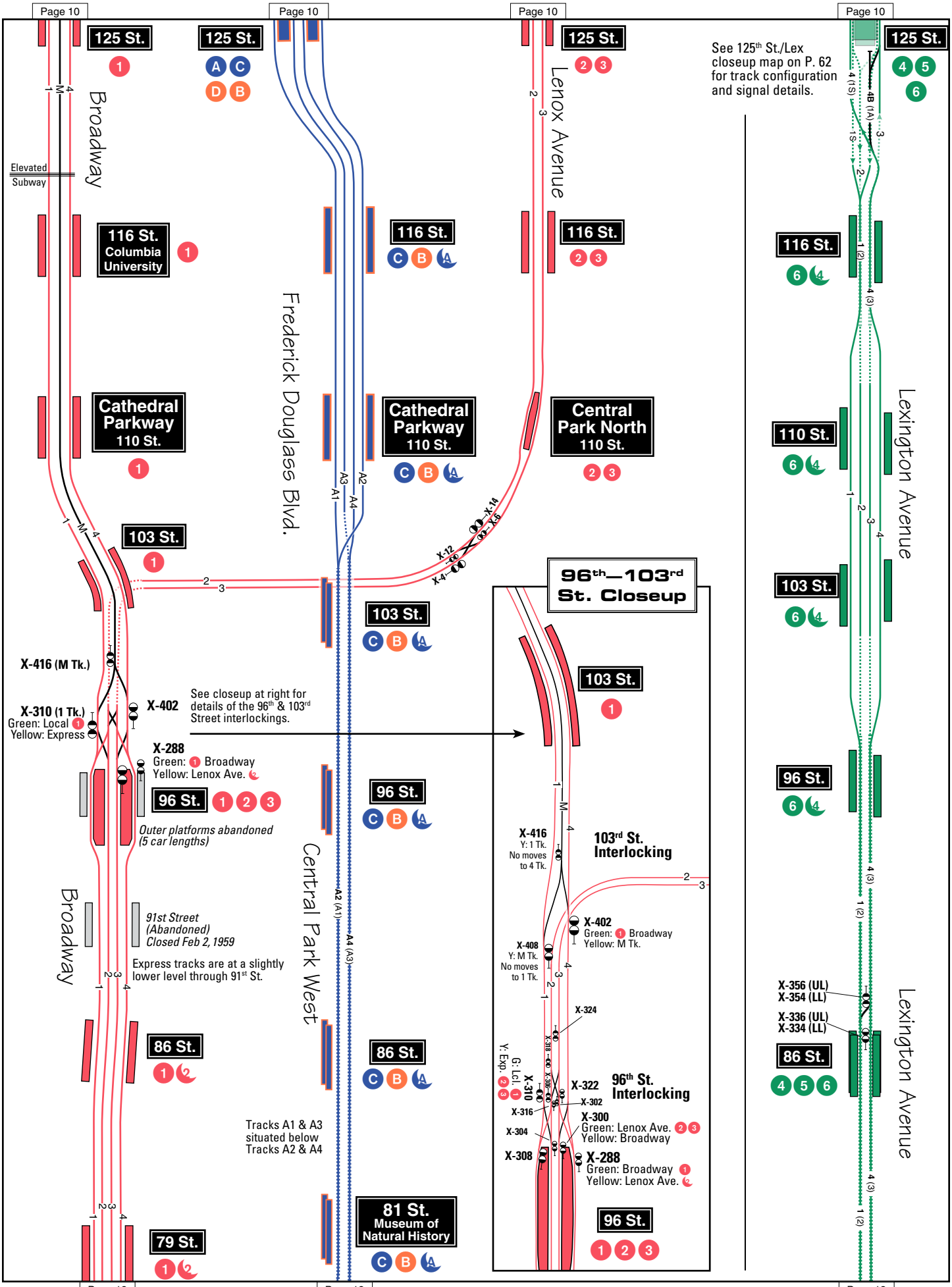


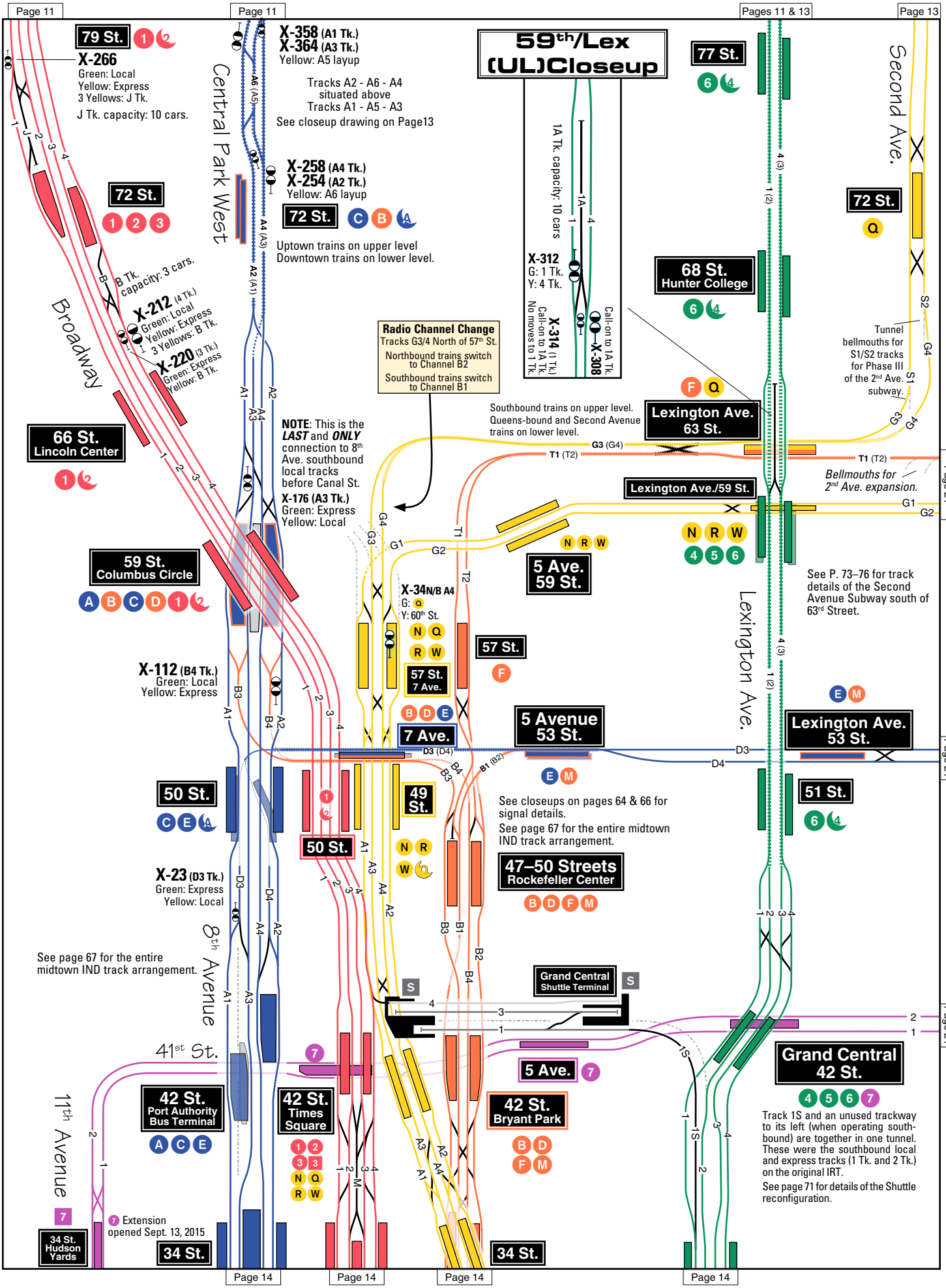


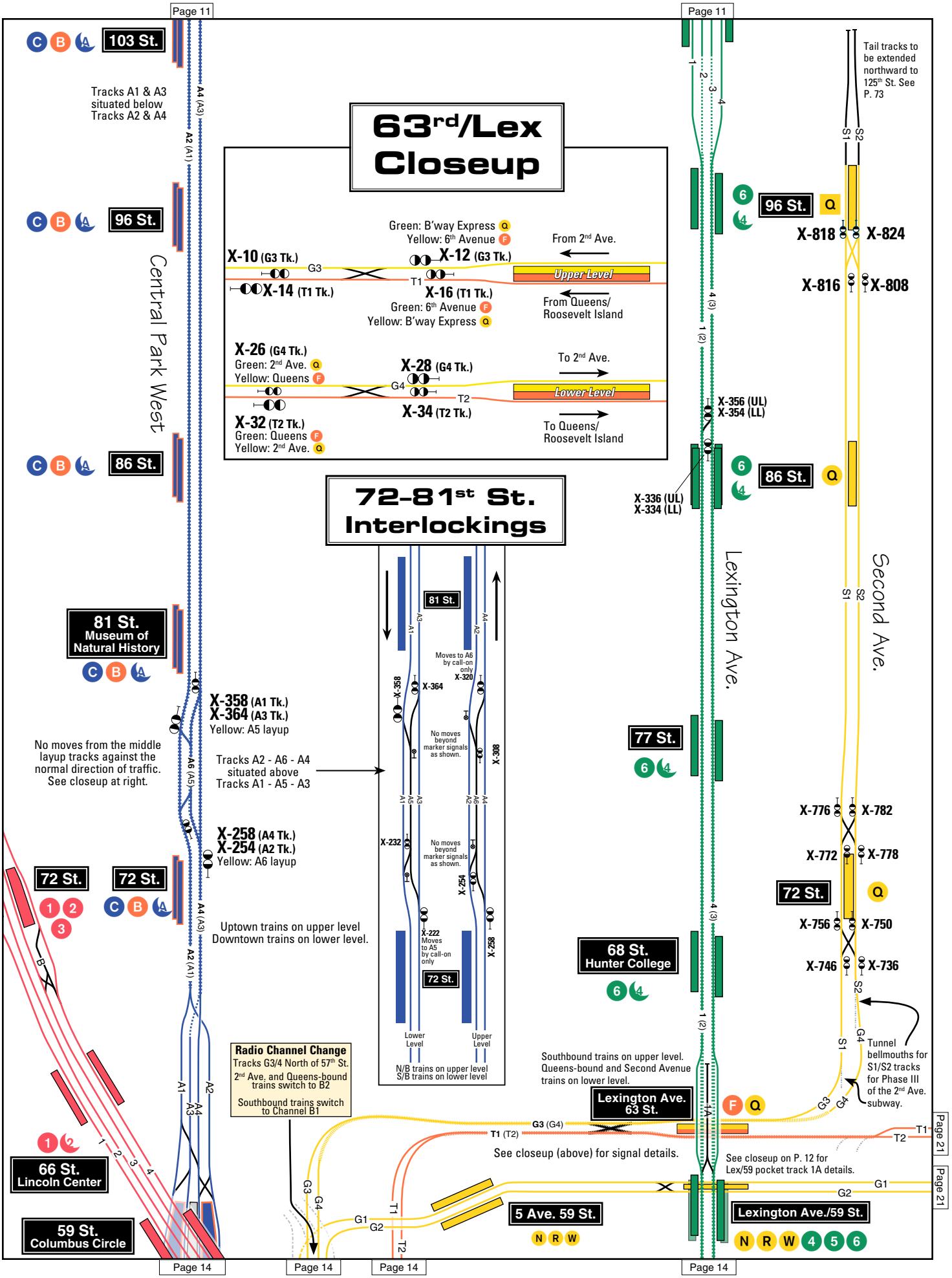
Page 9

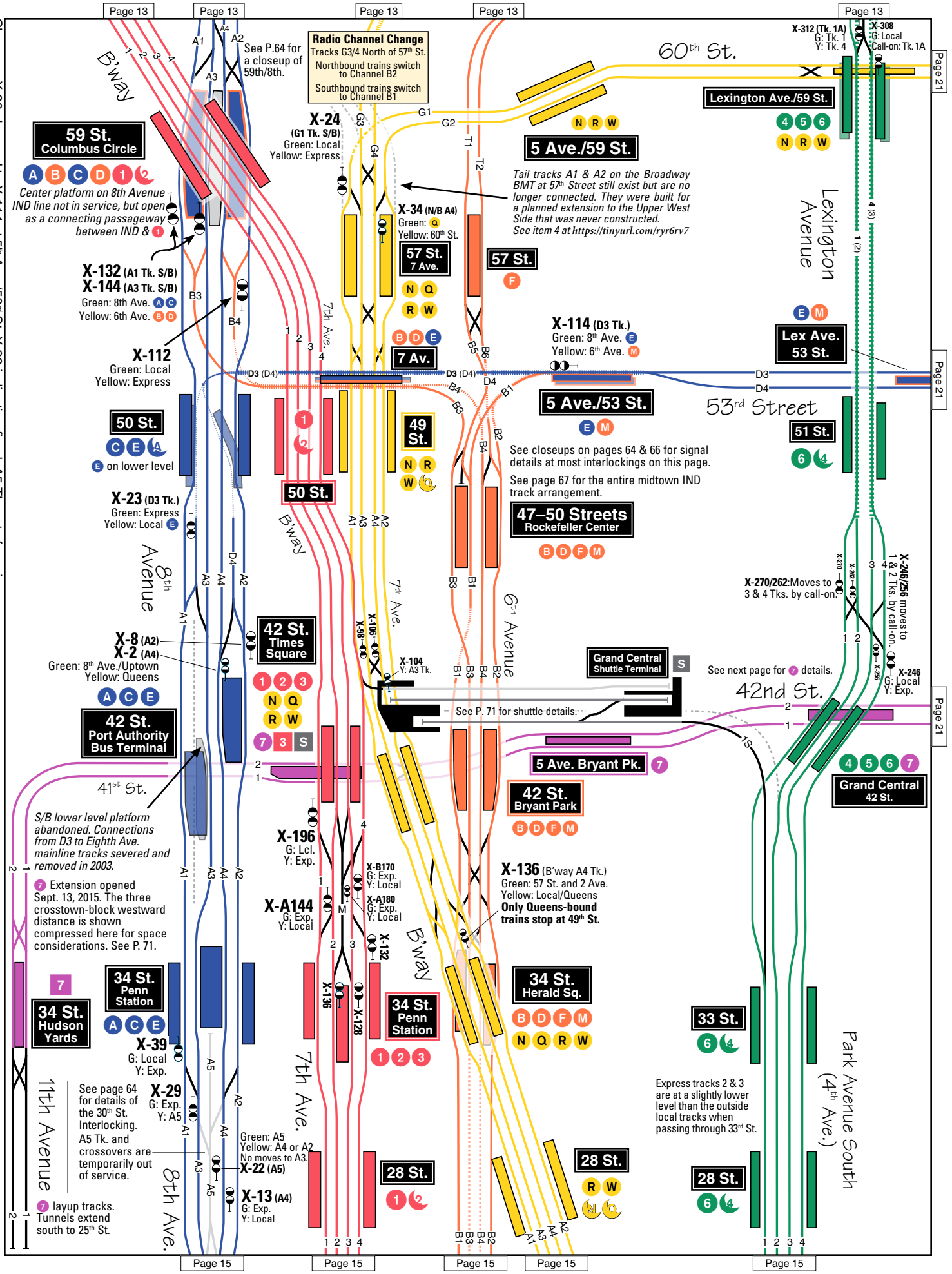




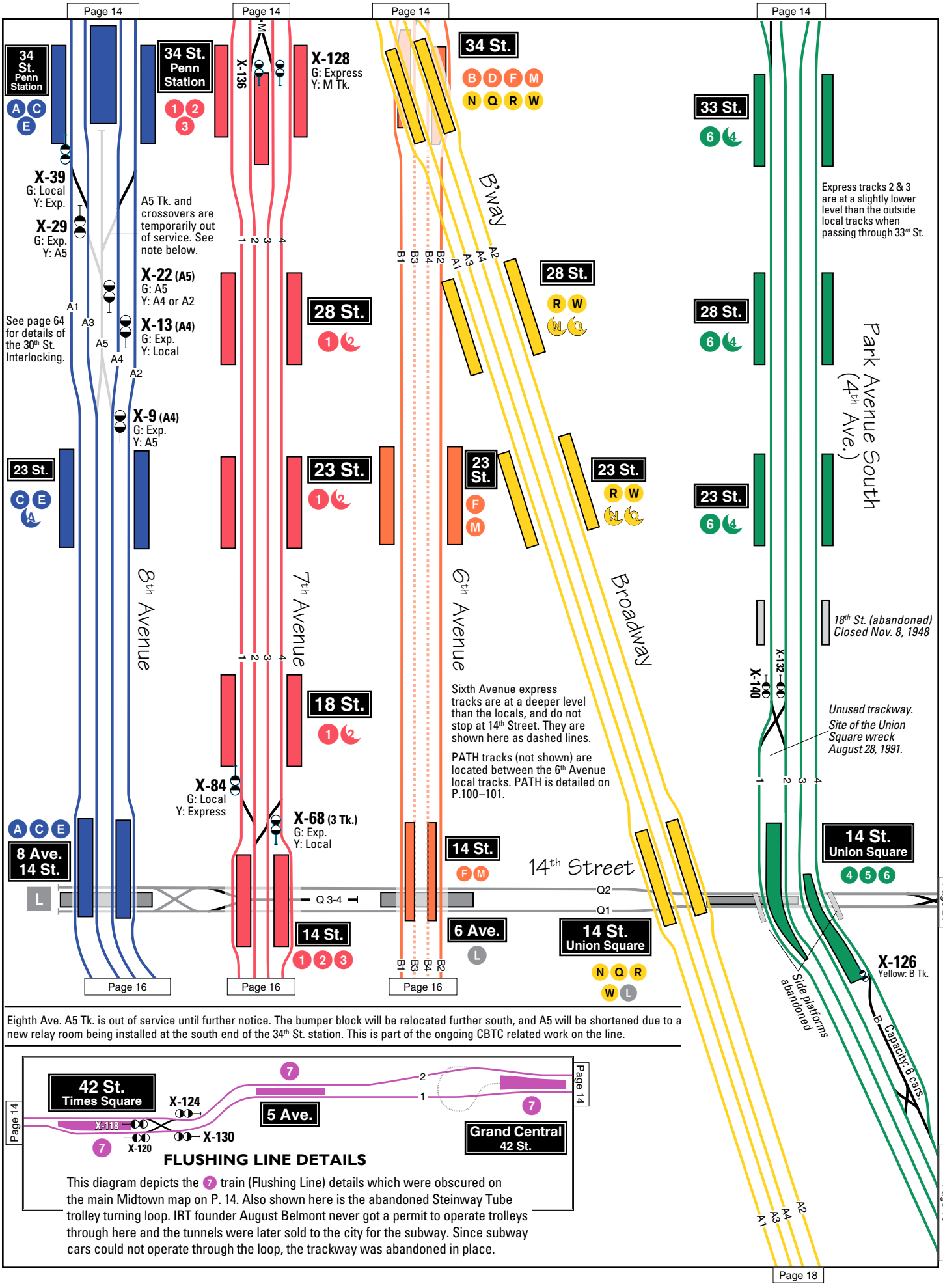








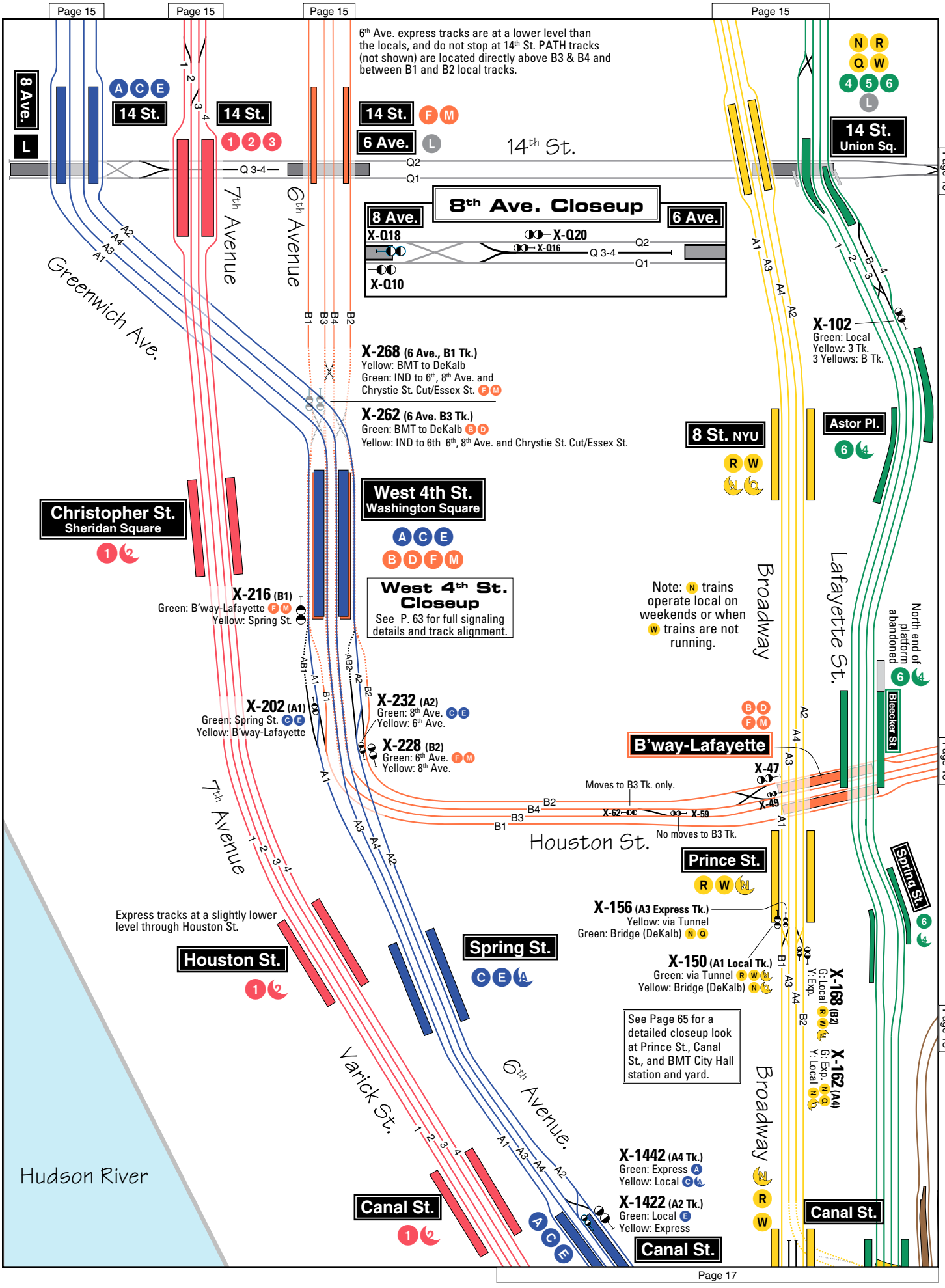
Changes: X-36 changed to X-114 at 5th Ave./53rd St; X-22 indication fixed; A5 Tk. out of service on 8th Ave.



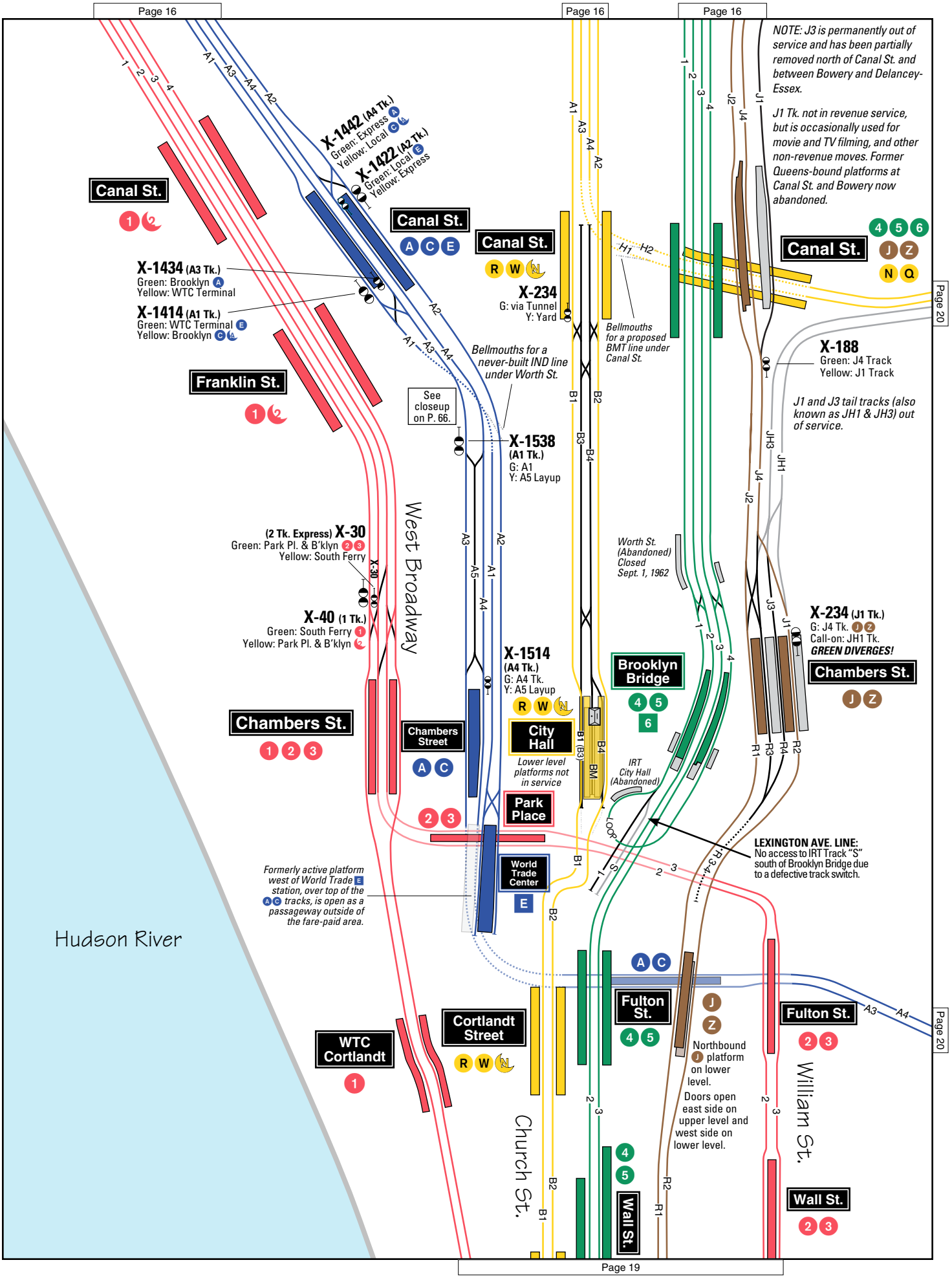
Eighth Ave. A5 Tk. is out of service until further notice. The bumper block will be relocated further south, and A5 will be shortened due to a new relay room being installed at the south end of the 34th St. station. This is part of the ongoing CBTC related work on the line.

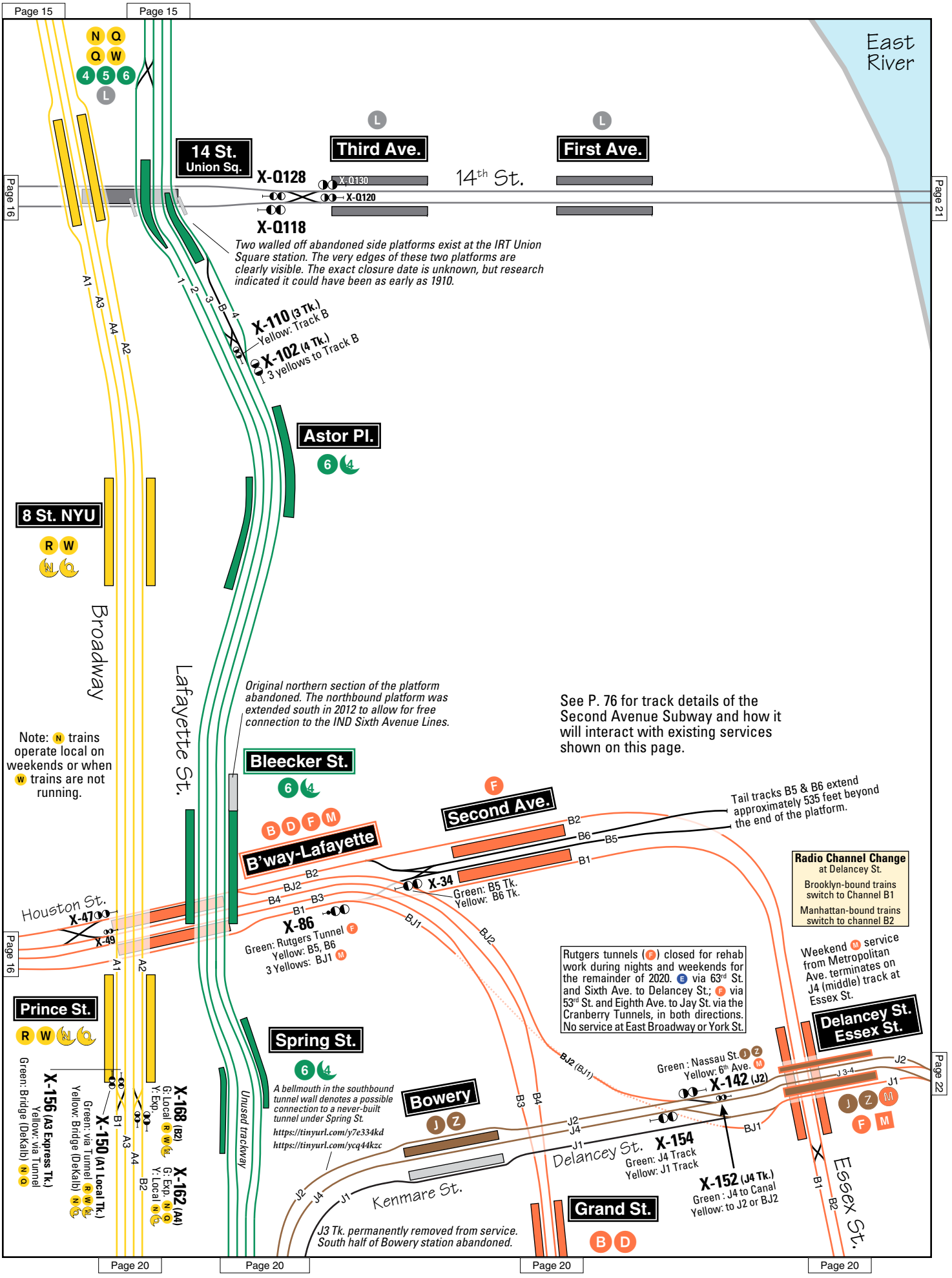
FLUSHING LINE DETAILS

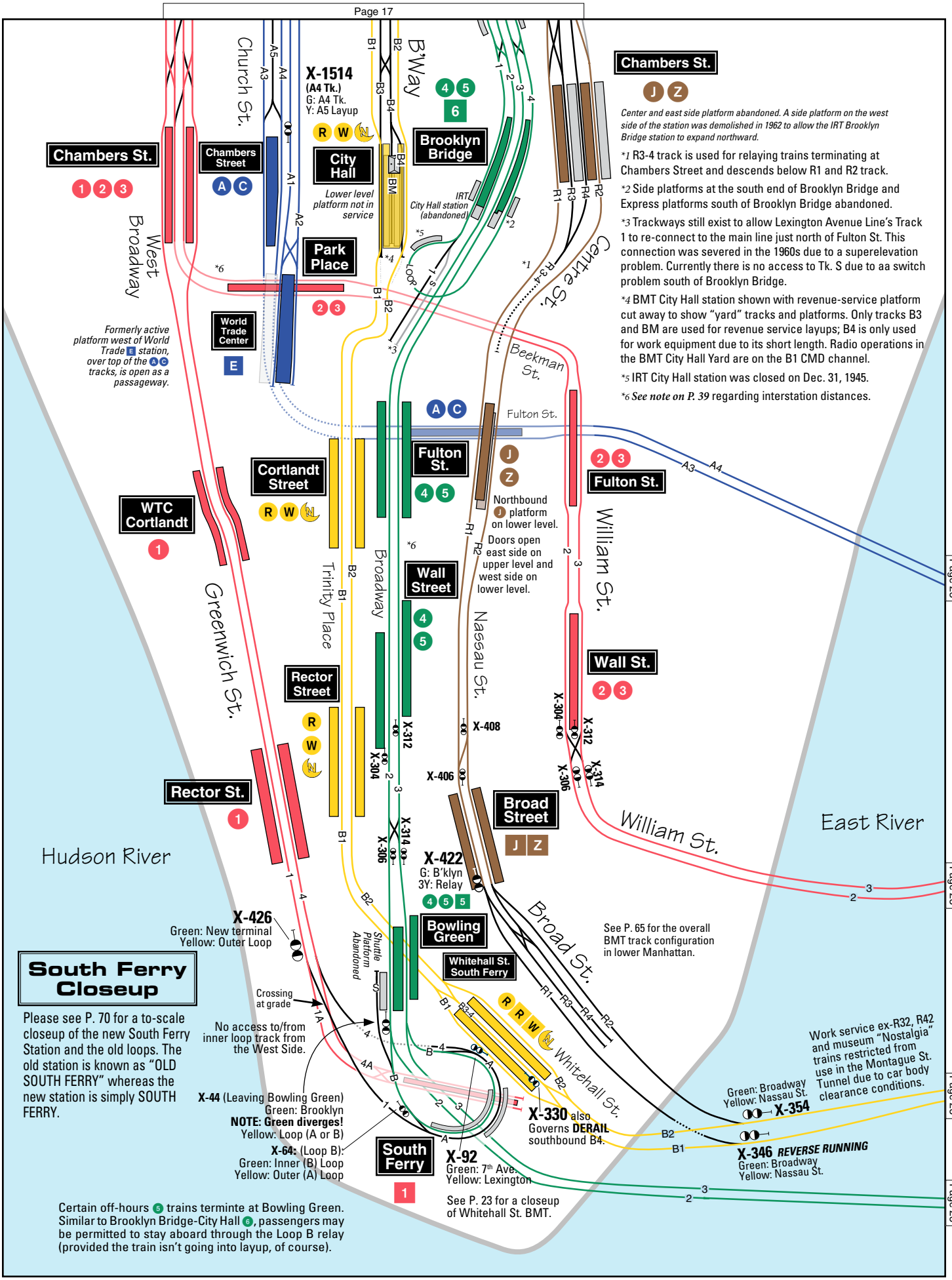
This diagram depicts the 7 train (Flushing Line) details which were obscured on the main Midtown map on P. 14. Also shown here is the abandoned Steinway Tube trolley turning loop. IRT founder August Belmont never got a permit to operate trolleys through here and the tunnels were later sold to the city for the subway. Since subway cars could not operate through the loop, the trackway was abandoned in place.



Changes: Signals at B'way-Lafayette added and crossovers positioned correctly; West 4th redrawn.







South Ferry Closeup

Please see P. 70 for a to-scale closeup of the new South Ferry Station and the old loops. The old station is known as "OLD SOUTH FERRY" whereas the new station is simply SOUTH FERRY.

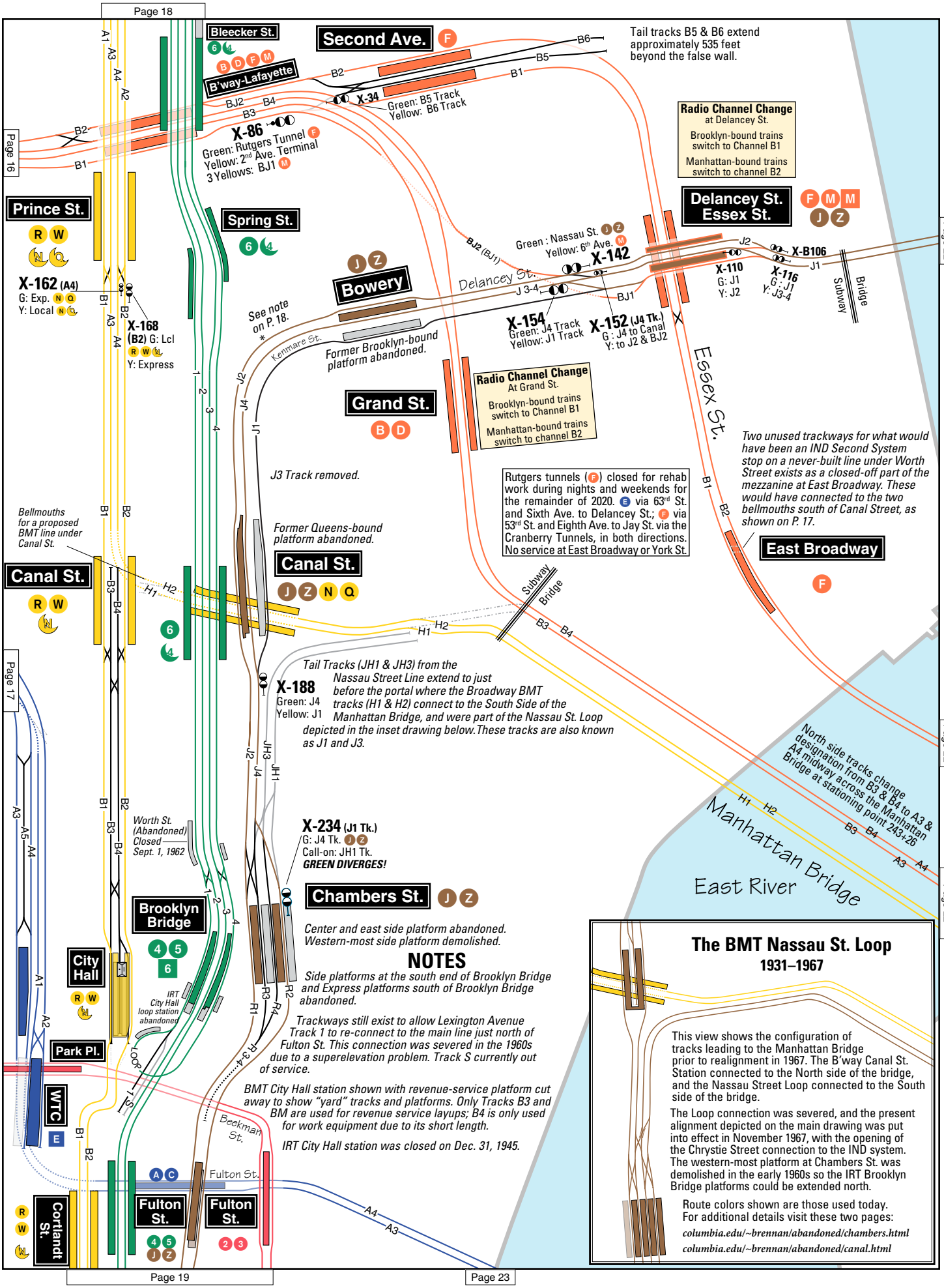
See P. 65 for the overall BMT track configuration in lower Manhattan.

See P. 23 for a closeup of Whitehall St. BMT.

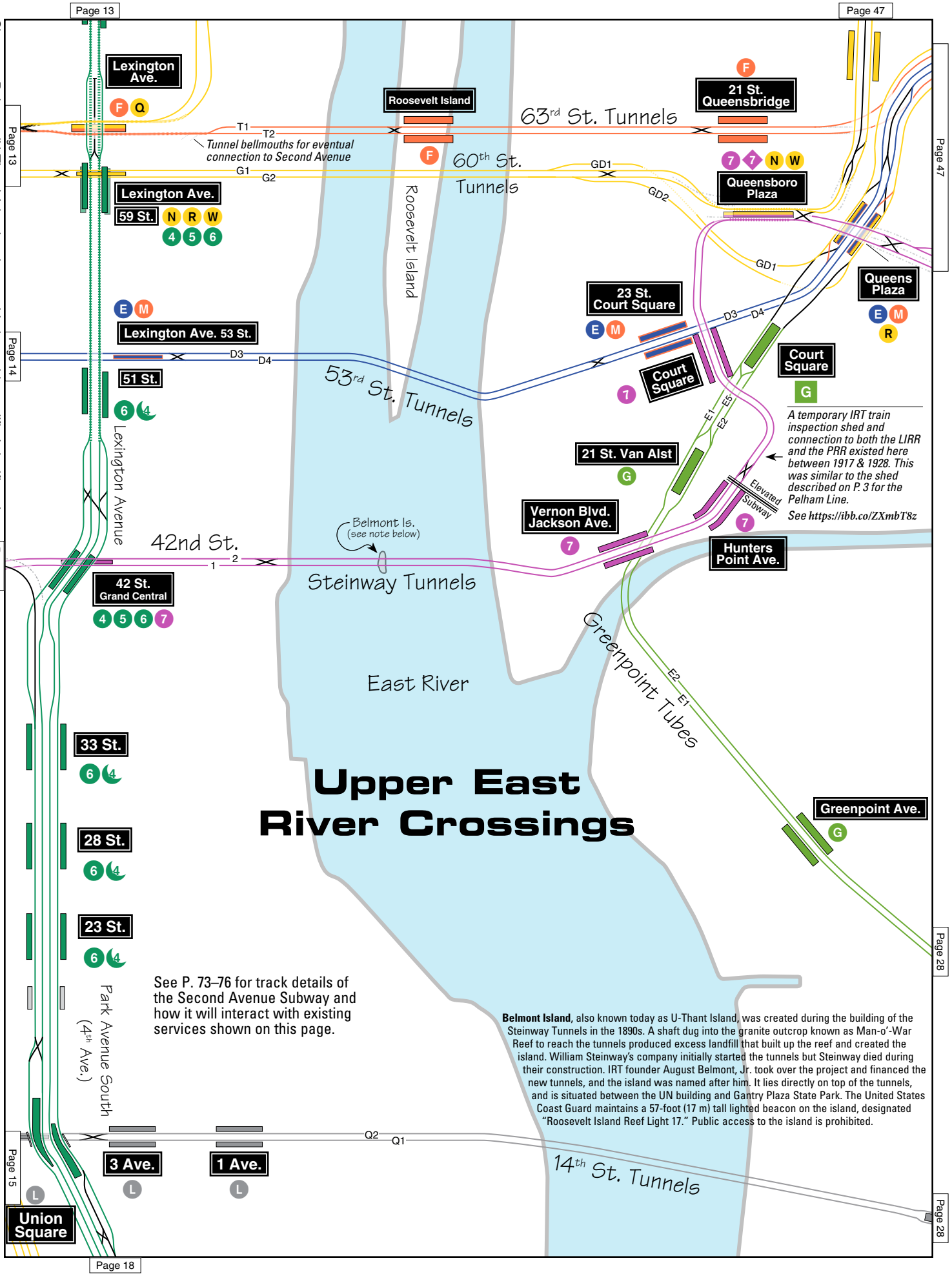
Certain off-hours 5 trains terminte at Bowling Green. Similar to Brooklyn Bridge-City Hall 6, passengers may be permitted to stay aboard through the Loop B relay (provided the train isn't going into layup, of course).

Changes: Signals at Wall St. 4 5 added; Footnote 6 and link to interstation distance information on P. 39 added; loop track numbering fixed.

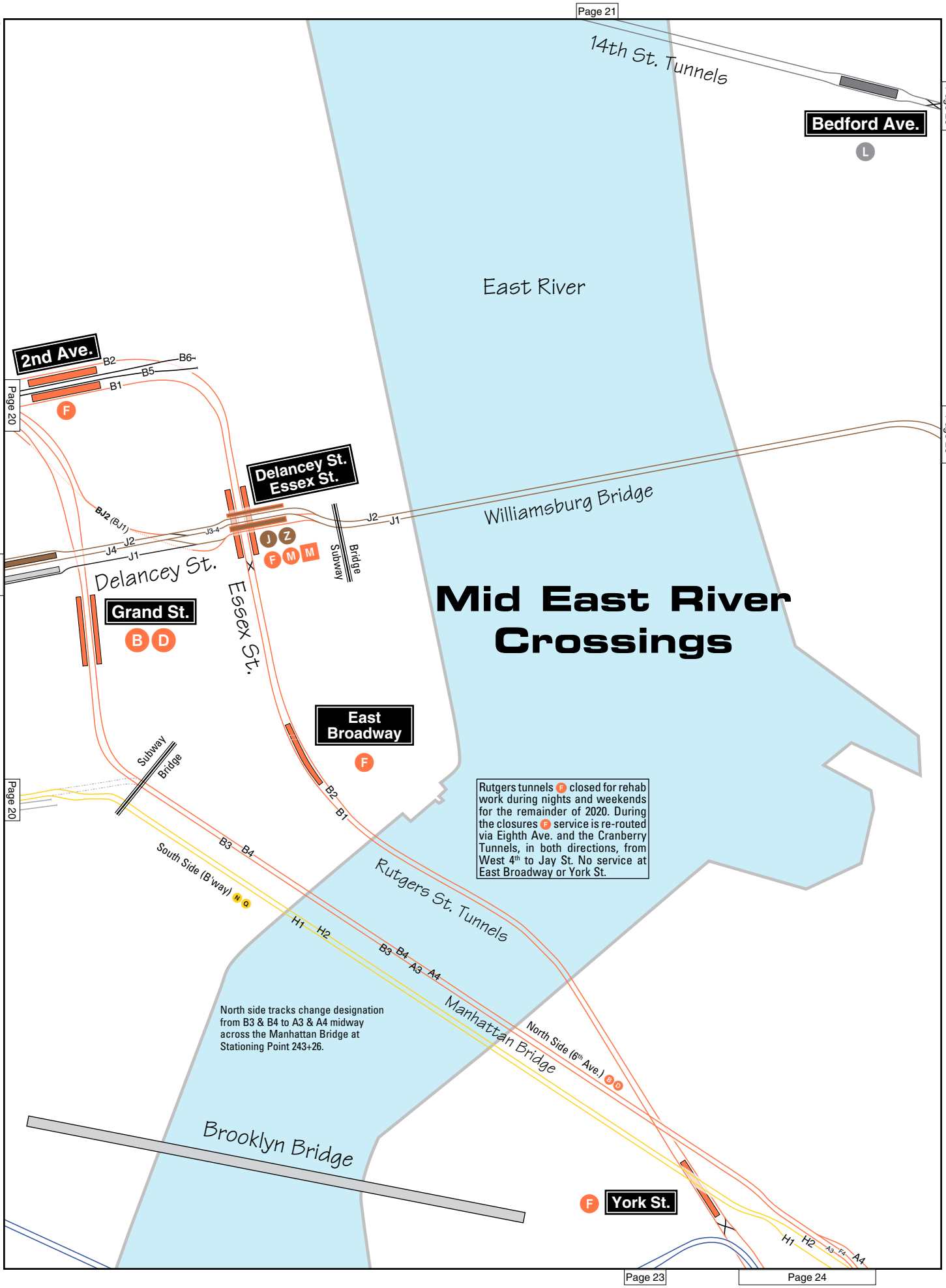
www.nyctrackbook.com 2021 Edition

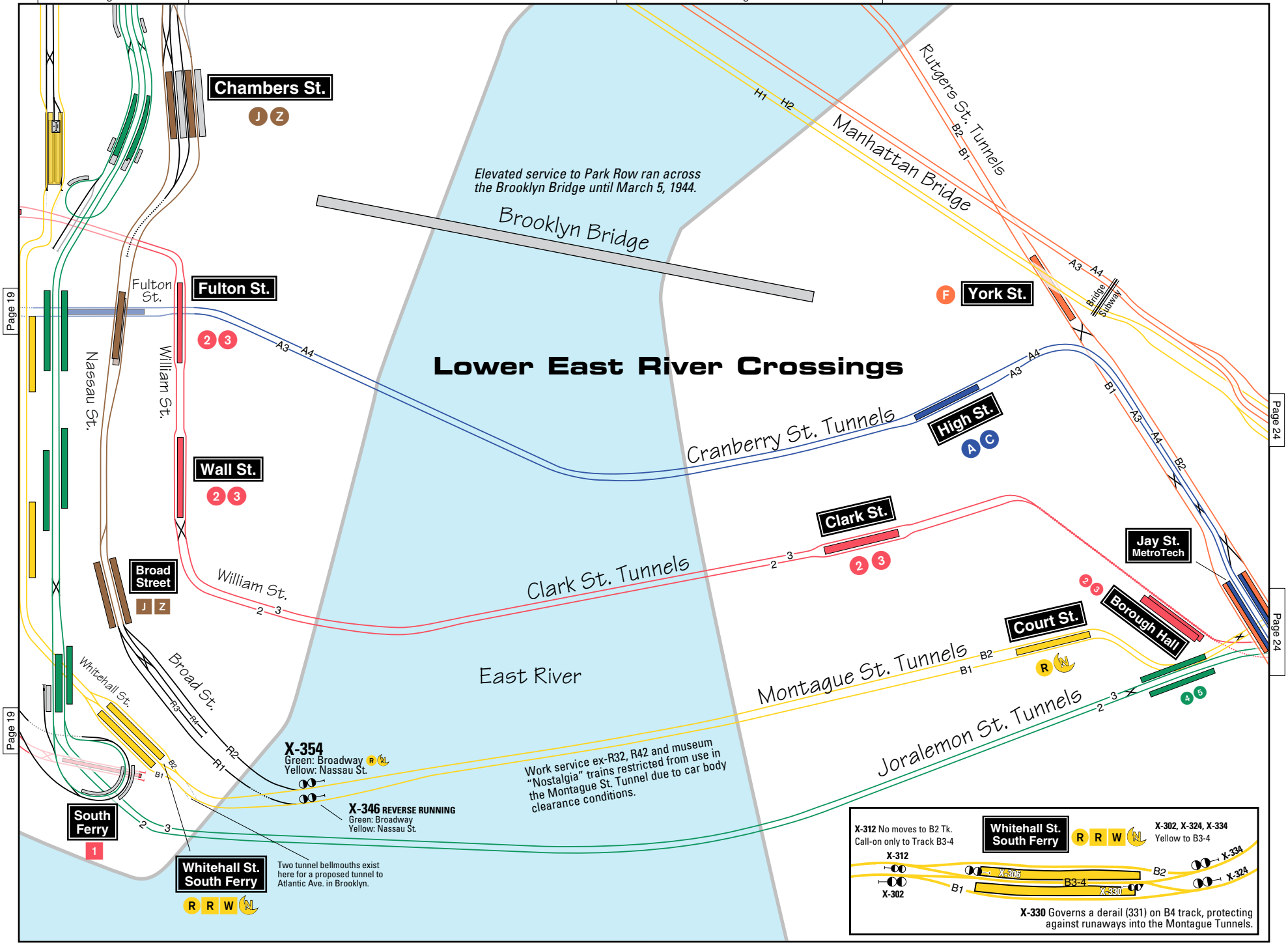


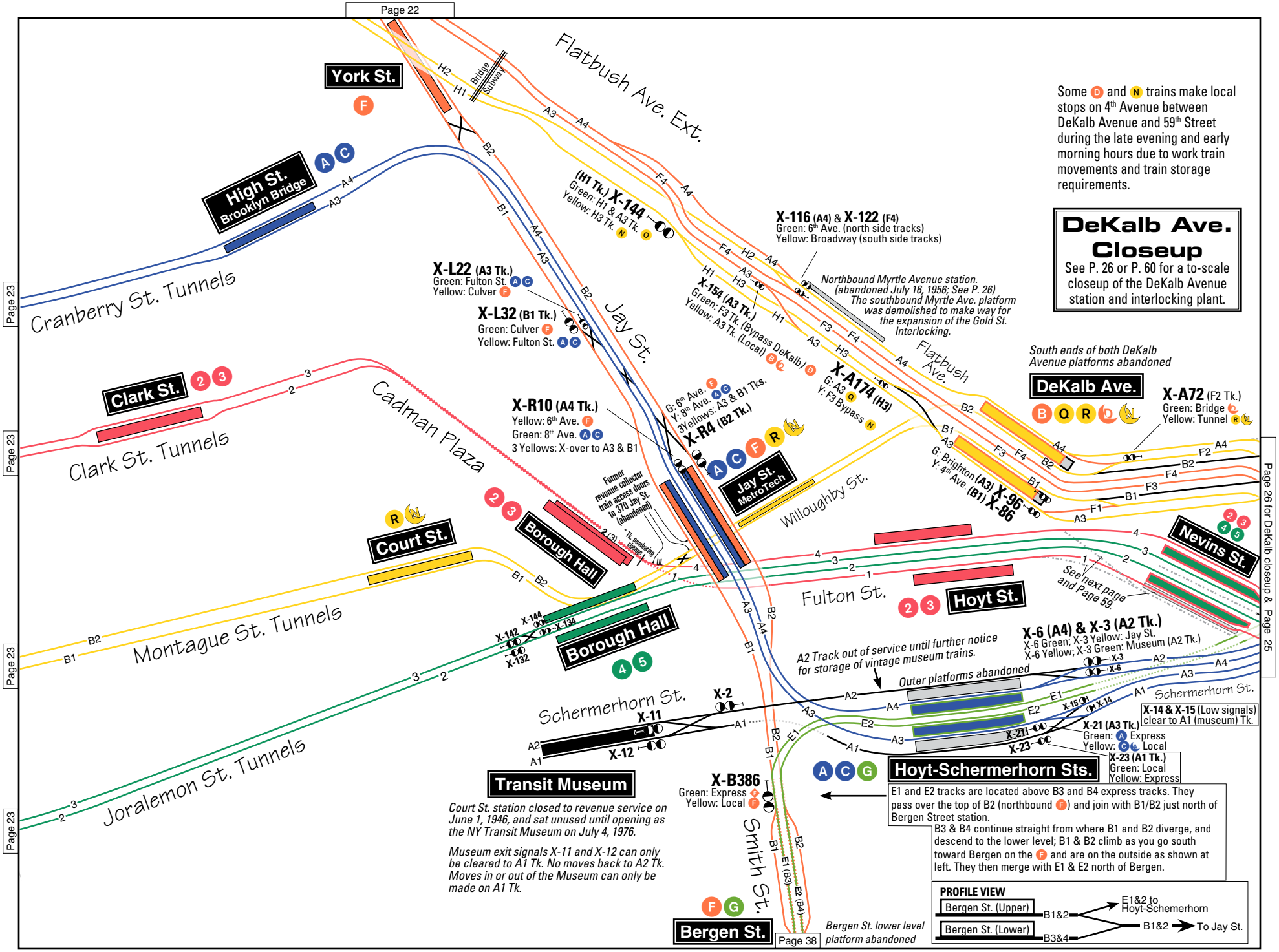
Changes: Abandoned Manhattan Bridge trackways added; note changed; trackways at East Broadway added; fixed radio channel notes. Nassau St. Loop drawing added; Rutgers Tunnels note added.



Belmont Island, also known today as U-Thant Island, was created during the building of the Steinway Tunnels in the 1890s. A shaft dug into the granite outcrop known as Man-o'-War Reef to reach the tunnels produced excess landfill that built up the reef and created the island. William Steinway's company initially started the tunnels but Steinway died during their construction. IRT founder August Belmont, Jr. took over the project and financed the new tunnels, and the island was named after him. It lies directly on top of the tunnels, and is situated between the UN building and Gantry Plaza State Park. The United States Coast Guard maintains a 57-foot (17 m) tall lighted beacon on the island, designated "Roosevelt Island Reef Light 17." Public access to the island is prohibited.

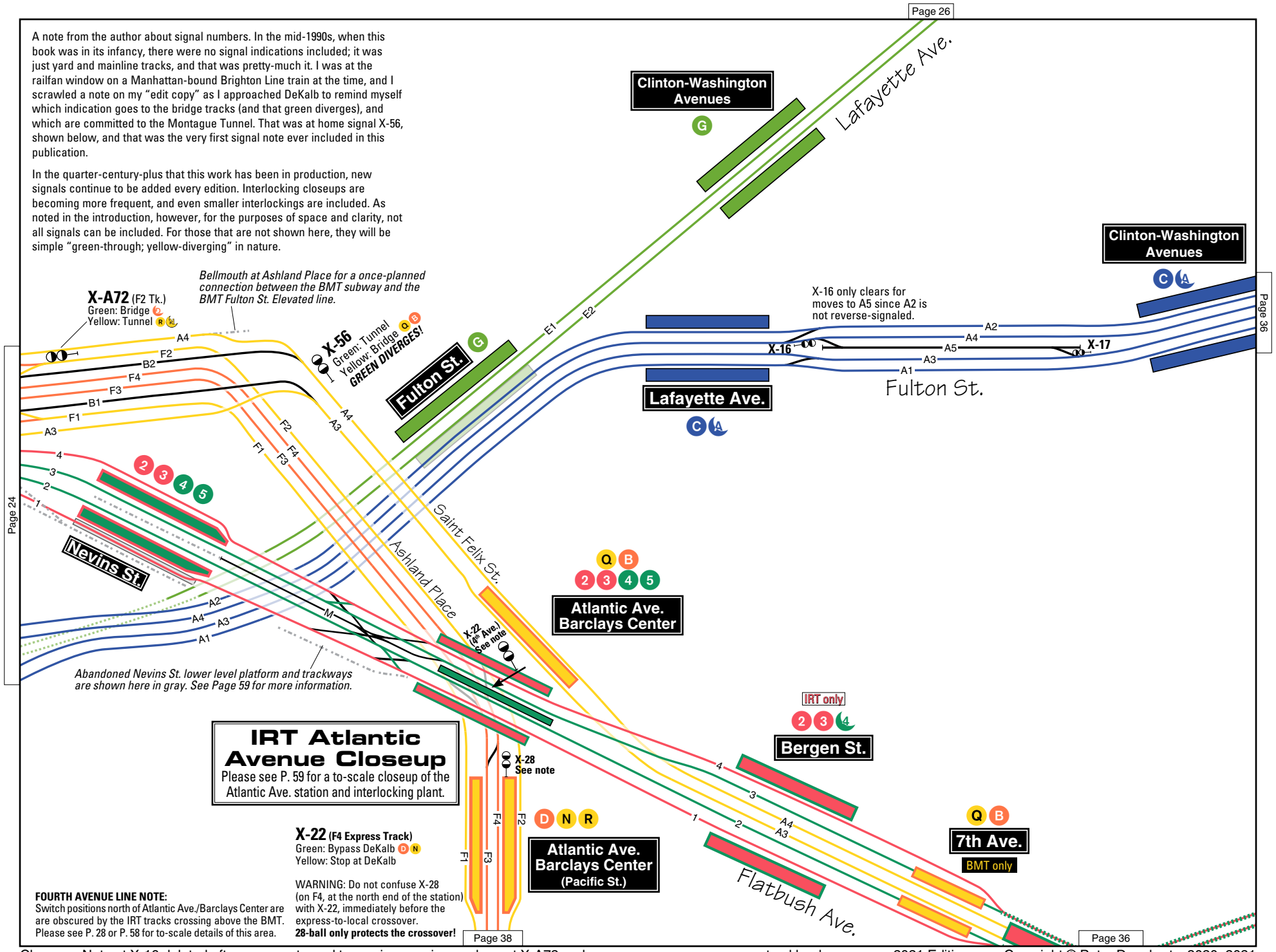




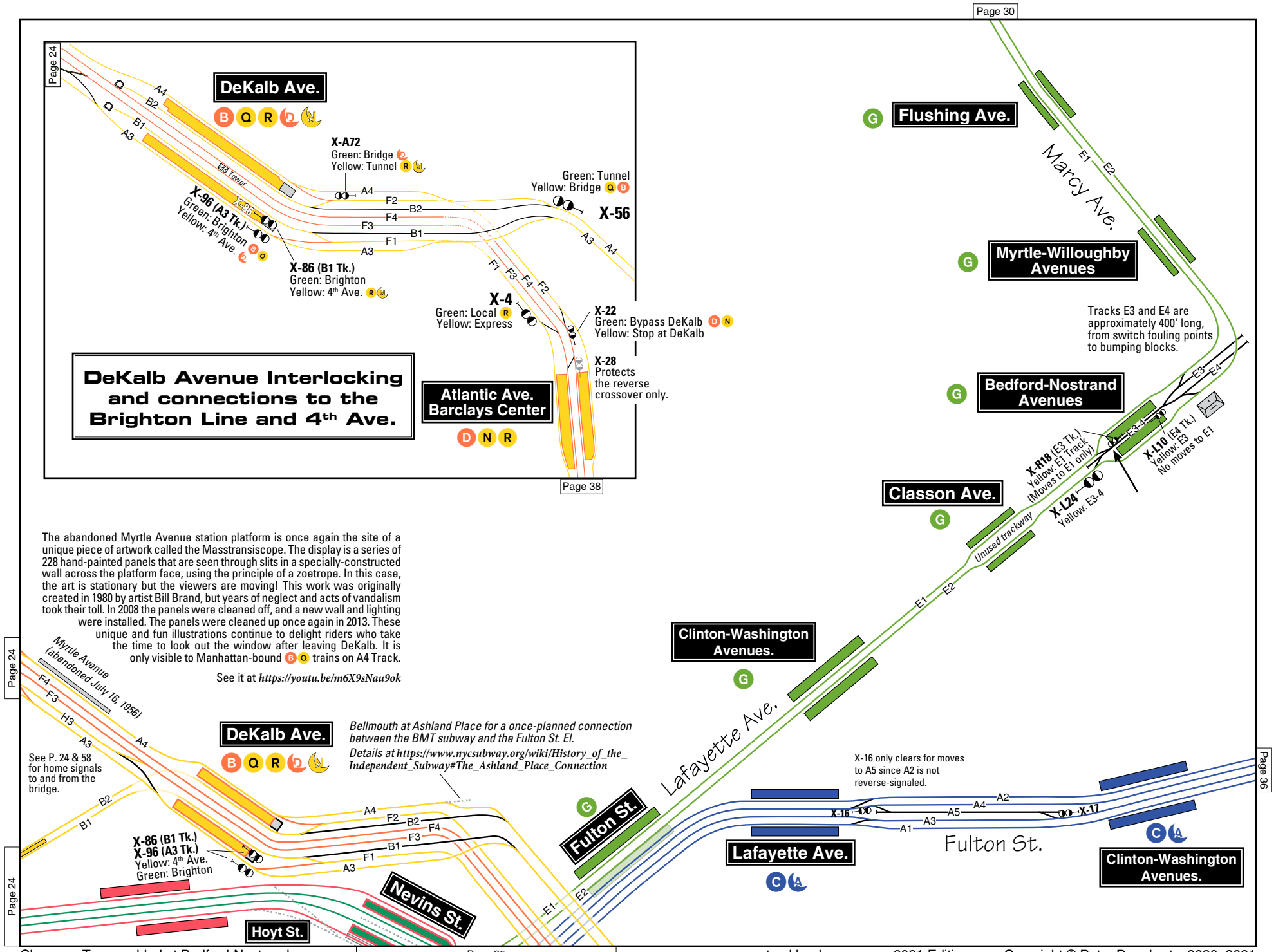


A note from the author about signal numbers. In the mid-1990s, when this book was in its infancy, there were no signal indications included; it was just yard and mainline tracks, and that was pretty-much it. I was at the railfan window on a Manhattan-bound Brighton Line train at the time, and I scrawled a note on my "edit copy" as I approached DeKalb to remind myself which indication goes to the bridge tracks (and that green diverges), and which are committed to the Montague Tunnel. That was at home signal X-56, shown below, and that was the very first signal note ever included in this publication.

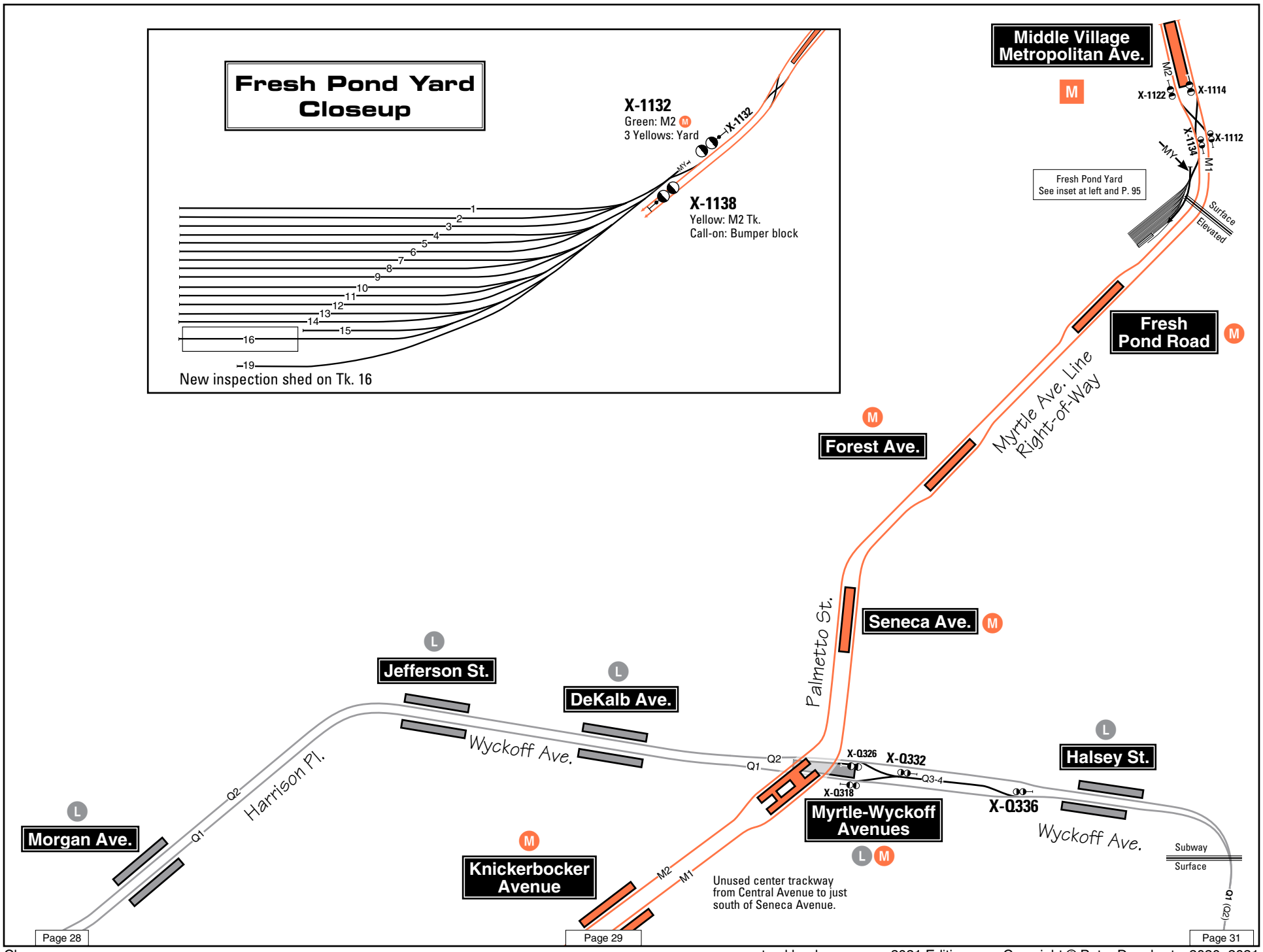
In the quarter-century-plus that this work has been in production, new signals continue to be added every edition. Interlocking closeups are becoming more frequent, and even smaller interlockings are included. As noted in the introduction, however, for the purposes of space and clarity, not all signals can be included. For those that are not shown here, they will be simple "green-through; yellow-diverging" in nature.



Changes: Note at X-16 deleted after x-over returned to service; service markers at X-A72 and X-56 added; Ashland Pl. bellmouth added; street names added.



Changes: Tower added at Bedford-Nostrand.
Note At X-16 deleted and x-over returned to service; Ashland Place bellmouth added;
E3-E4 note added.



Page 47

Manhattan Ave.

E1 E2

X-19 X-8 X-21 X-21 X-21

Nassau Ave. G

McCarren Park

Graham Ave. L

Grand St. L

Bedford Ave. L

Lorimer St. L

To 14th St. Tunnels

Q2 Q1

N. 7th St.

X-Q228 X-Q230 X-Q218 X-Q220

E1 E2

Metropolitan Ave.

Bushwick Ave.

Montrose Ave. L

Morgan Ave. L

Q1 Q2

Harrison Pl.

McKibbin St.

Metropolitan Ave. G

Union Ave.

A mammoth interchange station was planned for the second phase of the IND at South Fourth Street, at the north end of the Broadway station on the G. It was roughed in during the Crosstown Line's construction but never completed. It consists of four platforms and six trackways, similar to the configuration at the Hoyt-Schermerhorn station.

Photo: https://tinyurl.com/rblb2pt

J2 J1

Williamsburg Bridge

Marcy Ave. J M Z

J3-4

X-858
Green: Local
Yellow: Express

Hewes St. J M

Broadway G

Lorimer St. J M

Flushing Ave. J M

J Z M M

Myrtle Avenue

J3-4 J2 J1

Broadway

M1 M2

Broadway's (Brooklyn) elevated structure once continued westward to the foot of B'way where passengers could connect to the ferry to Manhattan. The original alignment of the structure can easily be seen just west of the Marcy Avenue station, as shown by the arrow.

There were two stations along this stretch: Broadway Ferry (opened July 14, 1888), and Driggs Avenue (opened June 25, 1888). After the BRT connection to the Williamsburg Bridge opened in 1908, this stub-end continued on for eight more years, closing on July 3, 1916. There's a photo essay on Facebook at:

https://www.facebook.com/pg/brooklynels/photos/?tab=album&album_id=594656150735230

See Marcy Ave. closeup above for signal details.

See Page 30 for home signal details at Myrtle Avenue.

Marcy Avenue Closeup

Green: J4 Tk.
Yellow: J2 Tk.
3 Yellows: J1 Tk.

J2 J1 J3-4

X-868 X-864 X-886 X-874

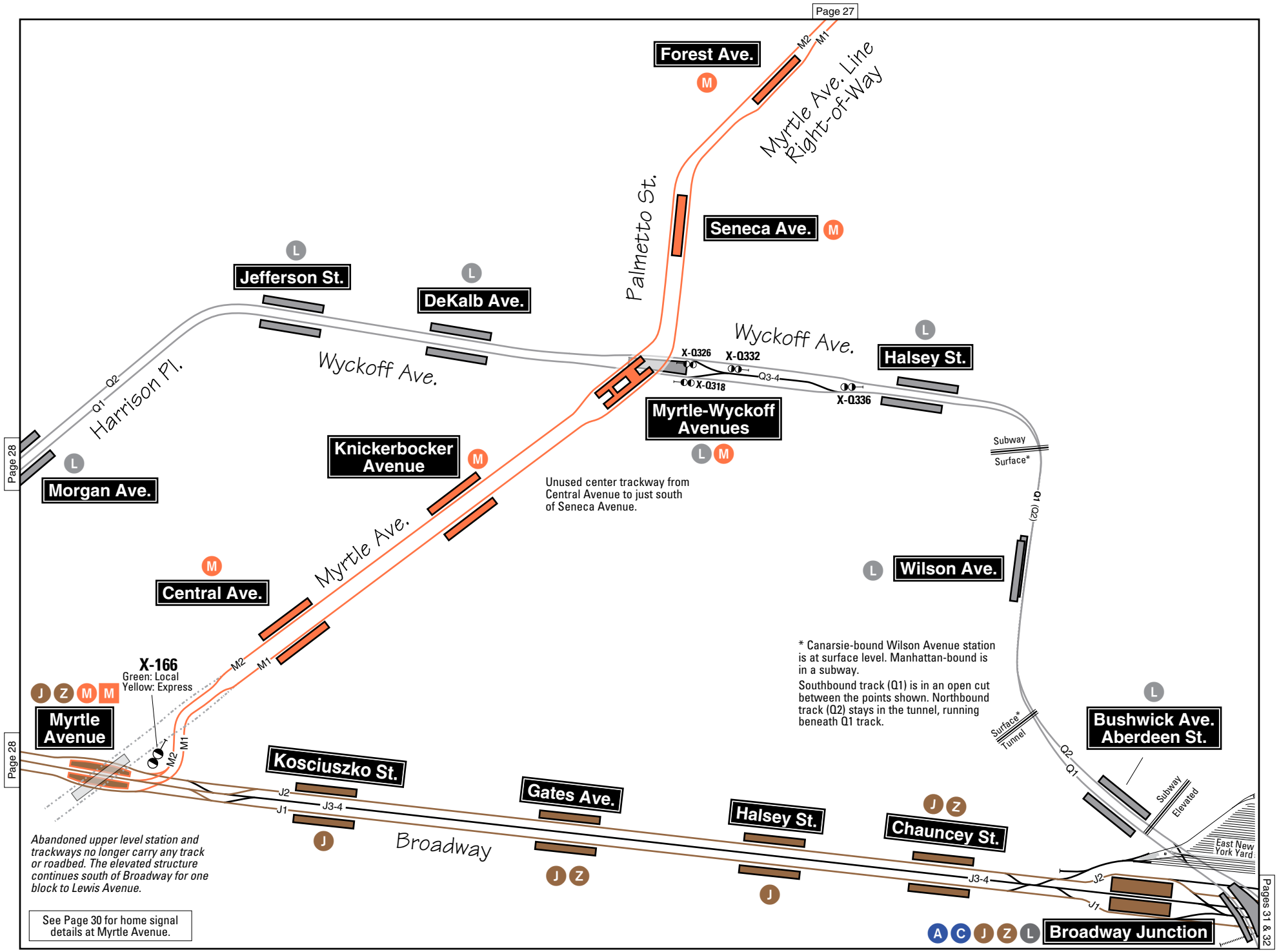
Marcy Ave. J M Z

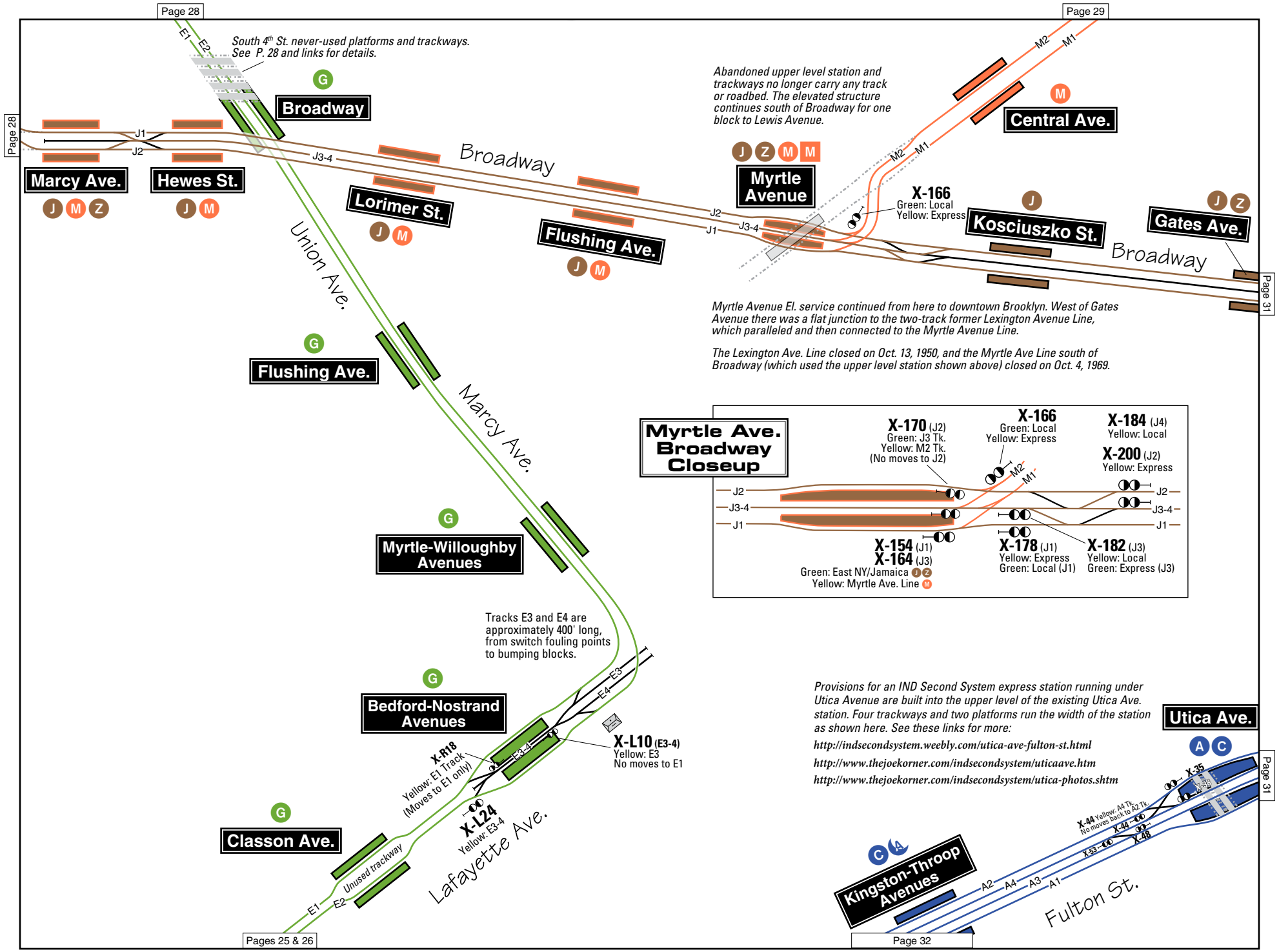
X-858
Green: Local
Yellow: Express

X-878
Green: Express
Yellow: Local
3 Yellows: J2 Tk.

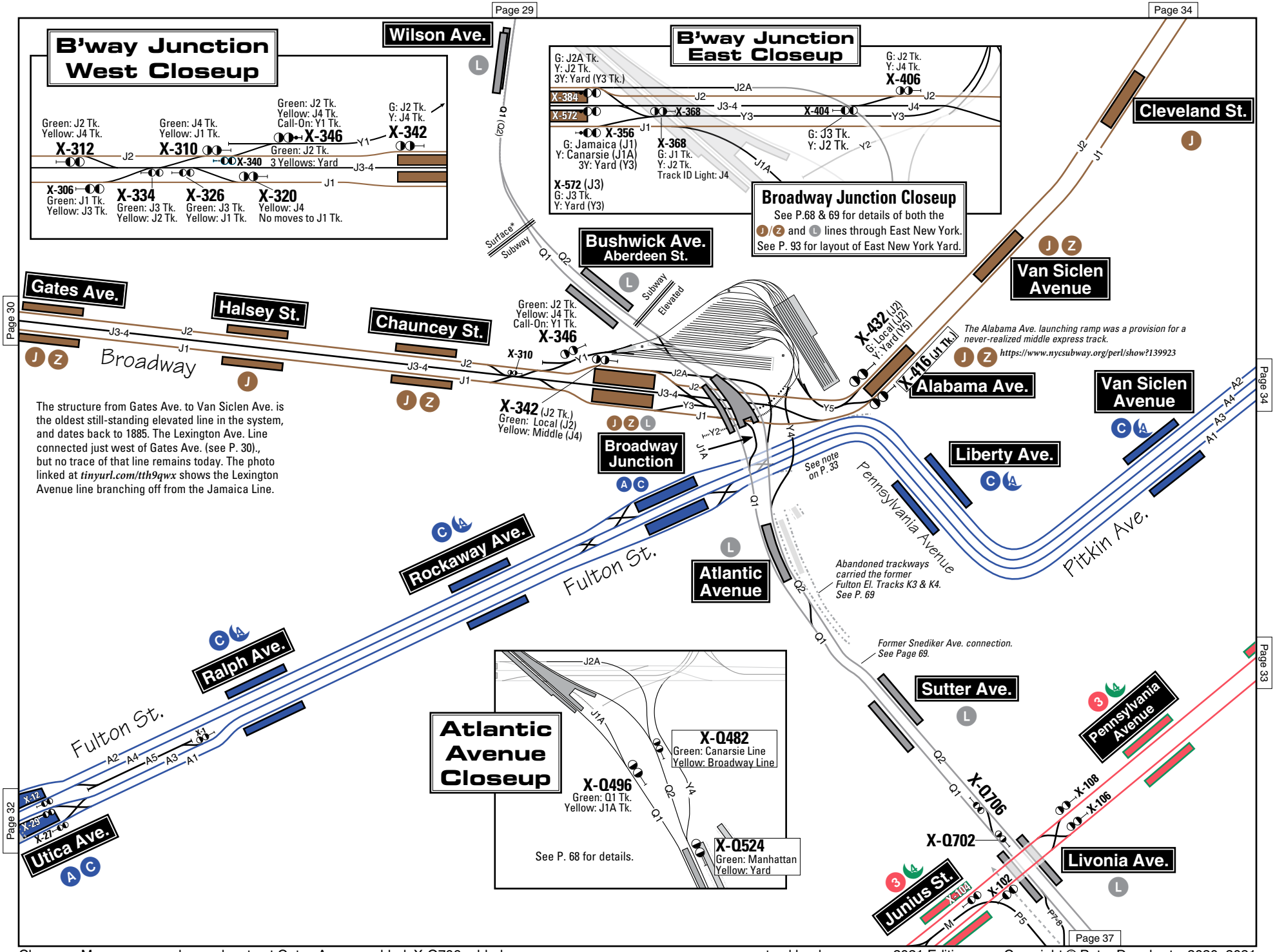
Hewes St. J M

Page 21
Page 22
Page 29
Pages 29 & 30
Page 30





Changes: Note added at Myrtle Ave. to include reference to the Lexington Ave. Line; tower added at Bedford-Nostrand; South 4th St. added; Utica Ave. disused platforms/trackways added; E3-E4 note added.



Page 31

Kosciuszko St.

Broadway

Gates Ave.

Halsey St.

J3-4 J2 J1

Page 31

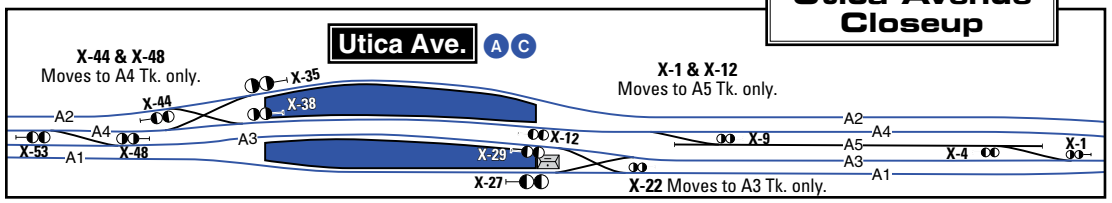
Page 30

Flushing Ave.

Marcy Ave.

Myrtle-Willoughby Avenues

Utica Avenue Closeup



X-L10 (E3-4)
Yellow: E3
No moves to E1

E1 E3 E4

Lafayette Ave.

Bedford-Nostrand Avenues

Pages 25 & 26

Classon Ave.

Kingston-Throop Avenues

Utica Ave.

X-44 Yellow: A4 Tk.
No moves back to A2 Tk.

Fulton St.

Ralph Ave.

Provisions for an IND Second System express station running under Utica Avenue are built into the upper level of the existing Utica Ave. station. Four trackways and two platforms run the width of the station as shown here.

See these links for more:
http://indsecondsystem.weebly.com/utica-ave-fulton-st.html
http://www.thejoekorner.com/indsecondsystem/uticaave.htm
http://www.thejoekorner.com/indsecondsystem/utica-photos.shtm

Nostrand Ave.

Franklin Ave.

Nostrand Avenue had initially been designed as a conventional side platform local station. The space where the two originally-intended express tracks would have been placed now form two unused and walled-off trackways between the two lower level (local) platforms. The two express platforms on the upper level (shaded) were later added to the design.

Crown Heights
Utica Ave.

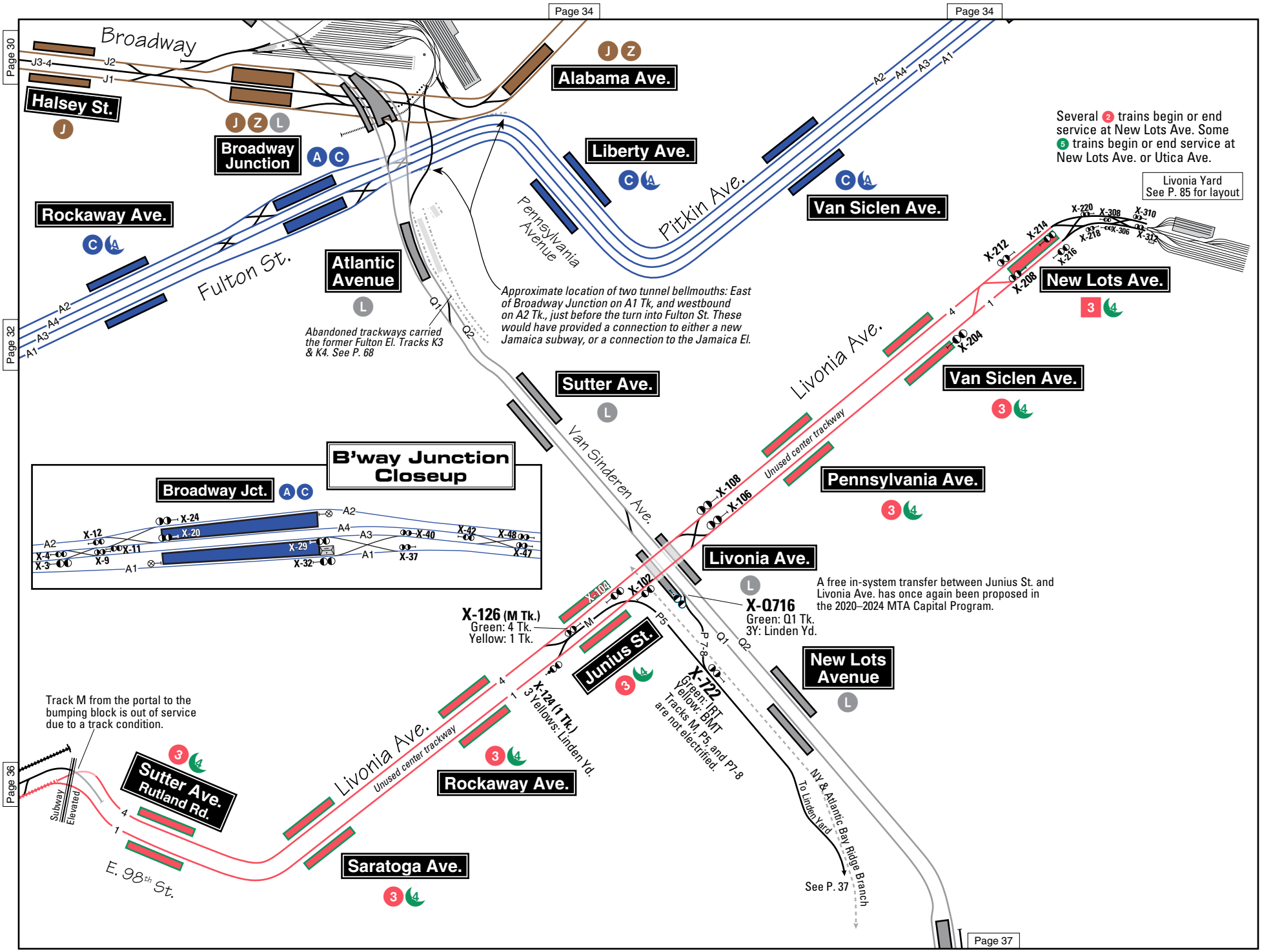
3 4

Page 35

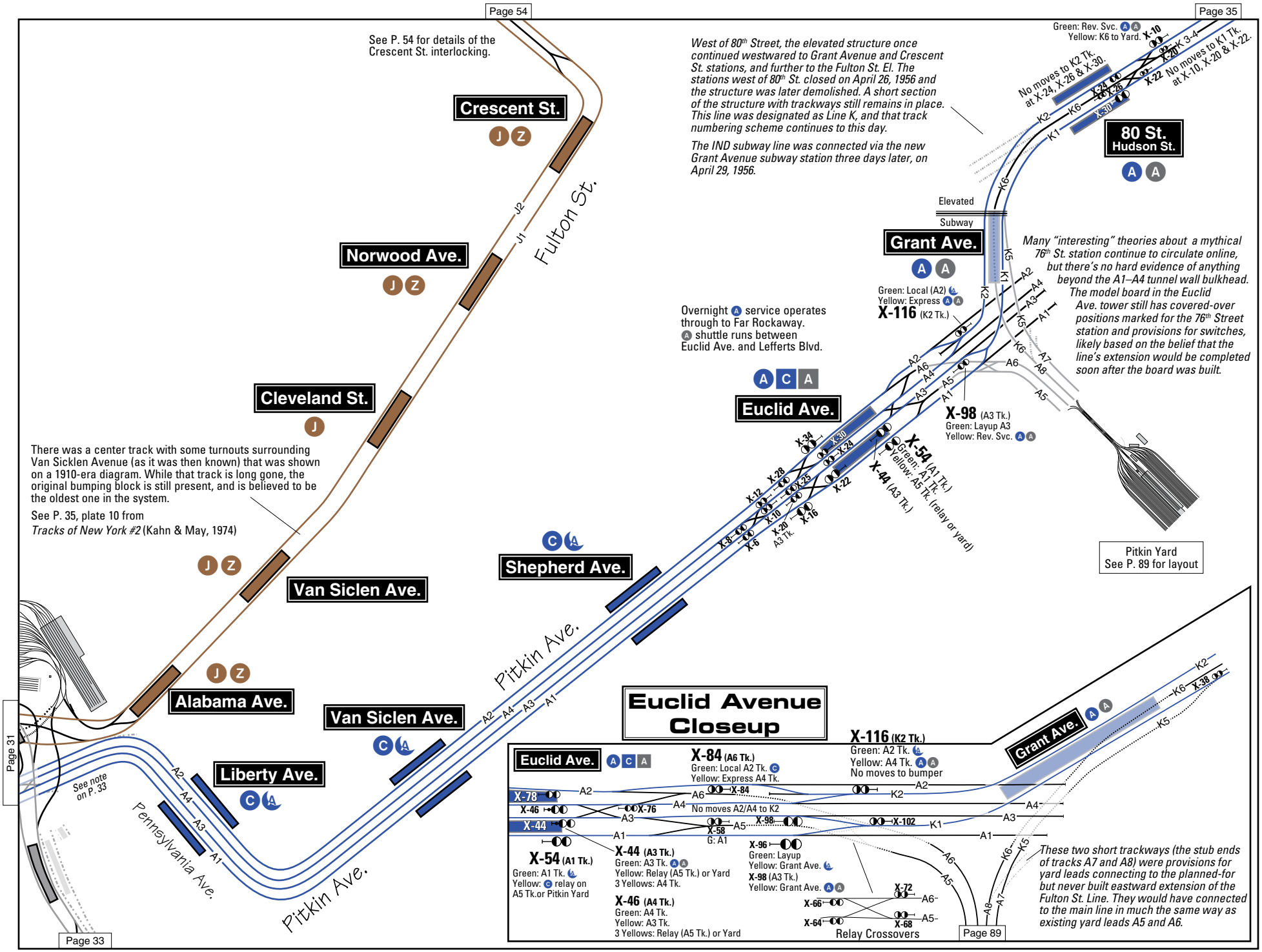
See Page 37 for signal details.

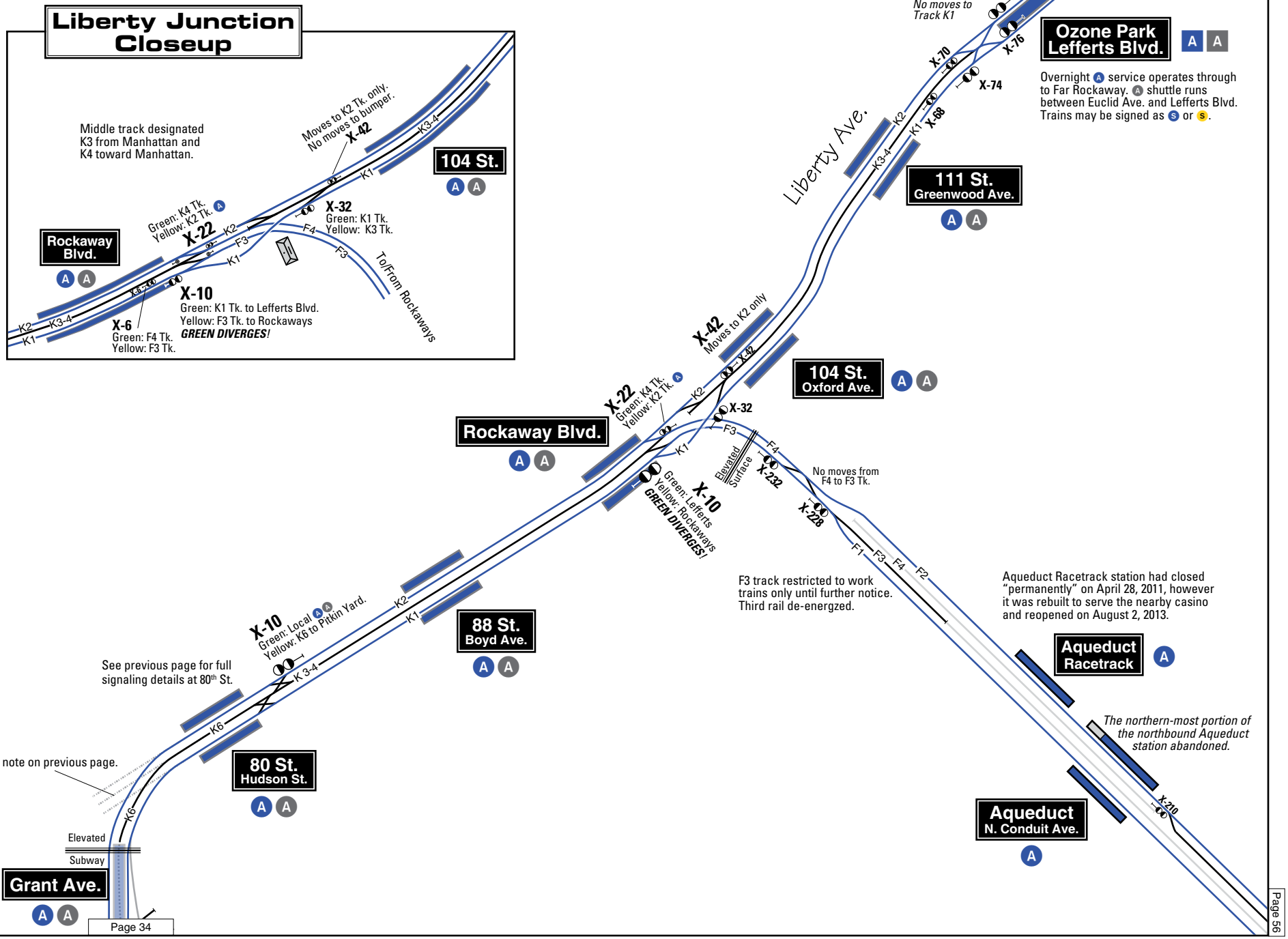
Page 33

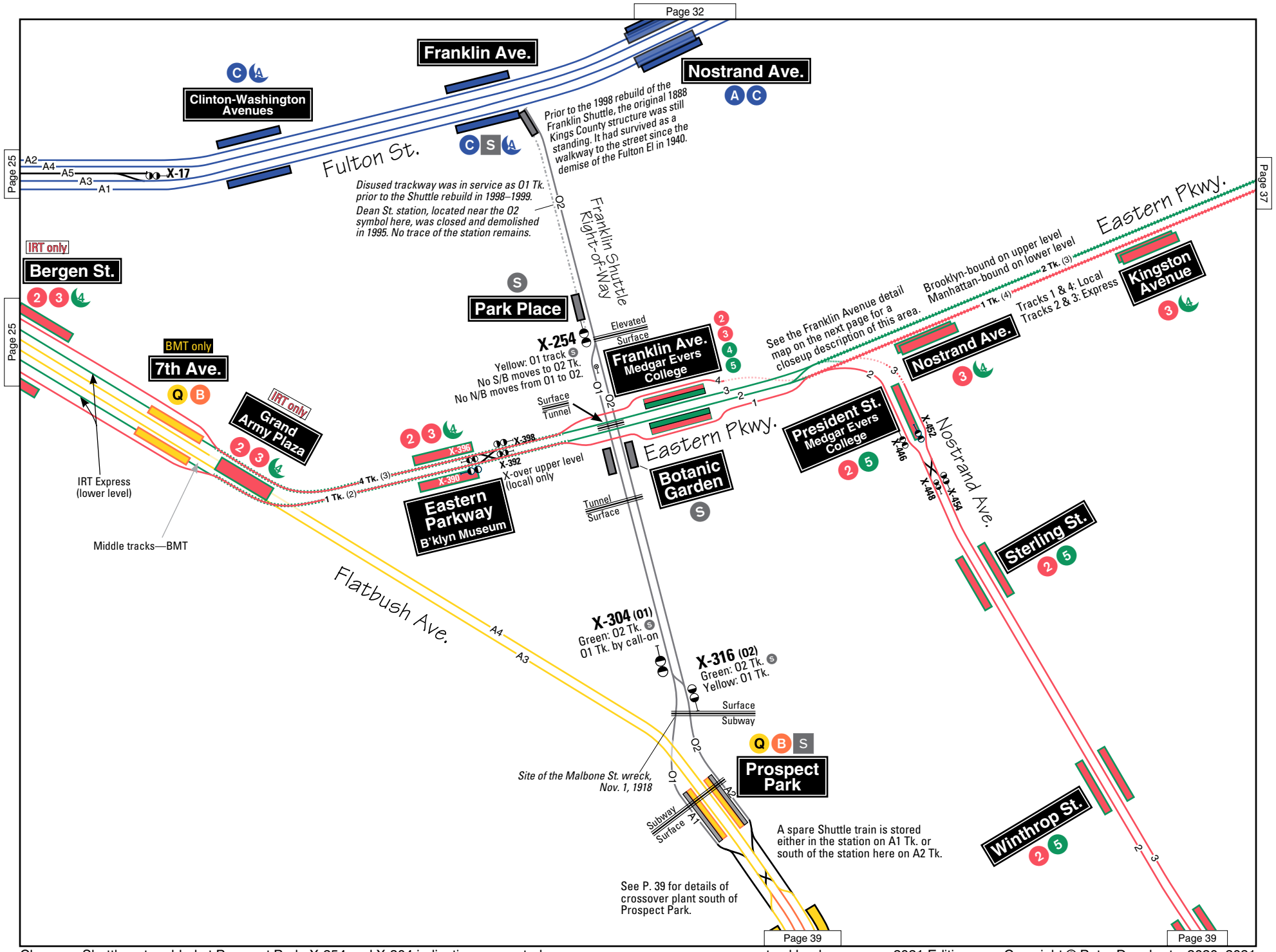
Page 25



Changes: New page; M Tk. (above) out of service as indicated; added X-722 and X-Q716; new B'way Jct. closeup added.







Utica Ave. Closeup

Brooklyn-bound Local 3 and Express 4 on Upper Level.

Upper Level

Lower Level

X-526 X-528 X-534 X-536 X-572 X-506 X-570 X-514 X-558 X-554 X-552 X-564 X-540 X-542 X-546

Yellow: M Tk. 3 Yellows: 3 Tk.

Yellow: 1 or 2 Tk. 3 Yellows: M Tk.

Green: M Tk. *Green Diverges!*
Yellow: Back to X-528 & upper level.

Portal

Manhattan-bound Local 3 and Express 4 on Lower Level.

4 relay: Green at 526, Yellow at 534, clear x-overs and change ends. Green at 572 and 564 to lower level north side. Or Green at 534, change ends and green* at 536, then as above.

M Track descends from the upper to lower level, and is used to relay express trains terminating at Utica Avenue. M Tk. is out of service from the portal to the bumper due to a track condition.

2 Tk. (3) 1 Tk. (4) M

(1 Tk.) X-514 Yellow: M Track

Subway Elevated

Eastern Pkwy.

Crown Heights Utica Ave. 3 4

Sutter Ave. Rutland Rd. 3 4

E. 98th St.

Livonia Ave. 4 1

Saratoga Ave. 3 4

Tracks M, P5, and P7-8 are not electrified.

Junius St. 3 4

X-126 (M Tk.) Green: 4 Tk. Yellow: 1 Tk.

Unused center trackway

Rockaway Ave. 3 4

X-124 (1 Tk.) 3 Yellows: Linden Yd.

X-Q716 Green: Q1 Tk. 3Y: Linden Yd.

X-722 Green: IRT Yellow: BMT

P5 P7-8 Q2 Q1

Elevated Surface

Livonia Ave. L

New Lots Avenue L

Van Sinderen Ave.

A switch from the BMT L line to what is now the Bay Ridge Branch of the New York and Atlantic Railway once existed here. A new connection outside the fence gate, shown in the closeup below, replaced it.

NY & Atlantic Bay Ridge Branch

To Linden Yard
Track and structures facility
See to-scale map below.

Site of the last grade crossing, which was eliminated in 1973.

E. 105 St. L

Y1 Track Capacity 8 cars

Put-ins from Canarsie Yard may enter service at E. 105th St.

Canarsie Rockaway Parkway L

Canarsie Yard
See P. 94 for layout.

Linden Yard & Iron Shop Closeup

Linden Yard is one of the more interesting facilities in the system. Unlike all the other yards that primarily service revenue service cars or are used for layup or light maintenance of way duties, Linden is where heavy maintenance of way, and iron work such as switch building, continuous welded rail fabrication (on Track 1), and track panel assembly takes place.

There's an interconnection with the New York and Atlantic Railway whose tracks are shown at the bottom, in gray. Supplies such as new rail, ballast, and ties arrive at Linden Yard in gondola cars and scrap is shipped out via this connection, which leads to the NY & NJ Rail's 65th St. Yard and car float. New cars coming in from the soon-to-be-built 3rd Ave. acceptance facility may also arrive this way, and cars can also arrive from the north via the Hell Gate Bridge. The New York and Atlantic operates freight service over Long Island Rail Road tracks. Note that Linden Yard is not electrified, nor are any of its leads, and there is no signal control beyond X-728 at the base of the flyover ramp.

Vacuum train dump track *1

Iron Shop

To the 65th St. Yard and NJ carfloat; also connection to the NY & NJ Rwy. See P. 42

Engine fueling platform

North Yard and rail storage

X-728 P7-8 P5

X-722 Green: IRT Yellow: BMT

North Gate X-730

Main fence gate

Canarsie Line

To NY & Atlantic Fresh Pond Yard, the Hell Gate Bridge and points north

Connection to Bay Ridge Branch

New Lots Ave.

*1 Former connection to the Bay Ridge Branch.

Franklin Avenue Interlocking

Also known as Nostrand Avenue Junction and Rogers Avenue Junction.

2 Tk. (3) 1 Tk. (4)

Nostrand Ave. 3 4

Franklin Ave. 2 3 4 5

President St. 2 5

Upper level track details (Brooklyn-bound)

X-420 G: **Express** 4 Y: **Local** & Nostrand Ave. 5 *GREEN DIVERGES!*

X-410 G: Utica & New Lots 3 4 Y: Nostrand Ave. 2 5

To Nostrand Ave. Line

X-428 Green: Local; Y: Express

From Nostrand Avenue Line

Lower level track details (Manhattan-bound)

That segment of the Canarsie Line from south of Broadway Junction to Rockaway Parkway was converted from Line P designation to Line Q in 2003. With that change, Line P designations finally disappeared entirely. In fact, the entire line has been re-stationed starting at the bumper block at the north end of the line at 14th Street/8th Avenue, however signal plates had not changed until 2008. Line QW signal plates remained in place between 6th Avenue and 8th Avenue between 2003 and 2008. The line has since been fully re-signaled for CBTC.

Page 36

Page 24

Page 26; Closeup P. 60

See P. 26 for continuation of IRT tracks.

Bergen St.

BMT only

7th Ave.

Q B

Eastern Parkway B'klyn Museum

2 3 4

Flatbush Ave.

2 3 4

Grand Army Plaza

Page 36

Atlantic Ave. Barclays Center (Pacific St.)

D N R

4th Avenue

F1 F3 F4 F2

X-B324

Green: G (E2 Tk.)

Yellow: F (B2 Tk.)

Bergen St.

F G

Lower level platform abandoned; trains bypass.

E1 (B3) E2 (B4) B1 B2

Smith St.

B2 (B4) B1 (B3)

Express tracks rise up from the lower level while passing through Carroll St. and meet up with the locals just before the portal.

Union St.

R D N

Carroll St.

F G

Subway

Viaduct

B4 B3 B2 B1

4th Avenue Closeup

4 Ave. 9 St. F G

X-406 (B2 Tk.) X-440 (B4 Tk.)

X-404 (B2 Tk.) X-408 (B4 Tk.)

B2 B4 Old B5 trackway B3 B1

X-418 X-424 X-430

X-446 & X-426 (B3 Tk.)

R D N services under 4th Avenue via a free in-system transfer.

F G

R D N

4 Ave. 9 St.

9th St.

B2 B1 See closeup, above. B4 B3

Smith–9th Sts.

F G

Subway

Viaduct

F F G

7 Ave. Park Slope

9th St.

B1 B2

Tunnel beneath Prospect Park

B3 B4

15 Street Prospect Park

F G

Prospect Park W.

Prospect Avenue

Highest station in the system at 88' above ground level.

The Culver Viaduct was rebuilt between 2010 and April 26, 2013. Prior to the rebuild there was a rarely-used pocket track (B5) between express tracks B4 and B3 in the viaduct's superstructure. This track was removed but the empty trackway still exists. It is shown in gray in the closeup.

Prospect Ave.

R D N

4th Avenue

25 St.

R D N

F1 F3 F4 F2

B1 (B3)

Fort Hamilton Parkway

F G

B2 (B4)

X-20 (F3 Tk.)
Green: Exp.
Yellow: Local

Some Coney Island-bound N Express trains run local from 36th to 59th Sts. early mornings and late evenings.

X-44 (F2 Tk.)
Green: Local
Yellow: Express

36 St.

D N R

See closeup drawing on Page 43 for signal details.

Radio Channel Change

Coney Island bound trains switch to Channel B1

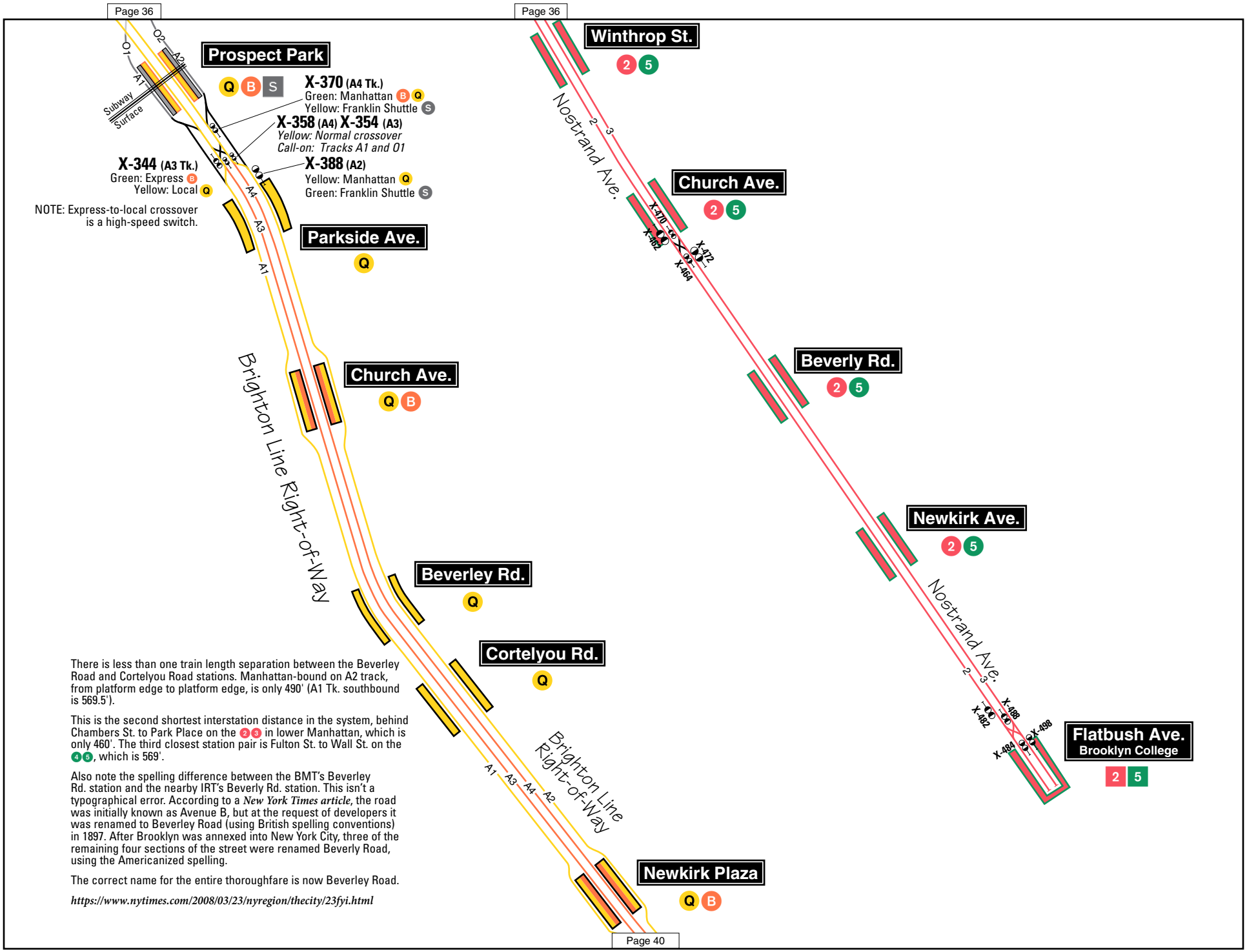
Manhattan-bound trains switch to channel B2

F F G

Church Ave.

Page 40

Page 43



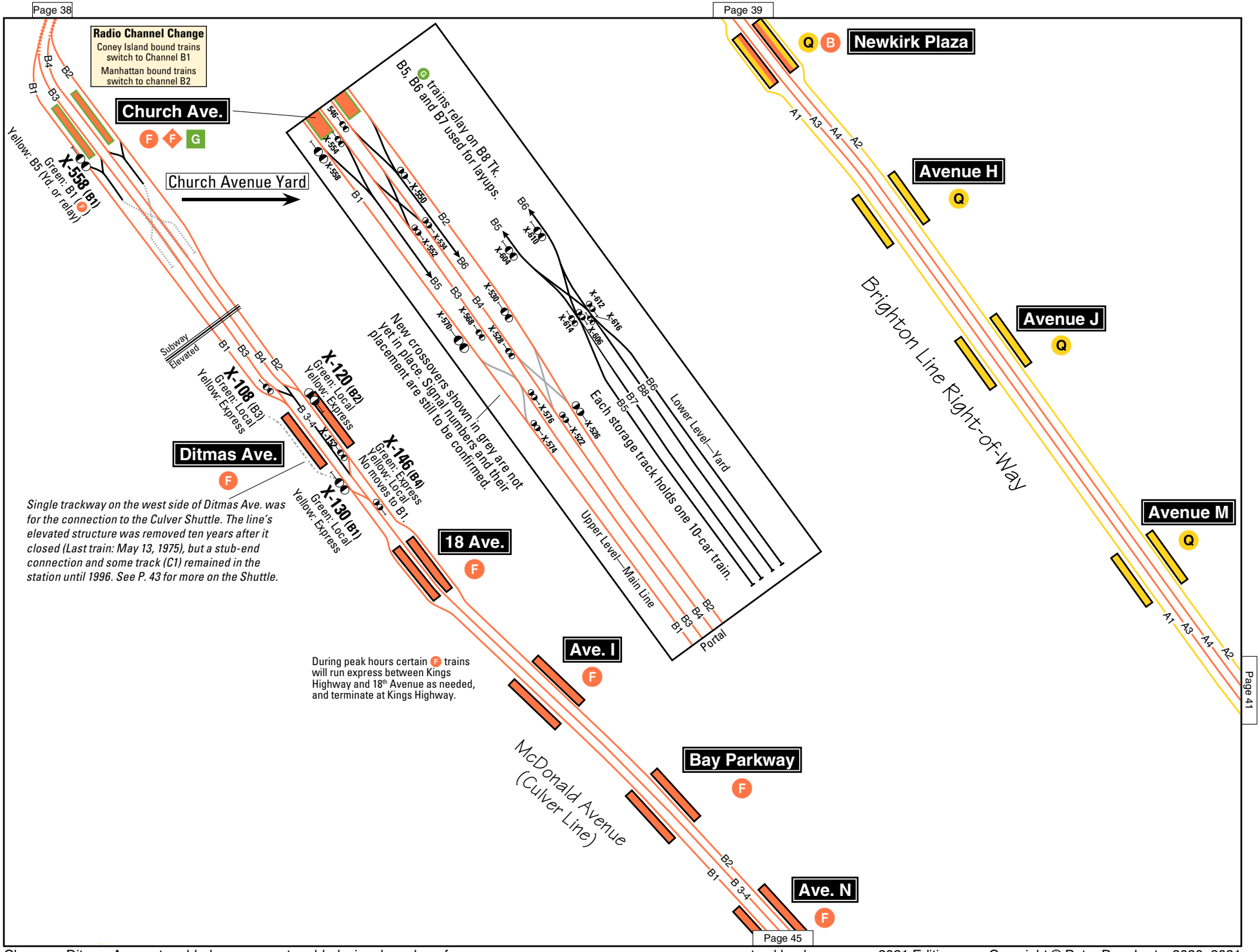
There is less than one train length separation between the Beverley Road and Cortelyou Road stations. Manhattan-bound on A2 track, from platform edge to platform edge, is only 490' (A1 Tk. southbound is 569.5').

This is the second shortest interstation distance in the system, behind Chambers St. to Park Place on the 2 3 in lower Manhattan, which is only 460'. The third closest station pair is Fulton St. to Wall St. on the 4 5, which is 569'.

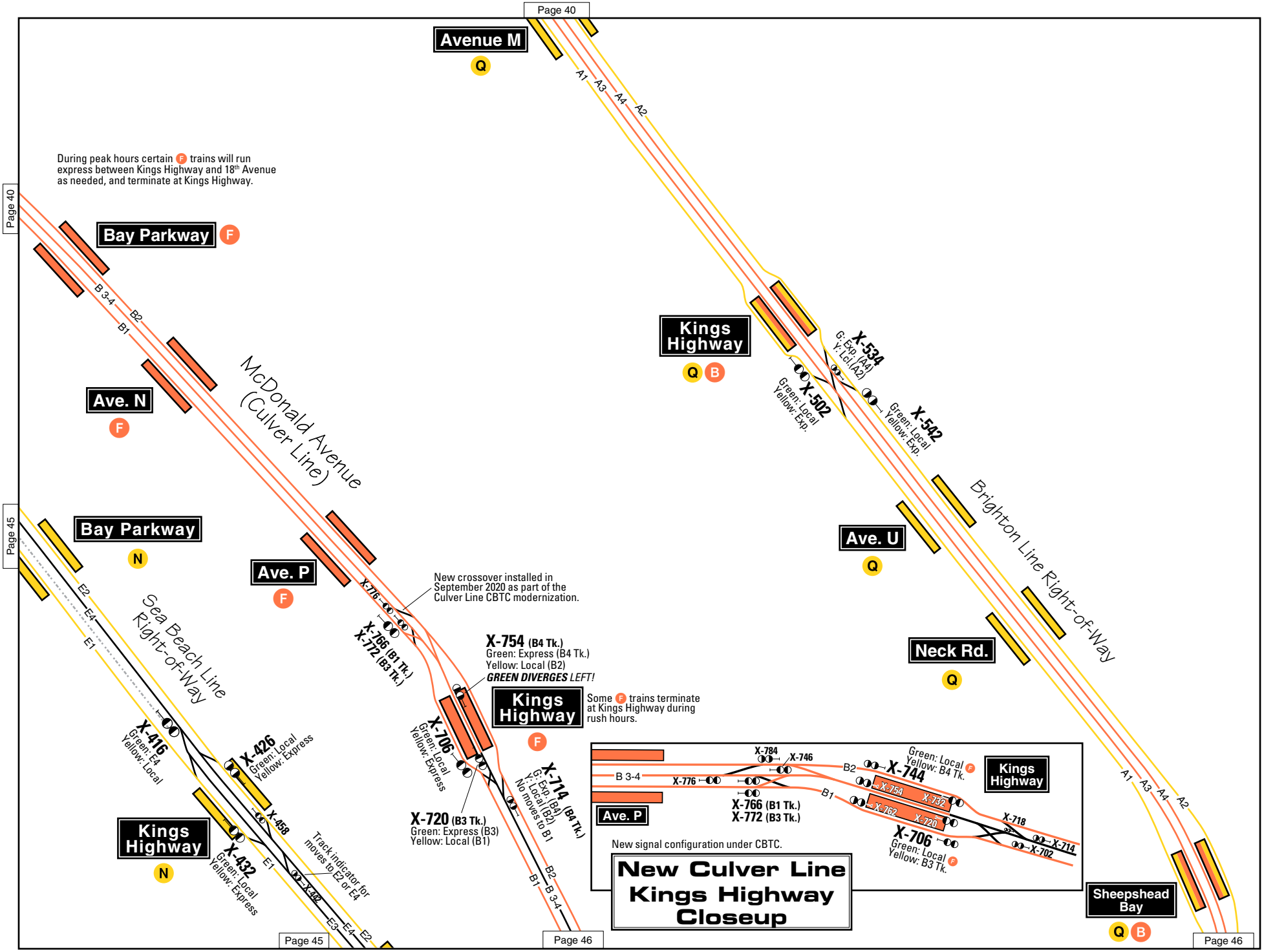
Also note the spelling difference between the BMT's Beverley Rd. station and the nearby IRT's Beverly Rd. station. This isn't a typographical error. According to a *New York Times article*, the road was initially known as Avenue B, but at the request of developers it was renamed to Beverley Road (using British spelling conventions) in 1897. After Brooklyn was annexed into New York City, three of the remaining four sections of the street were renamed Beverly Road, using the Americanized spelling.

The correct name for the entire thoroughfare is now Beverley Road.

https://www.nytimes.com/2008/03/23/nyregion/thecity/23fyi.html



Changes: Ditmas Ave. note added; express note added; signal numbers for new crossovers added.



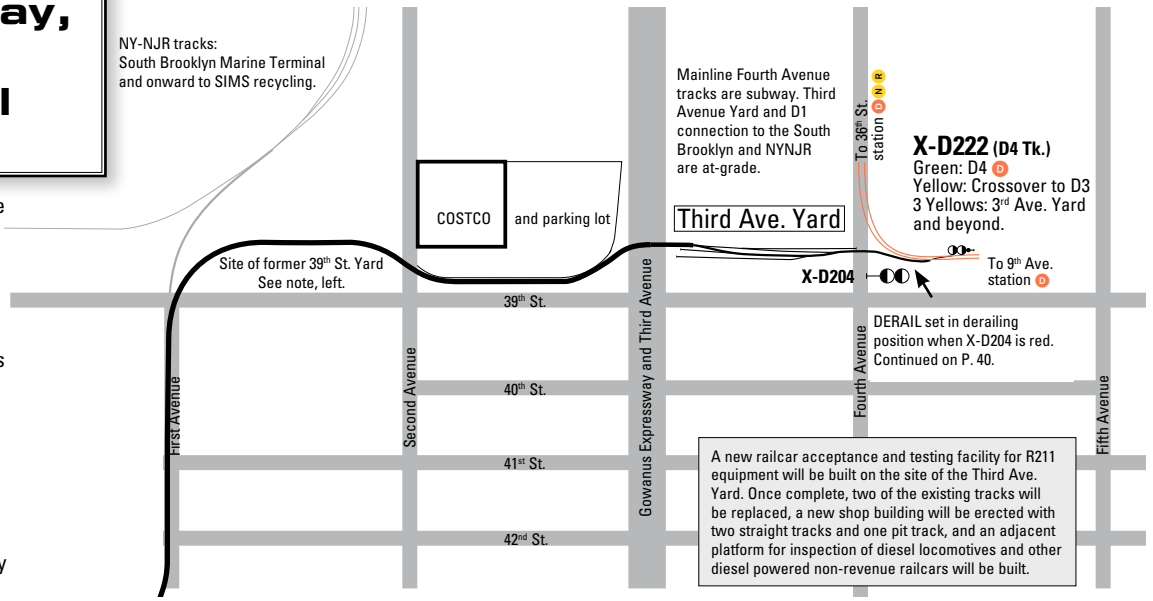
Changes: Map coverage adjusted; Crossover and new signal numbers at Kings Highway F; express note added.

The South Brooklyn Railway, Third Avenue Yard, and connections to NY-NJ Rail in Industry City

39th St. Yard: Also known as the "Dead Yard." Until 2010, a 10-track interchange yard just west of Costco was operated jointly by the MTA and the (then) New York and Atlantic Railway. Subway cars being sent out for scrap or refurbishment were interchanged here, then placed on car floats to New Jersey and connection to conventional railways. The southern portion of the yard was built in July 2001, but in March 2010 all tracks were removed west of the fence line at Second Avenue. By 2012 the alignment had changed to what's shown here now.

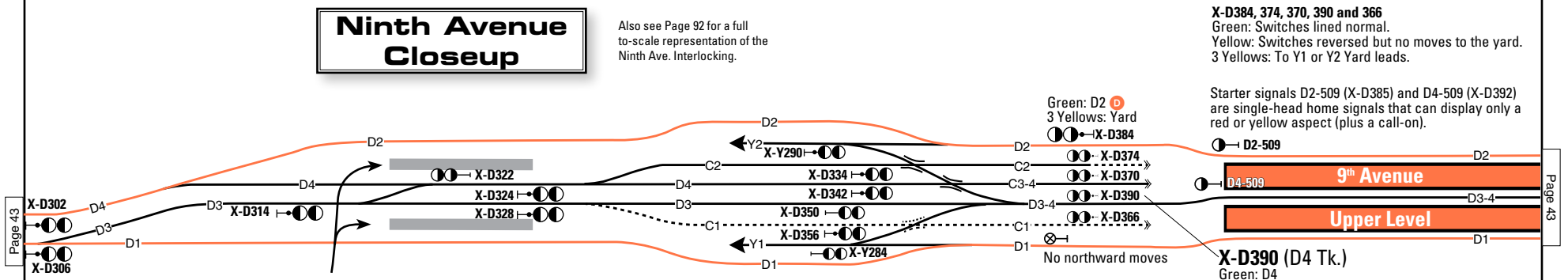
Moves from the South Brooklyn come off the West End Line, pass through the presently-unused Third Avenue Yard, cross Third and Second Avenues, and curve down to First Avenue. Tracks then run down the middle of First Ave. and enter an interchange yard with New York-New Jersey Rail south of 43rd Street, (51st St. Yard) and ultimately to the car float at 65th St.

NY-NJ Rail has been owned by the Port Authority of New York and New Jersey since 2008, and was previously known as the New York Cross Harbor Railroad until 2006. For more information on the NY-NJR visit *https://nynjr.com.*



Ninth Avenue Closeup

Also see Page 92 for a full to-scale representation of the Ninth Ave. Interlocking.



Abandoned ramps from 5th Avenue El. used during construction of the West End Line, circa 1915.

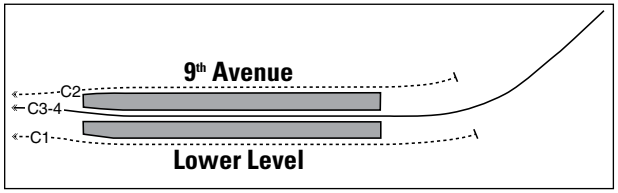
For a brief time around 1915, Fifth Avenue Elevated trains used the ramps shown above to access the station on the lower level, then connected to the Culver Line at Ditmas Avenue (today's F, before the Church Avenue IND–BMT connection was completed in 1954) for the trip to Coney Island. Later, from 1916–1940 they used what are today yard tracks 21 and 22, and the current Y1 and Y2 yard leads to access Ninth Avenue, after which time the elevated line was closed.

Strangely enough, the elevated line used the below-ground platforms, while the subway line stopped above it before heading down the West End Line.

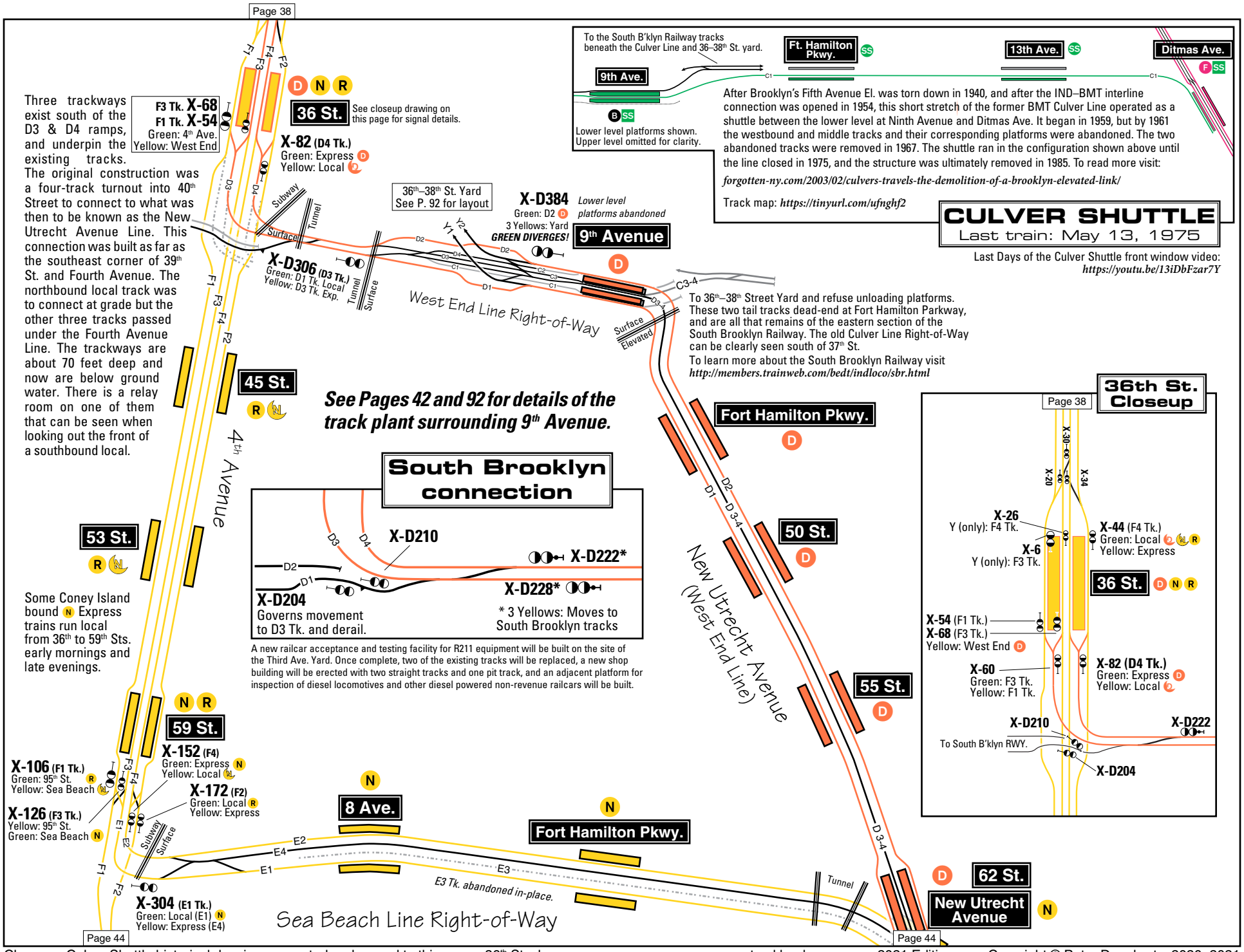
When the IND connection opened from Church Avenue, most Culver service moved over there, but the lower level was briefly used for some through trains from Culver to the BMT Fourth Avenue subway until 1959, after which all Culver through service ceased from Ninth Avenue, and the left over portion operated as a shuttle. When that closed in 1975, the lower level was abandoned for passenger service, but the tracks continued to be used for layups and for work trains accessing the refuse dump tracks in the yard.

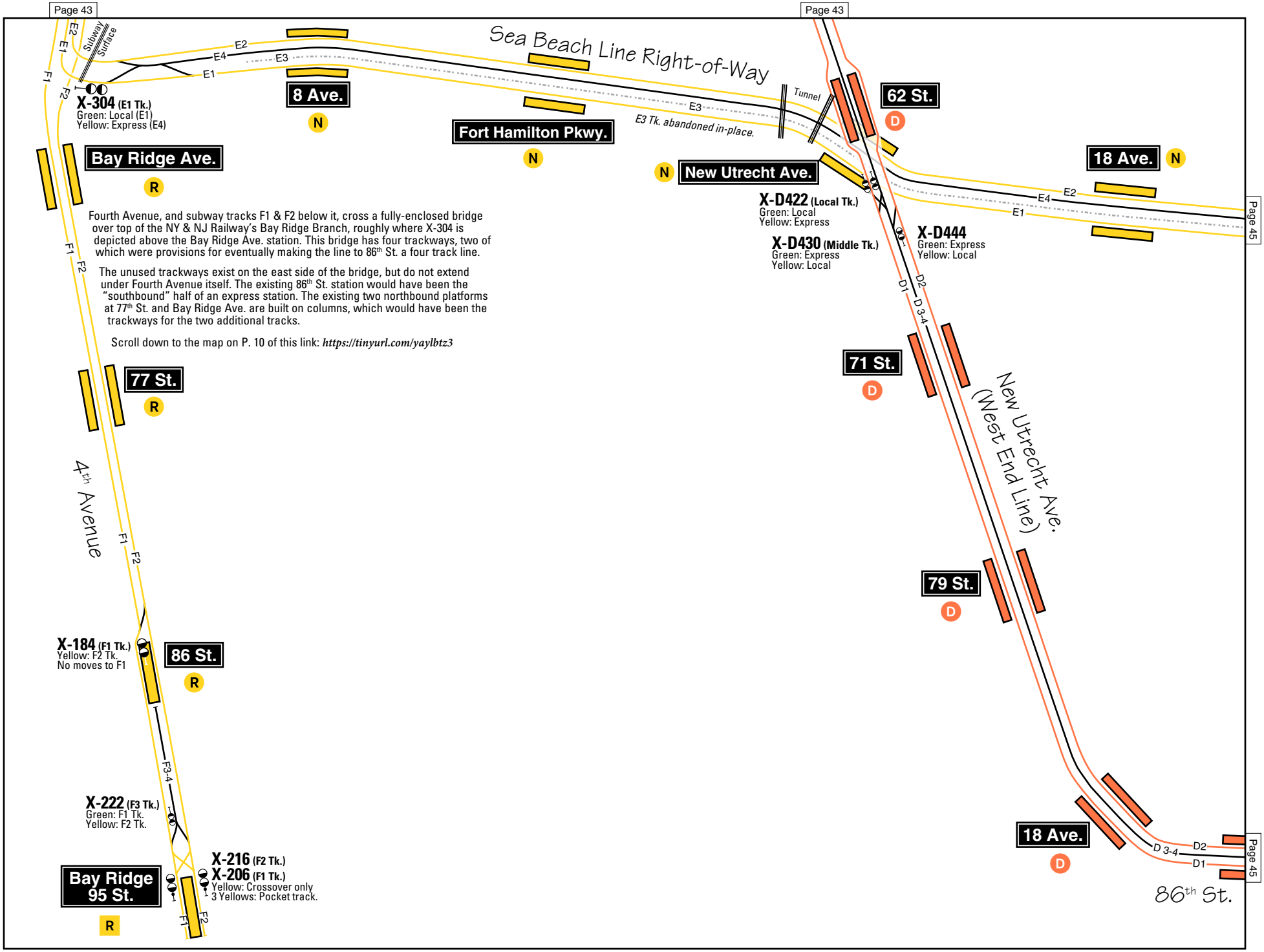
The lower level platforms fell into disrepair, but so did the supports for the upper level platforms, and for the last several years the outer tracks on the lower level have been blocked off so the supports could be shored up and rebuilt. The tracks are in bad condition.

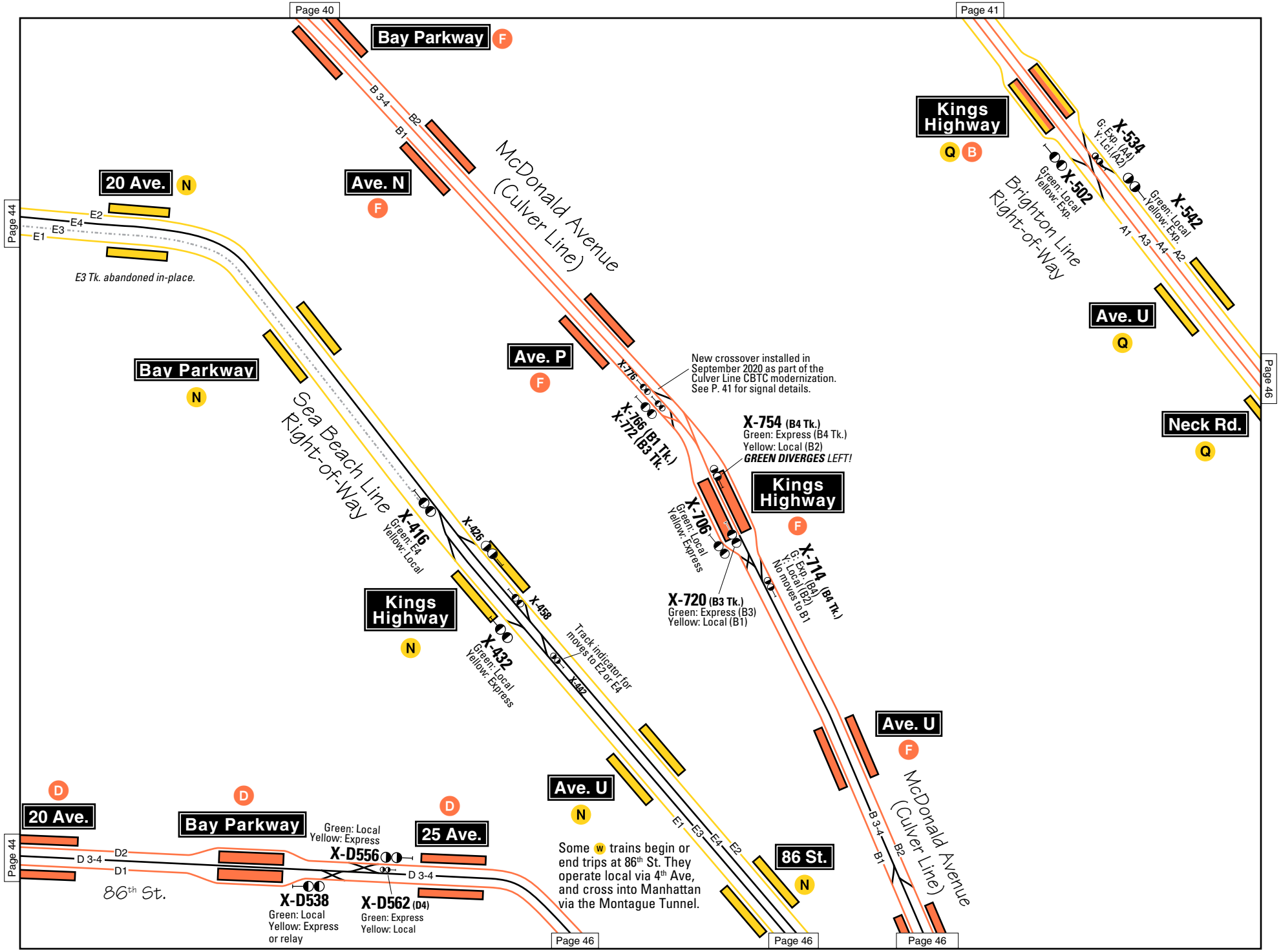
This complex bi-level interlocking can be better understood in the this video: *https://youtu.be/enk6LQ2az9c.*



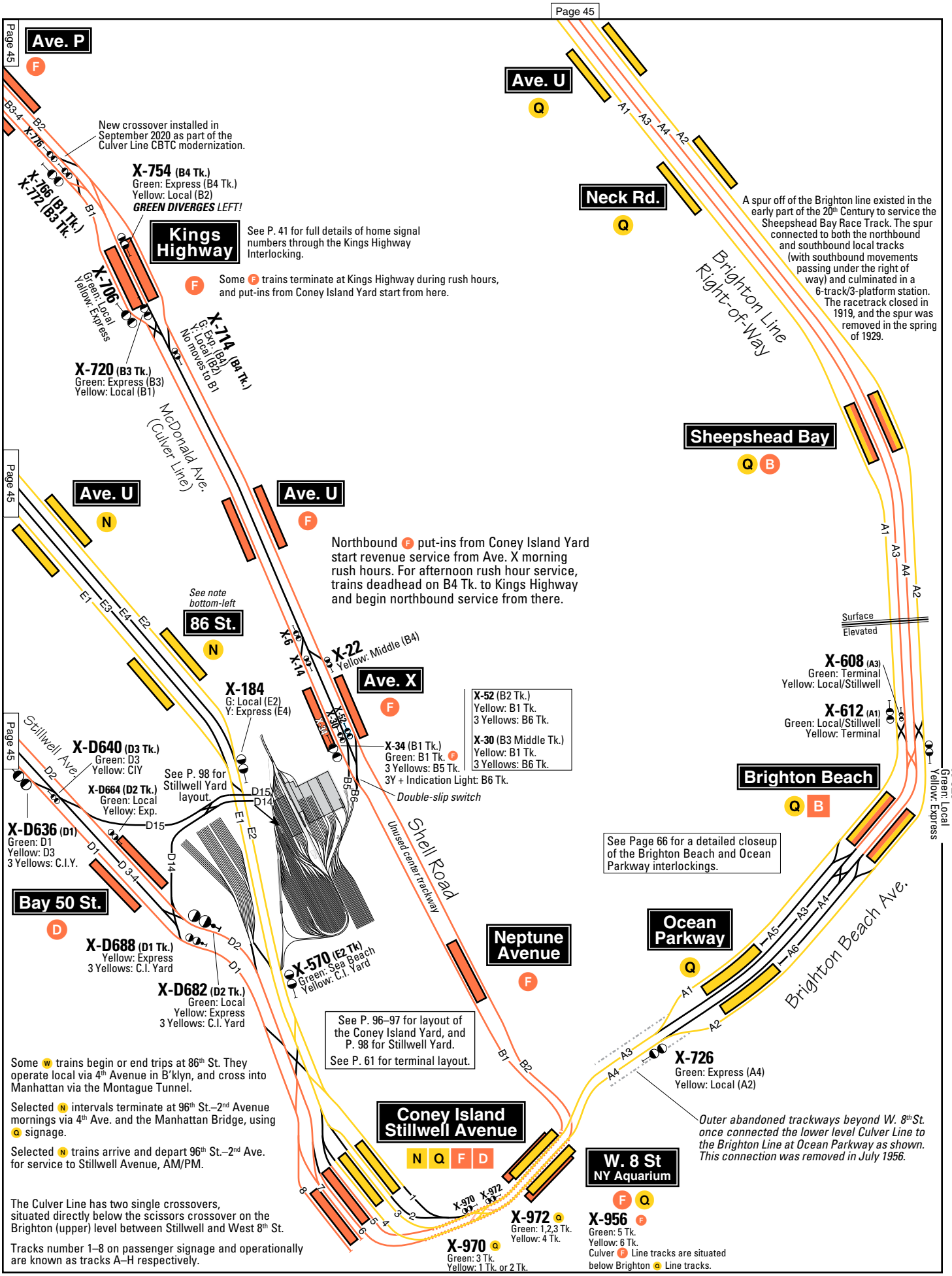
Tracks C1 & C2 (shown by the dashed lines) running through the abandoned lower level station are out of service due to poor track conditions.

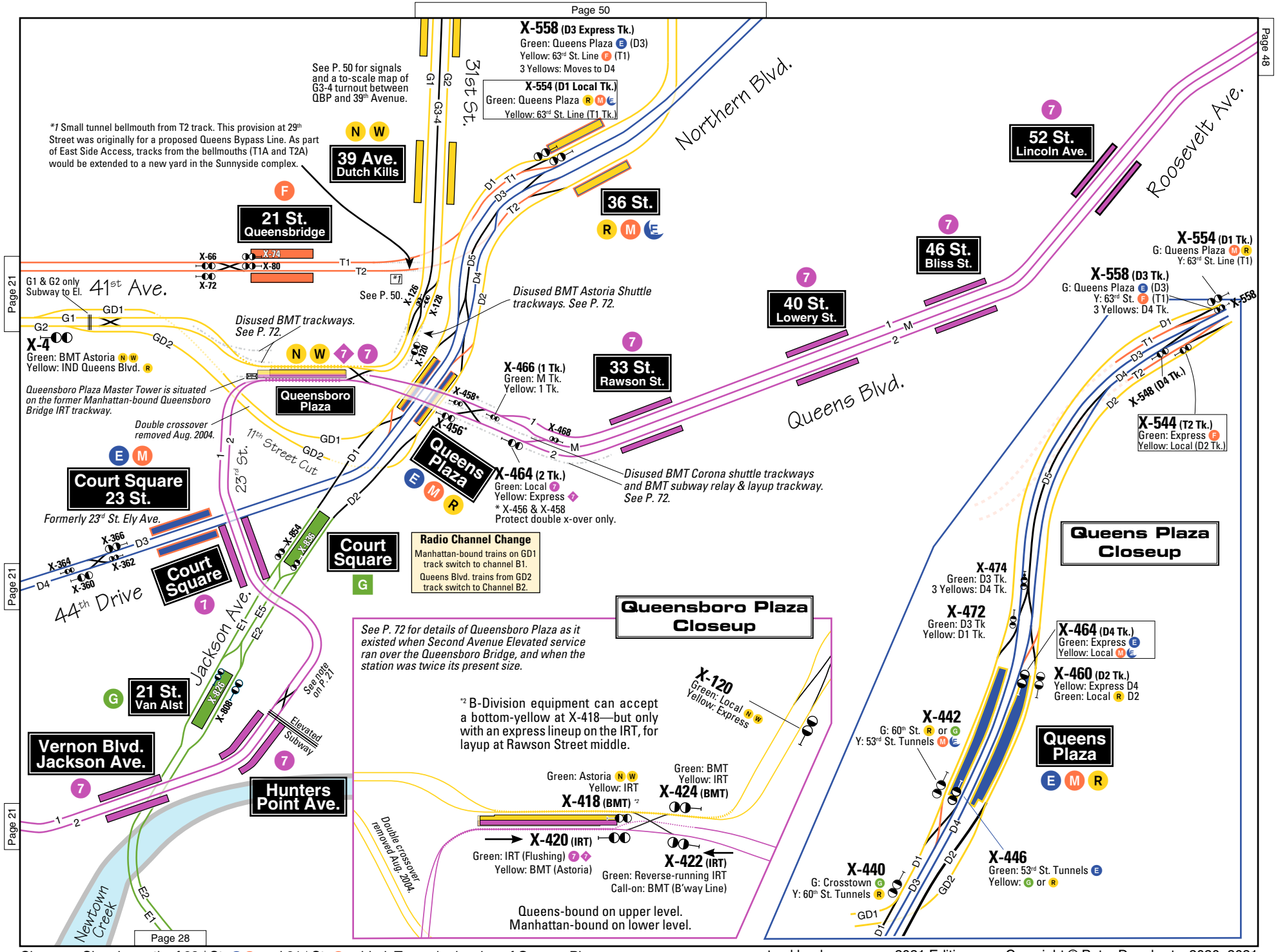


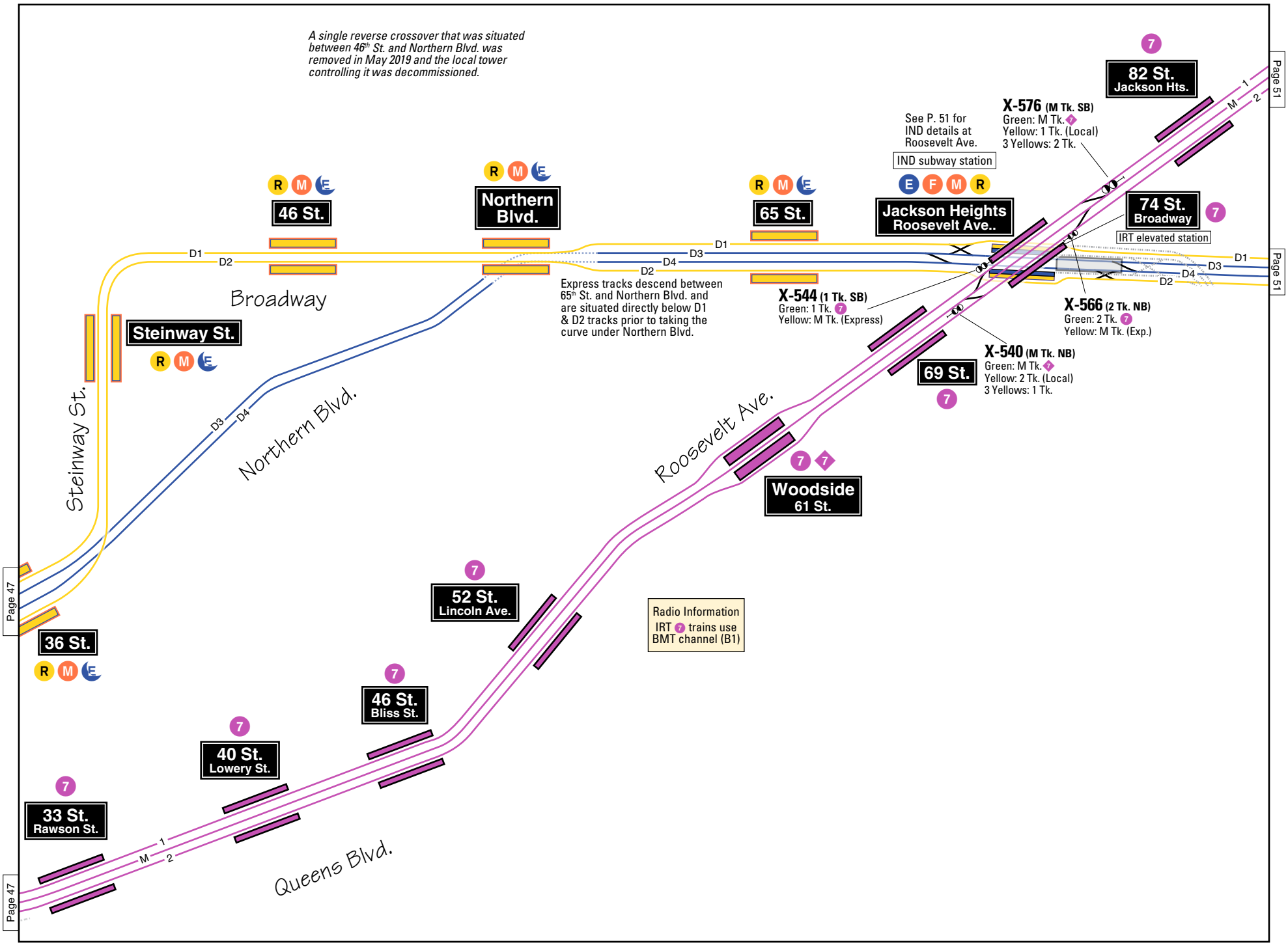


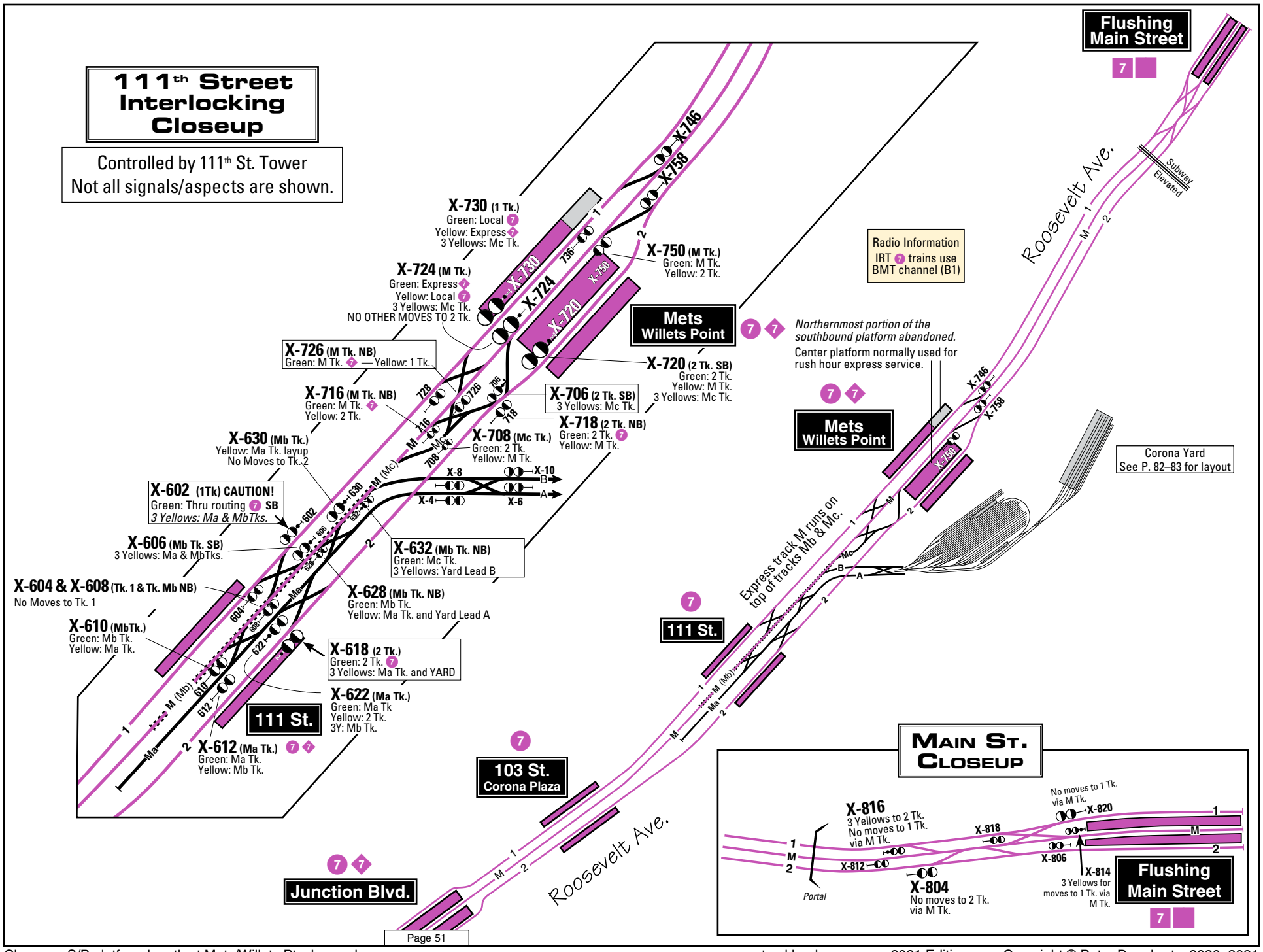


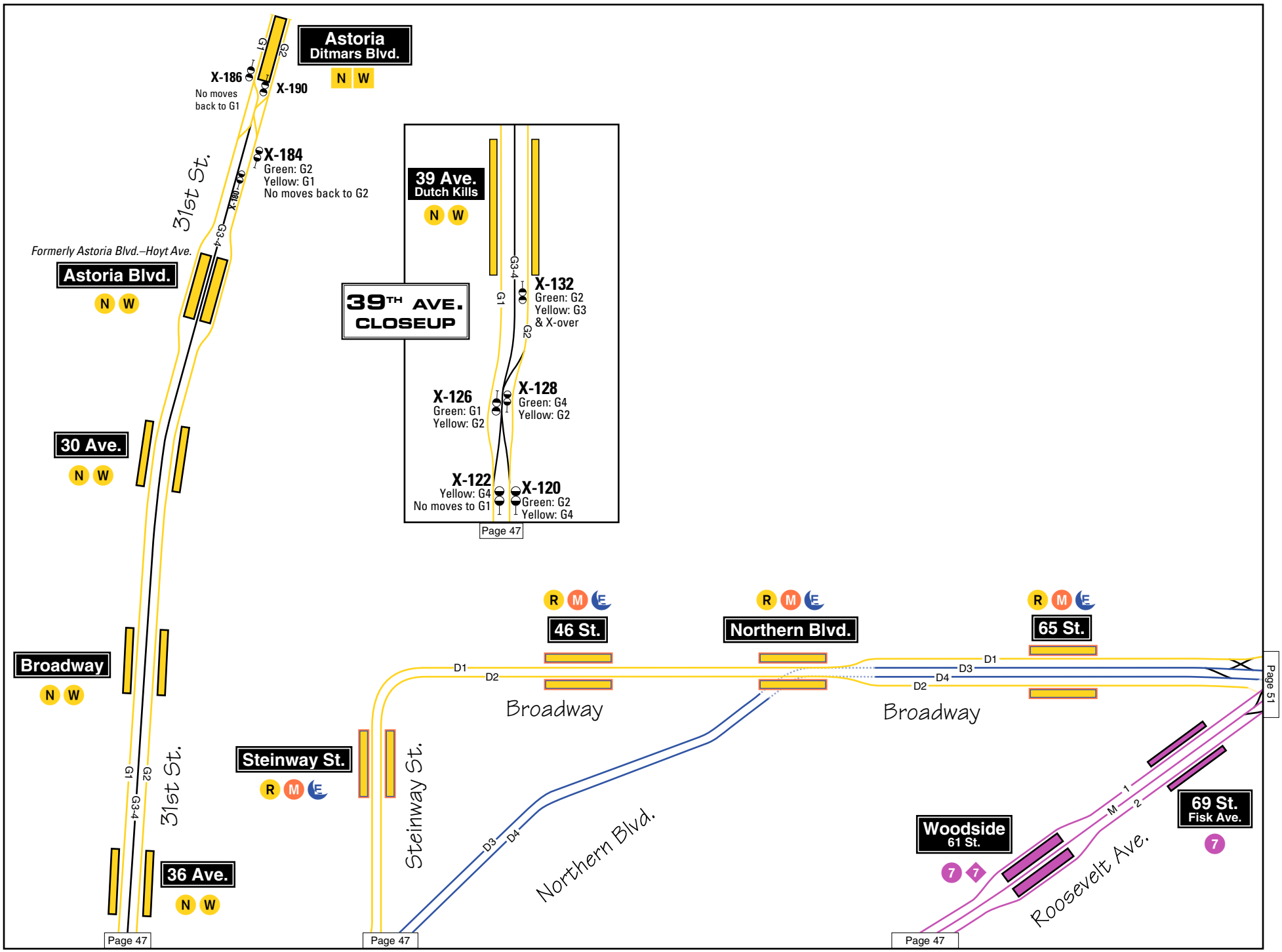
Changes: Crossover and new signal numbers added at Kings Highway F.



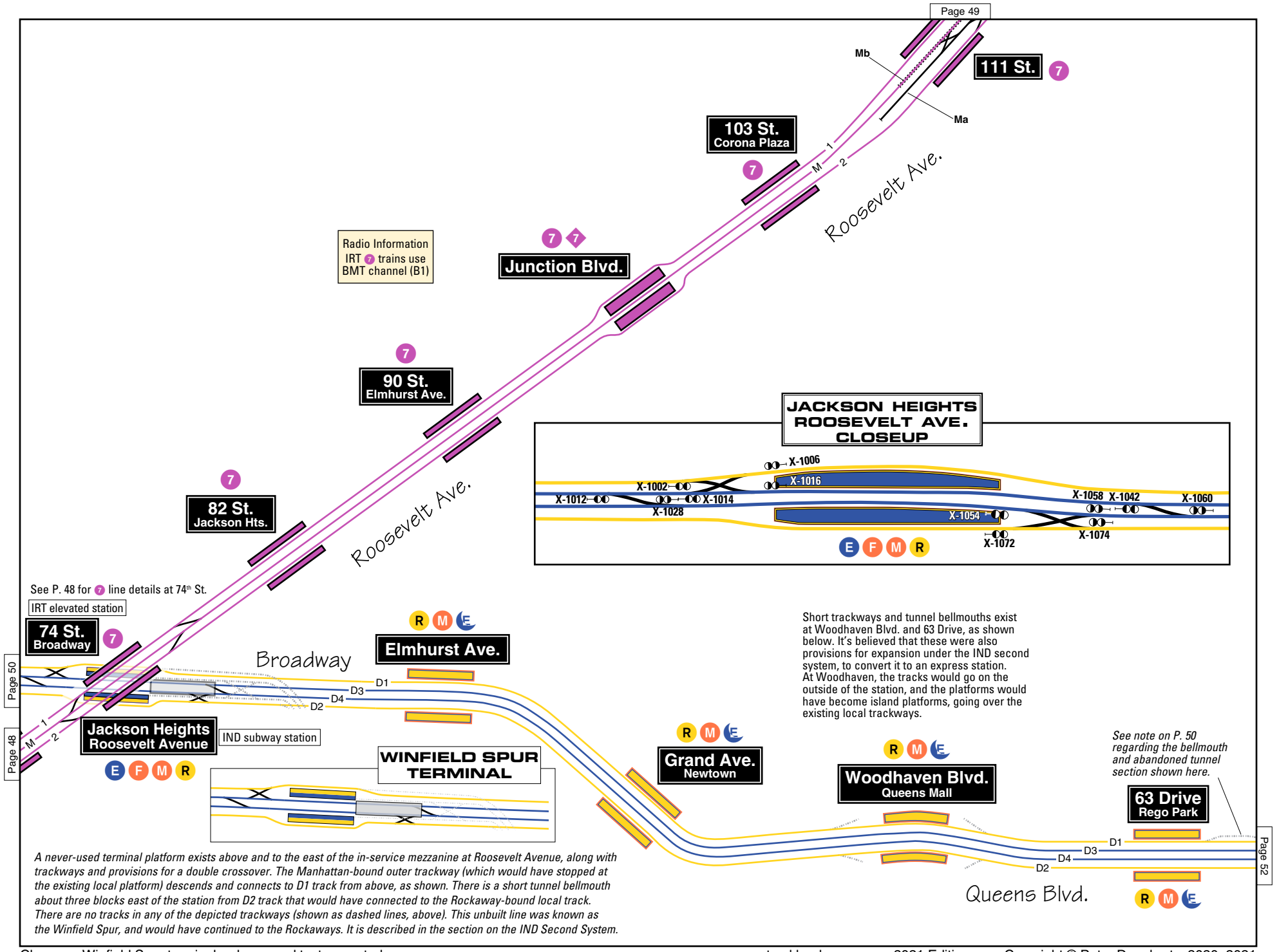




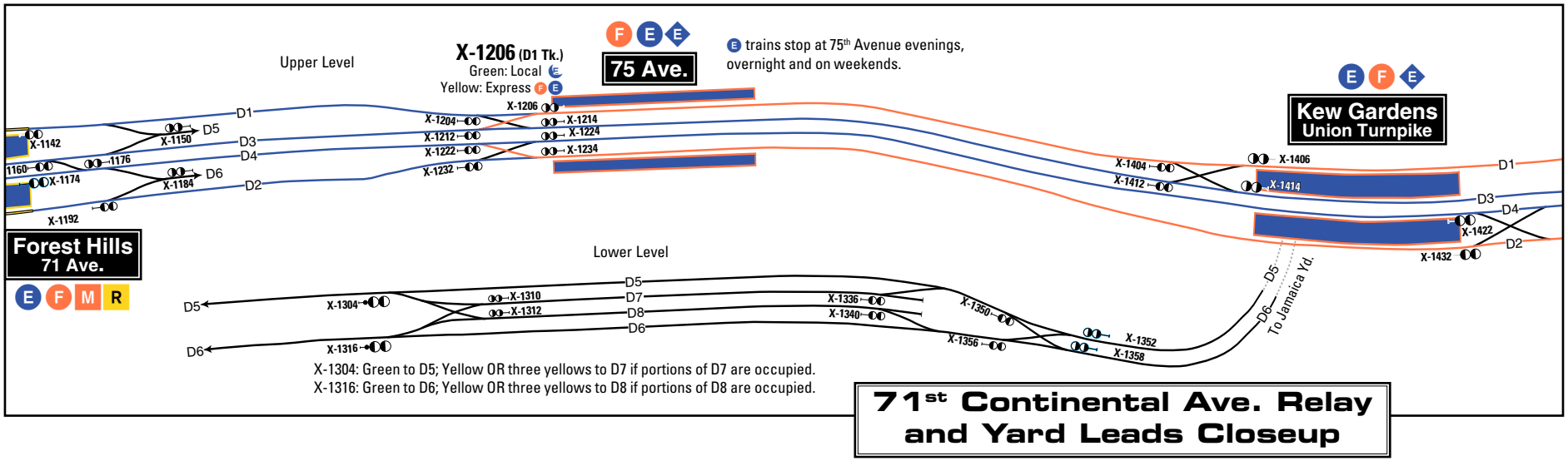




Changes: Astoria Blvd. station name changed and track alignment modified.



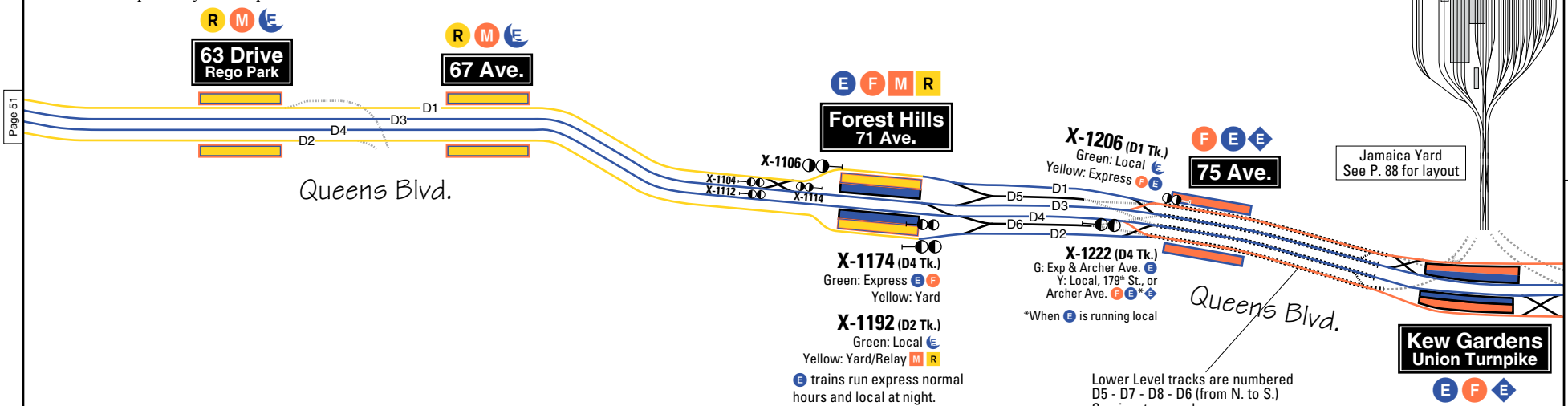
Changes: Winfield Spur terminal redrawn and text corrected.



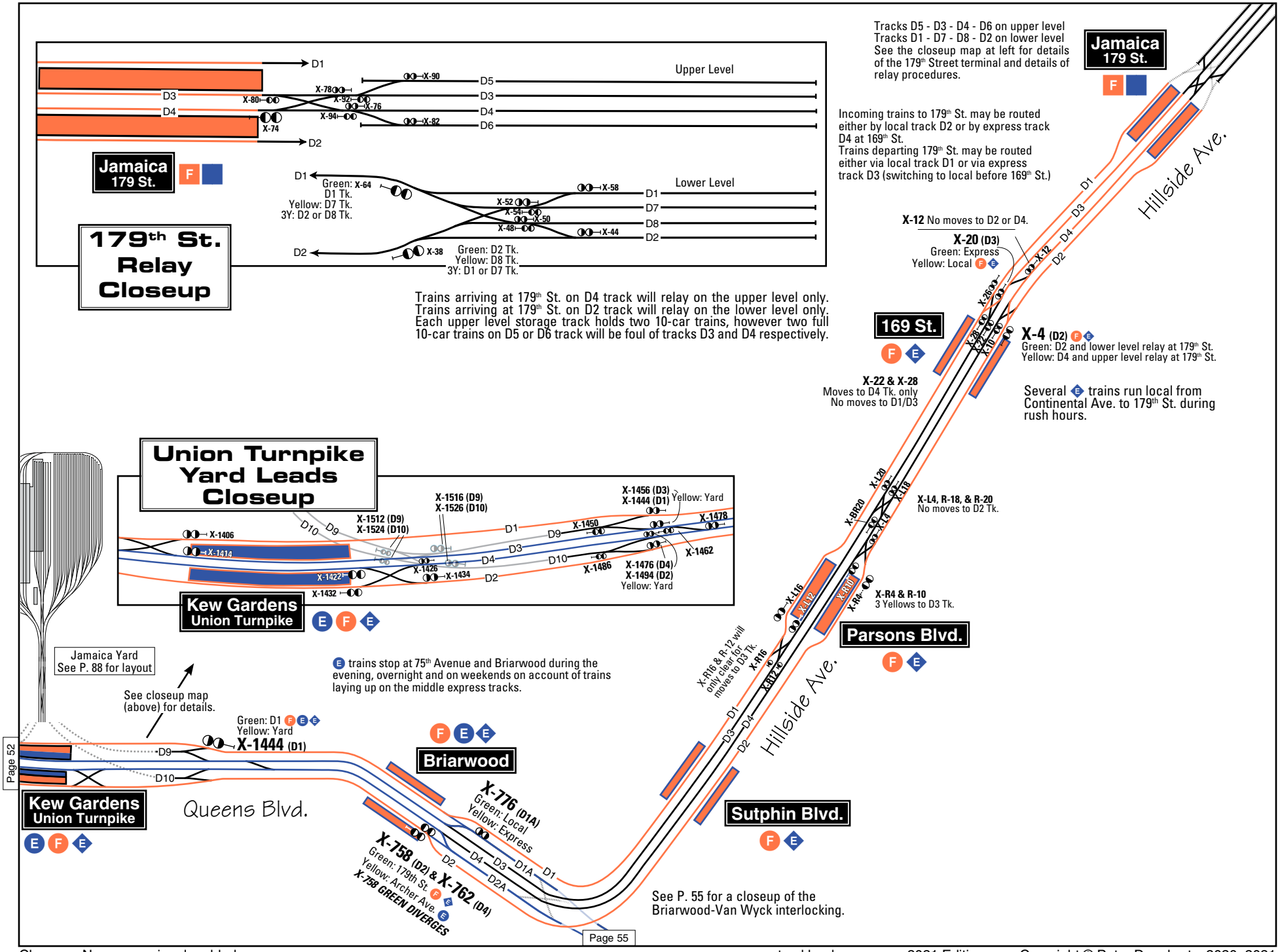
71st Continental Ave. Relay and Yard Leads Closeup

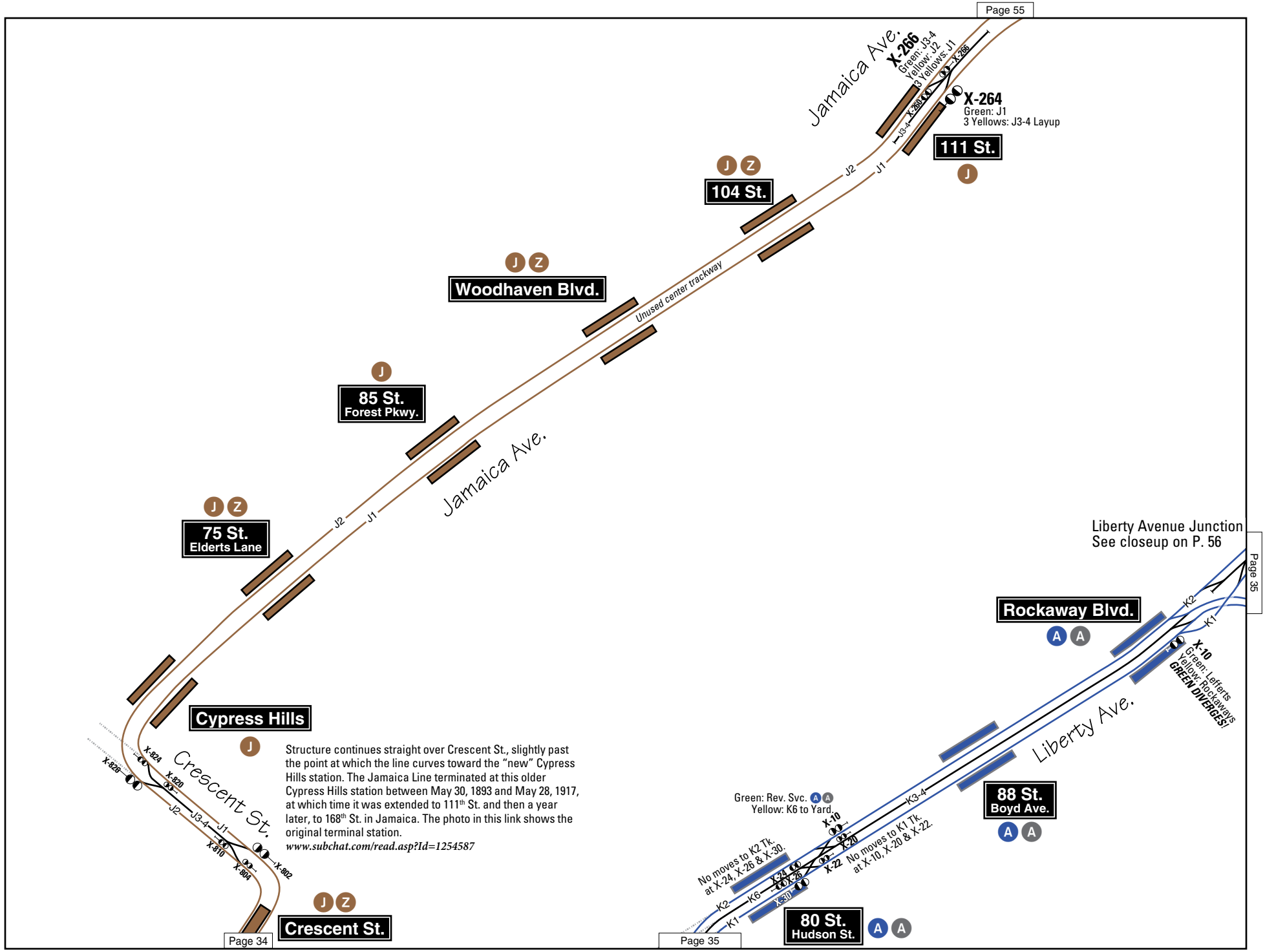
There's a provision just east of Rego Park dating from the IND Second System plans in the mid-1930s, to connect the Queens Blvd. Line to the Long Island Rail Road's Rockaway Beach Branch. A section of disused tunnel exists, forming what would be the connection to D1 Tk. as shown, as well as a tunnel bellmouth from D2 Tk. Both of these end at the south edge of Queens Blvd. The bellmouth and related story can be seen in this 1933 newspaper account:

https://www.flickr.com/photos/127872292@N06/37643949095/

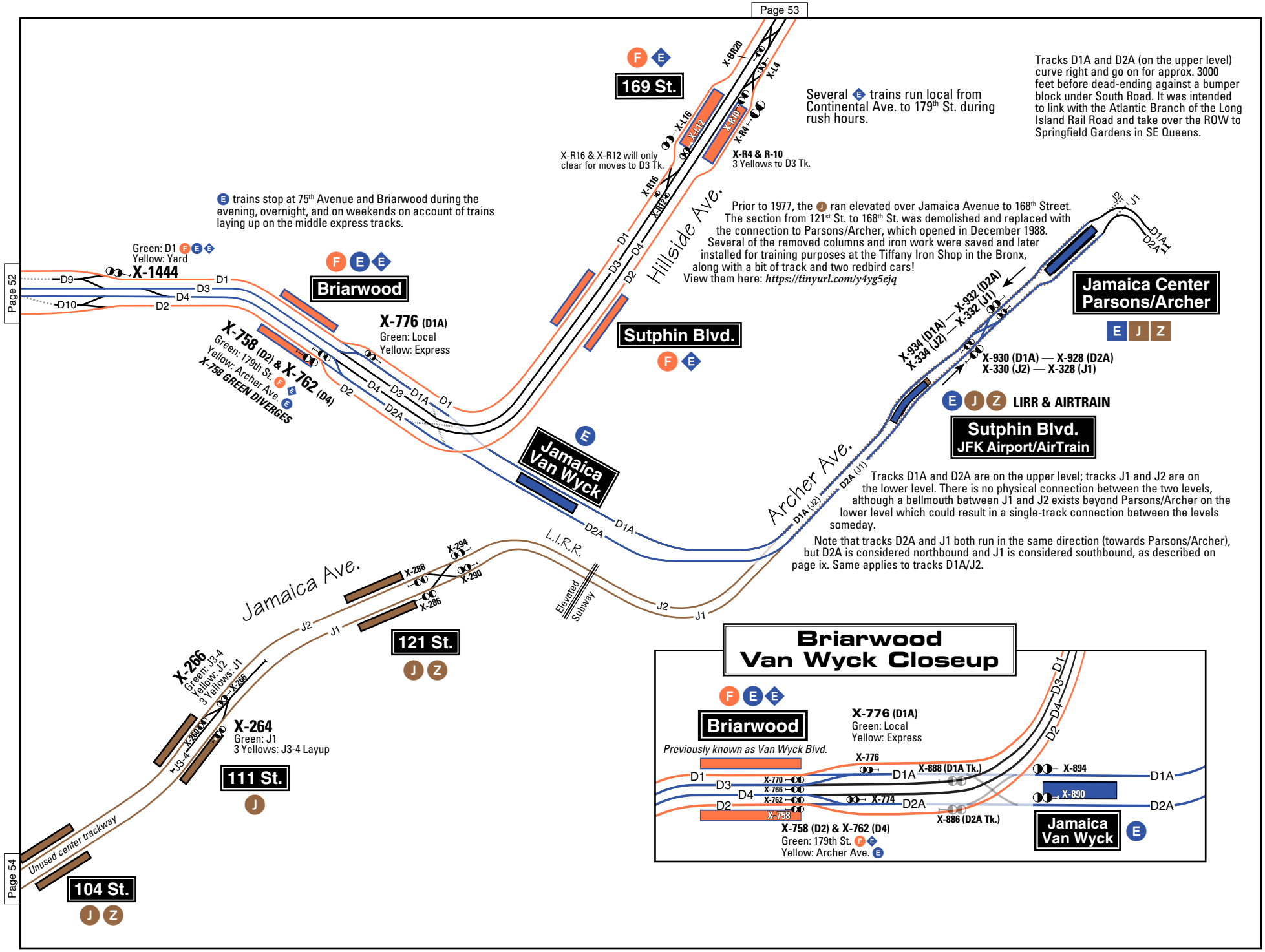


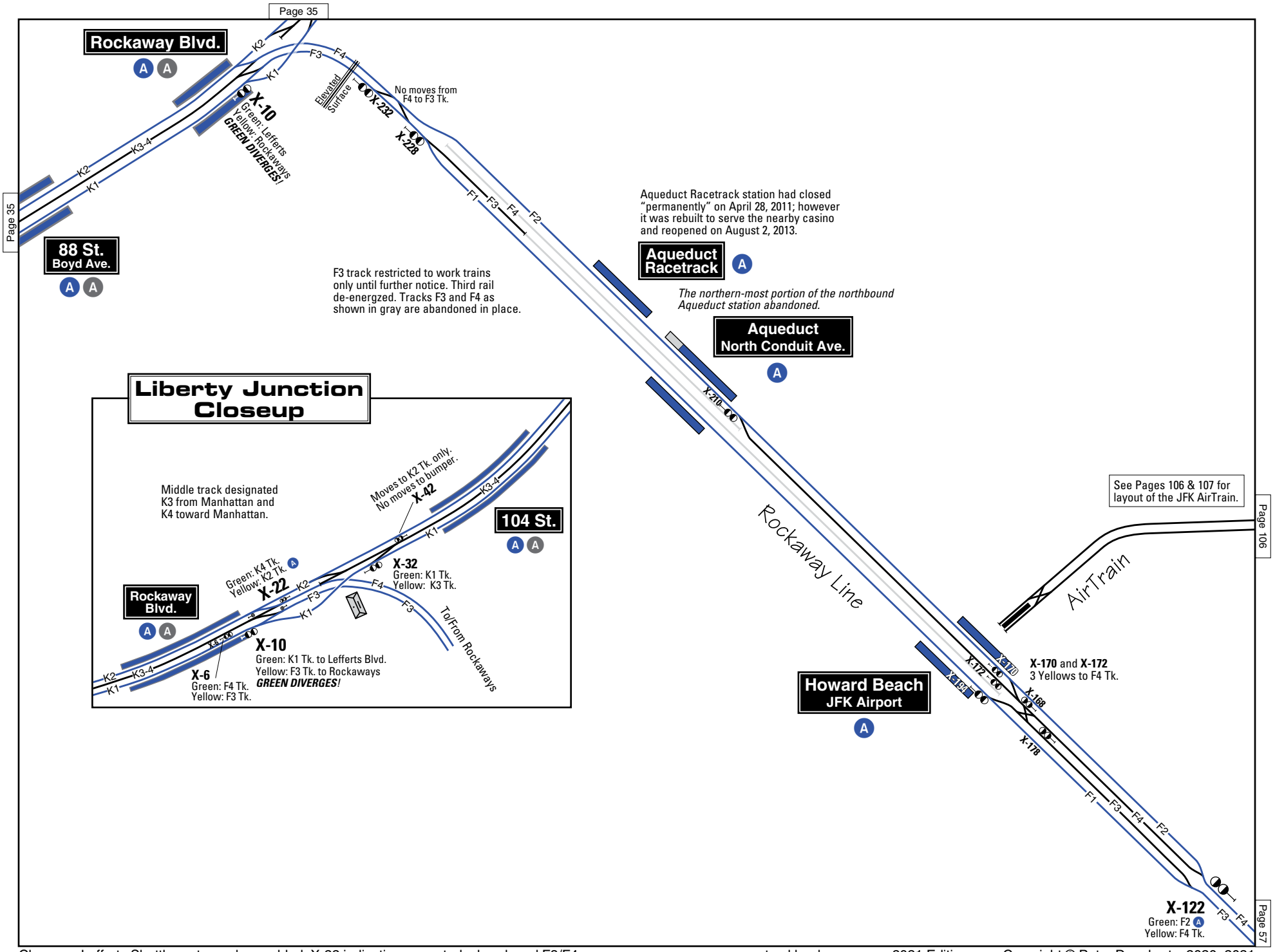
Page 51
Page 53 to 179th St. — Page 55 to Jamaica Center





Changes: Signal numbers at Crescent St. corrected; signal numbers at Hudson St. added; overnight shuttle route markers added.





Rockaways

The Rockaway line crosses Jamaica Bay just to the east of Cross Bay Boulevard on its own private right-of-way. The City of New York purchased the line from the Long Island Rail Road in 1952 and service began in 1956.

The North Channel "Swing Bridge" is no longer able to be moved—it's a permanent fixture. The ***Beach Channel Drawbridge*** does open regularly and can cause delays to Rockaway A and S services when it's open for marine traffic.

There is a long stretch of dual track south of the Beach Channel Drawbridge that is not shown here for purposes of space. There are no switches or interlocking signals along this section of track.

North Channel Swing Bridge

Jamaica Bay

F5 F3 F4 F6

F6 holds one 600-foot train.
F5 is 10,300 ft. long—just under 2 miles and is restricted to test trains only.
https://youtu.be/2JMy_IlyJ4U?t=164

X-322 (F4)
X-310 (F3)
Yellow: Crossover
3 Yellows: F5 or F6 with track destination light.

A A S **Broad Channel**

Far Rockaway Branch

A **Far Rockaway** Mott Avenue
X-2 X-6 X-4 X-8
A **Beach 36 St.** Edgemere
A **Beach 25 St.** Wavecrest A
A **Beach 44 St.** Frank Ave.
F3A F4A
Rockaway Freeway

Rockaway Park Closeup

F12 F11 F10 F9 F8 F7 F6 F5 F4 F3
Rockaway Park
X-92 X-88 X-86 X-84 X-82 X-78 X-76
X-84 (F3) Green: F3 Yellow: F4 3 Yellows: F5
X-78 (F3) Green: F3 Tk. Yellow: F4 Tk. 3 Yellows: Yard
X-82 3 Yellows: F5

Beach Channel Drawbridge

X-54
Green: Rockaway Pk. S A
Yellow: Far Rockaway A
GREEN DIVERGES!

Front window view of a move across Hammel's Wye:
https://tinyurl.com/y58kbzhp

Crossovers have been proposed for B105 St. in order to use that station as a terminal in case of storm damage to the Rockaway Park terminal.

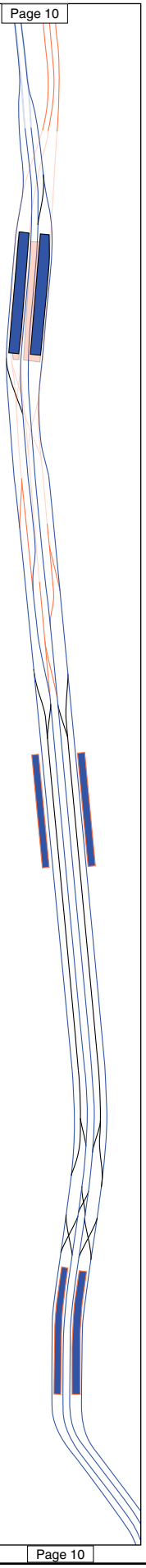
S A **Beach 98 St.** Playland
X-32 Yellow: F6 Tk.
X-22 & X-24A: Moves to F3 Tk. only.
X-24 X-22
X-26 G: Howard Beach S A Y: Far Rockaway
F3A F4A F6
Green: Howard Beach A Yellow: Rockaway Park **X-4**
No moves from F6 or F3A to F4A.
Hammel's Wye

S A **Rockaway Park** Beach 116 St.
Beach 105 St. Seaside
F6 – F12 X-78 F3 F4 F5
Rockaway Freeway
S A **B. 90 St.** Holland Ave. S A
Beach 67 St. Arverne by the Sea A
Beach 60 St. Straiton A
Beach 44 St. Frank Ave. A

Signal details in inset map, above.

Continues above

Changes: Hammel's Wye redrawn; X-82 & X-32 and notes added; X-26 indications changed; video link for F5 and F6 Tk. moves added; Video link added.



8TH AVENUE CLOSEUP

125th St. to 145th St.

To 207th Street, Manhattan and 207th St. Yard

Concourse Line to 205th St. and Bedford Park Blvd.

Center track designations:
C4 Northbound
C3 Southbound

Upper Level

Lower Level

145 St. A C D B B

X-646 (A4)
Green: Express A
Yellow: Local

X-634 (A1 track)
Green: Local C A
Yellow: Express

X-626 (C1 track)
Yellow: Local B
Green: Express D

X-552 (C3 S/B)
Yellow: To N/B A4 Tk.wrong-rail
Green: S/B Express (A3 Tk.) D

X-506
Green: A1 track to 135th St. B C A
3 Yellows: A5 layup

X-538
Green: S/B Express A D
3 Yellows: A5 or A5 to A1

X-560 (A4) Express
X-570 (A2) Local
Yellow: Concourse D B B
Green: 168 & 207 Sts. A C

X-542 (A4)
Yellow: Concourse Express D
Green: Upper level|207th St. A

X-528 (A6)
Yellow: Express (A4 Tk.)
Green: Local (A2 Tk.)

135 St. C B A

X-686 (C1 track)
X-692 (C3 middle)

X-682 (C4 N/B)
Green: Exp. & Tml. C4 Tk. D B
Yellow: Terminal C1 Tk. B

X-626 (C1 track)
Yellow: Local B
Green: Express D

XA-668 (C2 N/B)
Green: Concourse Local D B
Yellow: Concourse Exp. D B
and Terminal (also using C1)

X-552 (C3 S/B)
Green: S/B Express D
Yellow: To N/B A4 Tk. wrong-rail

X-538
Green: S/B Express D
3 Yellows: A5 or A5 to A1

Commonly-used routings

Uptown:

A: At 125th Street on A4 track:
Accept bottom-green at X-404, 542 and 560; proceed on A4 track.

B: At 135th Street on A2 track:
Accept bottom-yellow at X-570;
Accept bottom-green at X-668 to Concourse Local C2 Tk.

B: At 135th Street on A2 track:
Accept bottom-yellow at X-570 for C2 Tk. (to Lower Level);
Accept bottom-yellow at X-668 for C4 track;
Accept bottom-yellow at X-668 and 682 for C1 Tk.

C A: At 135th Street on A2 track:
Accept bottom-green at X-570 for A2 local track.

D: At 125th Street on A4 track (Concourse Local):
Accept bottom-green at X-404 and X-542;
Accept bottom-yellow at X-560 to Lower Level & C2 Tk.;
Accept bottom-green at X-668 for C2 local track.

At 125th Street on A4 track (Concourse Express):
Accept bottom-green at X-404;
Accept bottom-yellow at X-542 to C4 express track.

X-404 (A4) and **X-412** (A2)
3 Yellows: to A3, A5 & A6 with tracks unoccupied.

Commonly-used routings

Downtown:

A: At 145th Street on A3 track (UL):
Accept bottom green at X-538, 436 & 428;
Continue on A3 Tk., express to 59th Street.

B: At 145th Street on C1 (Lower Level):
Accept bottom-yellow at X-626 crossing over to A1 Tk.;
Accept bottom-green at X-506, operate local on A1 Tk.;

At 145th Street on C3 Tk. (Lower Level):
Accept bottom-yellow at X-692, and proceed as above.

C A: At 145th Street on A1 track (Upper Level):
Accept bottom-green at 634 and 506-balls operating on A1 local track.

D: At 145th Street on C3 track (Lower Level—Express):
Accept bottom-green at X-552, 538 (now A3 Tk.), 436 and 428, operating express on A3 track to 59th Street.

At 145th Street on C1 track (Lower Level—Local):
Accept bottom-green at X-686, X-626, and X-538; then proceed as above.

X-436
G: Exp. A D
Y: X-over to A4

X-428
G: Exp. A D
Y: Lcl. (A1 Tk.)

To CPW/8th Ave. Line Midtown Manhattan

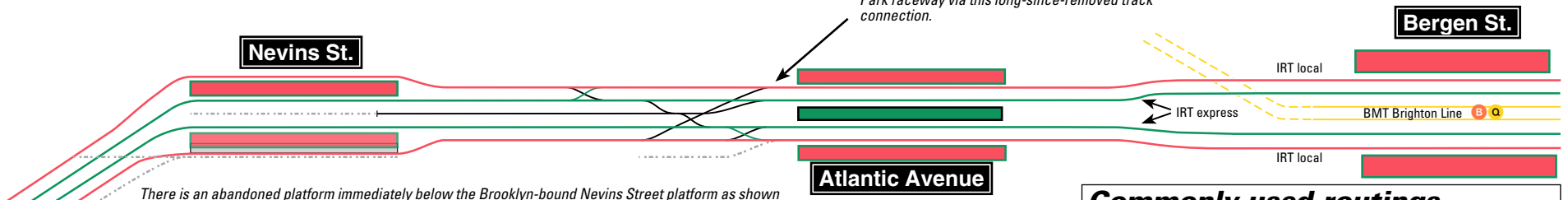
125 St. A C D B

Eastern Parkway Line
Nevins St. to Atlantic Avenue

Page 25

Page 25

A connection to the LIRR existed here at one time. Supposedly, IRT founder August Belmont brought his private subway car, the Mineola, to Belmont Park raceway via this long-since-removed track connection.



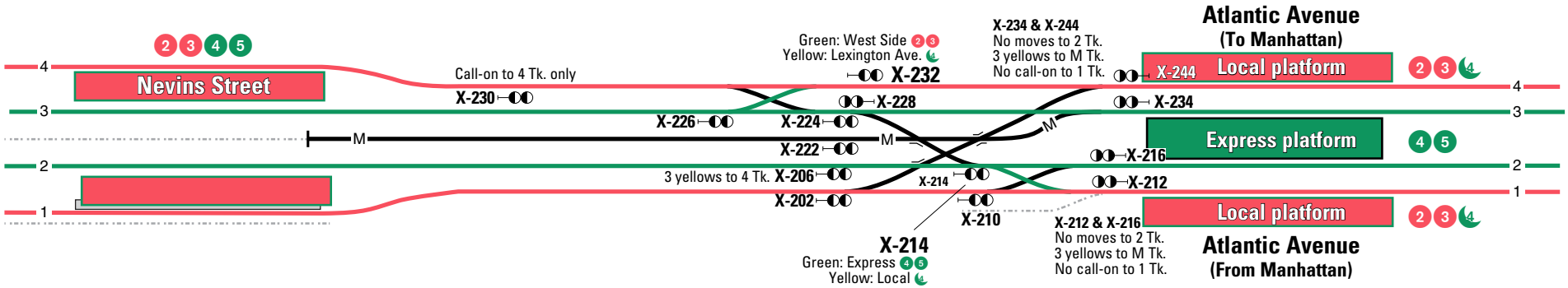
There is an abandoned platform immediately below the Brooklyn-bound Nevins Street platform as shown above, along with numerous trackways. Leaving Hoyt Street southbound on a 2 or 3 local train, there's a portal and trackway on a ramp down to the lower level. This trackway is joined by another trackway, which then curves beneath 1 track and the platform faces it. The trackway ends at the end of the platform—the IND Fulton Line is beyond that. The IRT allowed the city to cut through it when they were building the Fulton St. Line. On the other side of the Fulton Line the trackway continues and comes up just before Atlantic Avenue. There are bellmouth provisions for a never-built connection to both Fulton St. and a subway under Lafayette Avenue, which eventually became the G.
See Joe Brennan's site for more details: http://www.columbia.edu/~brennan/abandoned/nevins.html.

Commonly-used routings

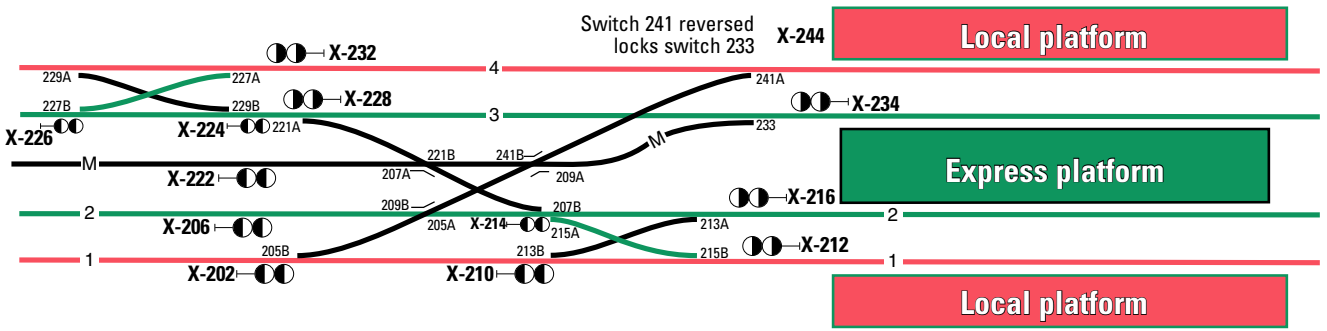
To Manhattan

West-side: West Side trains leaving Atlantic Avenue on 3 Tk. must take a bottom-yellow at X-228 and crossover to 4 Tk.

Lexington Avenue: Lexington Ave. trains leaving Atlantic Avenue on 4 Tk. must take a bottom-yellow at X-232 and crossover to 3 Tk.

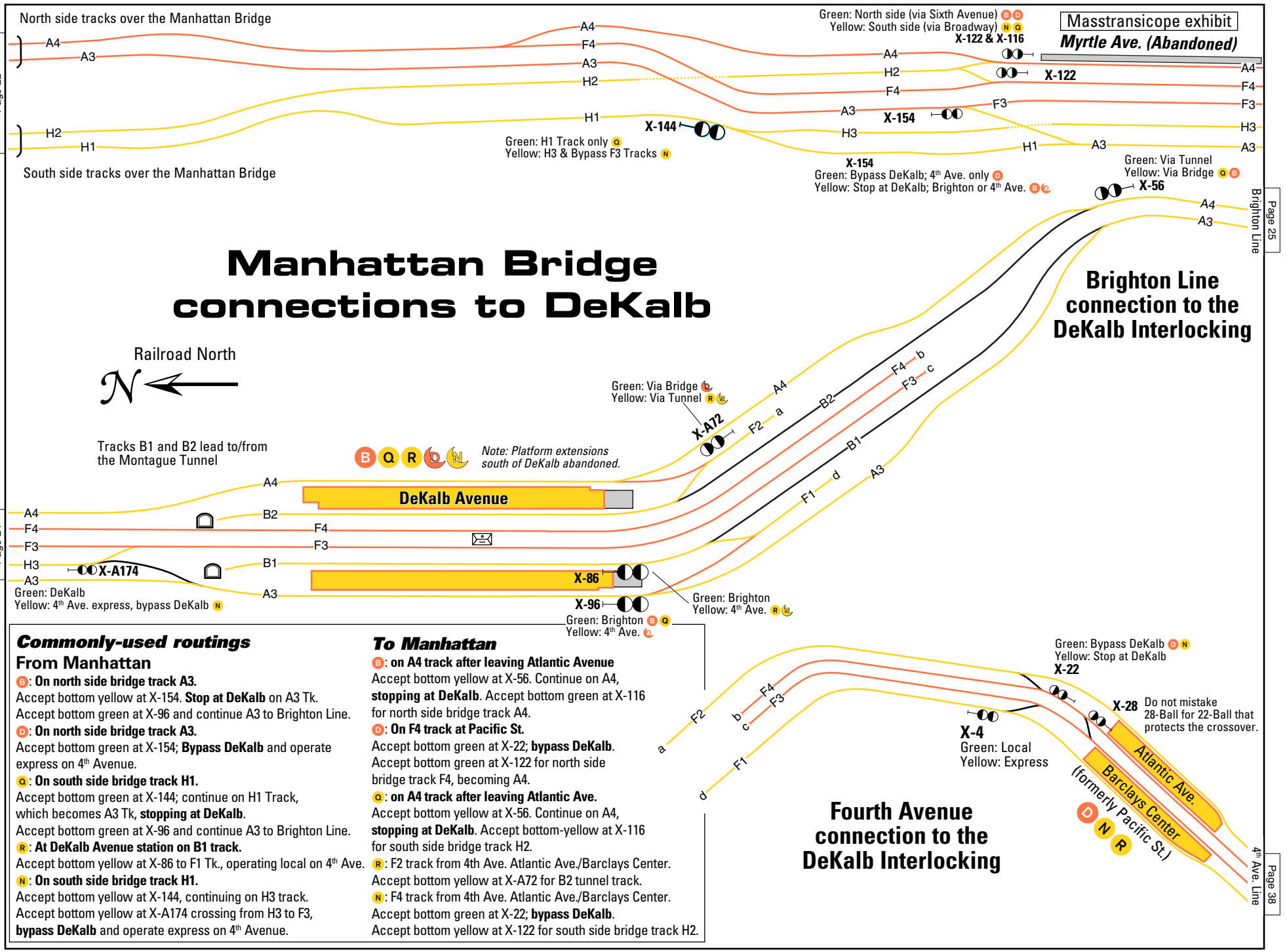


Railroad North



Legend

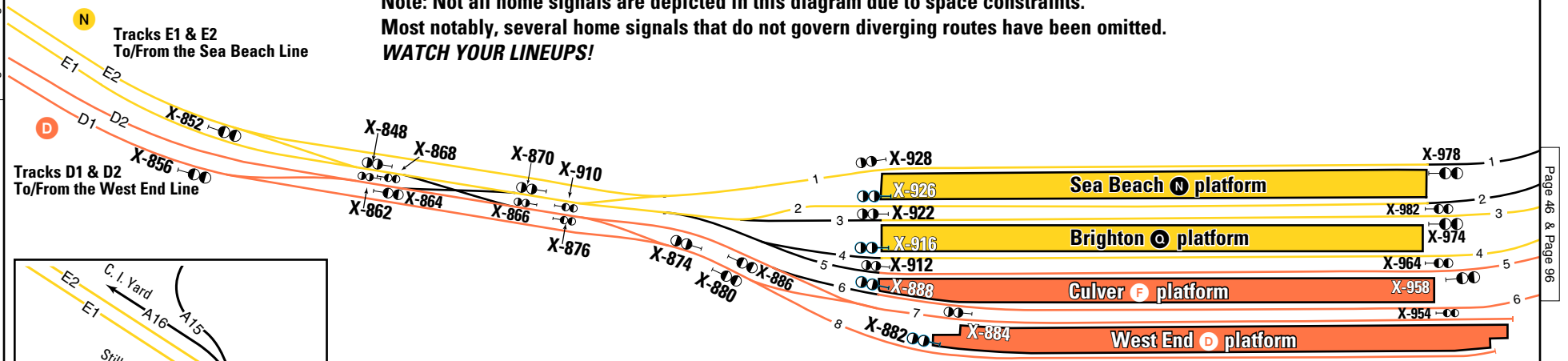
1	Track number
X-232	Home signal and signal number for direction of traffic ←
X-206	Home signal and signal number for direction of traffic →
	Slip (or double-slip) switch. This is a combination of a switch and a crossing-at-grade.
	Facing point movements are possible as shown. Switch numbers shown are not related to their signal numbers (e.g. X-125 and 214A/B).

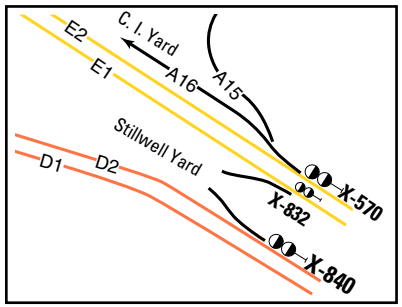


Page 46 & Page 96

Stillwell Avenue (Coney Island)
Track Configuration and Home Signals

Note: Not all home signals are depicted in this diagram due to space constraints.
Most notably, several home signals that do not govern diverging routes have been omitted.
WATCH YOUR LINEUPS!



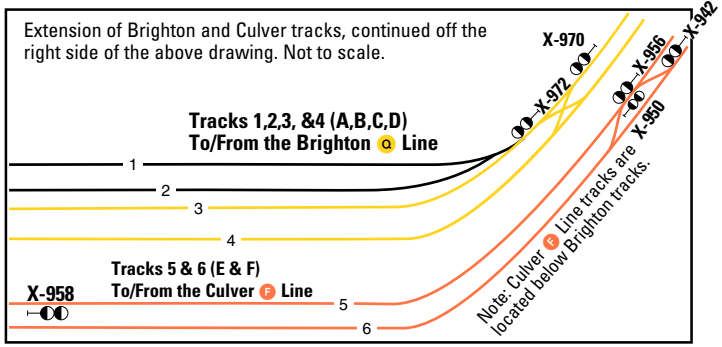


Extension of Sea Beach and West End tracks with leads to Coney Island Yard and Stillwell layup Yard. See P. 96–98 for yard track details. (Not to scale)

In May 2005 the entire Stillwell Avenue terminal was finally re-opened to all four train services after a 4 year rebuild from the ground up.

Tracks number from 1–8, top to bottom. Signal plates refer to them as tracks A–H, respectively.

Extension of Brighton and Culver tracks, continued off the right side of the above drawing. Not to scale.



Commonly-used routings

From Manhattan

N: Leaving 86th St. on E1 track
Accept bottom green at 868 then bottom yellow at X-910 for 1 Tk.
Accept bottom green at 868 then bottom green at X-910 for 2 Tk.
NOTE: 3 yellows at X-910 leads to Track 3 (C)(Brighton)

Q: At W. 8 St. station on B1 track (upper level)
Accept bottom green indication at X-970;
Accept bottom green at X-972 for Track 3 (C). OR
Accept bottom yellow at X-970 crossing over to Track 4 (D).
NON-REVENUE MOVES: Accept bottom green at X-970;
Accept bottom yellow at X-972 for Track 1 (and eventually 2).

F: At W. 8 St. station on B1 track (lower level)
Accept bottom green indication at X-956 to Track 5 (E).
Accept bottom yellow at X-956 crossing over to Track 6 (F)

D: Leaving Bay 50 St. on D1 track
Accept bottom green at X-856;
Accept bottom green at X-880 and proceed to Tk. 8 (H) OR
Accept bottom yellow at X-880 and cross over to Tk. 7 (G)

To Manhattan

N: On Track 1 (A) at Stillwell Terminal
Accept bottom green at X-928 and proceed on E2

On Track 2 (B) at Stillwell Terminal
Accept bottom green at X-926;
Accept bottom green at 870;
Accept bottom yellow at X-848, proceeding on E2 track.

Q: On Track 3 (C) at Stillwell Terminal
Accept bottom yellow at X-974. Cross over and proceed on A4

On Track 4 (D) at Stillwell Terminal
Accept bottom green at X-964 and proceed directly to A4

F: On Track 5 (E) at Stillwell Terminal
Accept bottom yellow at X-950. Cross over and proceed on B2.

On Track 6 (F), Accept bottom green at X-954, proceeding on B2

D: On Track 7 (G) at Stillwell Terminal
Accept bottom green at X-884, 866 & 862; proceed on D2 Track.

On Track 8 (H) at Stillwell Terminal
Accept bottom green at X-882;
Accept bottom yellow at X-874, crossing over;
Accept bottom-green at X-866 & 862; proceed on D2 Track.

To CI Yard

From 1 Tk. Accept bottom green at X-928. Proceed on E2 track.
Accept bottom yellow at X-570 to CI Yard.

From 2, 3, 4 & 5 Tk. Lead to E1 Tk, then
Accept bottom yellow at X-848. Cross over and proceed on E2 track.
Accept bottom yellow at X-570-ball to CI Yard.

From 6 Tk. Accept bottom green at starter signal X-888.
Accept bottom yellow at X-866, crossing over to E1 track;
Accept bottom yellow at X-848, crossing over to E2 track;
Accept bottom yellow at X-570 to CI Yard.

From 7 Tk: Accept green at starter signal X-884 to D2;
Accept bottom yellow at X-866 and X-848 to E2;
Accept bottom yellow at 570 to CI yard.

From 8 Tk: Accept green at starter-signal X-882;
Accept bottom yellow at X-874, crossing over to D2;
Accept bottom yelow at X-866 and X-848, crossing over to E2 track;
Accept bottom yellow at X-570 to CI Yard.

125th St. and Lexington Avenue

4 5 6

Commonly-used routings

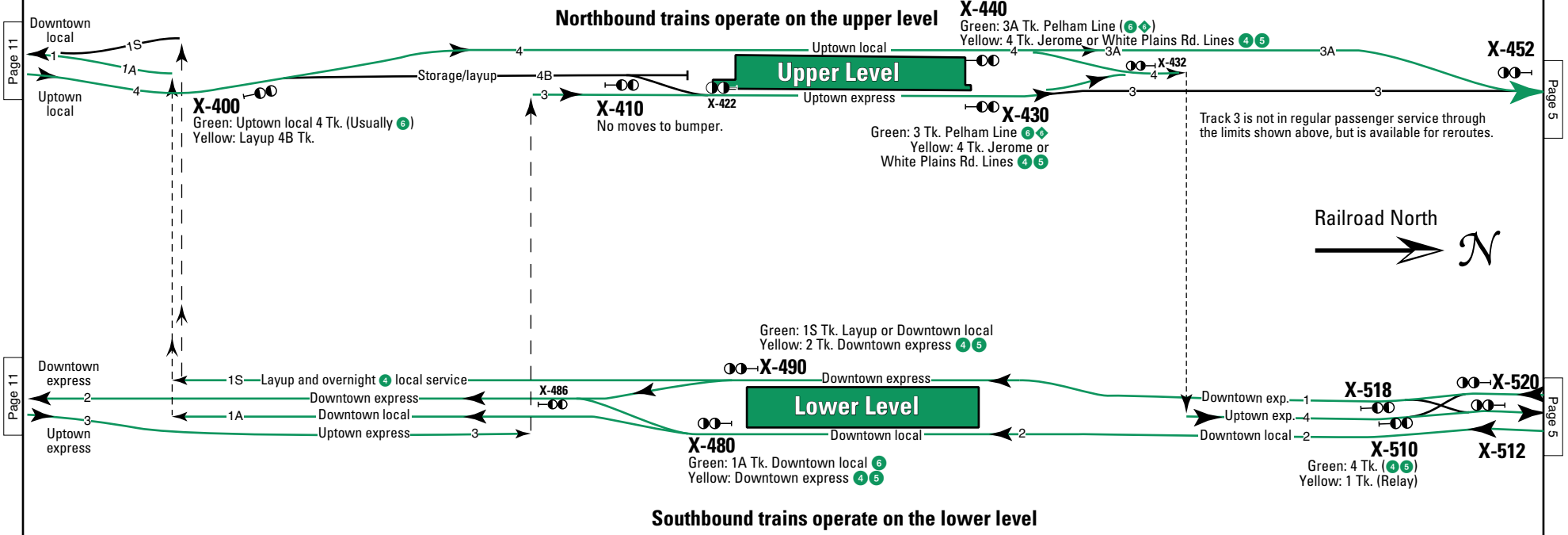
Uptown:

4 5: **On 3-track in the station**. Accept bottom yellow at X-430. Crossover and proceed on 4 Tk. to Jerome Avenue, Nereid Avenue, or Dyre Ave.

6: **Leaving 116th St. on 4 Tk**. At X-400 accept bottom green indication, entering on the west side of the 125th St. platform. Accept bottom green at X-440 and proceed via 3A Tk., which then joins with 3 Tk. Operating to Pelham Line.

Track 4B is used for storage layup, but may also be used for northbound trains arriving from Lex. local service (may run via Pelham or the White Plains Road/ Dyre Avenue Lines north of 125th St.)

No moves to bumper on 4B track.



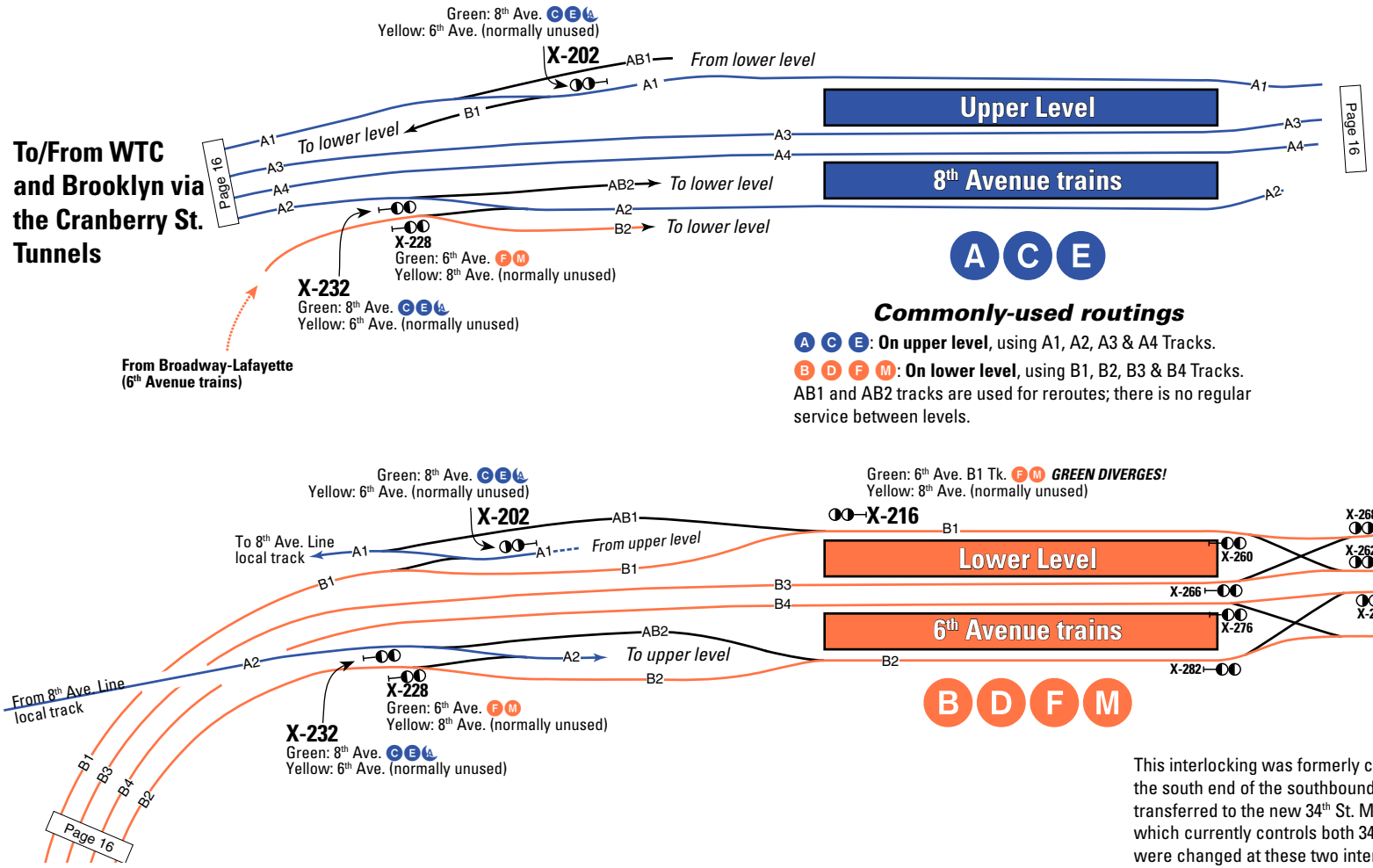
Commonly-used routings

Downtown:

4 5: **On 1-Track**. Accept bottom yellow at X-490. Proceed to 2 Tk. operating express.

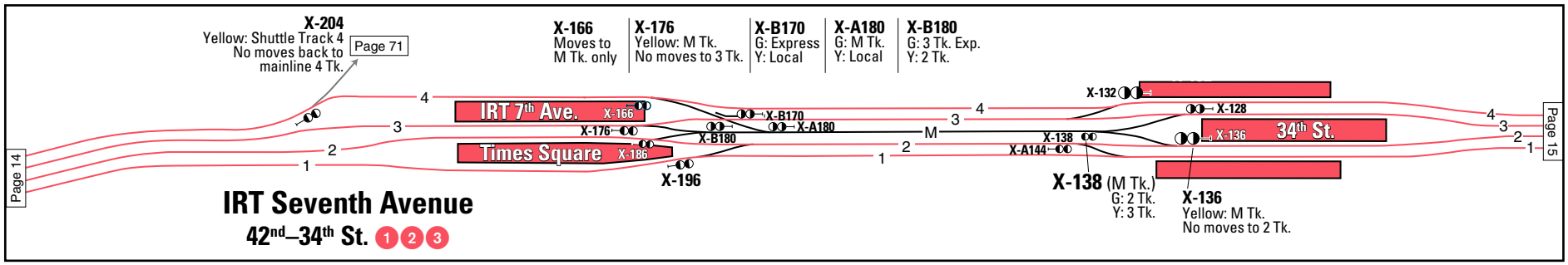
6: **On 2-Track**. Accept bottom green at X-480 onto 1A Tk. climb to upper level on 1A Tk., where 1A merges with 1 Track. Operate local.

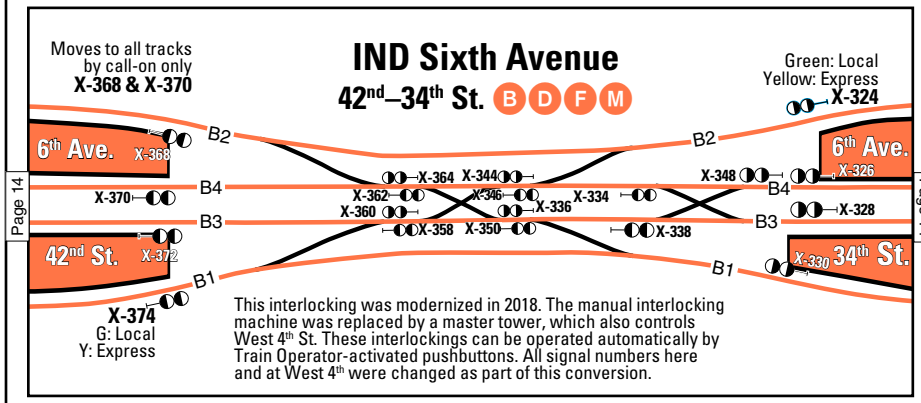
West 4th St. Washington Square complex
Track configuration and home signals

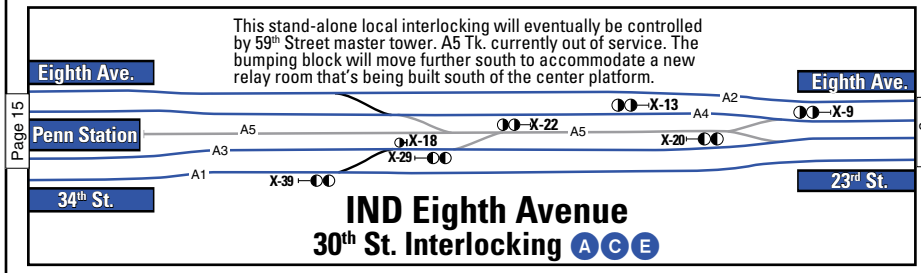


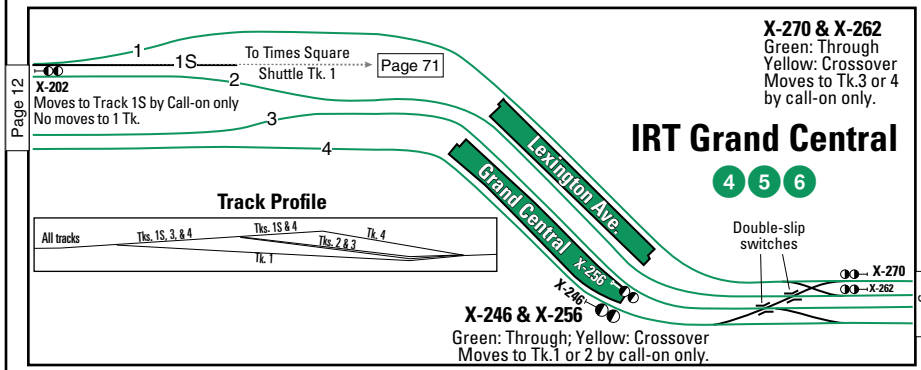
This interlocking was formerly controlled by a local tower located at the south end of the southbound lower level platform. Control was transferred to the new 34th St. Master Tower in late-summer 2018, which currently controls both 34th/6th, and West 4th. Signal numbers were changed at these two interlockings as a result.

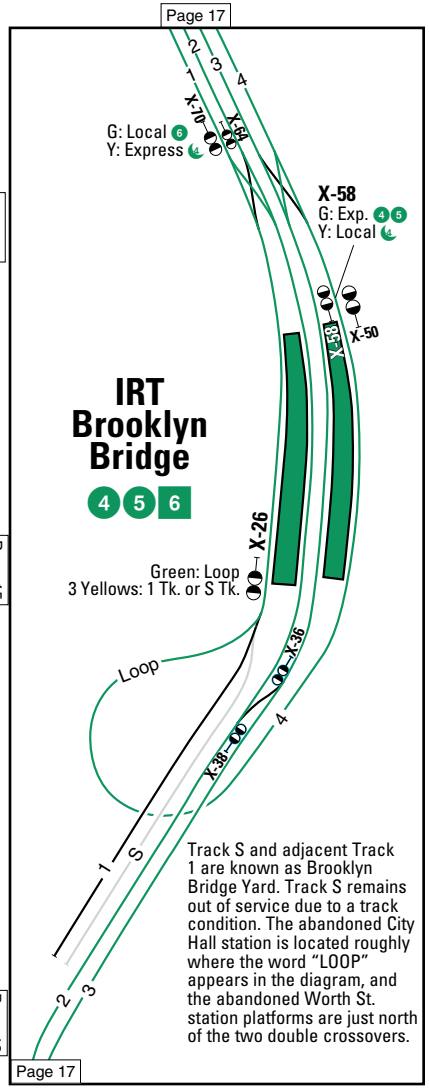
Also of note, this interlocking is not yet fully reverse-signaled, except for the three crossovers on the lower level, north of the station.

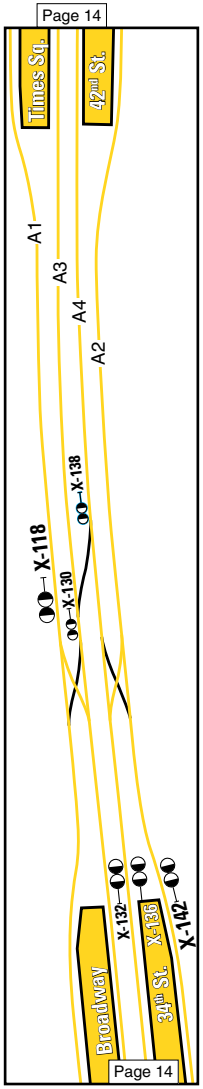


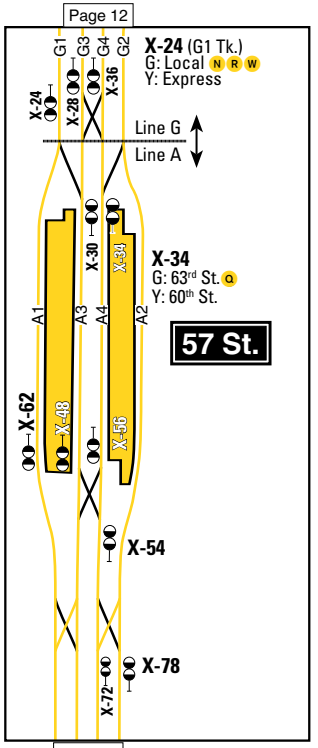












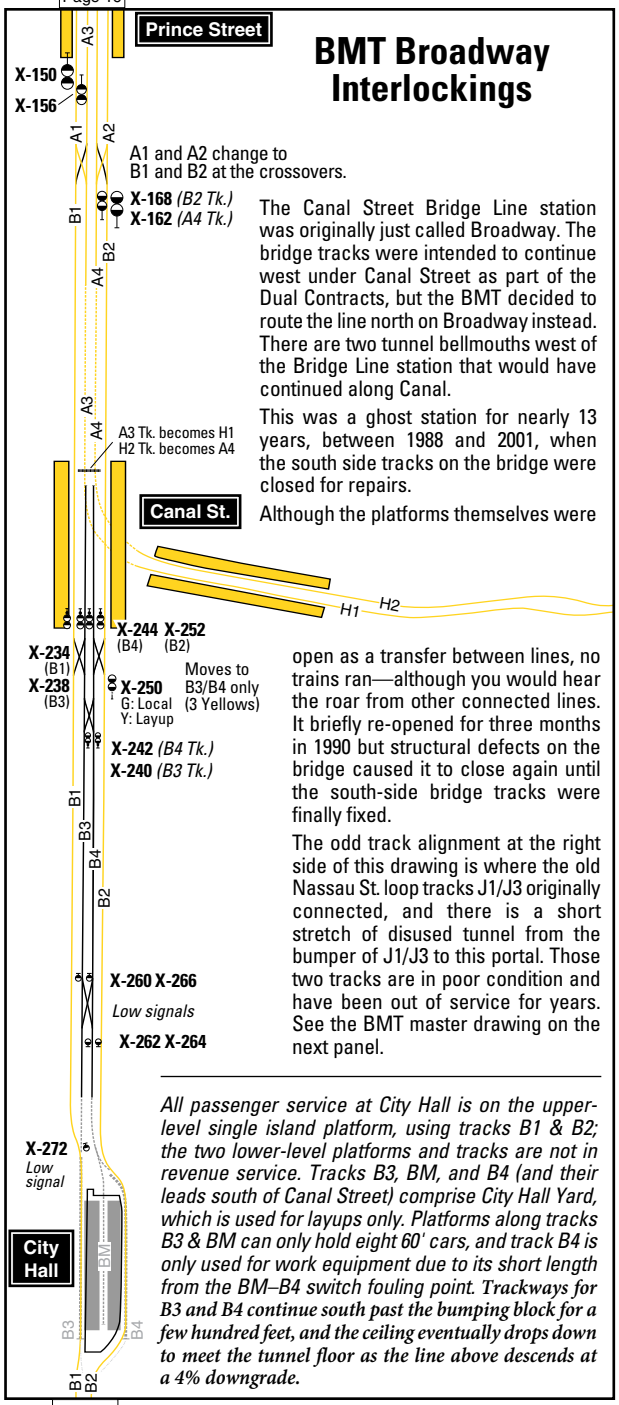
BMT Broadway Interlockings

57th St. (above) and 34th–42nd St. (left).

34th St. also controls a double crossover between A3 and A4 express tracks north of 42nd St.

N Q R W

BMT Broadway Interlockings



The Canal Street Bridge Line station was originally just called Broadway. The bridge tracks were intended to continue west under Canal Street as part of the Dual Contracts, but the BMT decided to route the line north on Broadway instead. There are two tunnel bellmouths west of the Bridge Line station that would have continued along Canal.

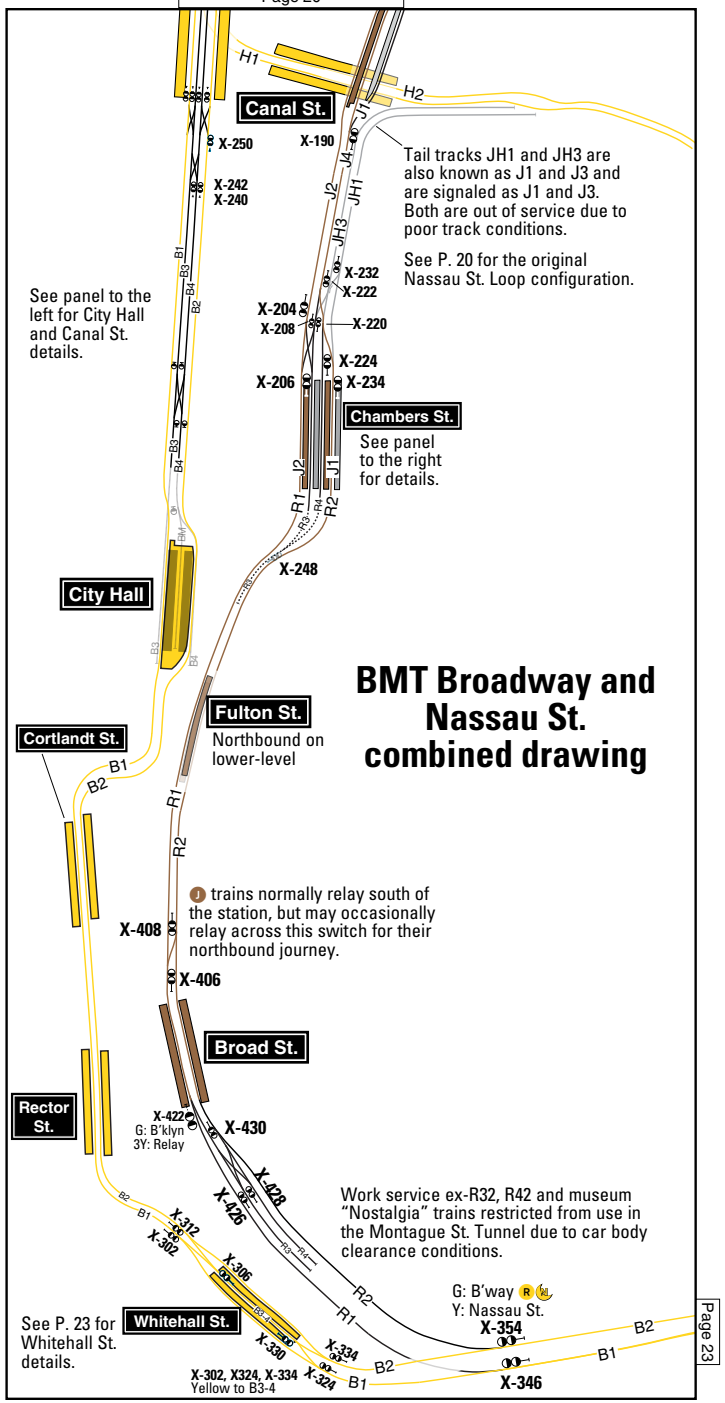
This was a ghost station for nearly 13 years, between 1988 and 2001, when the south side tracks on the bridge were closed for repairs.

Although the platforms themselves were open as a transfer between lines, no trains ran—although you would hear the roar from other connected lines. It briefly re-opened for three months in 1990 but structural defects on the bridge caused it to close again until the south-side bridge tracks were finally fixed.

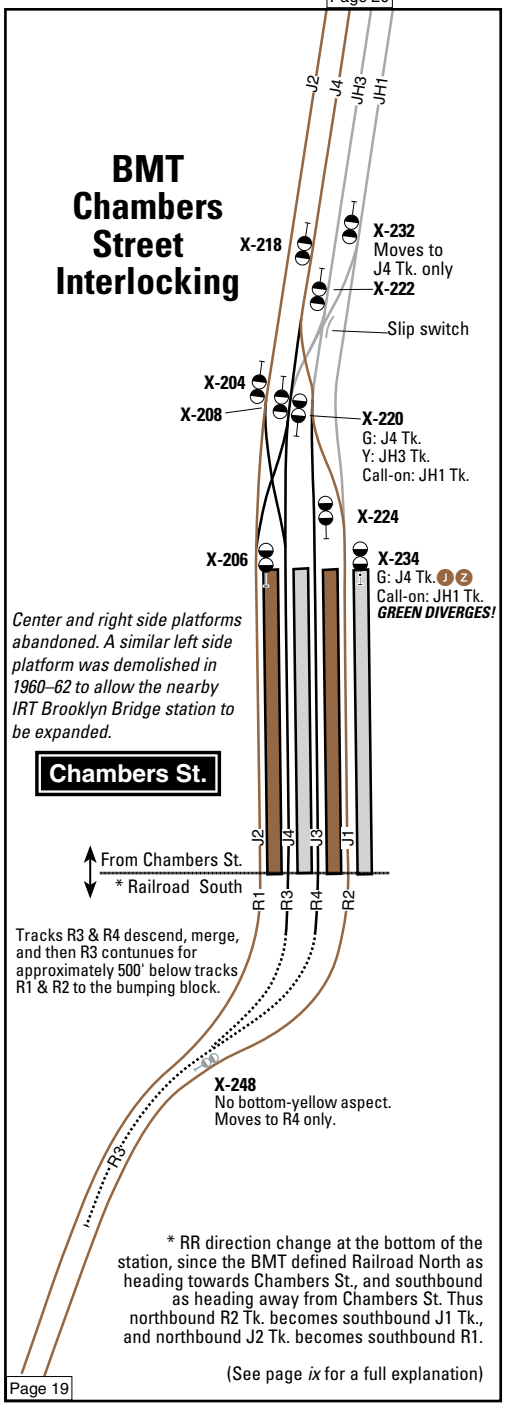
The odd track alignment at the right side of this drawing is where the old Nassau St. loop tracks J1/J3 originally connected, and there is a short stretch of disused tunnel from the bumper of J1/J3 to this portal. Those two tracks are in poor condition and have been out of service for years. See the BMT master drawing on the next panel.

All passenger service at City Hall is on the upper-level single island platform, using tracks B1 & B2; the two lower-level platforms and tracks are not in revenue service. Tracks B3, BM, and B4 (and their leads south of Canal Street) comprise City Hall Yard, which is used for layups only. Platforms along tracks B3 & BM can only hold eight 60' cars, and track B4 is only used for work equipment due to its short length from the BM–B4 switch fouling point. Trackways for B3 and B4 continue south past the bumping block for a few hundred feet, and the ceiling eventually drops down to meet the tunnel floor as the line above descends at a 4% downgrade.

BMT Broadway and Nassau St. combined drawing

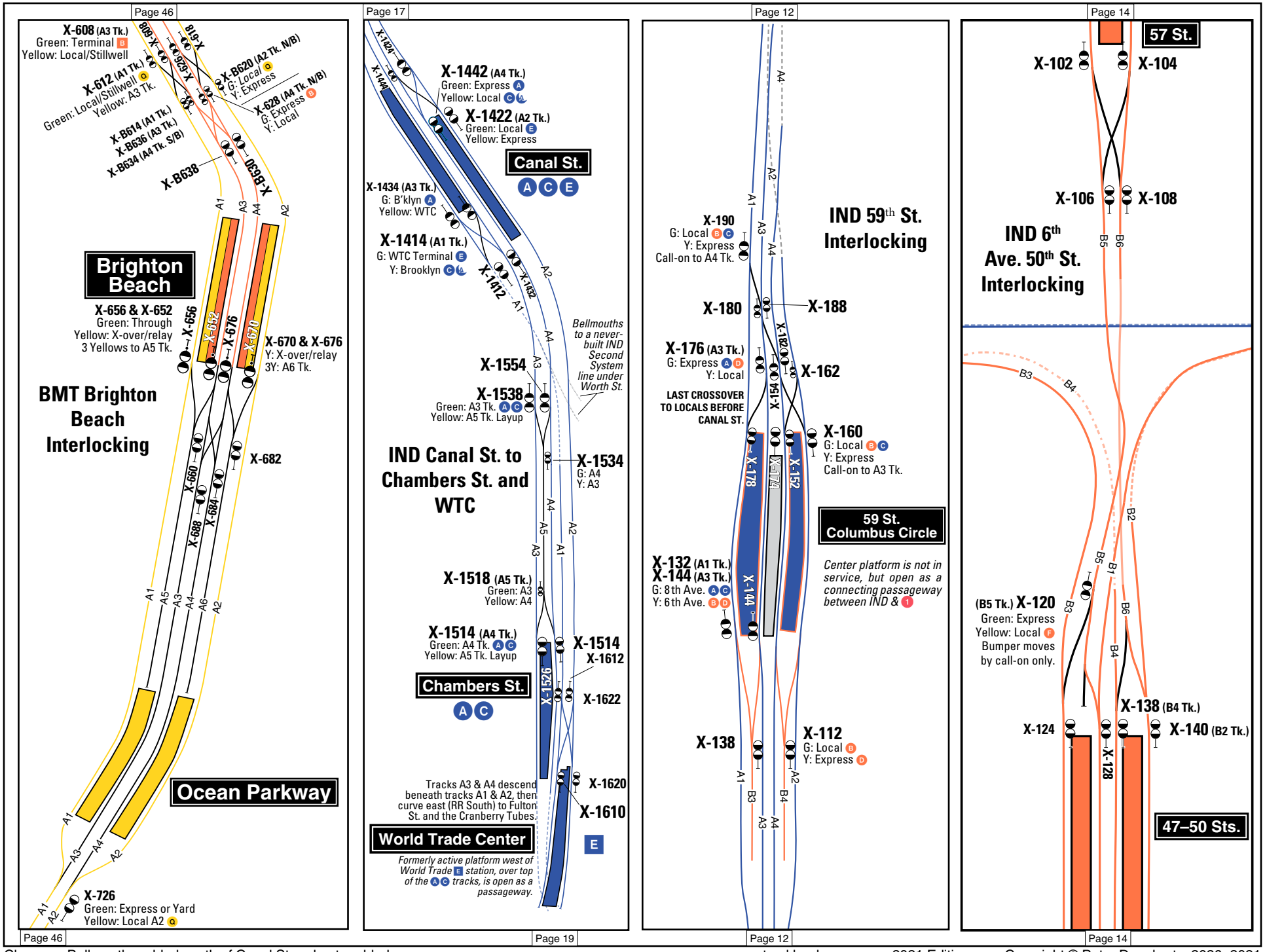


BMT Chambers Street Interlocking



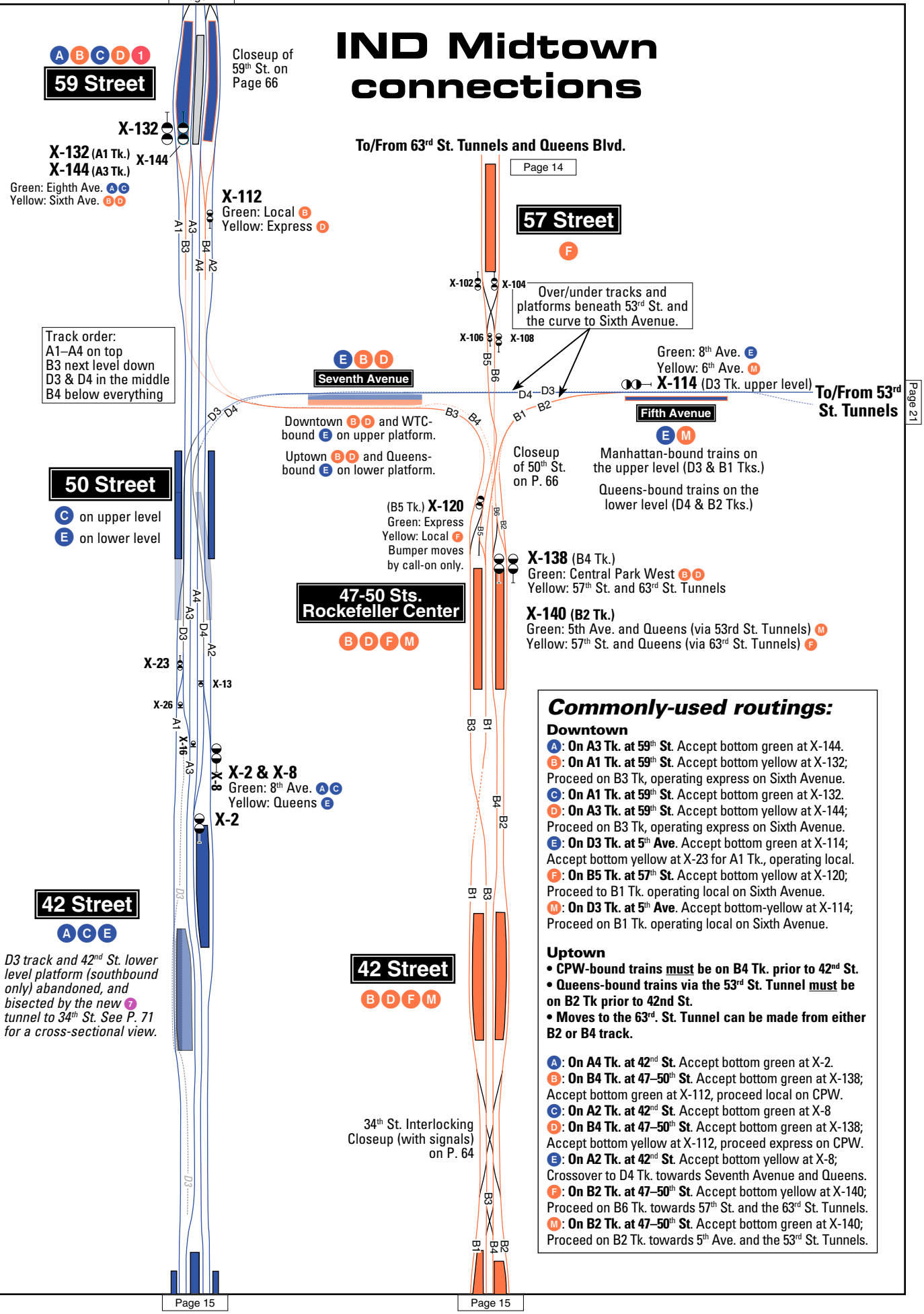
* RR direction change at the bottom of the station, since the BMT defined Railroad North as heading towards Chambers St., and southbound as heading away from Chambers St. Thus northbound R2 Tk. becomes southbound J1 Tk., and northbound J2 Tk. becomes southbound R1.

(See page *ix* for a full explanation)



Page 12

IND Midtown connections



Commonly-used routings:

Downtown

A: On A3 Tk. at 59th St. Accept bottom green at X-144.
B: On A1 Tk. at 59th St. Accept bottom yellow at X-132; Proceed on B3 Tk, operating express on Sixth Avenue.
C: On A1 Tk. at 59th St. Accept bottom green at X-132.
D: On A3 Tk. at 59th St. Accept bottom yellow at X-144; Proceed on B3 Tk, operating express on Sixth Avenue.
E: On D3 Tk. at 5th Ave. Accept bottom green at X-114; Accept bottom yellow at X-23 for A1 Tk., operating local.
F: On B5 Tk. at 57th St. Accept bottom yellow at X-120; Proceed to B1 Tk. operating local on Sixth Avenue.
M: On D3 Tk. at 5th Ave. Accept bottom-yellow at X-114; Proceed on B1 Tk. operating local on Sixth Avenue.

Uptown

- **CPW-bound trains must be on B4 Tk. prior to 42nd St.**
- **Queens-bound trains via the 53rd St. Tunnel must be on B2 Tk prior to 42nd St.**
- **Moves to the 63rd. St. Tunnel can be made from either B2 or B4 track.**

A: On A4 Tk. at 42nd St. Accept bottom green at X-2.
B: On B4 Tk. at 47–50th St. Accept bottom green at X-138; Accept bottom green at X-112, proceed local on CPW.
C: On A2 Tk. at 42nd St. Accept bottom green at X-8
D: On B4 Tk. at 47–50th St. Accept bottom green at X-138; Accept bottom yellow at X-112, proceed express on CPW.
E: On A2 Tk. at 42nd St. Accept bottom yellow at X-8; Crossover to D4 Tk. towards Seventh Avenue and Queens.
F: On B2 Tk. at 47–50th St. Accept bottom yellow at X-140; Proceed on B6 Tk. towards 57th St. and the 63rd St. Tunnels.
M: On B2 Tk. at 47–50th St. Accept bottom green at X-140; Proceed on B2 Tk. towards 5th Ave. and the 53rd St. Tunnels.

Commonly Used Routings:

Canarsie and Broadway trains do not inter-operate.

FROM Manhattan:

J Z: Proceed on J1; no track changes.

L: Proceed on Q1 track to Rockaway Parkway.

TO Manhattan:

J Z: Proceed on J2; no track changes.

L: On Q2 track at Atlantic Avenue. Accept bottom green at X-Q254 ball and also bottom-green at X-Q482 ball, proceeding to the Canarsie Line's Broadway Junction station.

To Manhattan via Canarsie Line

X-Q468

X-Q486

X-Q466
Green: Manhattan
Yellow: Relay

X-Q488

Q2

Q1

B'way Junction East Closeup

Green: J2A Tk.
Yellow: J2 Tk.
3 Yellows: Yard (Y3 Tk.)

X-384

X-572

X-356
G: Jamaica (J1)
Y: Canarsie (J1A)
3Y: Yard (Y3)

X-572 (J3)
Green: J3 Tk.
Yellow: Yard (Y3)

X-368
Green: J1 Tk.
Yellow: J2 Tk.
Track ID Light: J4

Green: J2 Tk.
Y: J4 Tk.
X-406

G: J4 Tk.
Y: J2 Tk.

J2A, J2, J3-4, Y3, J1, J1A, Y2

Broadway Junction

To East New York Yard

Page 31

Page 31

J2A, J2, J3-4, Y3, J1, Y5

Atlantic Avenue Closeup

X-Q524

A remnant of the Snediker Avenue elevated structure remains at Sutter Avenue, and a small portion with an unused platform and disused trackways remains aligned with Van Sinderen Avenue over top of Atlantic Ave. It supports the fare control area (mezzanine) under it. When trackage was modified for CBTC, the mezzanine was not reduced in size.

Abandoned trackways for the old Fulton El. (Tracks K3 and K4) are still in place on either side of the disused platform at, and continue parallel to the active line to just north of Pitkin Avenue, at which point the curve as shown on the next page would have started.

Q1, Q2

X-Q562

Existing track configuration of the Canarsie Line south of Atlantic Avenue

X-Q554

Q2, Y2, J2A, J1A, Q1

X-Q482
Green: Canarsie Line L
Yellow: Broadway Line

X-Q496
Green: Q1 Tk.
Yellow: J1A Tk.

Q1, Q2, Y4

Final track configuration north of Atlantic Avenue, as of July 10, 2004. Track Q2 (old K1) was cut in over the 2003 Labor Day weekend.

X-Q524
Green: L
Yellow: ENY Yard Y4 Tk.

Atlantic Avenue

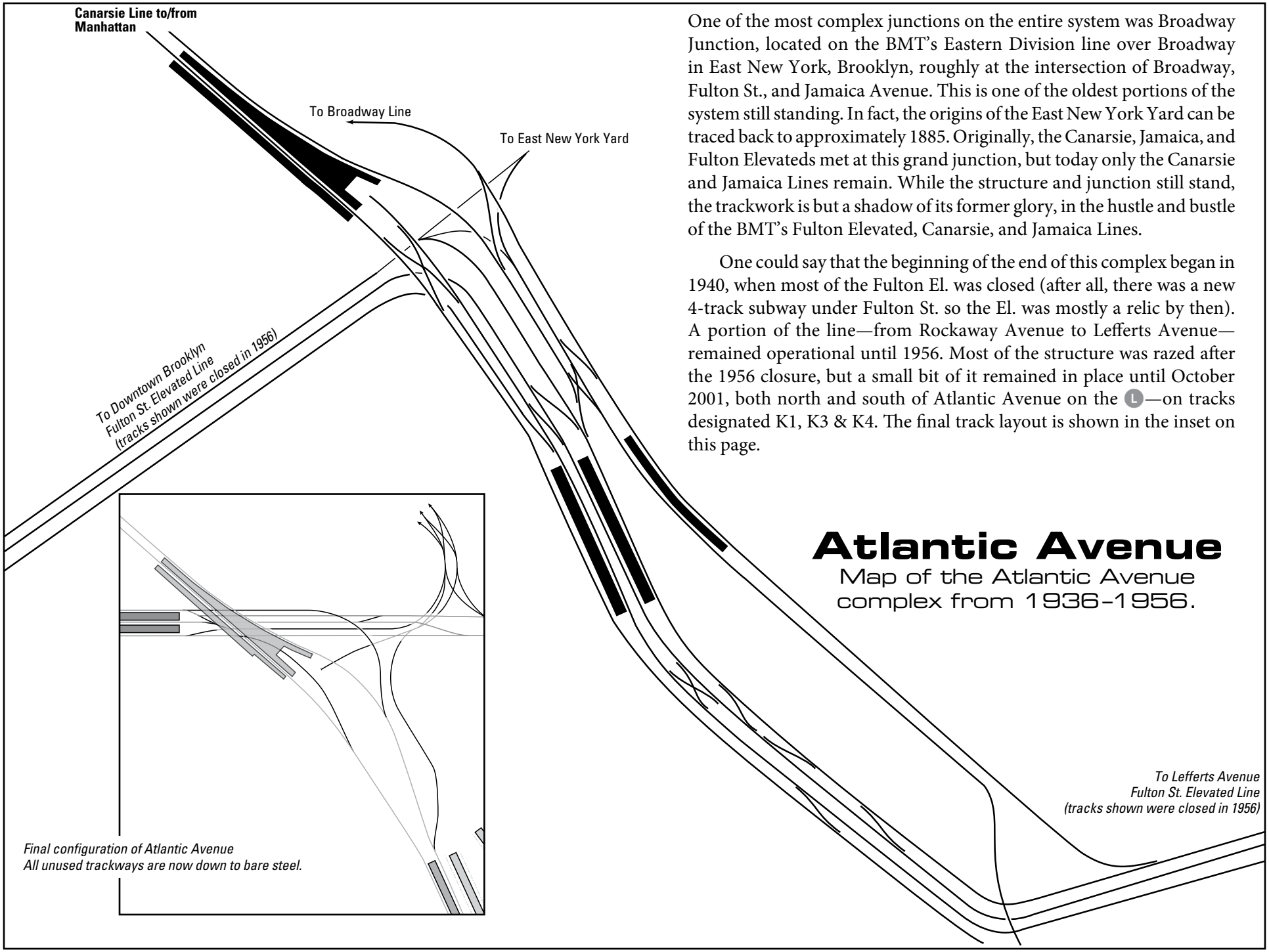
Broadway Junction

Relative placement of Canarsie and Broadway Lines

Page 32

Atlantic Avenue

Map of the Atlantic Avenue complex from 1936–1956.



Final configuration of Atlantic Avenue
All unused trackways are now down to bare steel.

One of the most complex junctions on the entire system was Broadway Junction, located on the BMT's Eastern Division line over Broadway in East New York, Brooklyn, roughly at the intersection of Broadway, Fulton St., and Jamaica Avenue. This is one of the oldest portions of the system still standing. In fact, the origins of the East New York Yard can be traced back to approximately 1885. Originally, the Canarsie, Jamaica, and Fulton Elevateds met at this grand junction, but today only the Canarsie and Jamaica Lines remain. While the structure and junction still stand, the trackwork is but a shadow of its former glory, in the hustle and bustle of the BMT's Fulton Elevated, Canarsie, and Jamaica Lines.

One could say that the beginning of the end of this complex began in 1940, when most of the Fulton El. was closed (after all, there was a new 4-track subway under Fulton St. so the El. was mostly a relic by then). A portion of the line—from Rockaway Avenue to Lefferts Avenue—remained operational until 1956. Most of the structure was razed after the 1956 closure, but a small bit of it remained in place until October 2001, both north and south of Atlantic Avenue on the L—on tracks designated K1, K3 & K4. The final track layout is shown in the inset on this page.

SOUTH FERRY LOOP

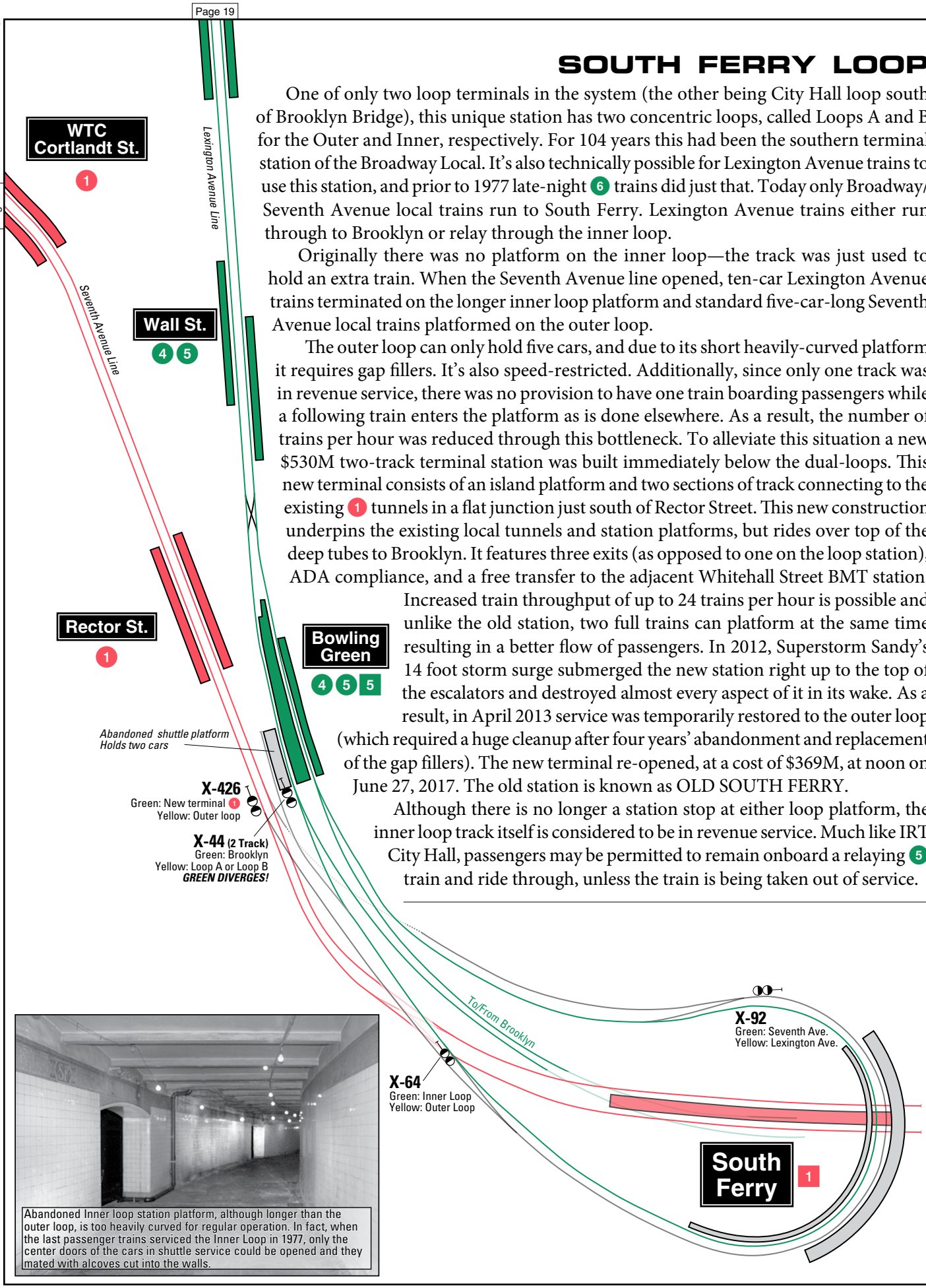
One of only two loop terminals in the system (the other being City Hall loop south of Brooklyn Bridge), this unique station has two concentric loops, called Loops A and B for the Outer and Inner, respectively. For 104 years this had been the southern terminal station of the Broadway Local. It's also technically possible for Lexington Avenue trains to use this station, and prior to 1977 late-night 6 trains did just that. Today only Broadway/Seventh Avenue local trains run to South Ferry. Lexington Avenue trains either run through to Brooklyn or relay through the inner loop.

Originally there was no platform on the inner loop—the track was just used to hold an extra train. When the Seventh Avenue line opened, ten-car Lexington Avenue trains terminated on the longer inner loop platform and standard five-car-long Seventh Avenue local trains platformed on the outer loop.

The outer loop can only hold five cars, and due to its short heavily-curved platform it requires gap fillers. It's also speed-restricted. Additionally, since only one track was in revenue service, there was no provision to have one train boarding passengers while a following train enters the platform as is done elsewhere. As a result, the number of trains per hour was reduced through this bottleneck. To alleviate this situation a new $530M two-track terminal station was built immediately below the dual-loops. This new terminal consists of an island platform and two sections of track connecting to the existing 1 tunnels in a flat junction just south of Rector Street. This new construction underpins the existing local tunnels and station platforms, but rides over top of the deep tubes to Brooklyn. It features three exits (as opposed to one on the loop station), ADA compliance, and a free transfer to the adjacent Whitehall Street BMT station.

Increased train throughput of up to 24 trains per hour is possible and unlike the old station, two full trains can platform at the same time resulting in a better flow of passengers. In 2012, Superstorm Sandy's 14 foot storm surge submerged the new station right up to the top of the escalators and destroyed almost every aspect of it in its wake. As a result, in April 2013 service was temporarily restored to the outer loop (which required a huge cleanup after four years' abandonment and replacement of the gap fillers). The new terminal re-opened, at a cost of $369M, at noon on June 27, 2017. The old station is known as OLD SOUTH FERRY.

Although there is no longer a station stop at either loop platform, the inner loop track itself is considered to be in revenue service. Much like IRT City Hall, passengers may be permitted to remain onboard a relaying 5 train and ride through, unless the train is being taken out of service.



Abandoned Inner loop station platform, although longer than the outer loop, is too heavily curved for regular operation. In fact, when the last passenger trains serviced the Inner Loop in 1977, only the center doors of the cars in shuttle service could be opened and they mated with alcoves cut into the walls.

Page 14

11th Avenue

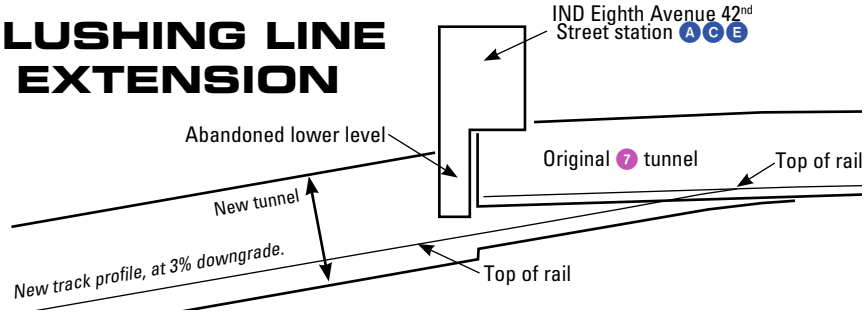
34 St. Hudson Yards

7

34th Street Hudson Yards opened on September 13, 2015 after a number of project delays, and two years after a photo-op train with former Mayor Michael Bloomberg first rolled through the extension.

Like the Second Avenue project—but unlike most Manhattan subway lines—this extension was built using deep tube tunneling, although the new station and a few small sections of tunnel were built cut-and-cover. As shown in the diagram at right, the original tail tracks extended roughly 700 feet west of the Times Square station and the old tunnel bulkhead abutted the abandoned lower level Eighth Avenue IND station's shell. The extension cut through this level in 2009 and has reshaped the new tunnel, which begins a steep 3% downgrade to the west, burrowing under the Port Authority Bus Terminal. On average, the line sits roughly 70 to 80 feet below the surface, and passes about 20 feet under the Lincoln Tunnel tubes, and 40 feet under the Amtrak-NJT tunnels from New Jersey. There were originally supposed to be two stations in this extension; the first at Tenth Avenue and 41st Street, and the second at Eleventh Avenue and 34th Street, serving the Javits convention center. Due to budgetary problems, plans for the Tenth Avenue station were dropped before construction started. Advocates had wanted a compromise, a shell of a station which could be finished later, but even that was dropped from the final contract. The only concession to this effect was that the tracks are level through Tenth Avenue so adding a side platform at some point in the future might be somewhat feasible.

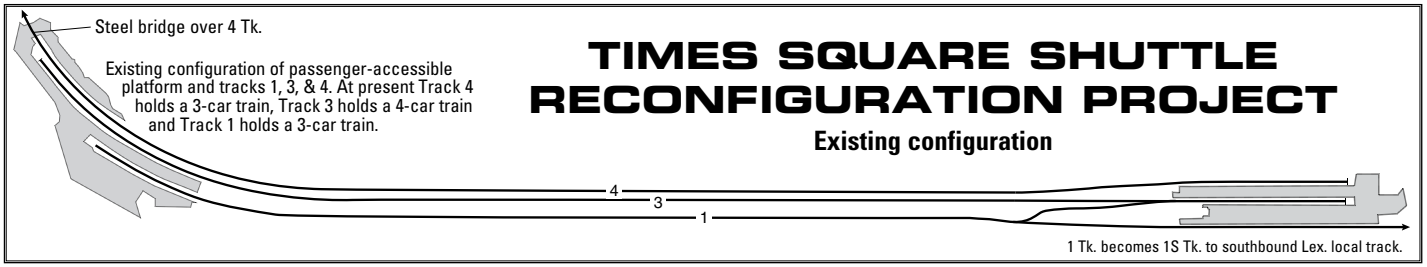
FLUSHING LINE EXTENSION



Tail tracks are used for layups and can hold 3 trains each. They continue south to between 25th and 26th Streets, which could allow the line to be extended further south to Chelsea Piers or perhaps beyond. The tunnels are on a downgrade and there are three piped pump train standpipe-style connections to the street so flood waters can be easily pumped to the street above.

Page 14

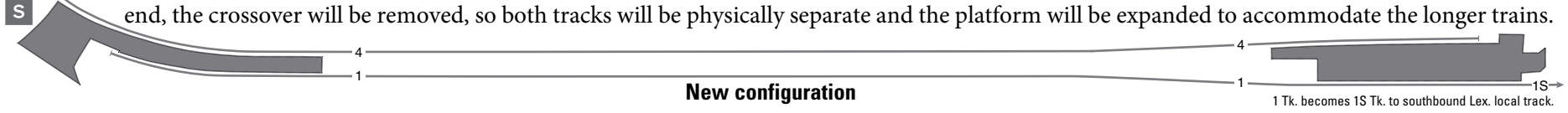
TIMES SQUARE SHUTTLE RECONFIGURATION PROJECT



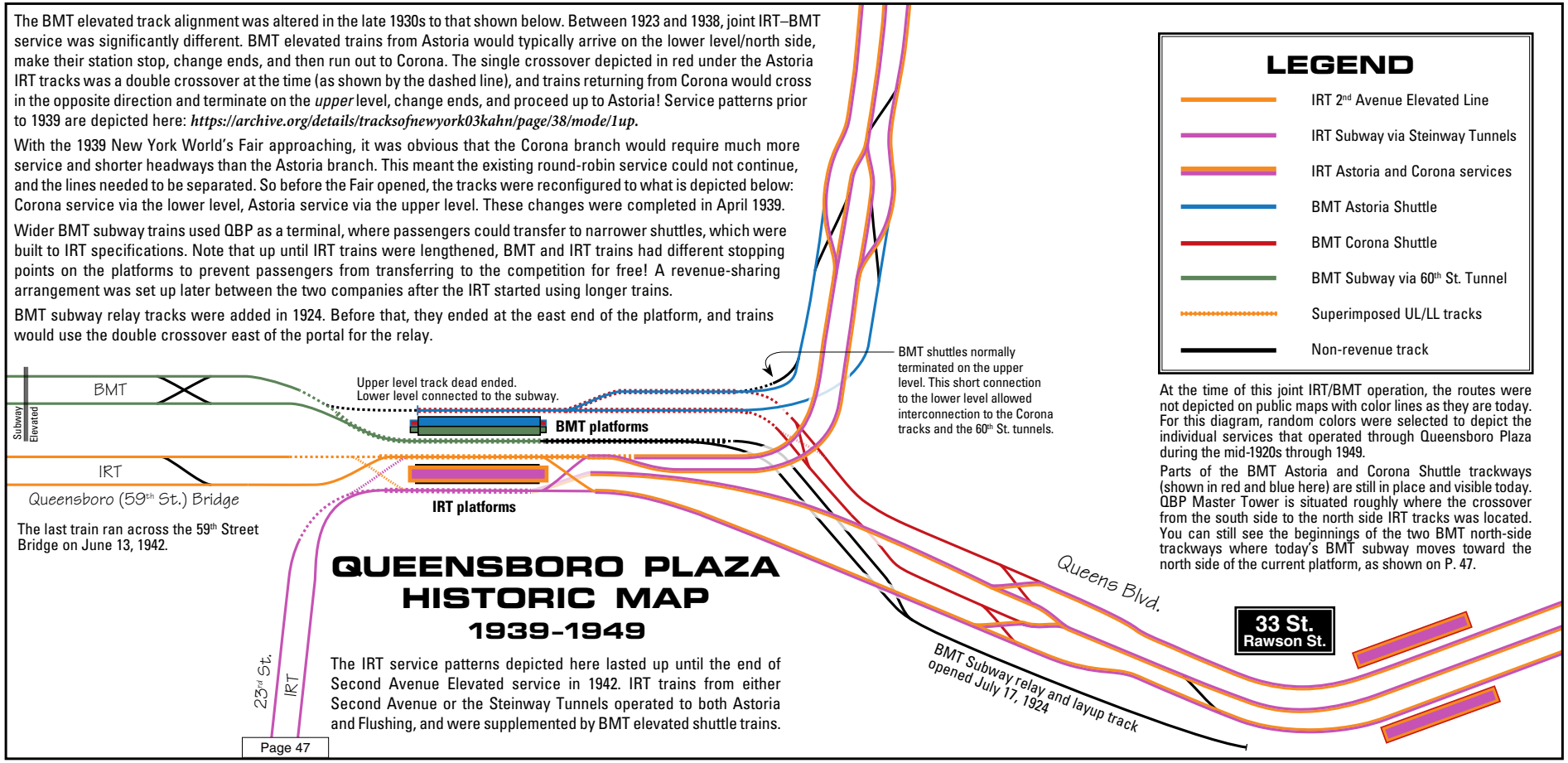
Page 64

4 Tk. connects to the uptown local track as depicted in the top drawing on P. 64.

Work on the Times Square–Grand Central Terminal Shuttle began in 2019 and will be complete by 2022. When finished, Track 3 will be abandoned in place. The platform at Times Square will move east from its existing placement, it will be expanded to accommodate six-car trains, and the steel bridge at the west end of 4 Tk. at Times Square will be removed since that portion of the station will no longer be in passenger service. The new platform will be much wider (and longer), will have fewer columns, and will not require the use of gap fillers, as is necessary with the existing configuration. On the GCT end, the crossover will be removed, so both tracks will be physically separate and the platform will be expanded to accommodate the longer trains.



Page 12



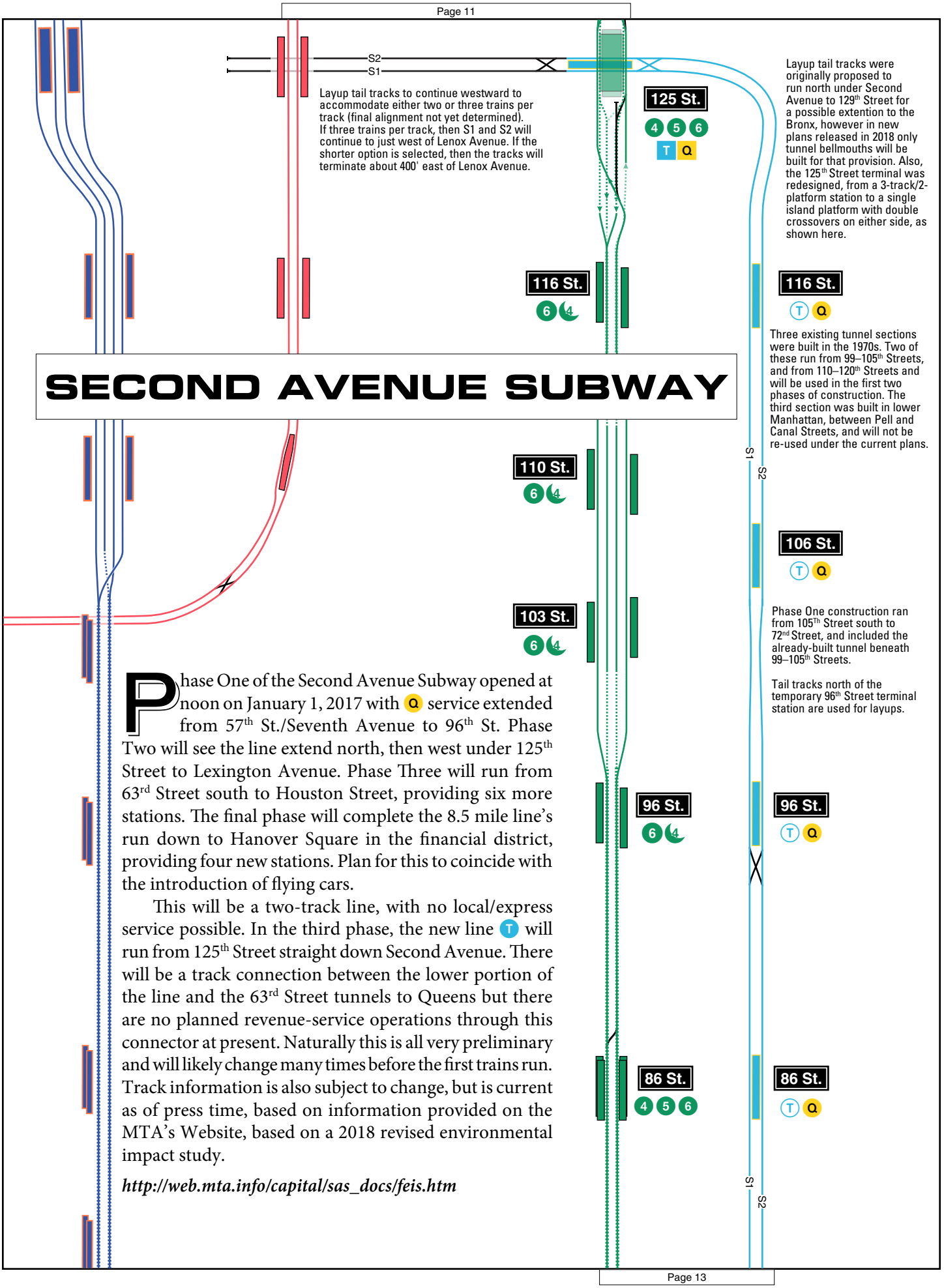
One of the biggest successes of the Dual Contract era—when the IRT operated service jointly with the BMT—was the arrangement for northern Queens service via both the Astoria Line (today's N W) and the Flushing Line (today's 7). Starting in 1915, the IRT began operations through the Steinway Tunnels—named after William Steinway, of Steinway & Sons Pianos fame—and in 1917, the IRT Second Avenue El. began running across the 59th Street Bridge. BMT subway trains began running through the 60th Street Tunnels in 1920, and narrower elevated cars ran to Astoria and Corona. These services converged at Queensboro Plaza, a massive eight-track, four-platform elevated station.

BMT trains used the northern half of the station and the IRT ran on the south side. BMT elevated trains used the upper and lower outside tracks at the top of the diagram above, and the wider steel subway cars from the 60th St. tunnel used the inside tracks. Subway service terminated on the upper level, and trains relayed on the tracks shown in black and returned on the lower level for their trip back to Manhattan. On the IRT side, Second Avenue trains to/from the 59th St. Bridge used the inner tracks, and Steinway trains used the southernmost tracks as they still do today; Queens-bound on the upper level, Manhattan-bound on the lower level. After the Second Avenue El. closed in 1942, IRT Astoria shuttles continued to operate using the former 2nd Avenue tracks and the bridge approach. Those shuttles ceased in 1949 when it was decided to extend BMT Subway service to Astoria and discontinue the joint operation. A new connection was provided from the 60th St. Tunnels to the former Second Avenue portion of the IRT station. The old bridge approaches were no longer needed for relays., and the BMT platforms were shaved back between Queensboro Plaza and Ditmars Boulevard for the 10-inch-wider BMT trains. This configuration is still in use today.

The north half of Queensboro Plaza was abandoned in 1949 and was torn down 15 years later, in 1964. Today, many of those old disconnected trackways can still be seen on either side of the existing station, but the active tracks are those of the original IRT half of the station. One double crossover remains on the upper level as the Flushing Line's only connection to the rest of the system.

Drone footage of the entire complex can be found at ***https://youtu.be/zoLOUd9751o***, and rare movie footage of the complex in action in 1948 can be seen at ***https://youtu.be/DDFc_0qk418?t=45.*** A full description of QBP can be found at ***http://www.subchat.com/readflat.asp?Id=1254355.***

SECOND AVENUE SUBWAY



Phase One of the Second Avenue Subway opened at noon on January 1, 2017 with Q service extended from 57th St./Seventh Avenue to 96th St. Phase Two will see the line extend north, then west under 125th Street to Lexington Avenue. Phase Three will run from 63rd Street south to Houston Street, providing six more stations. The final phase will complete the 8.5 mile line's run down to Hanover Square in the financial district, providing four new stations. Plan for this to coincide with the introduction of flying cars.

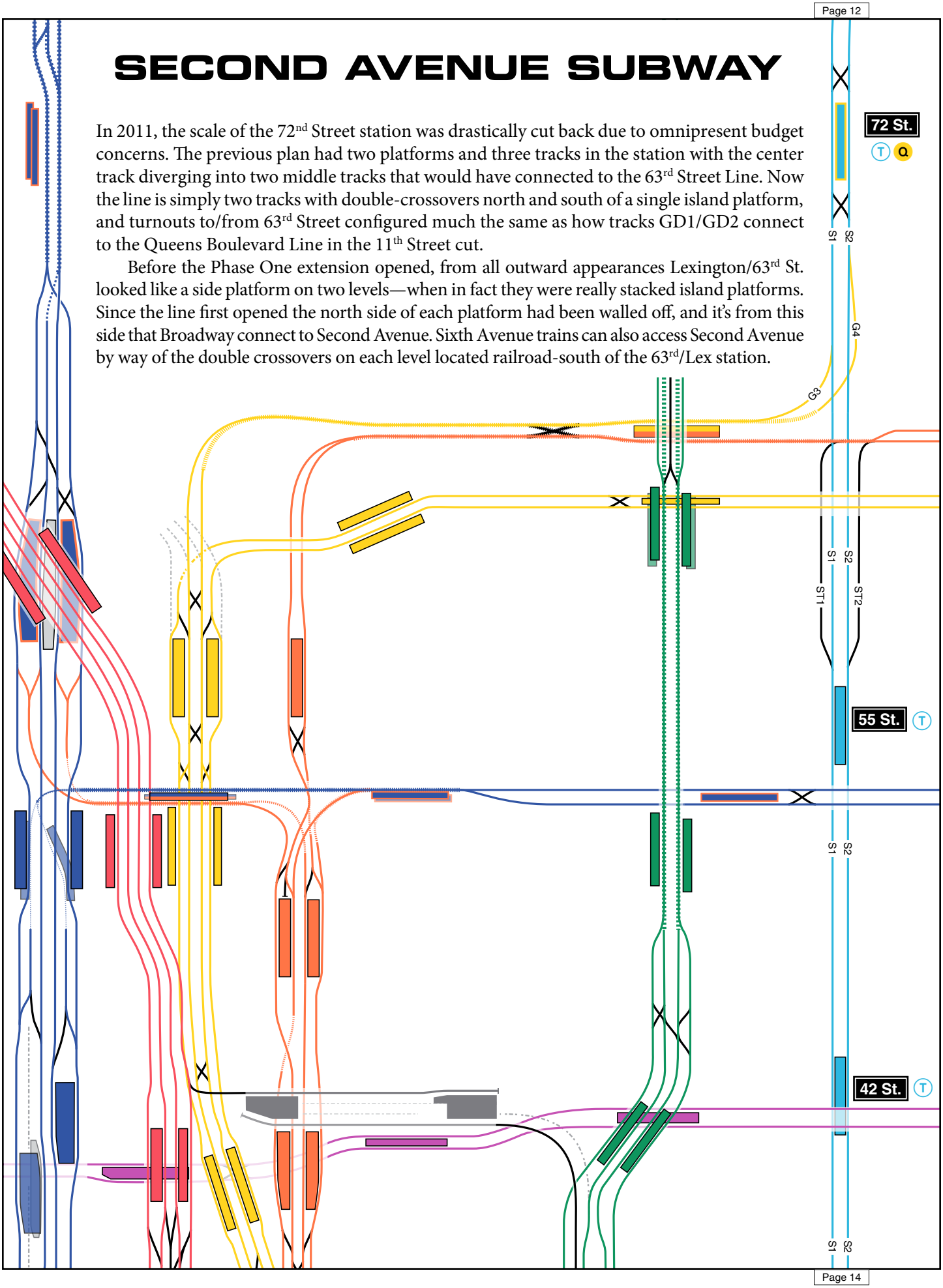
This will be a two-track line, with no local/express service possible. In the third phase, the new line T will run from 125th Street straight down Second Avenue. There will be a track connection between the lower portion of the line and the 63rd Street tunnels to Queens but there are no planned revenue-service operations through this connector at present. Naturally this is all very preliminary and will likely change many times before the first trains run. Track information is also subject to change, but is current as of press time, based on information provided on the MTA's Website, based on a 2018 revised environmental impact study.

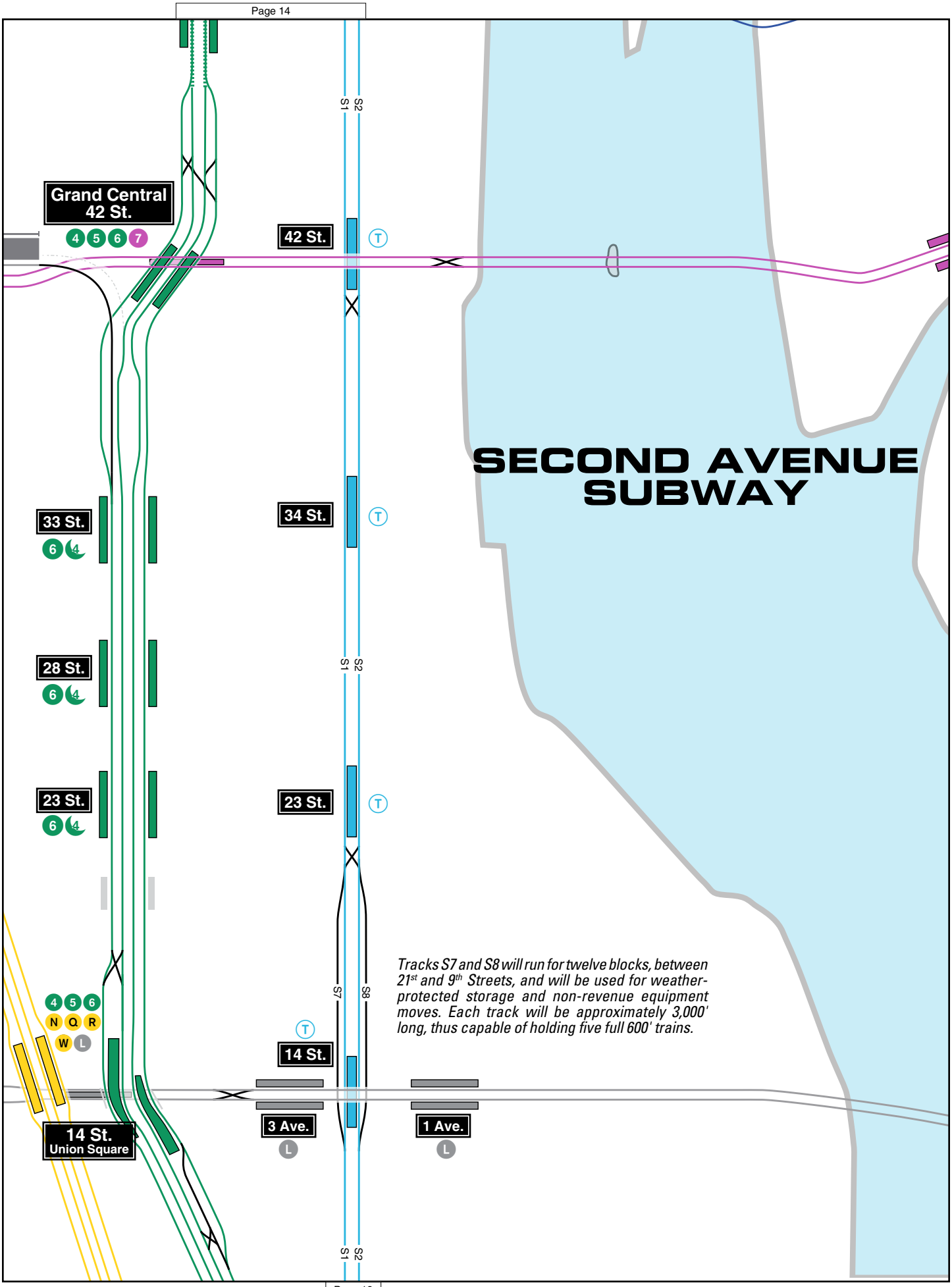
http://web.mta.info/capital/sas_docs/feis.htm

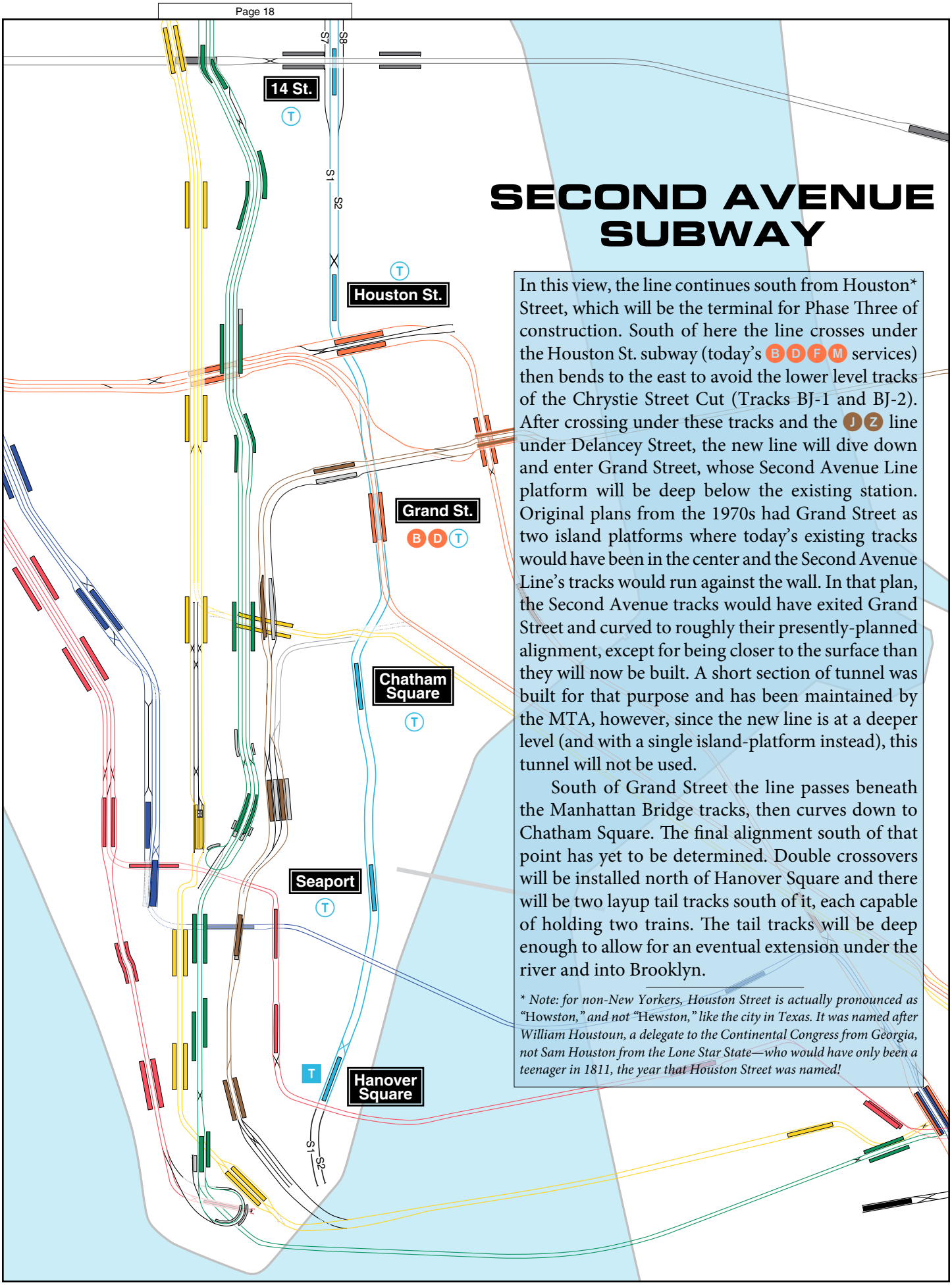
SECOND AVENUE SUBWAY

In 2011, the scale of the 72nd Street station was drastically cut back due to omnipresent budget concerns. The previous plan had two platforms and three tracks in the station with the center track diverging into two middle tracks that would have connected to the 63rd Street Line. Now the line is simply two tracks with double-crossovers north and south of a single island platform, and turnouts to/from 63rd Street configured much the same as how tracks GD1/GD2 connect to the Queens Boulevard Line in the 11th Street cut.

Before the Phase One extension opened, from all outward appearances Lexington/63rd St. looked like a side platform on two levels—when in fact they were really stacked island platforms. Since the line first opened the north side of each platform had been walled off, and it's from this side that Broadway connect to Second Avenue. Sixth Avenue trains can also access Second Avenue by way of the double crossovers on each level located railroad-south of the 63rd/Lex station.







SECOND AVENUE SUBWAY

In this view, the line continues south from Houston* Street, which will be the terminal for Phase Three of construction. South of here the line crosses under the Houston St. subway (today's B D F M services) then bends to the east to avoid the lower level tracks of the Chrystie Street Cut (Tracks BJ-1 and BJ-2). After crossing under these tracks and the J Z line under Delancey Street, the new line will dive down and enter Grand Street, whose Second Avenue Line platform will be deep below the existing station. Original plans from the 1970s had Grand Street as two island platforms where today's existing tracks would have been in the center and the Second Avenue Line's tracks would run against the wall. In that plan, the Second Avenue tracks would have exited Grand Street and curved to roughly their presently-planned alignment, except for being closer to the surface than they will now be built. A short section of tunnel was built for that purpose and has been maintained by the MTA, however, since the new line is at a deeper level (and with a single island-platform instead), this tunnel will not be used.

South of Grand Street the line passes beneath the Manhattan Bridge tracks, then curves down to Chatham Square. The final alignment south of that point has yet to be determined. Double crossovers will be installed north of Hanover Square and there will be two layup tail tracks south of it, each capable of holding two trains. The tail tracks will be deep enough to allow for an eventual extension under the river and into Brooklyn.

** Note: for non-New Yorkers, Houston Street is actually pronounced as "Howston," and not "Hewston," like the city in Texas. It was named after William Houstoun, a delegate to the Continental Congress from Georgia, not Sam Houston from the Lone Star State—who would have only been a teenager in 1811, the year that Houston Street was named!*

Yard Maps

R62As in the shop at Coney Island Yard. Image copyright © Zach Summer, 2010

Yards

This section depicts each of the system's yards. Even before unification each division had its own facilities for storage, repairs, and basic maintenance. Most of these are in the same location, but all have been expanded over the years as new facilities were added.

Many of the system's 24 yards are just for layups (off-hour storage). Some have inspection facilities where basic routine maintenance is carried out such as door repairs, signage, lighting, etc. Seven yards incorporate car wash stations.

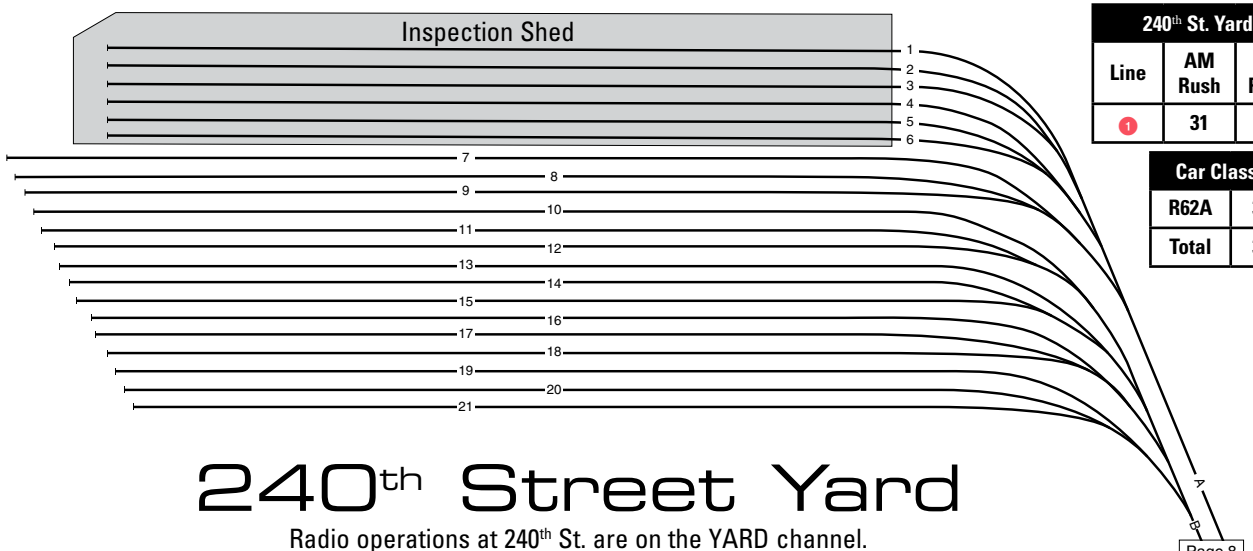
Two yards incorporate major overhaul and car rebuilding facilities in addition to layup and maintenance duties. These are the IND's 207th Street Yard in the north end of Manhattan and the BMT's sprawling Coney Island Overhaul Complex in the Gravesend section of Brooklyn—the largest rapid transit yard in North America and the only TA maintenance facility with a wheel shop certified compliant to American Association of Railroads (AAR) standards.

Each line's cars are generally associated with only a single facility and each yard only handles one or two lines (with the exception of Coney Island, Jamaica and East New York). This way rolling stock types are not mixed within a yard, which allows local maintenance crews to focus on the details of a single car type rather than having to master the entire fleet.

Yard track and shop details are only as accurate as the information received. While some changes to the 117+ miles of track (and over 1,000 switches) may have occurred since this book was prepared, the overall plan of every yard remains relatively unchanged. Information concerning changes or corrections to this section would be greatly appreciated since the author has no access to any of these facilities.

Also known as Van Cortlandt Yard (or VC Yard). This facility is located near the northern terminus of the 1, and it serves only the west side IRT local. From the northern terminal at 242nd Street it's about a 14.6 mile run via Broadway and the Upper West Side, then down through the heart of the theatre district to South Ferry.

There is no car washer at this yard—that duty falls to the 207th St. Yard, or others in the Bronx. SMS inspections and light maintenance duties are carried out in the barn. The yard is built entirely on an elevated structure and consists of 15 layup tracks and six indoor shop/inspection tracks. As part of the 2020–2024 Capital Plan the shop will be rebuilt with more space in between tracks and the replacement of pits with elevated tracks.



240th St. Yard		
Line	AM Rush	PM Rush
1	31	31

Car Classes	
R62A	365
Total	365

240th Street Yard

Radio operations at 240th St. are on the YARD channel.

Page 8

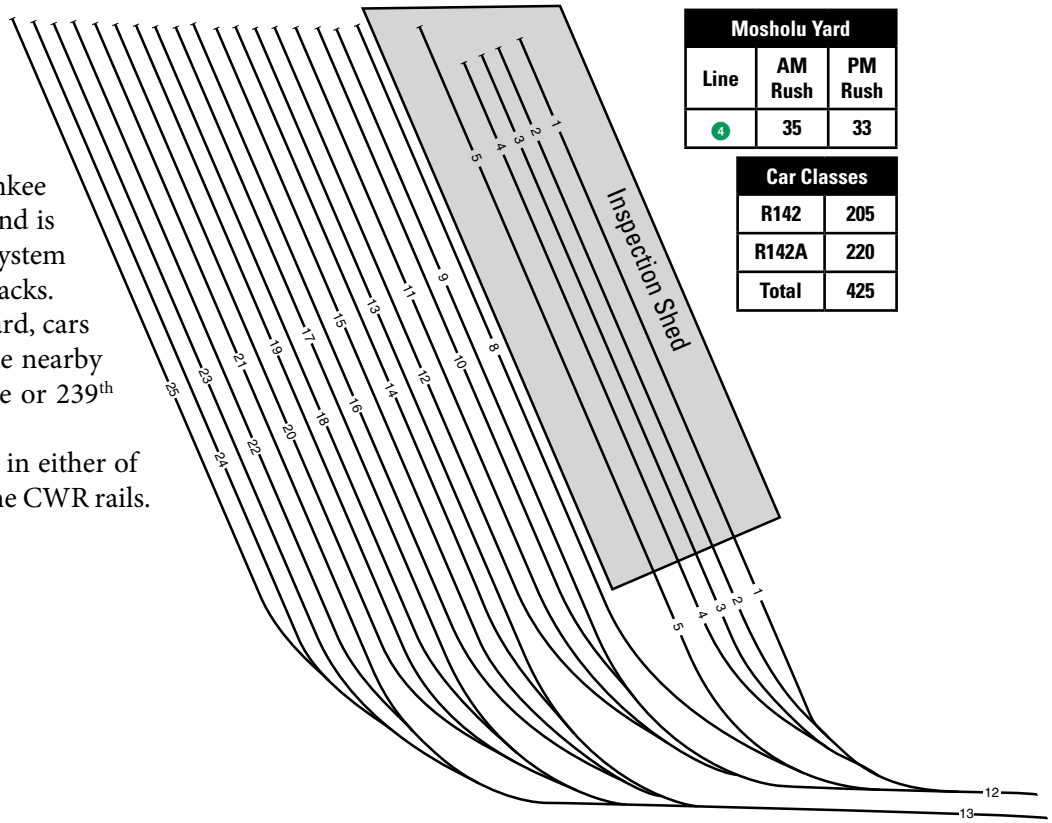
Mosholu Yard

Radio operations are on the A-Division Train-to-Train channel.

Mosholu Yard (a.k.a. Jerome Yard) is located just up the road from Yankee Stadium, at 3191 Jerome Avenue in the Bronx. It was built in 1925 and is one of the smaller maintenance facilities in the New York City Transit system consisting of four shop tracks, a fifth utility track and eighteen layup tracks.

The *Mosh Pit* is home to the IRT 4 line. In addition to Jerome Yard, cars of the 4 are stored during off-peak hours at Livonia Yard and at the nearby IND Concourse Yard. Number Fours get a bath at either Concourse or 239th Street Yards.

Note that loaded Continuous Welded Rail trains are not allowed in either of these two yards due to the sharp curves that may potentially damage the CWR rails. Empty CWR trains are permitted.



Mosholu Yard		
Line	AM Rush	PM Rush
4	35	33

Car Classes	
R142	205
R142A	220
Total	425

Page 6

239th St. Yard

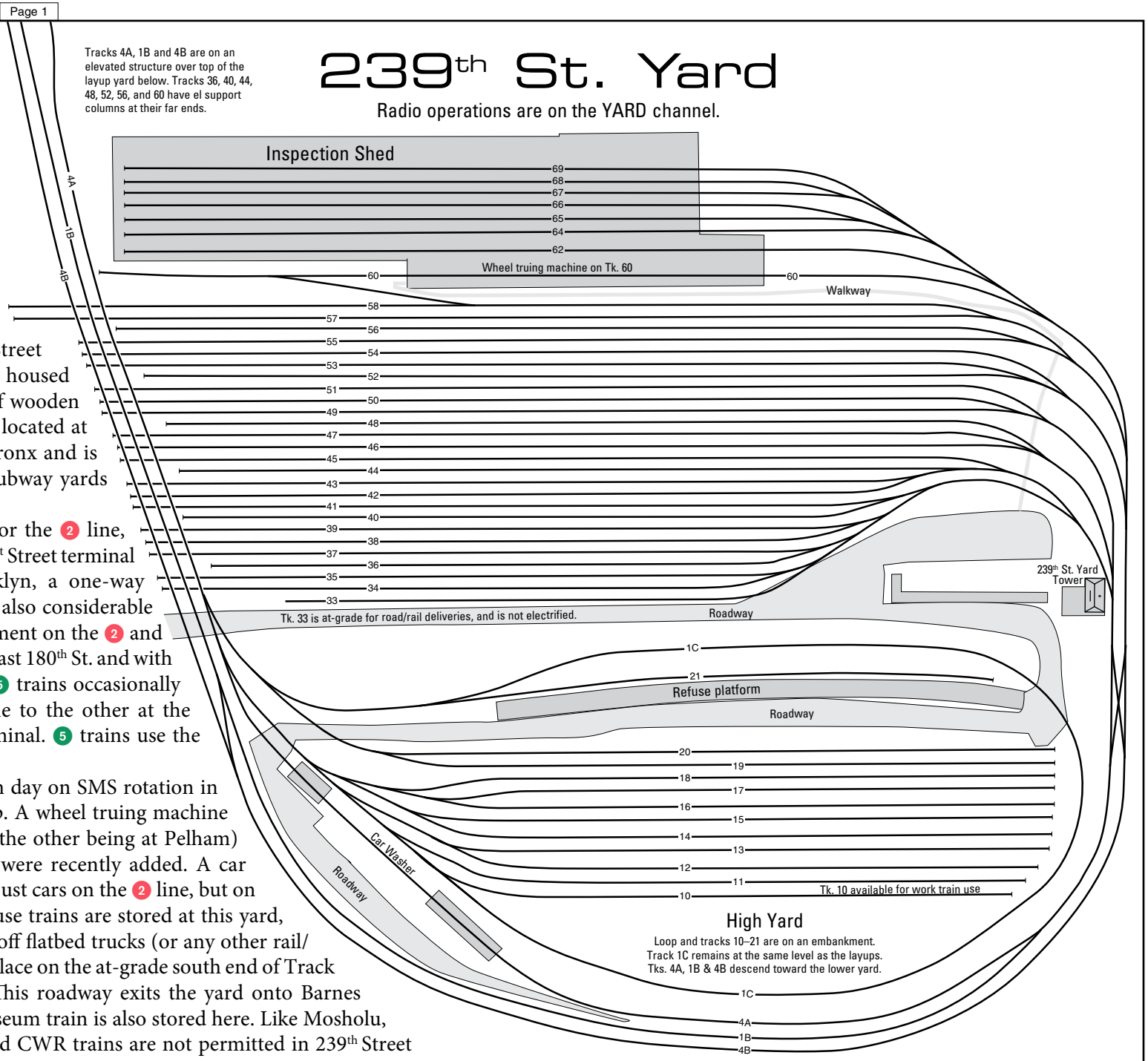
Radio operations are on the YARD channel.

To White Plains Rd. Lline

Tracks 4A, 1B and 4B are on an elevated structure over top of the layup yard below. Tracks 36, 40, 44, 48, 52, 56, and 60 have el support columns at their far ends.

239th St. Yard		
Line	AM Rush	PM Rush
2	36	35

Car Classes	
R142	410
Total	410



Built in 1916, the 239th Street maintenance facility once housed a carpenter shop where parts of wooden subway cars were repaired. It's located at 4570 Furman Avenue in the Bronx and is the most northerly of all the subway yards in the city.

239th Street is home base for the 2 line, which runs from the nearby 241st Street terminal to Flatbush Avenue in Brooklyn, a one-way distance of 26.6 miles. There is also considerable interoperability between equipment on the 2 and 5 lines, the latter based out of East 180th St. and with a similarly-sized fleet. 2 and 5 trains occasionally change identities from one line to the other at the southern Flatbush Avenue terminal. 5 trains use the upper yard for layups.

Ten cars are inspected each day on SMS rotation in the seven track inspection shop. A wheel truing machine (one of only two on the IRT—the other being at Pelham) and a 10-car inspection track were recently added. A car wash serves to brighten up not just cars on the 2 line, but on the 1 3 4 5 lines as well. Refuse trains are stored at this yard, and new subway car deliveries off flatbed trucks (or any other rail/highway application) can take place on the at-grade south end of Track 33, adjacent to the roadway. This roadway exits the yard onto Barnes Avenue. The old IRT Lo-V museum train is also stored here. Like Mosholu, 240th and 148th St. Yards, loaded CWR trains are not permitted in 239th Street Yard due to tight curves.

Westchester Yard, also known as the Pelham Maintenance Shop, is home to one of the busiest lines in the system, the 6 Lexington Avenue local. The Pelham Line extends from Pelham Bay Park, through the Bronx, down Manhattan's crowded east side, terminating at Brooklyn Bridge; about a 17 mile trek. Once there, trains relay through the City Hall loop and proceed to either 177th St. Parkchester or through to Pelham Bay Park. Trains terminating at Pelham generally run express in the Bronx, while trains short-turning at Parkchester usually run local. Express service runs to Manhattan during the morning rush hours, and from Manhattan starting mid-day, similar to the Flushing Line's service patterns.

Ten cars a day are inspected at their scheduled maintenance intervals in the yard's four track inspection shed along with pre-trip inspections, minor (and some major) repairs. Pelham also hosts a wheel truing machine and one of the IRT's busiest car washes, serving 900 cars a week from the 1 3 4 lines.

If all that isn't enough, the IRT's Maintenance of Way crews are based at Pelham with a wide variety of work equipment including a pump train, a refuse collection bag train, snow throwers, third rail de-icers, ballast spreaders and tampers, plus both the A- and B-Divisions' diesel locomotives. Three older R77E electric locomotives are also stored here.

There is a two-track diesel locomotive repair shop on site, and work trains are pre-tripped daily from Westchester Yard or from a Road Car Inspector at Brooklyn's 36th–38th St. Yard.

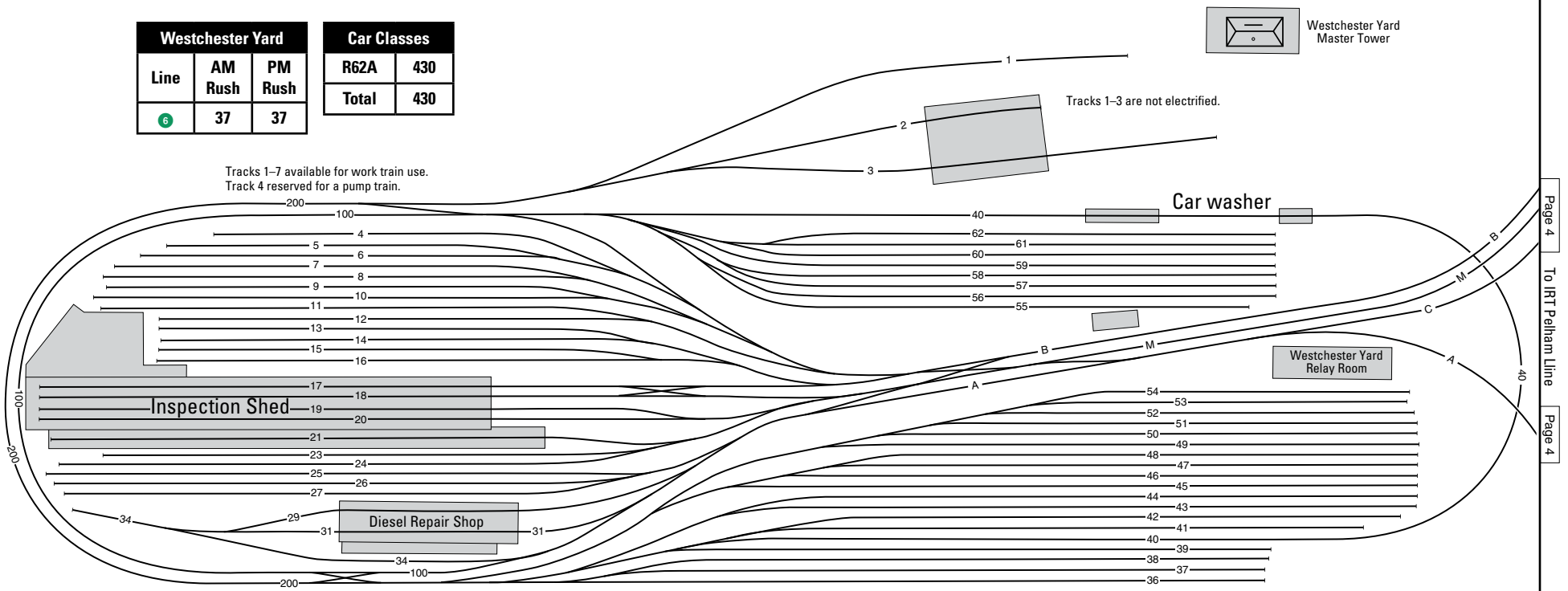
This 2004 YouTube front-window video shows the southbound approach and the B lead, operating around the loop and through the wash. ***https://youtu.be/FUD_BZbUGpQ?t=495***

Westchester Yard

Radio operations are on the YARD channel.

Westchester Yard		
Line	AM Rush	PM Rush
6	37	37

Car Classes	
R62A	430
Total	430



Corona Yard serves the Flushing 7 Line from Willets Point Boulevard in Queens. The 7 is a 9.4 mile long line running from from the new 34th St. station in Manhattan to Main Street in Queens, and offering peak-direction express service along a center track between Queensboro Plaza and Willets Point.

The 7 is essentially "landlocked." There is only one connection from the 7 to the rest of the NY Subway system, which is via a double crossover to the Astoria Line on the upper level of Queensboro Plaza, just north of the station. From there Flushing trains can be escorted by suitably-equipped lead cars through to other destinations in the system. A new shop building opened in 2008 and new layup tracks were installed during 2010 in the space formerly occupied by the old shops.

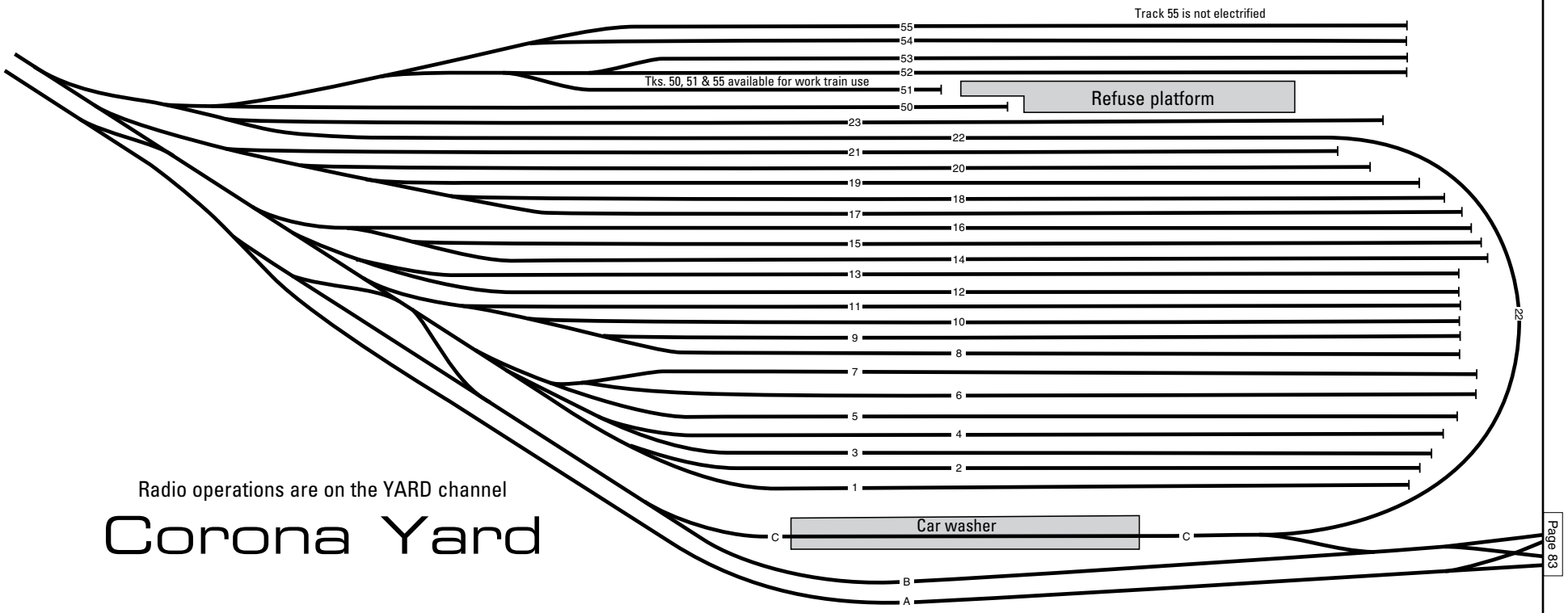
The inspection shop has five tracks, each capable of holding the unique eleven car trains in use on the 7, and personnel can inspect eight or nine cars on a typical workday. There is also a car wash station on the loop track and a refuse unloading platform on the north side of the yard.

The Flushing Line sees some of the most crowded conditions in New York, partly through operating in under-served Queens, but also due to high passenger loads for New York Mets baseball games at nearby Citi Field, and the U.S. Open tennis tournament at Arthur Ashe Stadium. With capacity increases from the CBTC upgrade, the line presently supports up to 29 trains per hour, but that capacity could be increased with improvements to the Main St. terminal, as well as new power substations, controls, and cabling.

A public walkway between the Willets Point station and the Long Island Rail Road crosses over top of Corona Yard, roughly near the double crossover on the lead between the old and new yards, affording excellent views of yard operations.

With more track mileage to cover and tighter spacing between trains, the 7 will eventually require more trainsets. To that end, several years ago the MTA announced plans to expand the yard with a second loop and six layup tracks. If it's ever built, this new section of yard will be located on what was once the right of way for the LIRR Whitestone Branch. This is a strip of land that extends past the existing shop building, under Roosevelt Avenue, and between Willets Point Blvd., the Van Wyck Expressway and the Flushing River.

Page 49

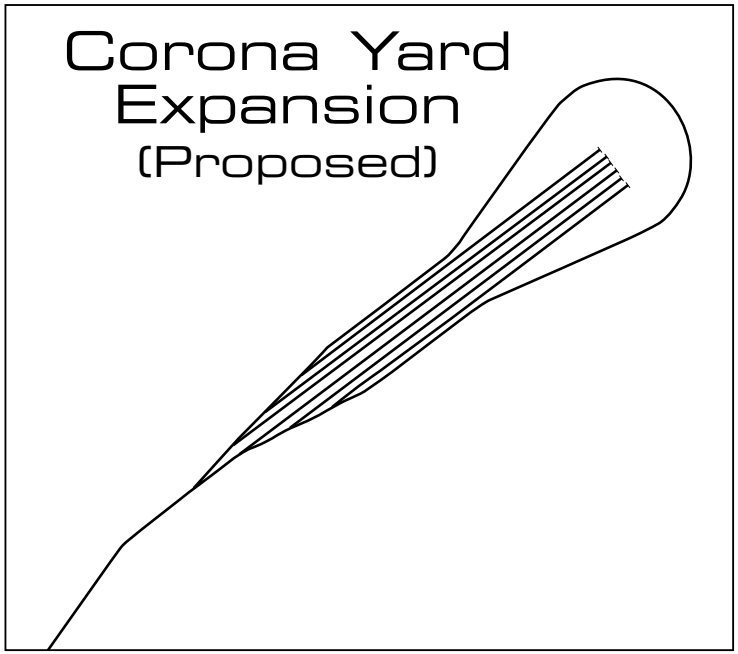


Radio operations are on the YARD channel

Corona Yard

Page 83

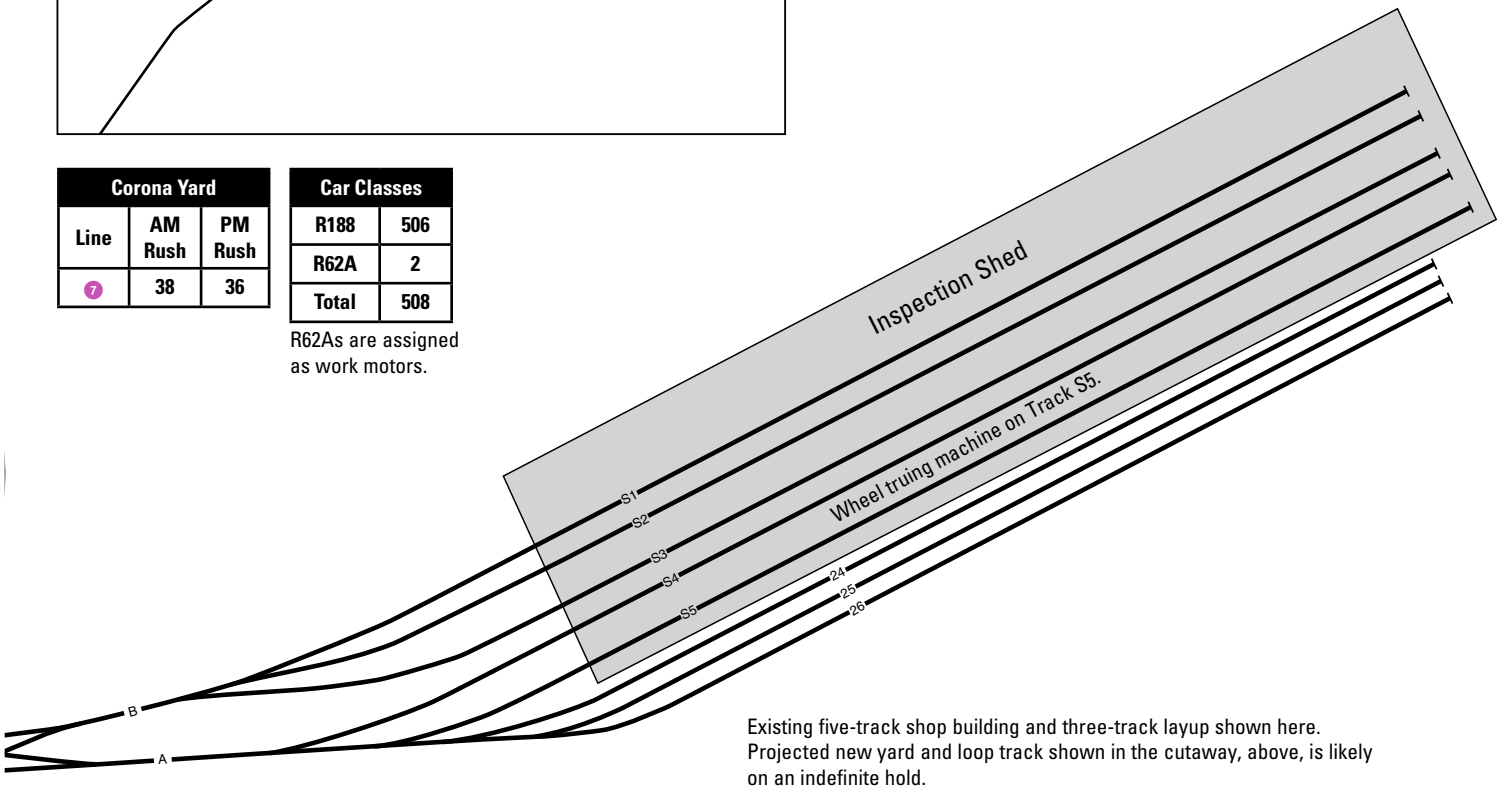
Corona Yard Expansion (Proposed)



Corona Yard		
Line	AM Rush	PM Rush
7	38	36

Car Classes	
R188	506
R62A	2
Total	508

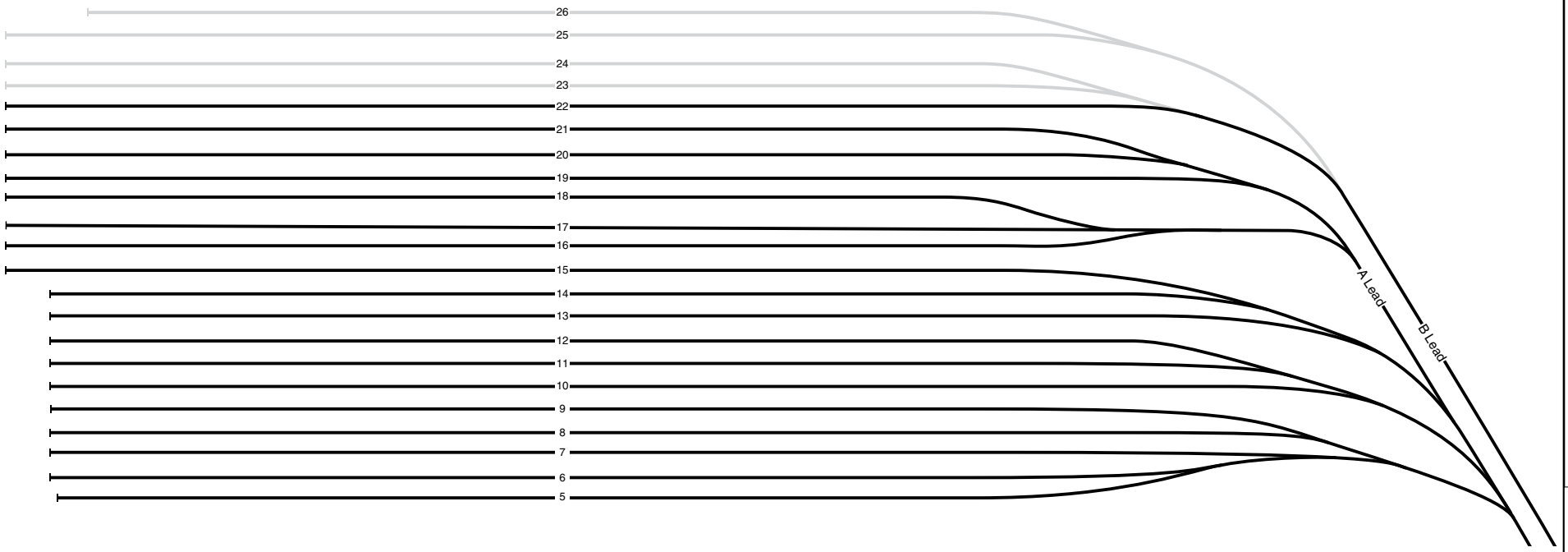
R62As are assigned as work motors.



Existing five-track shop building and three-track layup shown here. Projected new yard and loop track shown in the cutaway, above, is likely on an indefinite hold.

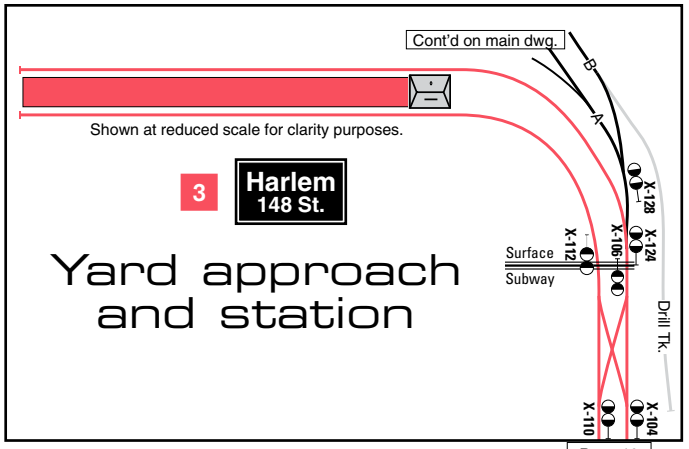
Lenox Avenue Yard

Radio operations are on the A-Division CMD channel.



See inset dwg. below

There isn't much to be said about 148th Street; it's simply a 22-track storage yard located just beside the IRT 3 line's northern terminus of 148th Street. No maintenance is performed at 148th. It must be noted, however, that this was once the IRT's original overhaul shop facility. The yard is outside, at street level, and a building presently sits atop it. In 1968 two tracks were converted into what is now the Harlem/148th St. terminus. As of the date of publication, Tracks 25 and 26 are out of service to facilitate the construction of a perimeter flood wall, Tracks 23 and 24 are out of service long term due to a track defect, and the drill track shown at right is also out of service due to repairs to concrete falling to tracks on the portal walkway. CWR trains may not enter this yard when loaded with rails.



Page 10

Livonia Yard

Radio operations are on the A-Division Train-to-Train channel.

Another one of the system's smaller maintenance facilities, Livonia Yard comprises just four shop tracks and 13 layup tracks. It's located in East New York, at the end of the 3 line at New Lots Avenue and situated entirely on an elevated structure. Included in Livonia's facilities is the 148th Street terminal 18.2 miles away in Manhattan and the 148th St. Yard.

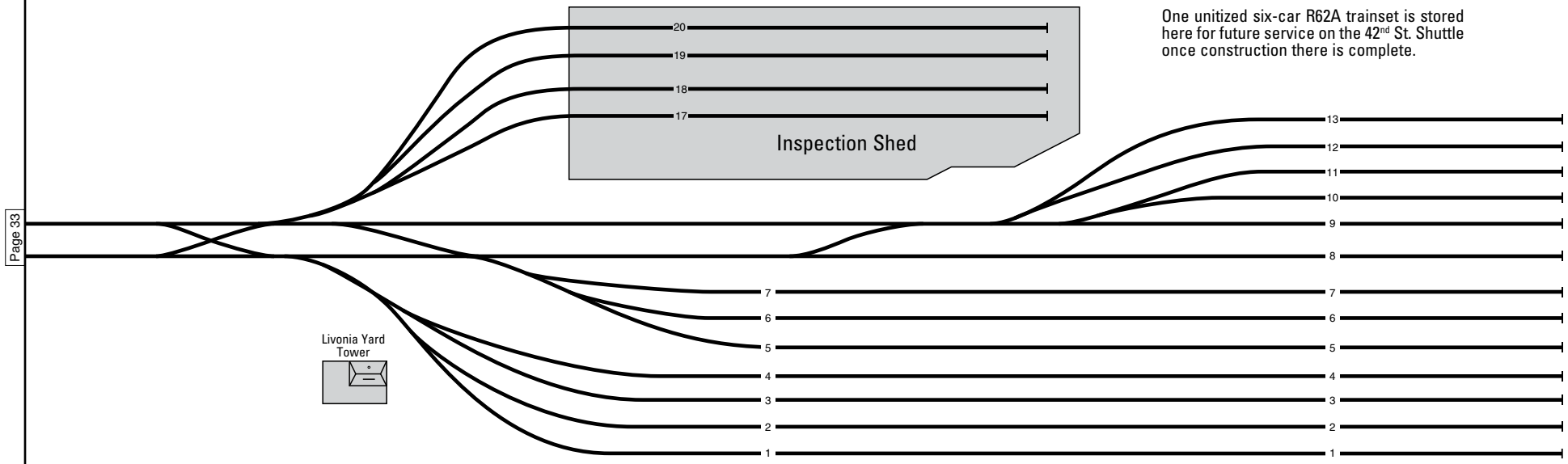
Like most yards in the system, SMS inspections are performed in the car barn every weekday, along with some light maintenance. Since neither Livonia nor 148th Street yards contain a car washer, several 3 trains are washed every day at either 239th St. Yard or at Westchester Yard (both located in the Bronx). 2 4 5 trains may also layup at Livonia off-hours.

All three A-Division revenue collector trains (and one spare) were based at Livonia prior to the discontinuation of collector trains altogether in 2007. Twenty seven R62A cars from Livonia are set aside for the Times Square–Grand Central shuttle. Note that loaded Continuous Welded Rail trains are not allowed in Livonia Yard due to sharp curves that could damage the CWR rails. Empty CWR trains are permitted.

Car Classes	
R62	315
R62A	27
Total	342

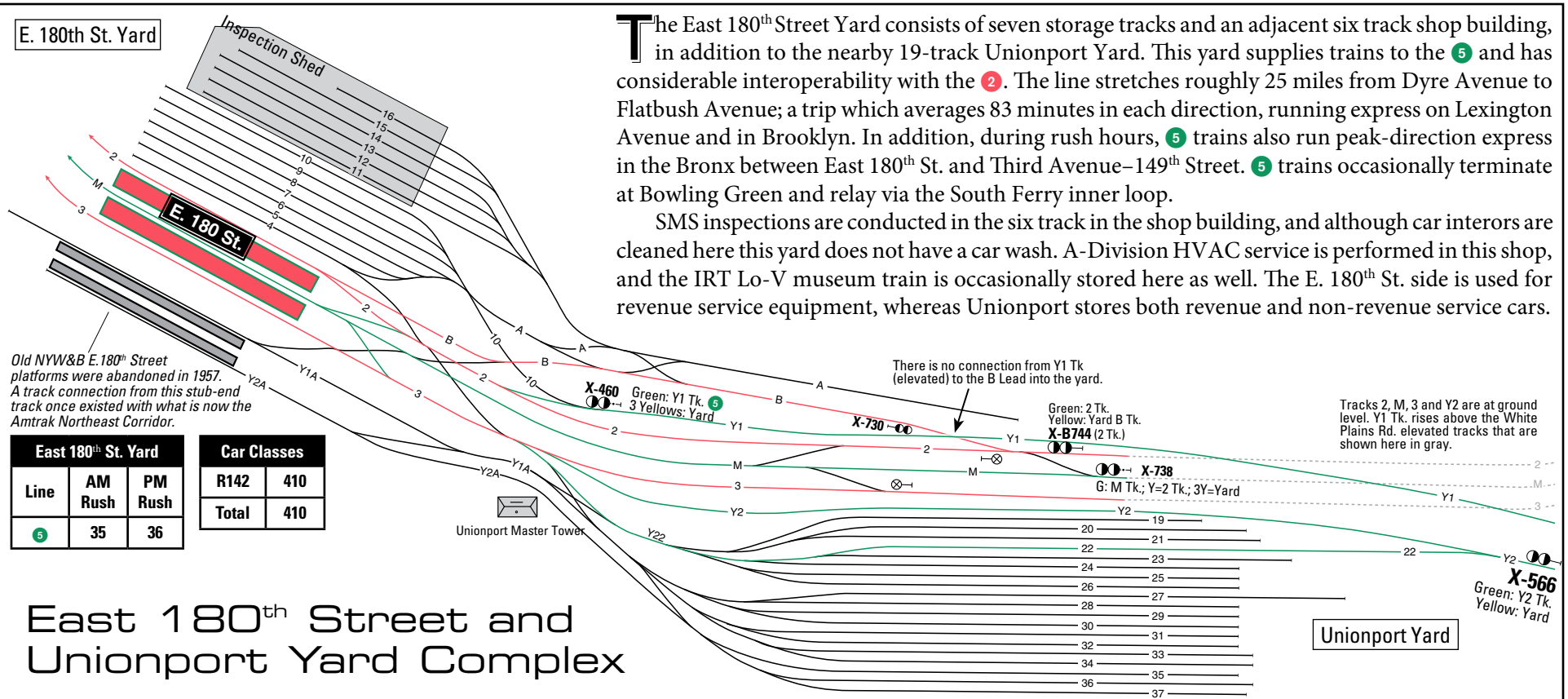
Livonia Yard		
Line	AM Rush	PM Rush
3	26	26
S	2	2

One unitized six-car R62A trainset is stored here for future service on the 42nd St. Shuttle once construction there is complete.



Page 33

E. 180th St. Yard



East 180th St. Yard		
Line	AM Rush	PM Rush
5	35	36

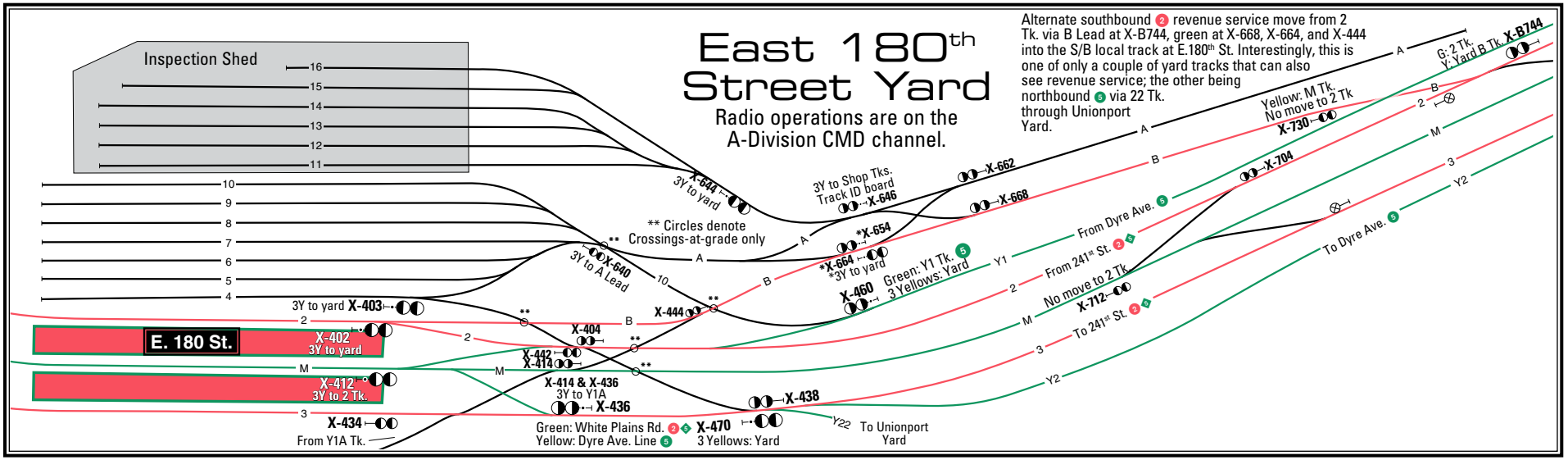
Car Classes	
R142	410
Total	410

East 180th Street and Unionport Yard Complex

The East 180th Street Yard consists of seven storage tracks and an adjacent six track shop building, in addition to the nearby 19-track Unionport Yard. This yard supplies trains to the 5 and has considerable interoperability with the 2. The line stretches roughly 25 miles from Dyre Avenue to Flatbush Avenue; a trip which averages 83 minutes in each direction, running express on Lexington Avenue and in Brooklyn. In addition, during rush hours, 5 trains also run peak-direction express in the Bronx between East 180th St. and Third Avenue–149th Street. 5 trains occasionally terminate at Bowling Green and relay via the South Ferry inner loop.

SMS inspections are conducted in the six track in the shop building, and although car interors are cleaned here this yard does not have a car wash. A-Division HVAC service is performed in this shop, and the IRT Lo-V museum train is occasionally stored here as well. The E. 180th St. side is used for revenue service equipment, whereas Unionport stores both revenue and non-revenue service cars.

Page 3

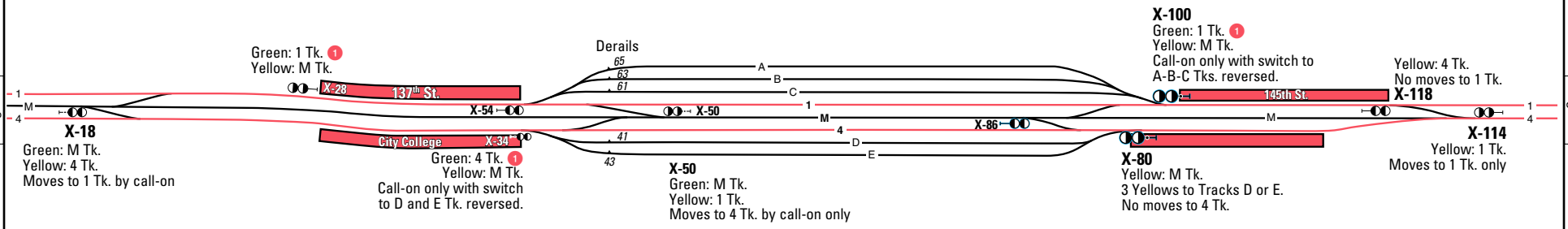


Page 3

Page 1 & 2

137th St. Yard

Radio operations are on the A-Division CMD channel.



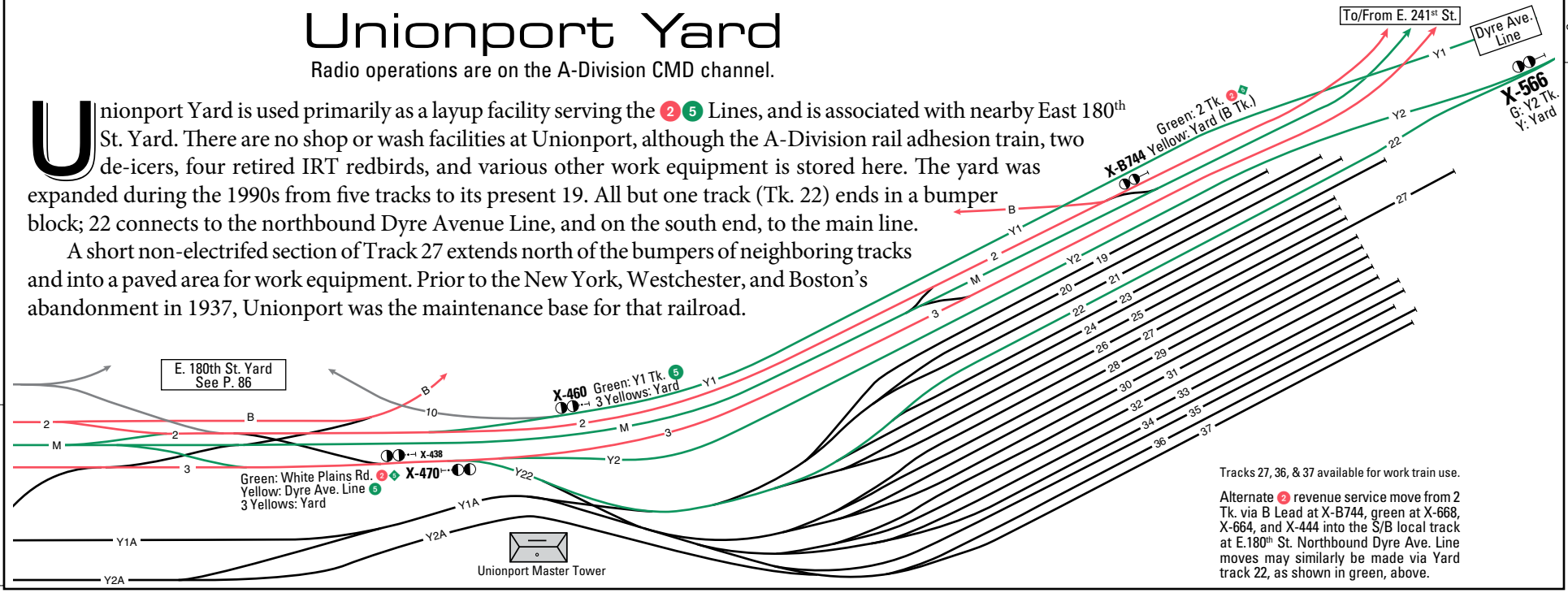
This is strictly a layup facility serving the IRT 1 line and is entirely underground. There are five storage tracks in total, each with a capacity for two trains each, for a total of 10 trains. Since the tracks are on about a 1% downgrade southbound, each of the five layup tracks is equipped with a derail to prevent an improperly secured train from potentially running out onto the main line.

Unionport Yard

Radio operations are on the A-Division CMD channel.

Unionport Yard is used primarily as a layup facility serving the 2 5 Lines, and is associated with nearby East 180th St. Yard. There are no shop or wash facilities at Unionport, although the A-Division rail adhesion train, two de-icers, four retired IRT redbirds, and various other work equipment is stored here. The yard was expanded during the 1990s from five tracks to its present 19. All but one track (Tk. 22) ends in a bumper block; 22 connects to the northbound Dyre Avenue Line, and on the south end, to the main line.

A short non-electrifed section of Track 27 extends north of the bumpers of neighboring tracks and into a paved area for work equipment. Prior to the New York, Westchester, and Boston's abandonment in 1937, Unionport was the maintenance base for that railroad.



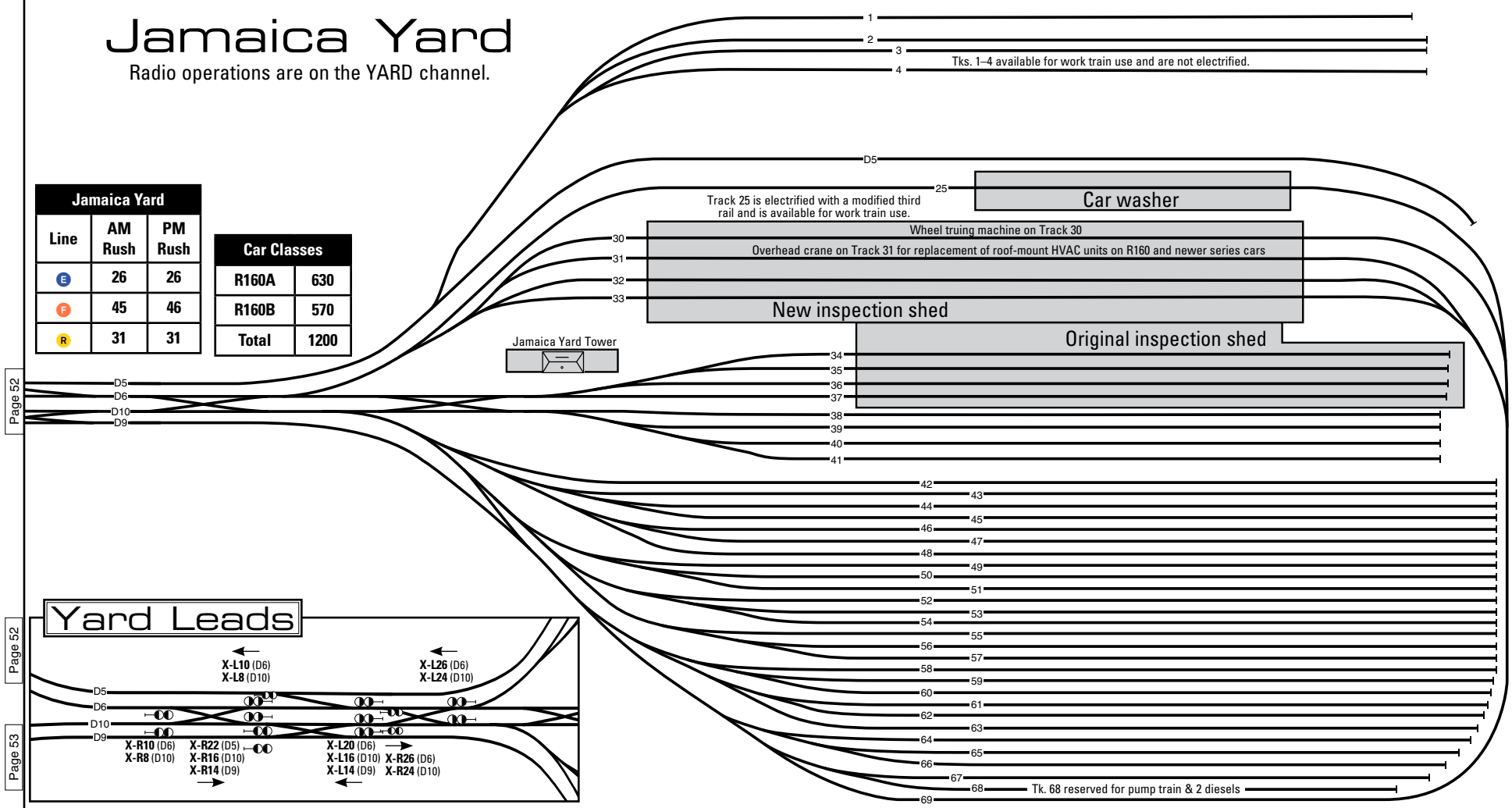
Page 10
Page 10
Page 2
See E. 180th St. Yd on P. 86

Jamaica Yard

Radio operations are on the YARD channel.

Jamaica Yard		
Line	AM Rush	PM Rush
E	26	26
F	45	46
R	31	31

Car Classes	
R160A	630
R160B	570
Total	1200



Yard Leads

Jamaica Maintenance Shop and Yard is located in Kew Gardens, Queens, adjacent to the Van Wyck Expressway and Grand Central Parkway on 27.5 acres at the south end of Flushing Meadows-Corona Park. Jamaica has traditionally been home to all the Queens Blvd. lines but starting in 2010 this changed slightly. The shorter M trains, which operate local on Queens Boulevard, are based at East New York since that line is still a BMT Eastern Division line. E F and R trains continue to call Jamaica Yard home, and M trains layup here occasionally. Jamaica's fleet is larger than any other North American city's *entire* fleet (with the exception of Chicago's) and makes up roughly 20% of the entire NYC Subway fleet. Pump trains and other work equipment are also stored at Jamaica, in addition to revenue-service layups.

Jamaica is the largest of the 14 maintenance facilities in the Division of Car Equipment. It includes a wheel truing machine on Track 30 and a car wash that cleans roughly 800 cars a week. Jamaica-based crews are also responsible for terminal cleaning operations at 179th St., Jamaica Center, 71st-Continental Avenue, and 95th Street. The shop can hold sixty four 75-foot cars or eighty 60-footers on its four indoor pit tracks. Jamaica inspects each car in its fleet every 10,000 operating miles or 66 days at a rate of 22 cars every work day. Jamaica now hosts a unified fleet of R160 class cars. The old World's Fair Line once operated through land now occupied by this yard.

Changes: Signals on yard leads added.

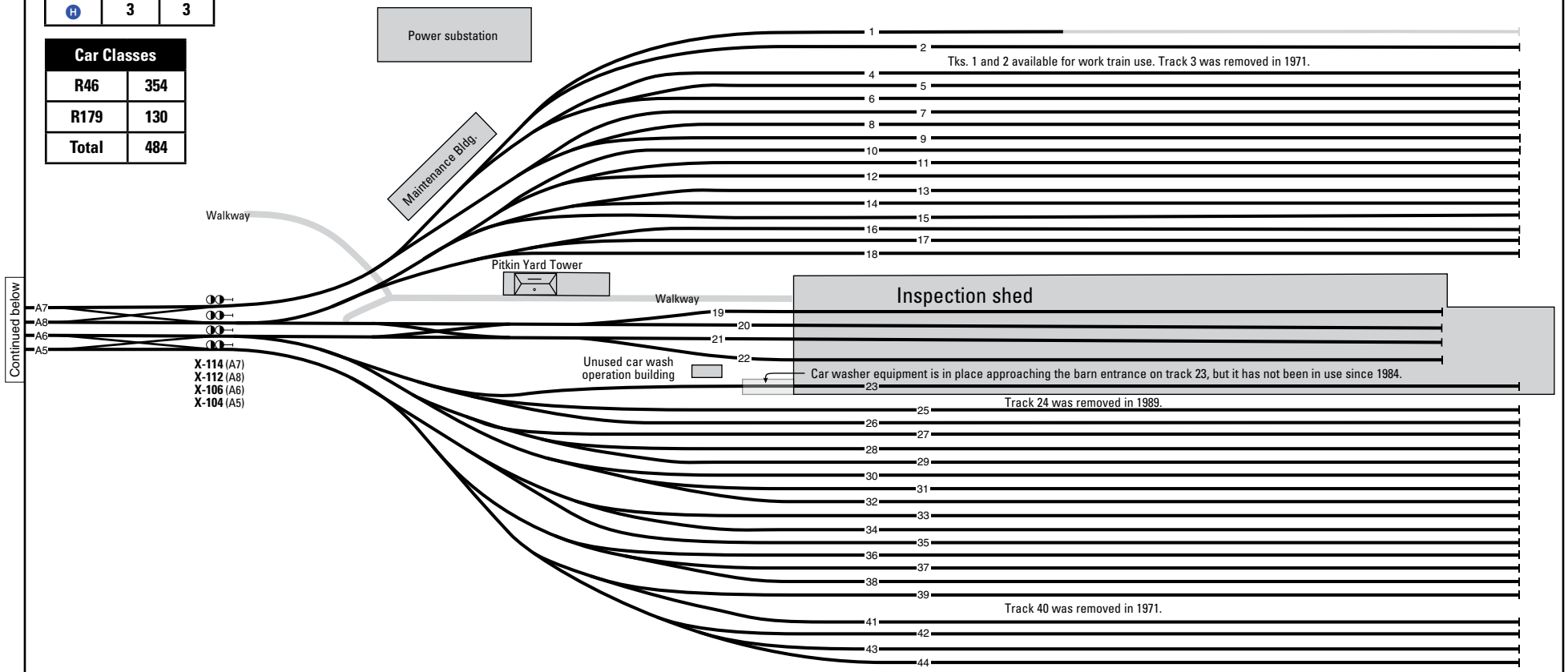
Pitkin Yard

Radio operations are on the YARD channel.

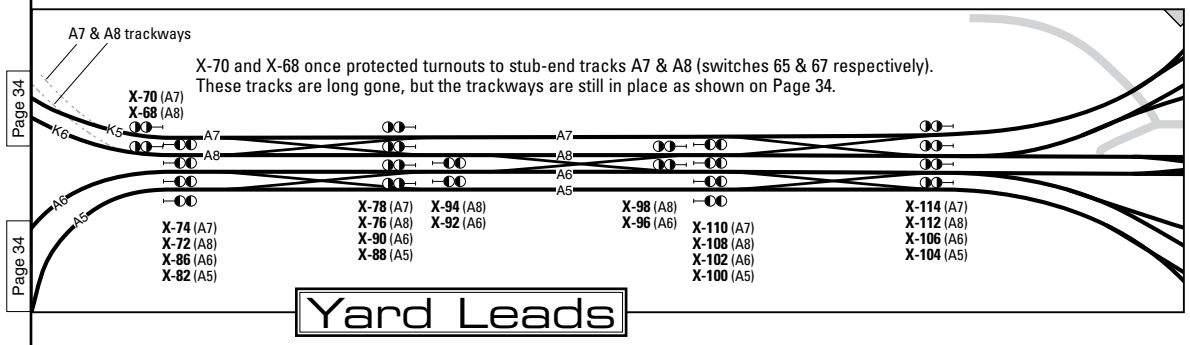
Track 1 is a third rail electrified track, but is used only for work trains and is where Pitkin Yard stores its Rail Adhesion and De-icer units. Pitkin Yard does not have any diesel engines assigned to it on a regular basis. Track 1 usage has been shortened as a safety measure by the installation of a tie-bumper and standing red flag due to severe roof flooding emanating from the Linden Plaza Apartment Complex above, which covers all tracks to their bumper blocks in Pitkin Yard.

Pitkin Yard		
Line	AM Rush	PM Rush
A	38	40
H	3	3

Car Classes	
R46	354
R179	130
Total	484



Continued below



Page 34

Page 34

Yard Leads

Pitkin Yard is one of two yards serving the Eighth Avenue Line. 75' R46s and 60' R179s operating on the A C and Rockaway Park Shuttle (H) are based here. Pitkin is paired with 207th Street, which handles the 60' cars that operate on the C. Scheduled maintenance and repairs are performed in the five track shop building.

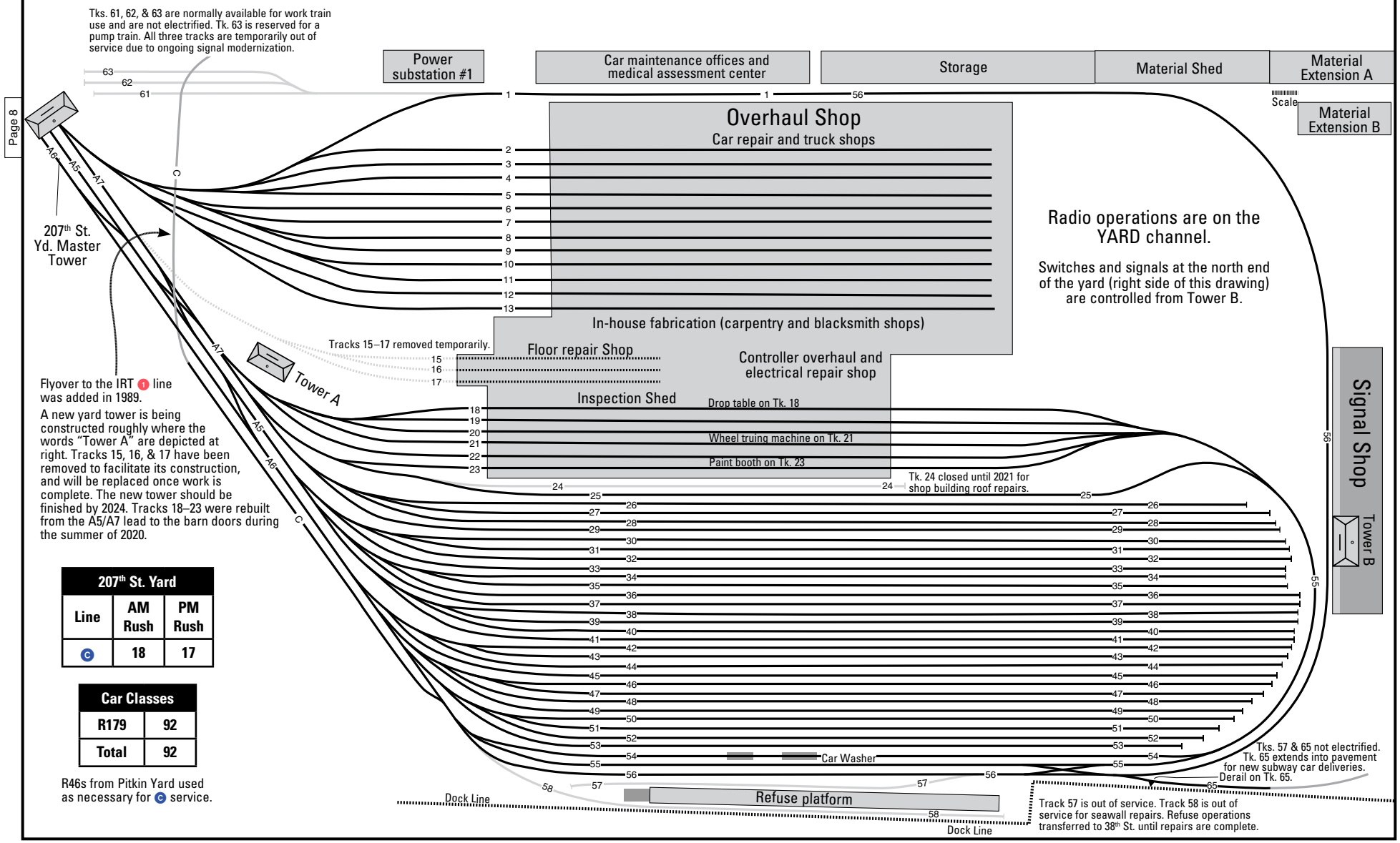
New car acceptance testing is performed here, and a sidelined museum Triplex unit is stored here as well (the other is at CIY).

Pitkin Yard was not originally covered. In 1971 the Linden Plaza apartment complex was built over the south half of the yard. Their walking plaza and parking garage required concrete pylon sabilization, necessitating the removal of Tracks 3 and 40. In 1989 City engineers determined additional cement pylon stabilization was required and Track 24 was removed for that purpose.

Changes: Yard leads, signals, and note; track removal dates for tracks 3, 24, & 40; disused car washer note added for track 23, and barn dimensions modified; Tk. 1 note added.

207th Street Yard

207th St. is the maintenance base for the C in conjunction with Pitkin Yard. Four-car 60' R179 units are based here, with Pitkin handling the 75' R46s and five-car R179s assigned to the A. There are six shop tracks to handle SMS inspections, and 12 repair shop tracks and three more servicing the floor shop where A- and B-Division equipment is overhauled. There is also a truck shop with a wheel truing machine, a car wash, paint booth, a controller, and electrical repair shop. New railcar deliveries (from flatbed trucks) take place on Track 65. Retired cars are stripped and prepared for disposal at 207th St. and there's a refuse unloading platform on Track 58 (currently out of service for construction of a long-term seawall repair project). The remaining tracks handle layup duties. Some museum equipment is overhauled and occasionally stored here, as well as pump trains and refuse collectors. Numerous ongoing major construction projects may reduce this yard's capacity for the forseeable future.



207th St. Yard		
Line	AM Rush	PM Rush
C	18	17

Car Classes	
R179	92
Total	92

R46s from Pitkin Yard used as necessary for C service.

Changes: Tracks 15–17 temporarily out of service; Switch 39 leading to long-gone track 14 removed; switch 49 and track 64 permanently removed in April 2020; tracks 57 & 58 out of service.

While the Coney Island complex is the largest maintenance facility in the NYC transit system, Concourse is the largest single yard, and the home base for D trains. In addition to the revenue service rolling stock based at Concourse, various pieces of work equipment are based here, and until their withdrawal from service in 2007, two revenue collector cars operated out of Concourse Yard.

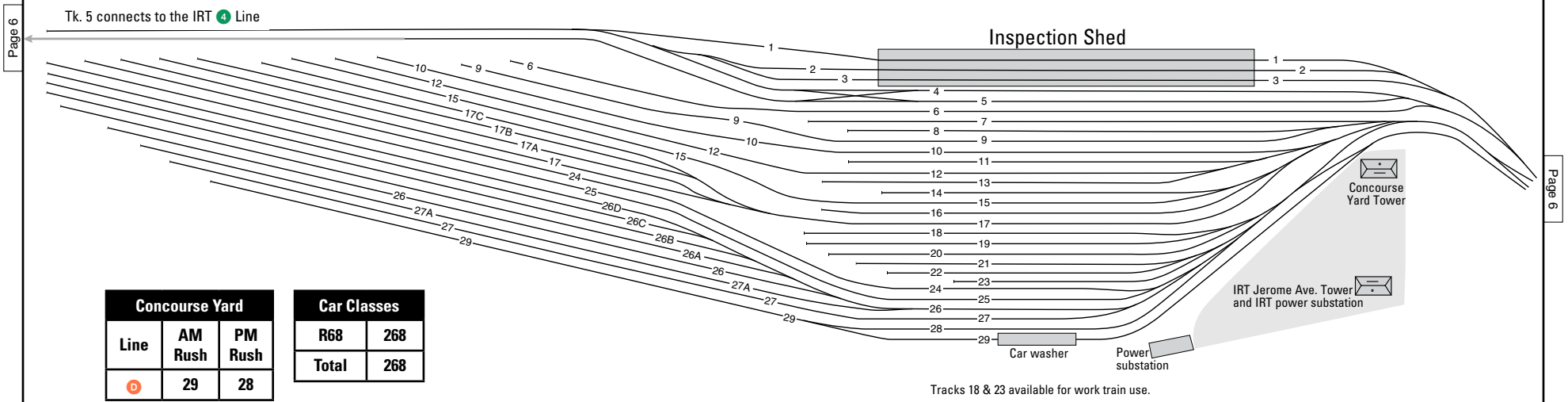
SMS is carried out in the yard's three inspection tracks, which are accessible from either end of the shop building. Concourse has a wheel truing machine that typically returns 10 axles (20 wheels) a day to a pre-defined contour and smooths out flat spots. Similar to 207th Street, there's a ramp from the nearby IRT into Concourse Yard. Here, trains from the 4 layup on one of Concourse's 36 storage tracks, necessary due to the relatively small size of the nearby IRT Mosholu (Jerome) Yard. 4 trains also go through the car wash, located on Track 29. B trains also layup at Concourse as well as Coney Island and Stillwell Yards. In addition to washing, layup trains are inspected and cleaned before going back into revenue service.

Six R77E electric locomotives, six old IRT Redbirds and two retired IRT work motors are currently in long term storage at Concourse.

Access to to the yard is provided through two tracks—C5 and C6—that run north from Bedford Park Blvd. station, and from Track C7 that runs south from 205th Street, the northern terminal of the D. Concourse Yard is located in the Bronx, at 3119 Jerome Avenue.

Concourse Yard

Radio operations are on the YARD channel.

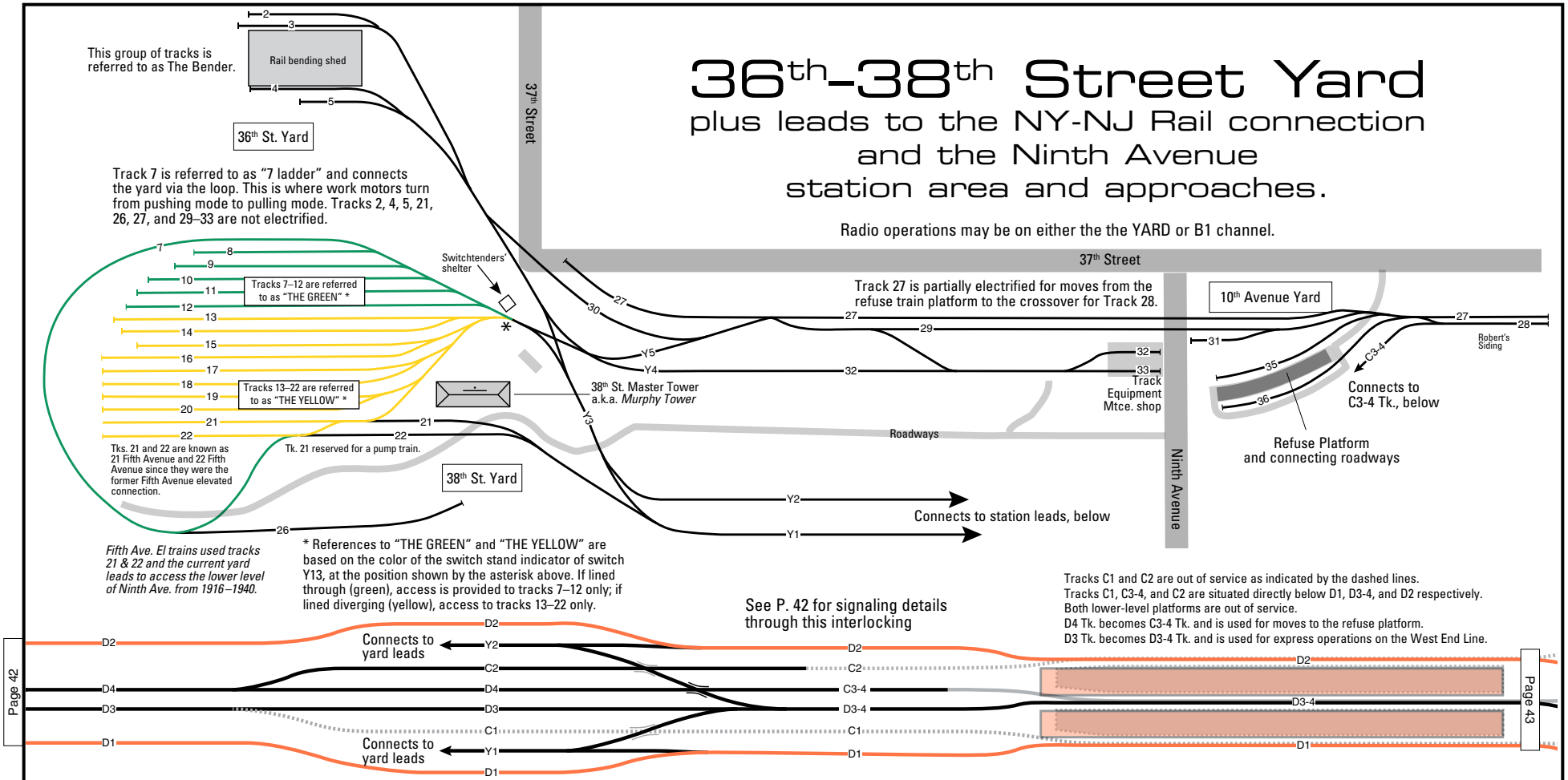


Concourse Yard		
Line	AM Rush	PM Rush
D	29	28

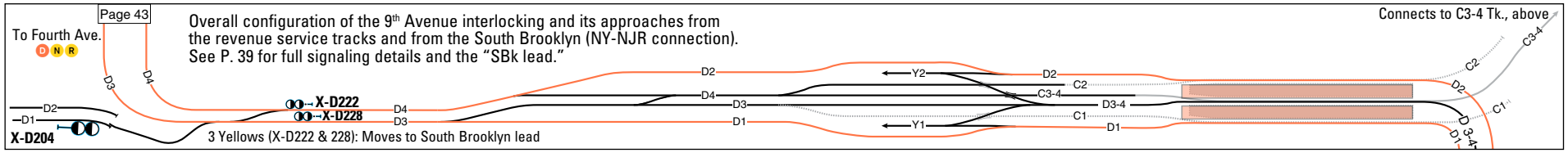
Car Classes	
R68	268
Total	268

36th–38th Street Yard

plus leads to the NY-NJ Rail connection and the Ninth Avenue station area and approaches.



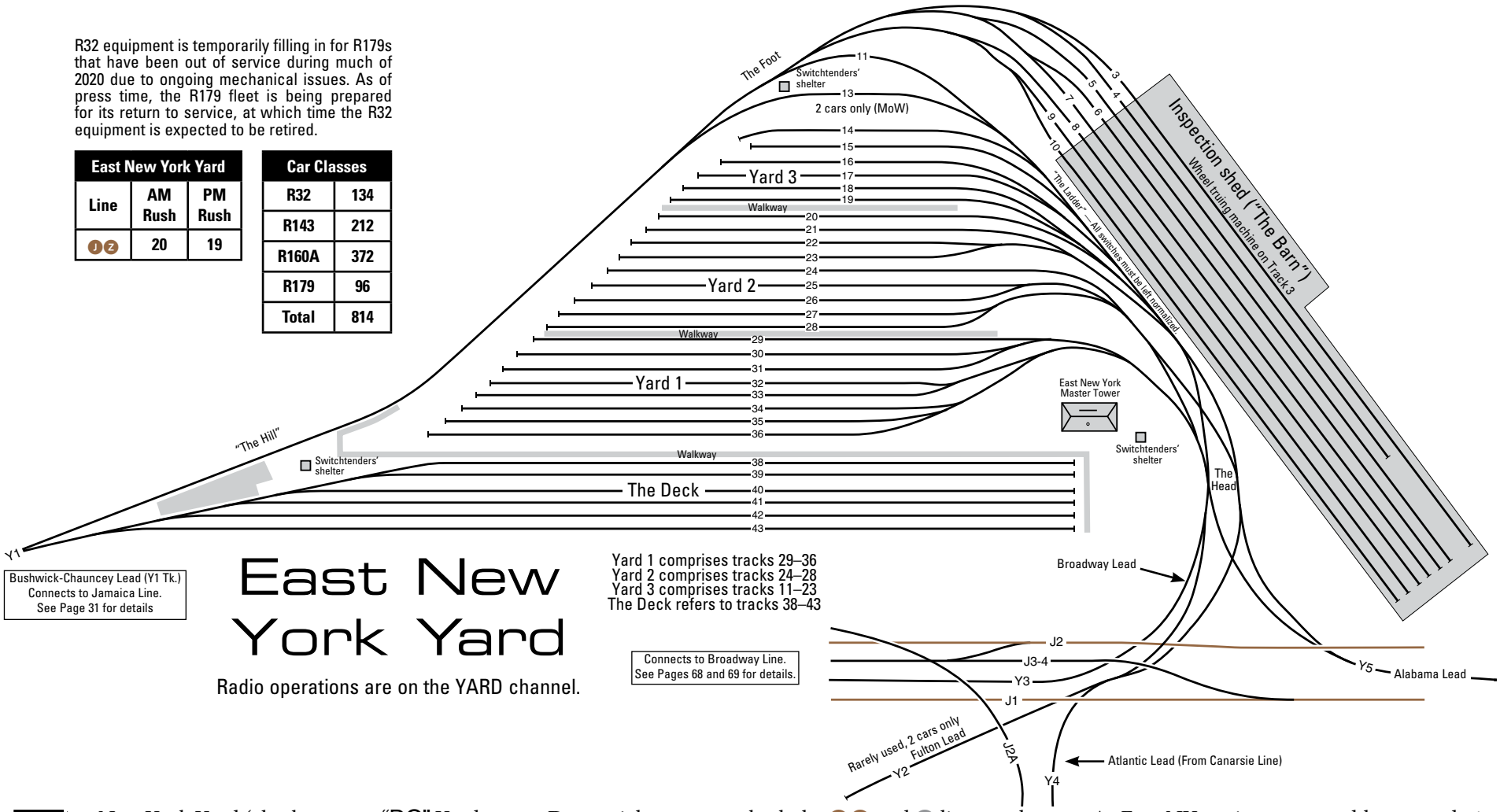
This yard, as well as portions of Westchester Yard in the Bronx, houses equipment that makes up the C-Division. This is equipment not in revenue (passenger) service and comprises diesel locomotives, flat cars, cranes, ballast hoppers, gondolas, snow fighting equipment, rail grinders, de-icers, garbage removal trains, pump trains, and much more. Before their withdrawal from service in 2007, two B-Division revenue collector trains were also based here. Unlike Westchester, no passenger equipment is based out of 36th–38th St. However, according to an Environmental Impact Statement for the Second Ave. Line* up to 12 tracks could eventually be added to this yard for SAS maintenance and layup, with MoW operations shifted elsewhere within the system. 36–38th St. Yard was also once the center of the South Brooklyn Railway, which extended from Bush Terminal, through here then down Gravesend Avenue (now McDonald Ave.), serving freight customers and into Coney Island Yard. Tracks D1 and D2, shown below, are the rarely-used connection to what is now New York-New Jersey Rail via the Third Avenue Yard. These tracks were reconfigured in 2012 and the connection is depicted on P. 42. The presently-unused Third Avenue Yard will be rebuilt as a railcar acceptance facility for R211 class equipment by 2021. * ***Link: http://web.mta.info/capital/sas_docs/feis/appendixb.pdf*** (P. B-35 & B-36).



R32 equipment is temporarily filling in for R179s that have been out of service during much of 2020 due to ongoing mechanical issues. As of press time, the R179 fleet is being prepared for its return to service, at which time the R32 equipment is expected to be retired.

East New York Yard		
Line	AM Rush	PM Rush
J Z	20	19

Car Classes	
R32	134
R143	212
R160A	372
R179	96
Total	814



East New York Yard

Yard 1 comprises tracks 29–36
Yard 2 comprises tracks 24–28
Yard 3 comprises tracks 11–23
The Deck refers to tracks 38–43

Radio operations are on the YARD channel.

East New York Yard (also known as "DO" Yard, short for District Office) is the oldest operating service facility in the New York Transit system. Its roots date back to 1880 when a horse carriage depot sat on the site, located at 1700 Bushwick Avenue in the East New York neighborhood of Brooklyn. El trains were maintained here after the Broadway (Brooklyn) line was extended to East NY in 1889 and the last of the nineteenth century facilities came down in 1948. ENY Yard is now home to the J M Z and L lines, which comprise the BMT's Eastern Division.

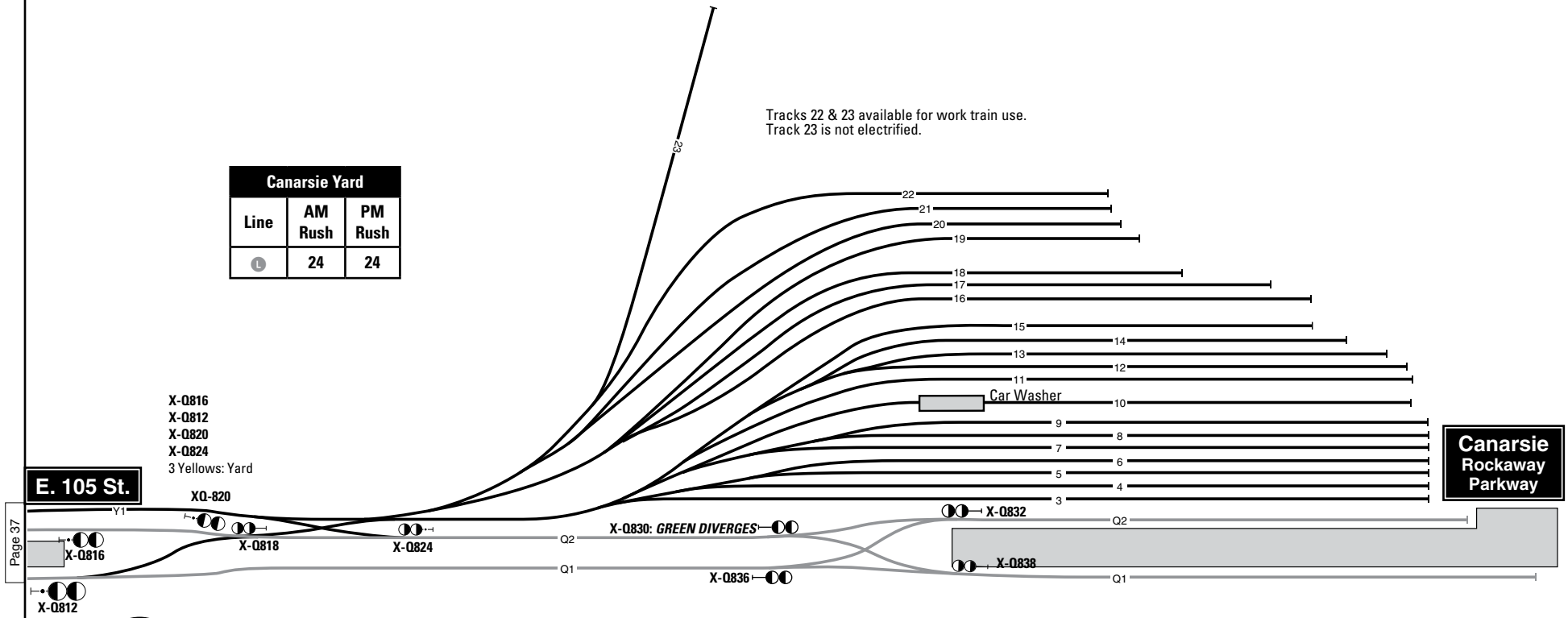
Due to tight curves on both the J Z and L lines, the Eastern Division is restricted to cars of 60 feet in length. Additionally, the Eastern Division's platforms are shorter than rest of the B-Division, limiting trains to 8 cars (480' trains). Routine and schedulted maintenance in performed in the eight track inspection shed. A wheel truing machine is situated on Track 3, but there is no car washer in ENY—that is located at Canarsie.

East New York and Fresh Pond yards are still manually operated; i.e. all switches are still hand-thrown. At East NY, trains enter and leave yards 1, 2 and 3 via the Atlantic, Broadway or Alabama lead tracks at *The Head*, shown above. The switchman at The Head generally calls the shots for movements within the yard and coordinates with other switchmen at *The Foot* and on *The Deck*. Trains can also enter via the Bushwick-Chauncey lead (Y1 Track) and either go *down the hill* to The Barn, or layup on The Deck. East New York Master controls the leads south of The Head.

Page 31
Page 31

Canarsie Yard

Radio operations are on the B1 Train-To-Train channel.



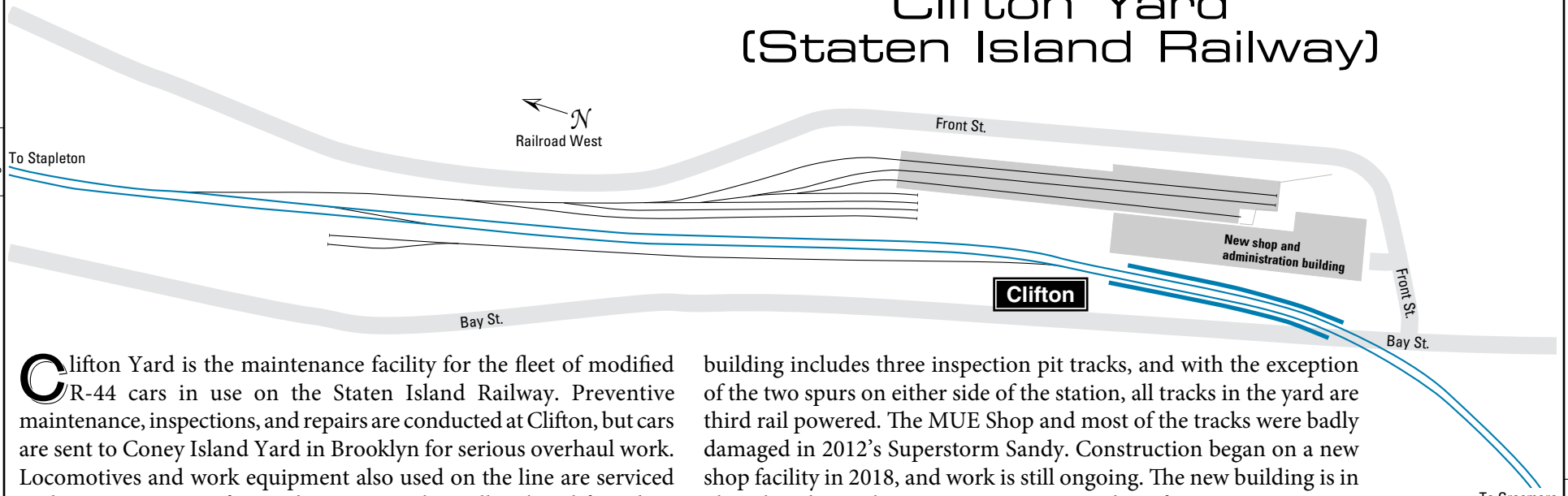
Page 37

Canarsie Yard (also known as "AY" Yard, short for Atlantic Yard) is located at the south end of the L line, between the East 105th Street station and the line's southern terminal at Rockaway Parkway. Canarsie is primarily a layup yard, although there is a car wash station on Track 10 that serves all trains on the BMT's Eastern Division. Work equipment can use Track 22, and non-electrified Track 23.

While servicing and inspection of trains on the L is performed at East New York Yard, basic cleaning and the checking of passenger amenities and the most basic of maintenance is carried out at the Canarsie terminal. The yard was only signaled in 2002, and many new interlocking appliances and signal heads were installed at the Rockaway Parkway station, throughout the yard and to a point north of East 105th Street. Track changes were made to allow easy access to any of the yard's tracks to a train approaching from the main line. A diamond crossover immediately south of East 105th Street was removed and a new double crossover was installed immediately north of the terminal.

Clifton Yard
(Staten Island Railway)

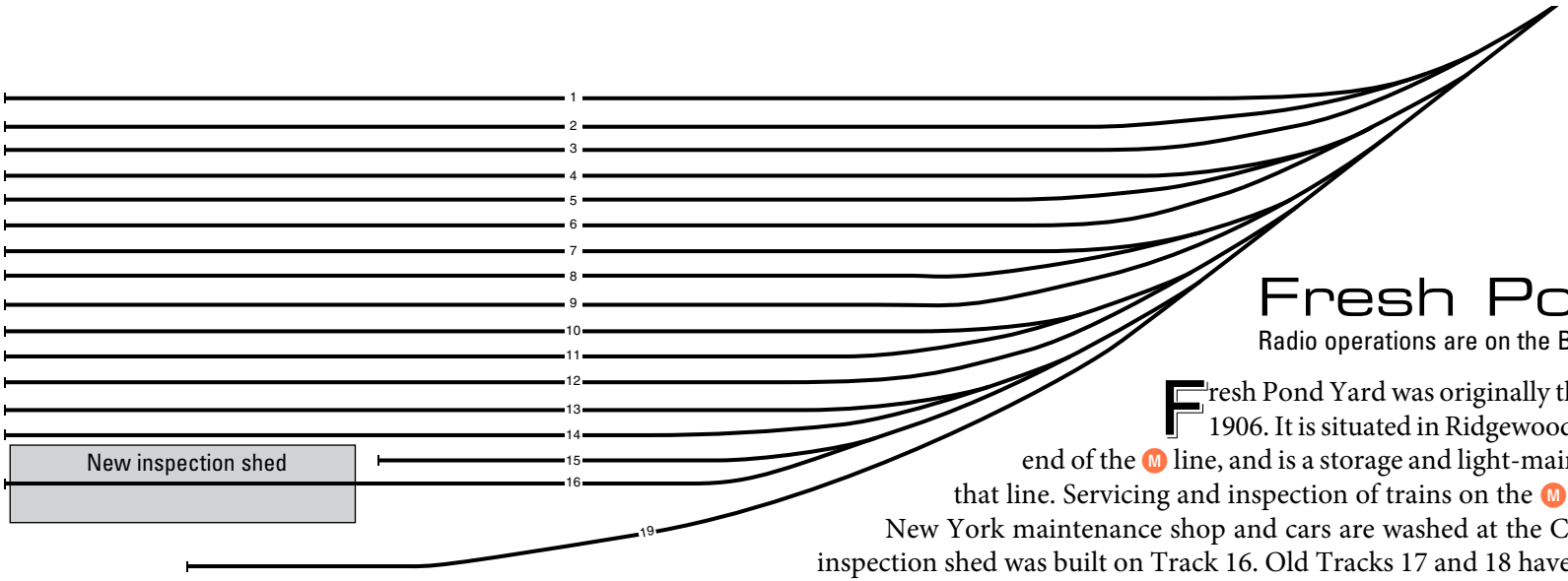
Page 105



Clifton Yard is the maintenance facility for the fleet of modified R-44 cars in use on the Staten Island Railway. Preventive maintenance, inspections, and repairs are conducted at Clifton, but cars are sent to Coney Island Yard in Brooklyn for serious overhaul work. Locomotives and work equipment also used on the line are serviced at the Maintenance of Way shop at Tompkinsville. The Clifton shop building includes three inspection pit tracks, and with the exception of the two spurs on either side of the station, all tracks in the yard are third rail powered. The MUE Shop and most of the tracks were badly damaged in 2012's Superstorm Sandy. Construction began on a new shop facility in 2018, and work is still ongoing. The new building is in place, but the tracks were not yet connected as of press time.

Page 105

Page 27



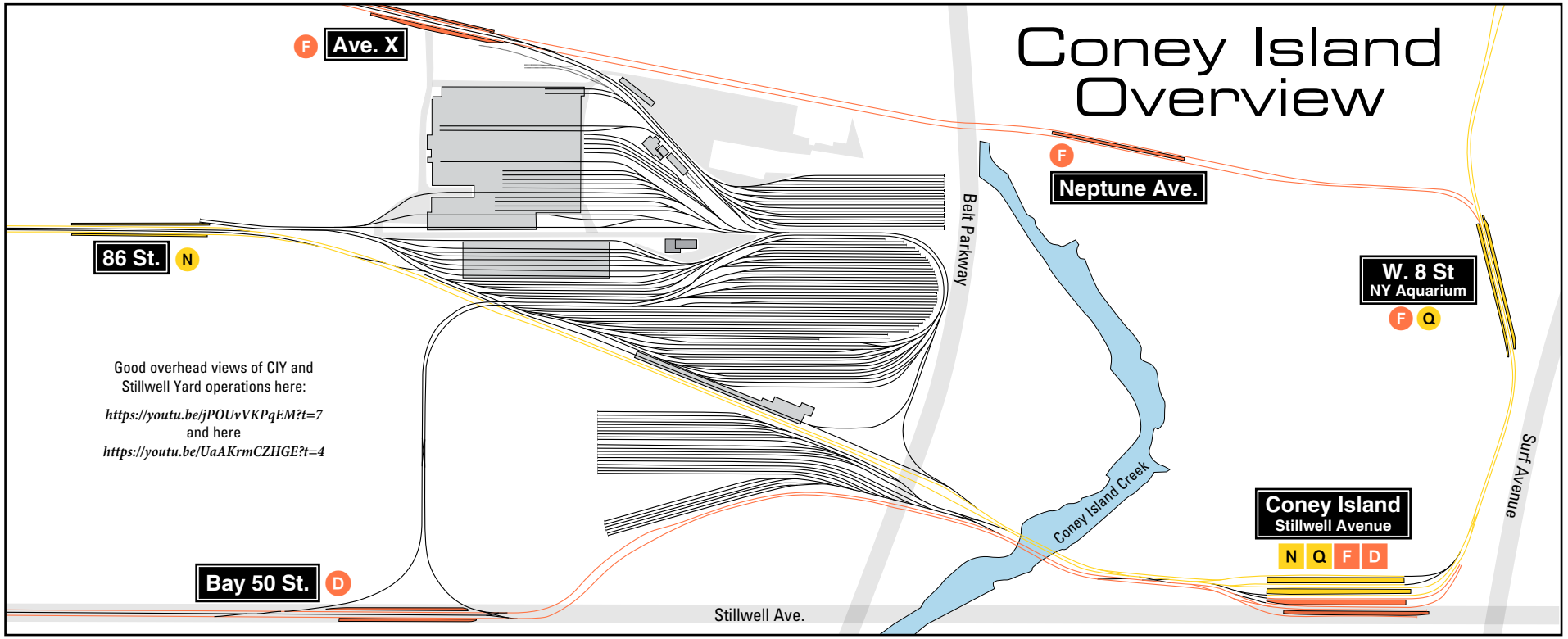
Fresh Pond Yard		
Line	AM Rush	PM Rush
M	24	23

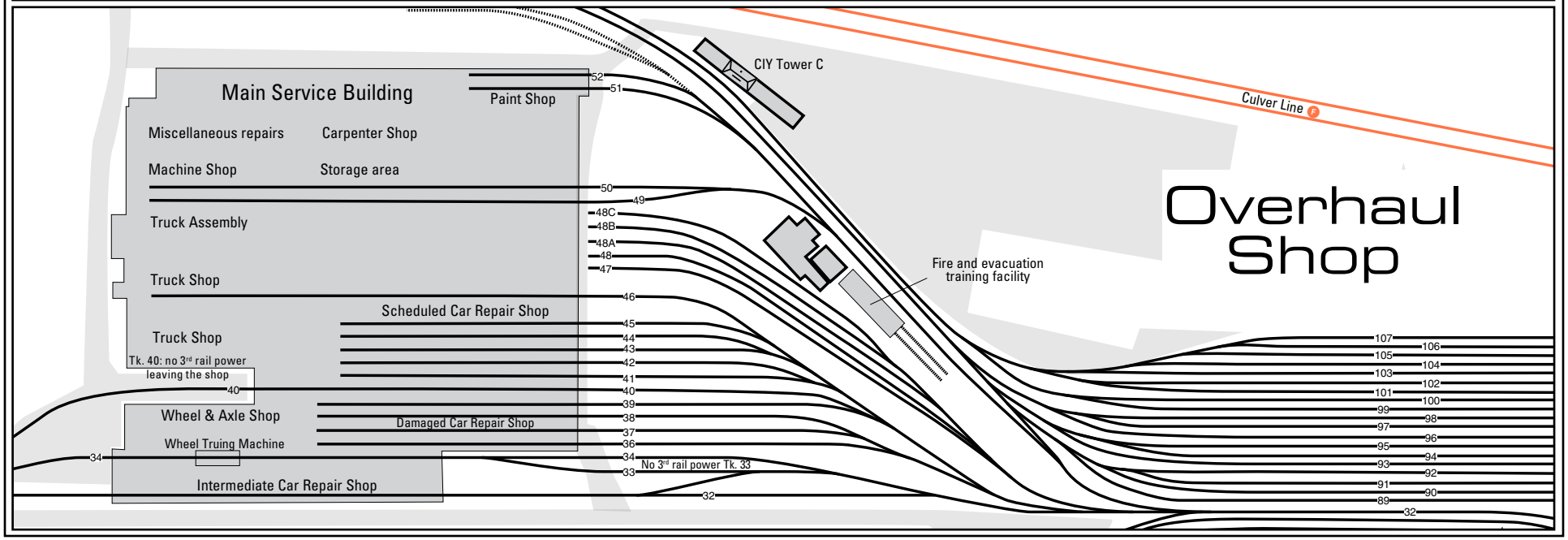
Fresh Pond Yard

Radio operations are on the B1 Train-To-Train channel.

Fresh Pond Yard was originally the site of a trolley barn in 1906. It is situated in Ridgewood, Queens at the northern end of the M line, and is a storage and light-maintenance facility only for that line. Servicing and inspection of trains on the M is performed at the East New York maintenance shop and cars are washed at the Canarsie Yard. A new car inspection shed was built on Track 16. Old Tracks 17 and 18 have been removed.

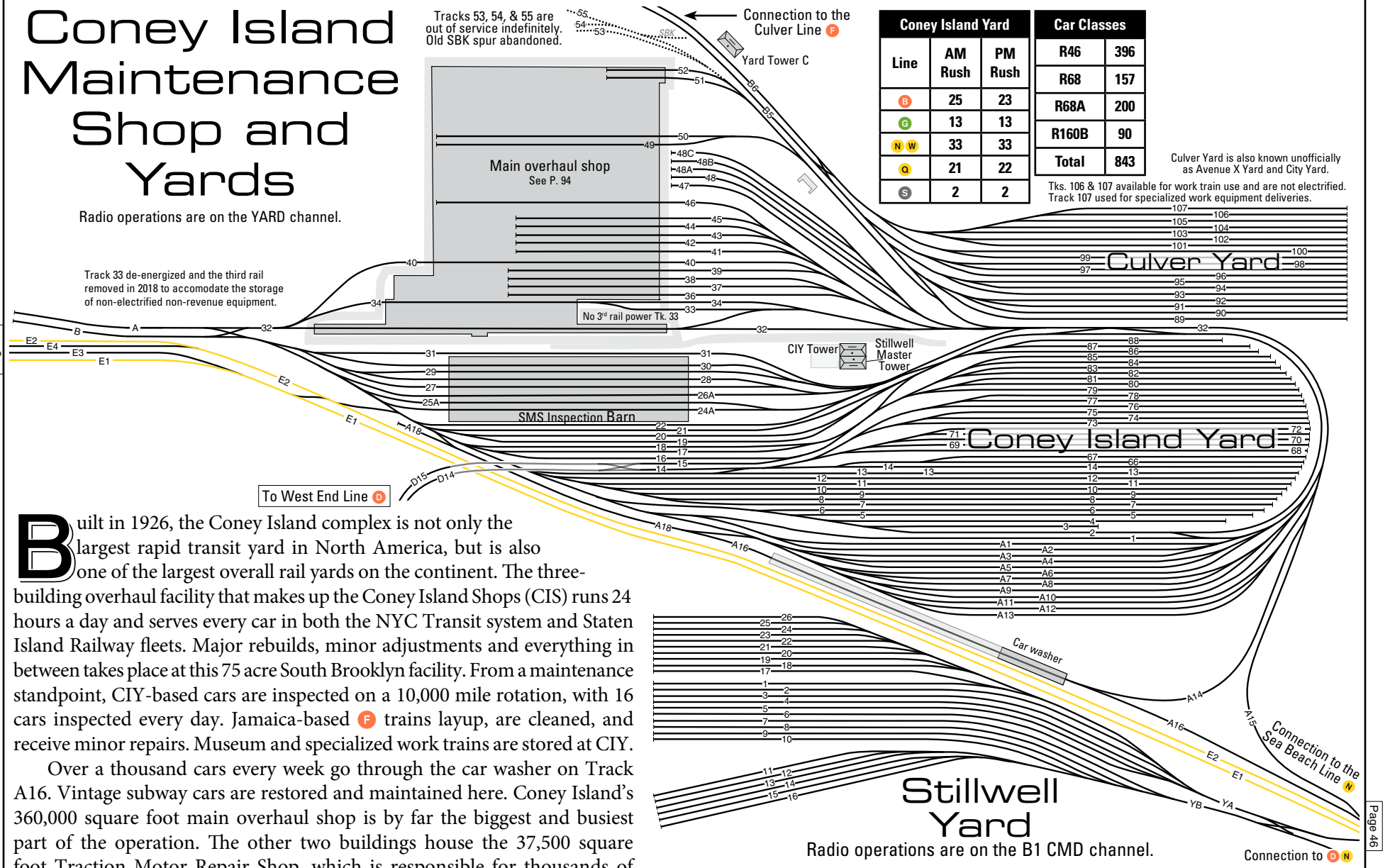
Page 46
Page 46





Coney Island Maintenance Shop and Yards

Radio operations are on the YARD channel.



Coney Island Yard		
Line	AM Rush	PM Rush
B	25	23
G	13	13
N W	33	33
Q	21	22
S	2	2

Car Classes	
R46	396
R68	157
R68A	200
R160B	90
Total	843

Culver Yard is also known unofficially as Avenue X Yard and City Yard.

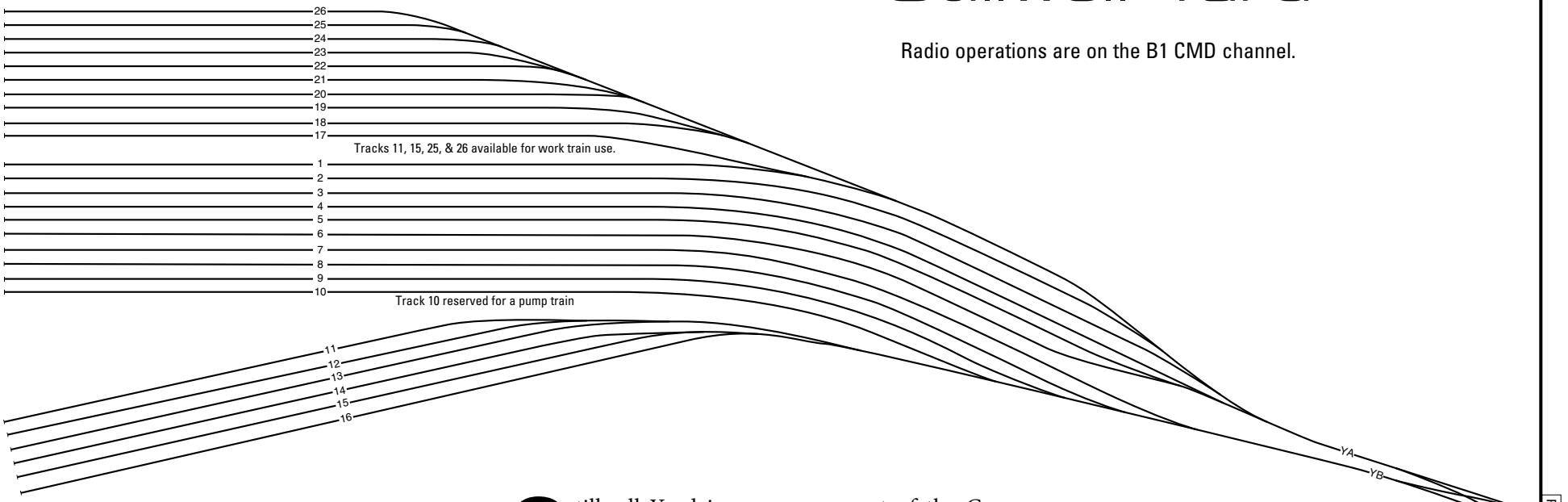
Tks. 106 & 107 available for work train use and are not electrified. Track 107 used for specialized work equipment deliveries.

Built in 1926, the Coney Island complex is not only the largest rapid transit yard in North America, but is also one of the largest overall rail yards on the continent. The three-building overhaul facility that makes up the Coney Island Shops (CIS) runs 24 hours a day and serves every car in both the NYC Transit system and Staten Island Railway fleets. Major rebuilds, minor adjustments and everything in between takes place at this 75 acre South Brooklyn facility. From a maintenance standpoint, CIY-based cars are inspected on a 10,000 mile rotation, with 16 cars inspected every day. Jamaica-based F trains layup, are cleaned, and receive minor repairs. Museum and specialized work trains are stored at CIY.

Over a thousand cars every week go through the car washer on Track A16. Vintage subway cars are restored and maintained here. Coney Island's 360,000 square foot main overhaul shop is by far the biggest and busiest part of the operation. The other two buildings house the 37,500 square foot Traction Motor Repair Shop, which is responsible for thousands of 115 horsepower traction motors (four per car), and the 30,000 square foot Pneumatic Shop that maintains air brakes. The overhaul shop also includes the system's only AAR-approved wheel and axle shop (with a wheel truing machine that re-shapes the 800-pound wheels), the damaged car repair shop, truck repair and assembly shops, the third-rail shoe beam shop, a small motor shop for things like blower motors and air compressors, a battery shop, a machine shop, a carpenter shop, and a paint shop. The shop is equipped with four 30-ton cranes that move car bodies between workstations. Other facilities of note are the NYPD Transit Division's firing range and vandal squad, a fire and evacuation training school, medical assessment center, boiler house and storage facilities.

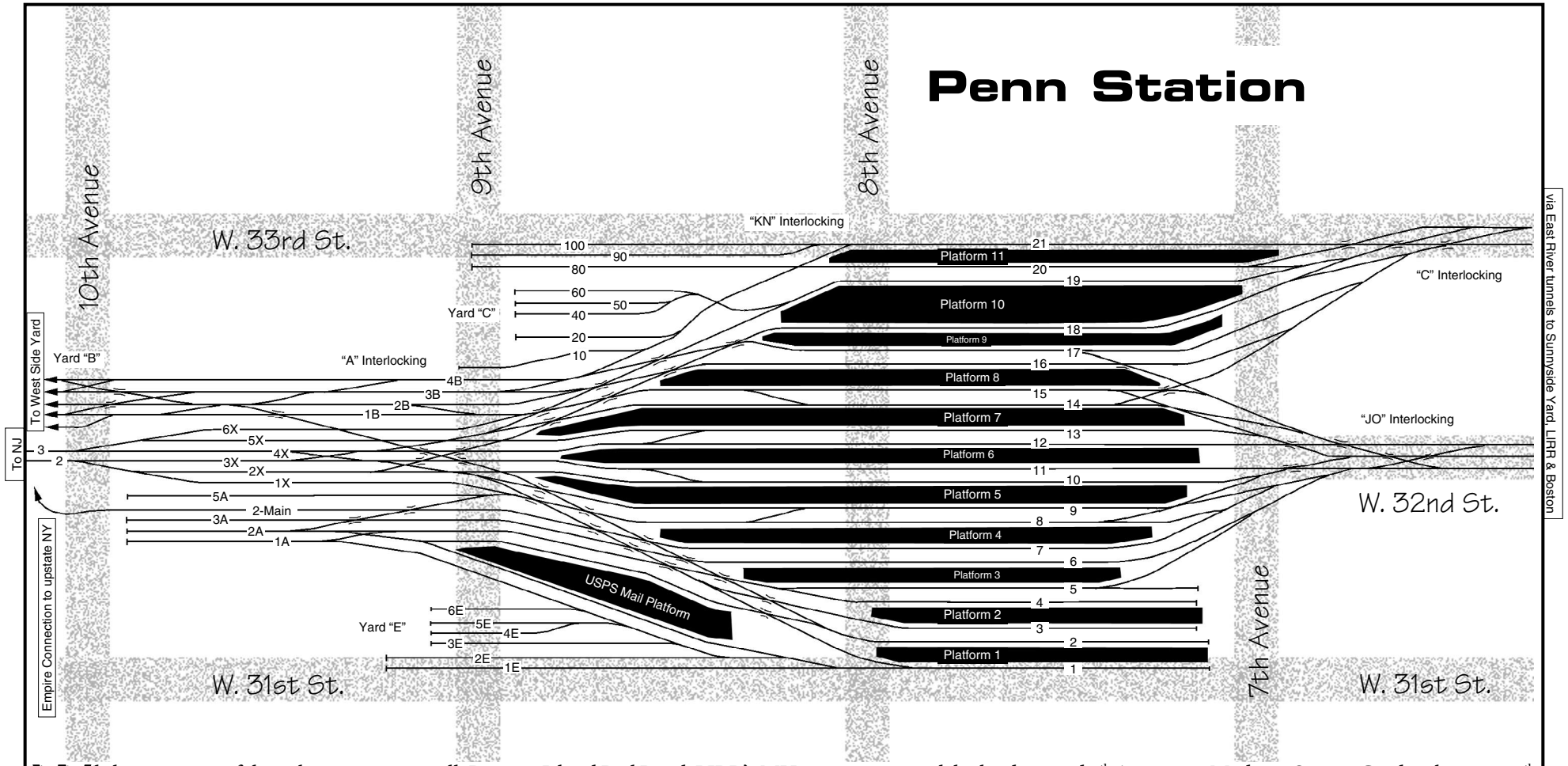
Stillwell Yard

Radio operations are on the B1 CMD channel.



Stillwell Yard is one component of the Coney Island Yard complex, consisting of 26 layup tracks for trains used on the Brighton B Q, West End D and Sea Beach N. It is situated between the West End and Sea Beach Lines as shown on Pages 97 and 46.

Page 46



While not a part of the subway system at all, Penn Station is situated entirely beneath the streets of New York City. Its tunnels extend both east and west of the station and cross the Hudson and East Rivers.

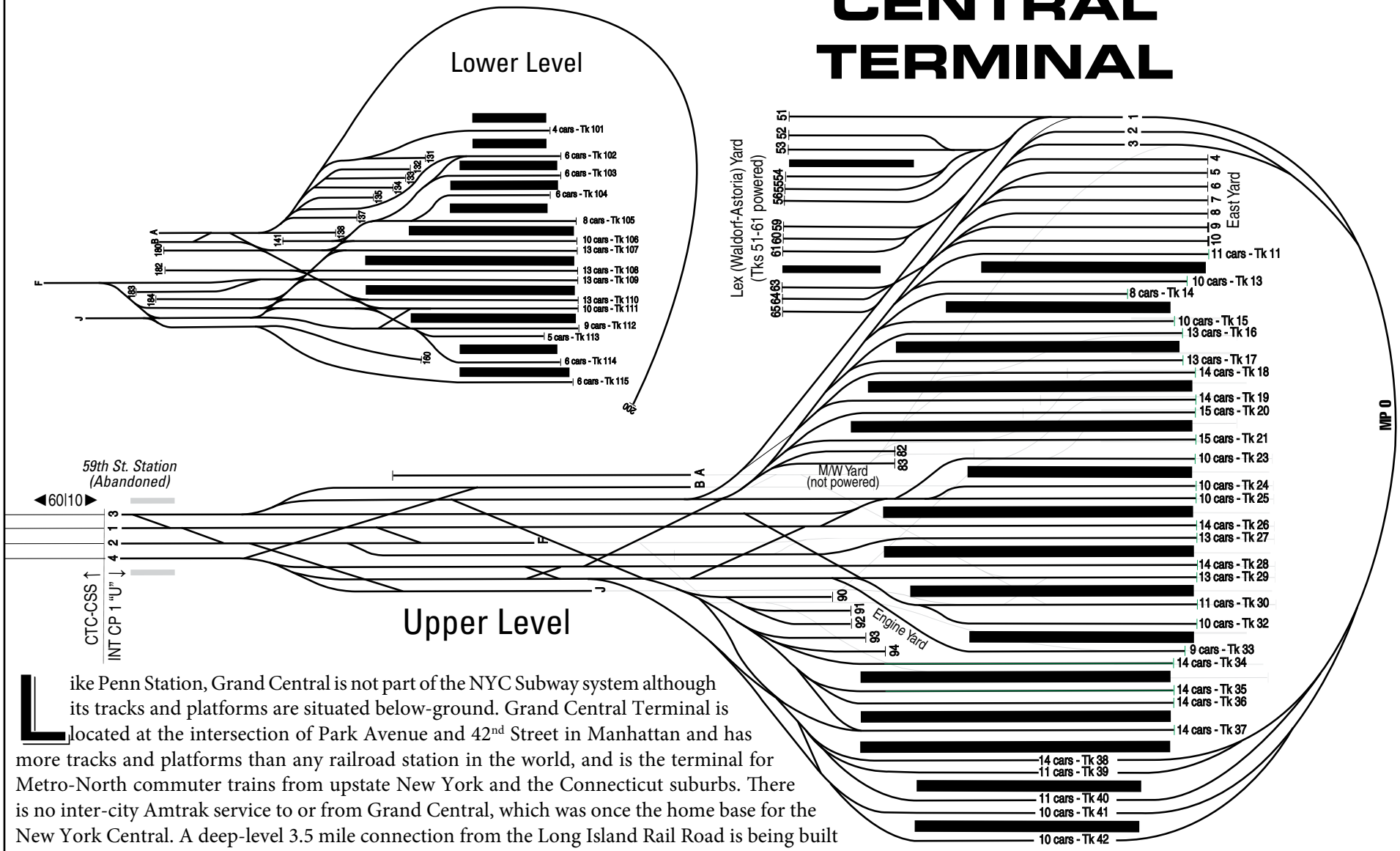
Over 500,000 passengers a day from three railroads leave, enter, or pass through NY Penn from Boston, Washington, and virtually every corner of the country via Amtrak as well as commuters from Long Island via the LIRR and from New Jersey via NJ Transit.

The station comprises 21 tracks serving 11 platforms (and one freight/mail platform). Amtrak and NJ Transit have exclusive use of tracks 1–12 and share tracks 13–16 (and occasionally 17) with the Long Island Rail Road. LIRR's MU equipment is solely third-rail powered, whereas Amtrak and NJT use an overhead catenary. LIRR has exclusive use of tracks 18–21. All tracks except 1–4 have third-rail power and all except C-Yard and the West Side Yard (used for LIRR layups and not shown here) have catenary as well.

In 1963, the original and architecturally stunning Penn Station was demolished—an act that spawned the preservation movement in New York City. Ever since, travelers have had to navigate in an uncomfortable maze of subterranean passageways in ultra-crowded conditions. The station sits below two important NYC landmarks. On the east, between 7th and 8th Avenue, is Madison Square Garden; between 8th and 9th lies the James A. Farley Post Office. This grand building is being transformed into the Daniel Patrick Moynihan Station, named after the late senator from New York who championed the idea. It is scheduled to open in 2021.

Penn Station is technically part of the Amtrak Northeast Corridor. Control of the station and its approaches is provided by Amtrak in PSCC (Penn Station Central Control), located nearby on 9th Avenue, using dispatchers from both the LIRR and Amtrak combined, and train movements operate under the NORAC rule book.

GRAND CENTRAL TERMINAL



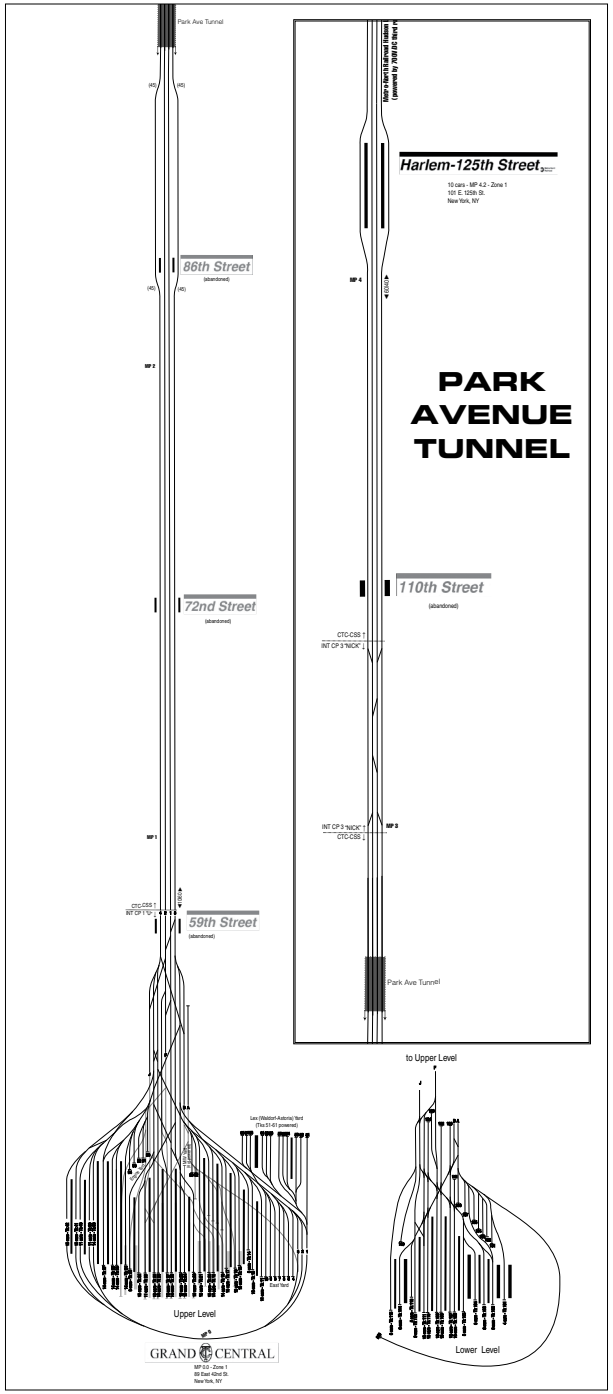
Track 14 on the upper level and track 101 on the lower level are used for garbage trains; both could be used in revenue service if needed.

Like Penn Station, Grand Central is not part of the NYC Subway system although its tracks and platforms are situated below-ground. Grand Central Terminal is located at the intersection of Park Avenue and 42nd Street in Manhattan and has more tracks and platforms than any railroad station in the world, and is the terminal for Metro-North commuter trains from upstate New York and the Connecticut suburbs. There is no inter-city Amtrak service to or from Grand Central, which was once the home base for the New York Central. A deep-level 3.5 mile connection from the Long Island Rail Road is being built that will allow LIRR trains from the lower level of the 63rd Street Tunnel to terminate at Grand Central, relieving the severe over-crowding at Penn Station. The East Side Access project will consist of a mezzanine and eight tracks on four platforms and will be located west of Track 115, well below the lower level. Grand Central *Station*, incidentally, refers to the nearby U.S. Post Office and not to this railway station.

This diagram depicts the Metro-North tracks from 125th Street, through the portal at 97th Street, under Park Avenue and down to Grand Central Terminal. Rail Traffic Controllers high above GCT funnel movements to and from all 67 revenue-service tracks into the four sub-surface main tracks, which run to 125th Street, then beyond to Westchester, Putnam, and Dutchess counties in New York state and Fairfield and New Haven counties in Connecticut.

Grand Central Terminal as we know it today was actually a replacement for Grand Central Depot, which operated on the same site from the mid-1870s until the new facility was opened in 1913. Steam trains were running below-ground for part of this run (96th St. to 59th St.) but ran at-grade until the new GCT opened. At that time, the remaining tracks and storage yards were put below-ground in roughly the configuration they are in today and the "air rights" sold to developers.

Along the route are four abandoned stations; 59th Street, 72nd Street, 86th Street and 110th Street. The 59th and 72nd Street platforms are only 150 feet long and are located on the outer sides of the tunnel. It is unclear if there was ever regularly-scheduled service to either of these two stations. 86th Street is a bit longer (172 feet) and is located between the outer and inner tracks on either side. Since there was never access to them from the center tracks, they were never considered "island" platforms. 86th St. and 110th St. each saw regular passenger service up until about the beginning of the twentieth century. Today, the three underground stations are



used for storage and their normally-sealed-off exits could be used in the event of emergency. 110th St. is above ground. They can still be seen through the windows of passing Metro-North trains.

TRACK 61

There also happens to be another disused track and platform at Grand Central with a far more storied history. As the new terminal was being constructed, there was also a powerhouse and a freight forwarding company who each had small low-level platforms in what is today the Lexington Yard. Once the new terminal was finished, there was room over the sidings and other peripheral tracks for new buildings. One of these was the Waldorf-Astoria hotel, built between 1929 and 1931 and situated between 49th and 50th Streets, from Park to Lexington Avenues. The former loading platform for the powerhouse was re-purposed by the Waldorf-Astoria after the powerhouse was closed in 1929, and Track 61 took on a whole new and glamorous purpose.

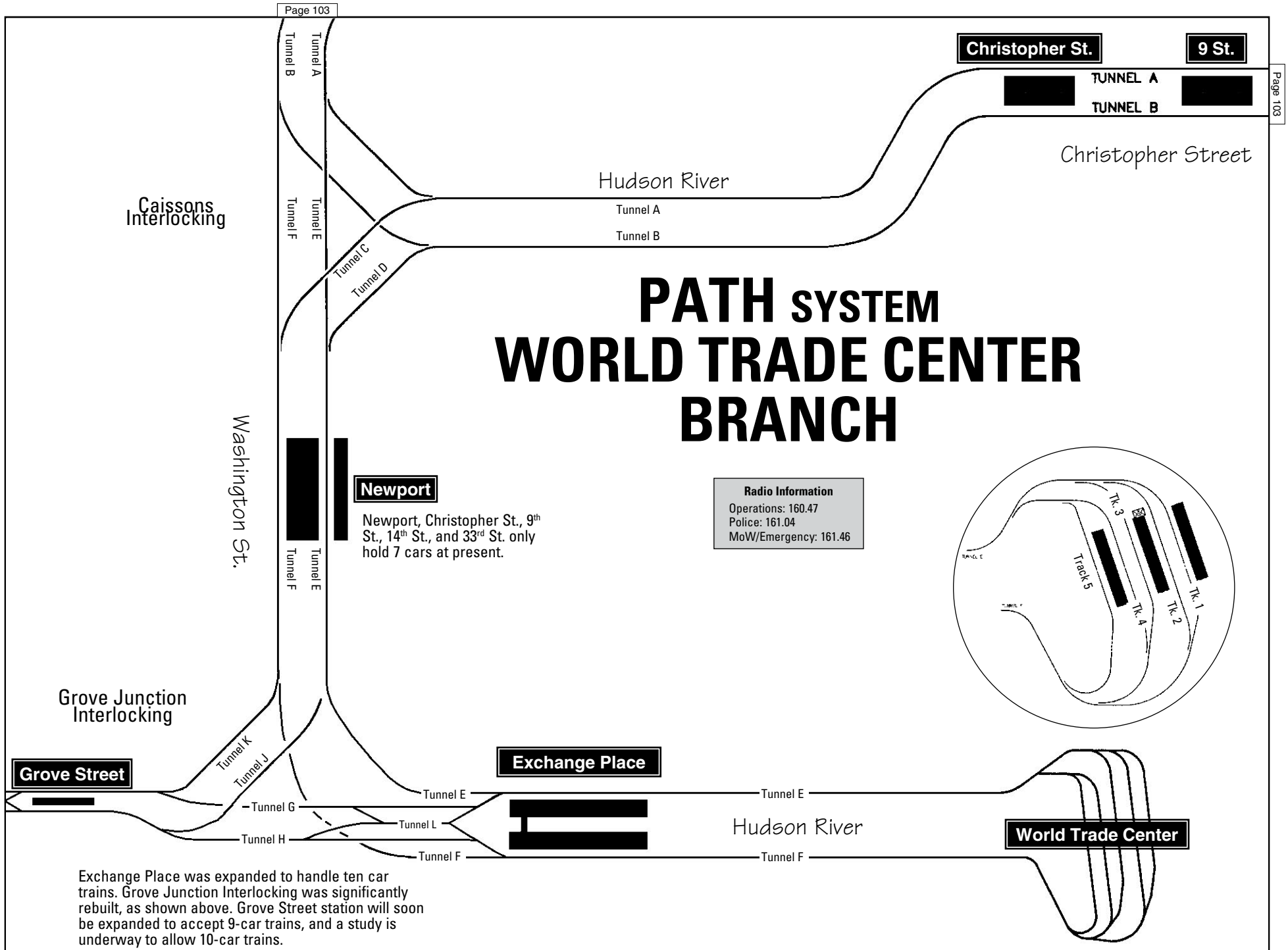
A stairway and freight elevator were installed that directly accessed the Waldorf's underground garage and, in the words of the New York Times of September 8, 1929, "Guests with private rail cars may have them routed directly to the hotel instead of to the Pennsylvania Station or the Grand Central Terminal, and may leave their cars at a special elevator which will take them directly to their suites or to the lobby."

Track 61 became known as the "Presidential Siding," when former U.S. President Franklin Delano Roosevelt would reportedly drive his armor plated Pierce-Arrow limousine off the train, into the freight elevator, and up to the hotel. This was not done solely for the sake of security, but also because wheelchair-bound FDR didn't wish to be seen or photographed as being disabled and this enabled him to get in and out of the city away from public view. Subsequent to FDR, track 61 has been used for numerous private functions including a party by Andy Warhol in 1965 and the debut of a massive 6,000 HP ALCO locomotive that would later serve the Sante Fe Railway. An armored blue 1940s era freight car sat there until May 2019, when it was moved to the Danbury Railway Museum. The whole area is still tightly restricted when the current U.S. President is in the hotel.

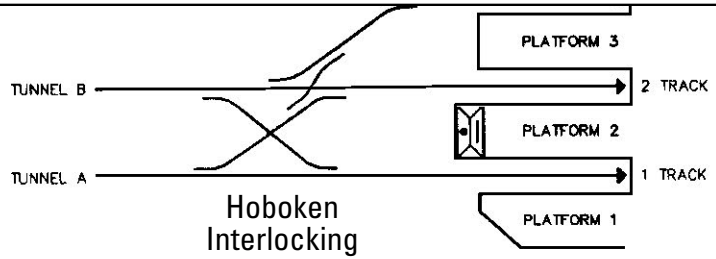
A stairway and the freight elevator that FDR's car used still rises up to a polished metal door on 49th Street today.

Page 103

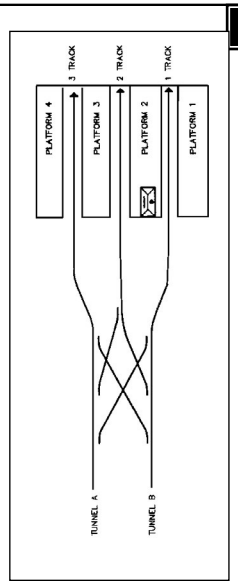
PATH SYSTEM
WORLD TRADE CENTER BRANCH



Exchange Place was expanded to handle ten car trains. Grove Junction Interlocking was significantly rebuilt, as shown above. Grove Street station will soon be expanded to accept 9-car trains, and a study is underway to allow 10-car trains.



Radio Information
Operations: 160.47
Police: 161.04
MoW/Emergency: 161.46



Tunnel bellmouth east of the 9th St. station was for a proposed but never-built line under 9th St.

PATH SYSTEM 33RD STREET BRANCH

PATH (short for Port Authority Trans-Hudson) trains, formerly known as the Hudson and Manhattan Railroad (or simply the Hudson Tubes) first began operating on February 25, 1908. This 43 track-mile system is not part of the NYC Subway, nor is it connected to any part of it. PATH operates frequent service between 33rd Street in Manhattan and either Hoboken or Journal Square, and between World Trade in Manhattan and either Newark or Hoboken in New Jersey.

Sixth Ave. PATH tunnels run between local IND subway tracks, and above the IND Express tracks between W. 9th Street and their 33rd Street terminal. Along Sixth Avenue there are two abandoned stations; one at 19th St. (closed to speed service and now an emergency fan plant), and the other at 28th St. As the IND Sixth Avenue subway was being built, they had to tunnel around the H&M/PATH system, which pre-dates the IND local tracks by 32 years, and the express tracks by 60 years!

Rolling stock is the same width as the IRT's at 8½ feet wide, but shorter, at 48 feet in length versus 51½ feet on the IRT. PATH cars have a slightly narrower profile. Eight car trains are in use from Newark Penn to WTC, although there are plans to upgrade this to 10-car trains. Other routes only use 7 cars per trainset due to shorter platform lengths. PATH fares are currently $2.75 with discounts available using multi-trip SmartLink cards. Pay-per-ride MetroCards (not unlimited cards) may also be used on on PATH.

Unlike NYC Transit, PATH falls under Federal Railroad Administration jurisdiction so its trains are operated by Locomotive Engineers. PATH falls under the government's 2018 positive train control mandate and as a result, the system has been converted to the Siemens Trainguard MT CBTC, with positive train control in place. The line is controlled at Journal Square. The old system will be retained as a backup and for legacy equipment moves. The fleet is made up entirely of PA-5 stock, with some older PA-4 cars retained for work train service. Unlike on the MTA network, it should be noted that photography of any kind is prohibited anywhere on PATH. The system is run by the Port Authority of New York and New Jersey.

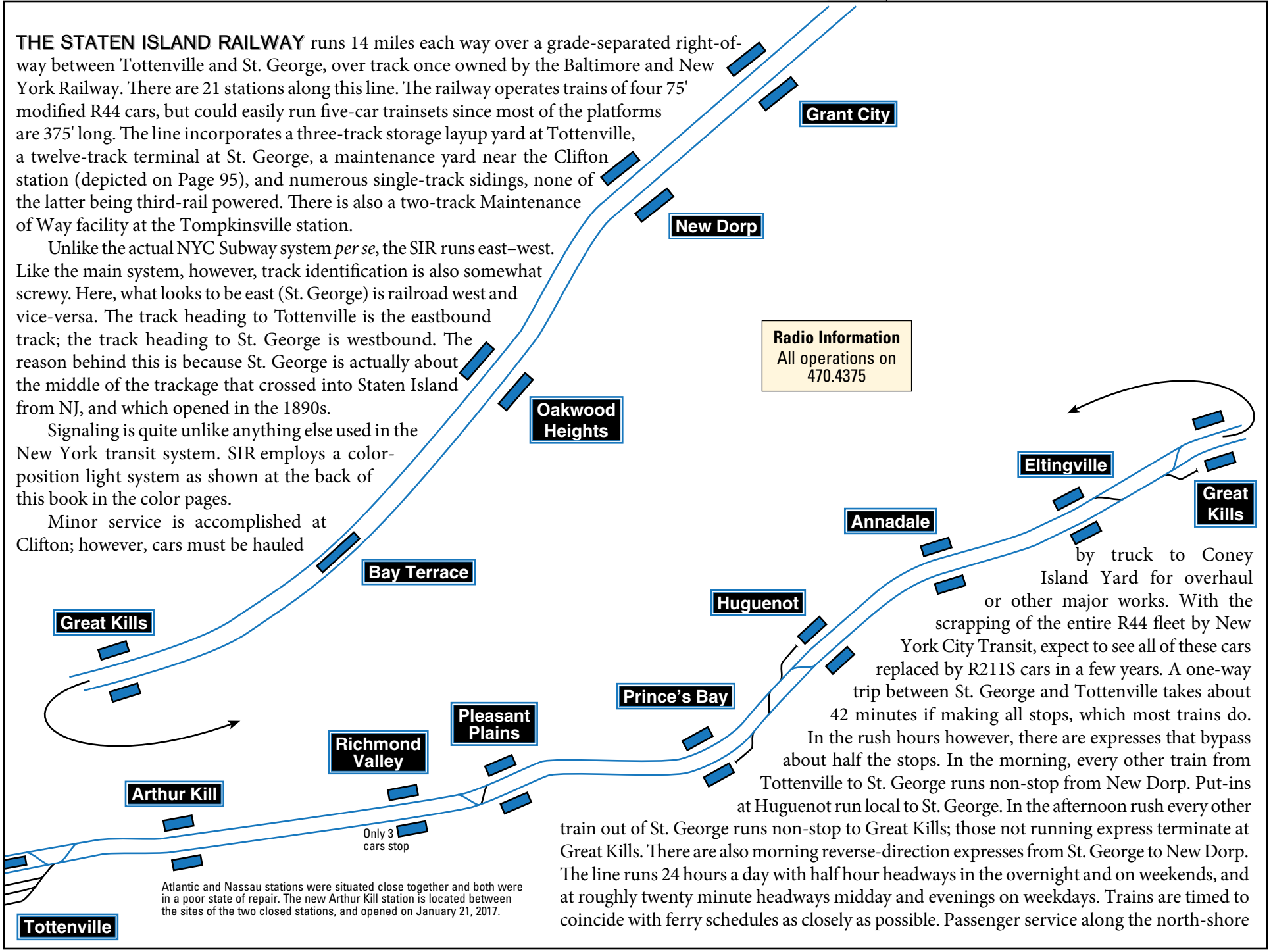
Page 102

THE STATEN ISLAND RAILWAY runs 14 miles each way over a grade-separated right-of-way between Tottenville and St. George, over track once owned by the Baltimore and New York Railway. There are 21 stations along this line. The railway operates trains of four 75' modified R44 cars, but could easily run five-car trainsets since most of the platforms are 375' long. The line incorporates a three-track storage layup yard at Tottenville, a twelve-track terminal at St. George, a maintenance yard near the Clifton station (depicted on Page 95), and numerous single-track sidings, none of the latter being third-rail powered. There is also a two-track Maintenance of Way facility at the Tompkinsville station.

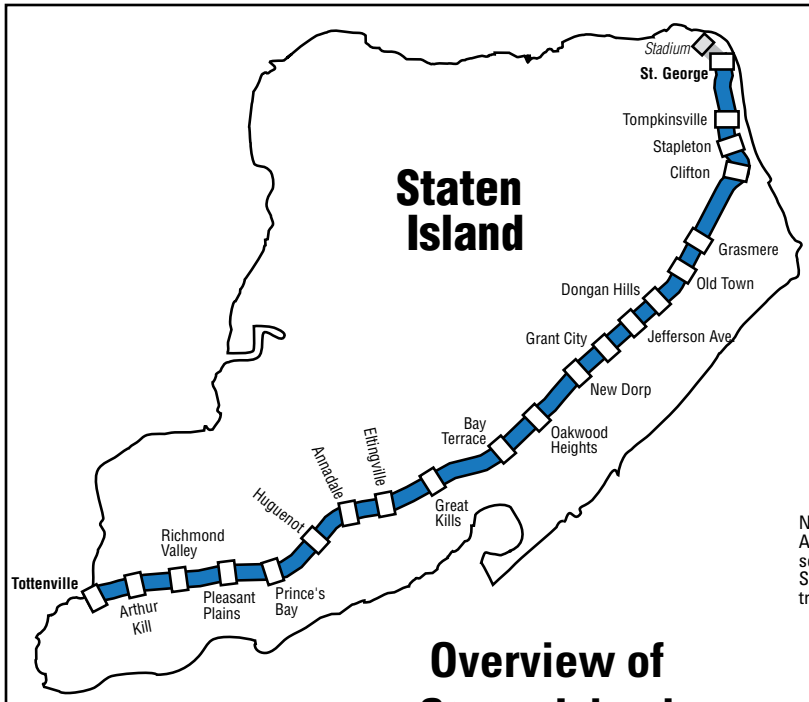
Unlike the actual NYC Subway system *per se*, the SIR runs east–west. Like the main system, however, track identification is also somewhat screwy. Here, what looks to be east (St. George) is railroad west and vice-versa. The track heading to Tottenville is the eastbound track; the track heading to St. George is westbound. The reason behind this is because St. George is actually about the middle of the trackage that crossed into Staten Island from NJ, and which opened in the 1890s.

Signaling is quite unlike anything else used in the New York transit system. SIR employs a color-position light system as shown at the back of this book in the color pages.

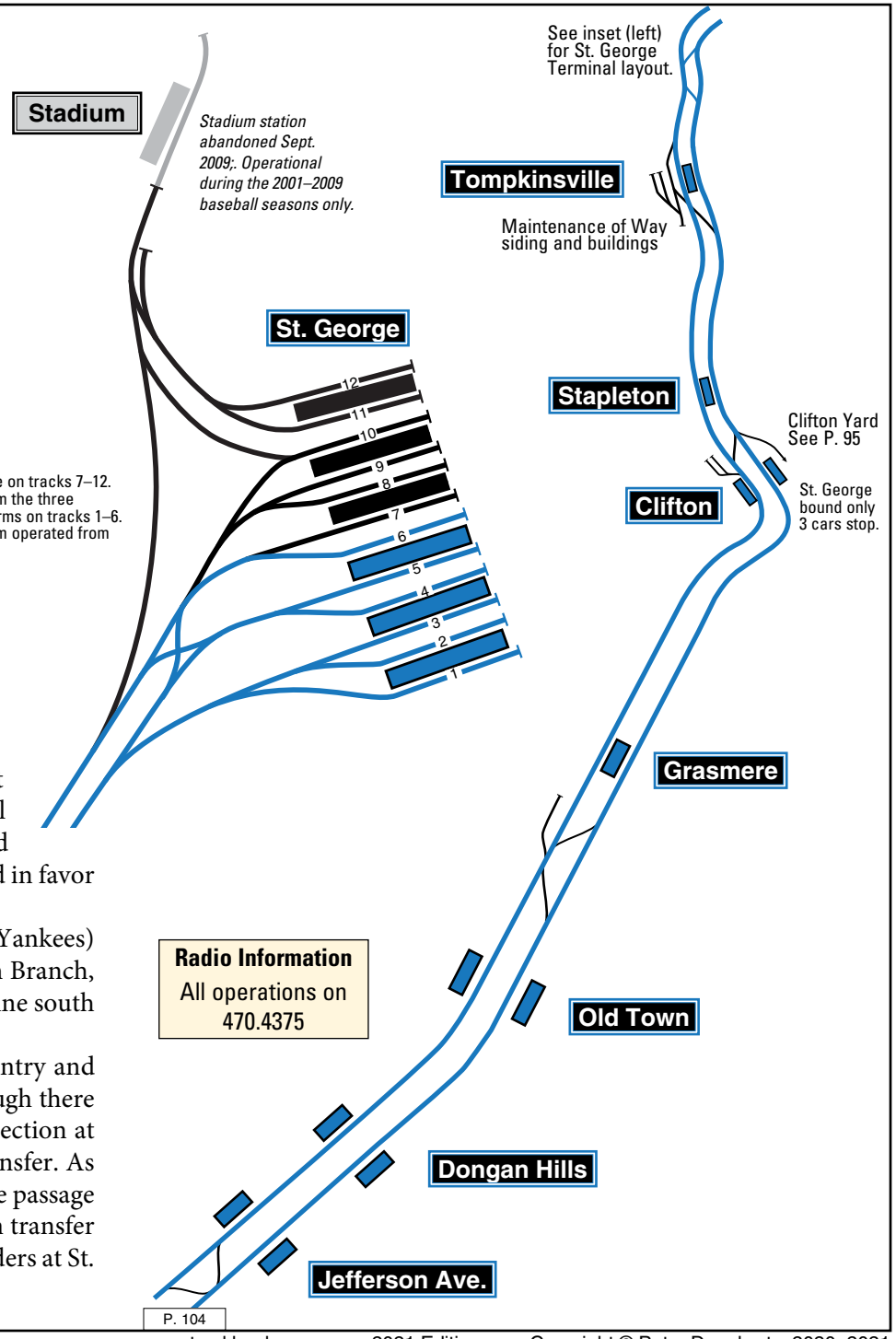
Minor service is accomplished at Clifton; however, cars must be hauled by truck to Coney Island Yard for overhaul or other major works. With the scrapping of the entire R44 fleet by New York City Transit, expect to see all of these cars replaced by R211S cars in a few years. A one-way trip between St. George and Tottenville takes about 42 minutes if making all stops, which most trains do. In the rush hours however, there are expresses that bypass about half the stops. In the morning, every other train from Tottenville to St. George runs non-stop from New Dorp. Put-ins at Huguenot run local to St. George. In the afternoon rush every other train out of St. George runs non-stop to Great Kills; those not running express terminate at Great Kills. There are also morning reverse-direction expresses from St. George to New Dorp. The line runs 24 hours a day with half hour headways in the overnight and on weekends, and at roughly twenty minute headways midday and evenings on weekdays. Trains are timed to coincide with ferry schedules as closely as possible. Passenger service along the north-shore



Atlantic and Nassau stations were situated close together and both were in a poor state of repair. The new Arthur Kill station is located between the sites of the two closed stations, and opened on January 21, 2017.



Overview of Staten Island and the SIR line



line (not pictured) and the South Beach Branch ceased in March 1953. Freight service was discontinued for many years, but resumed in 2006 after the Arthur Kill Vertical Lift Bridge's rehabilitation. Passenger service restoration was discussed for the North Shore Branch, from St. George to Port Ivory, but this was scrapped in favor of Bus Rapid Transit.

Service to the Richmond County Bank stadium (home of the Staten Island Yankees) opened in 2001 but ended in September 2009. A third branch, the South Beach Branch, was abandoned in 1953 and its tracks were removed. It branched off the main line south of Clifton and ran for 4.1 miles to Wentworth Avenue.

Fares are only collected at St. George and Tompkinsville stations, upon entry and exit. There is no charge to ride between any other stations along the line, although there are reportedly discussions underway that would see the restoration of fare collection at all SIR stations. SIR is part of the MetroCard system, which allows one free transfer. As such, a fare paid on the NYC Subway takes a rider to South Ferry and allows free passage on the Staten Island Ferry across the harbour to St. George. Passengers my then transfer at no charge to the SIR. Likewise in reverse, the fare is paid by city-bound SIR riders at St. George and after the free ferry ride, they enter the subway on a transfer.

JFK AirTrain

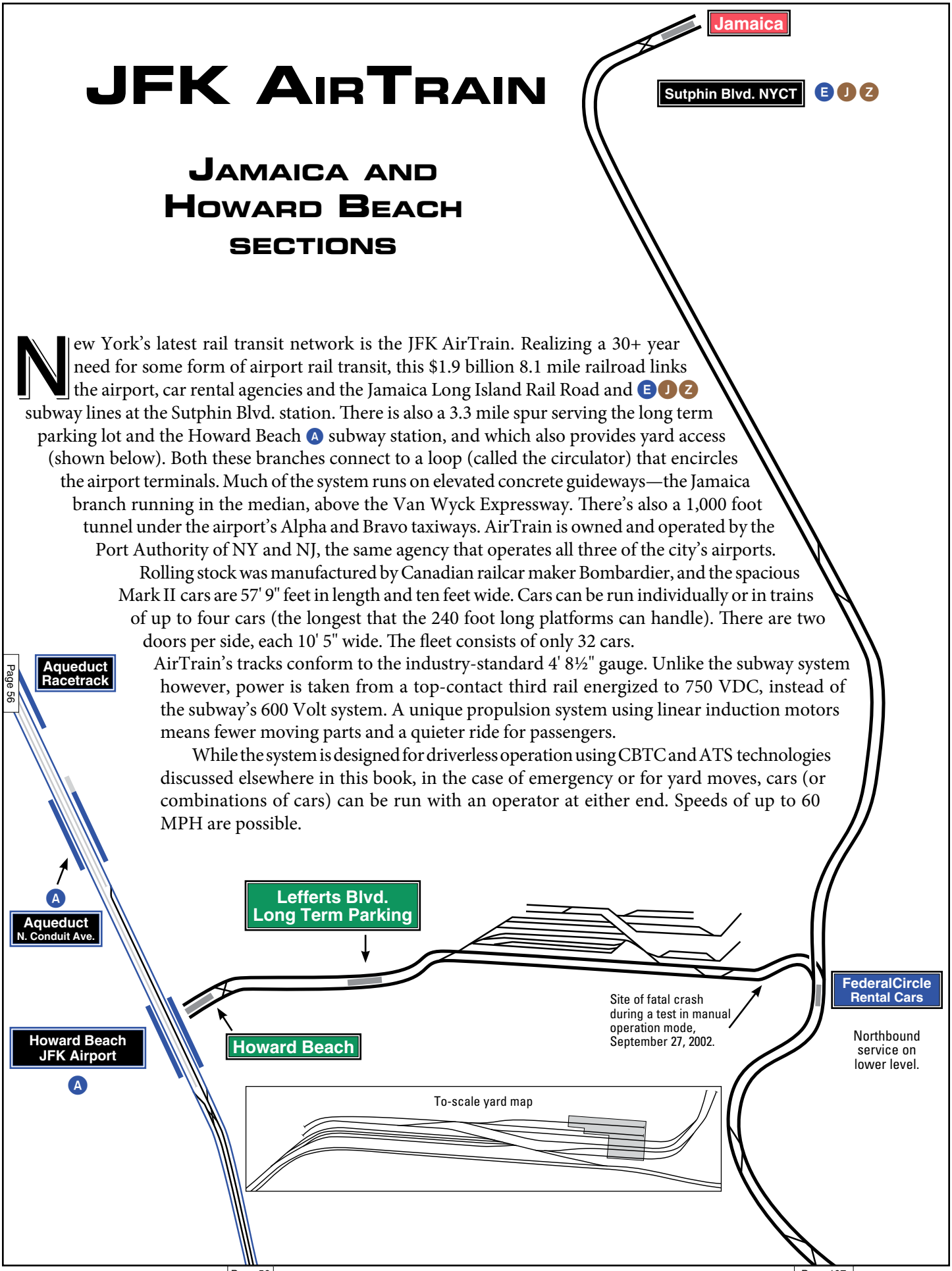
Jamaica and Howard Beach sections

New York's latest rail transit network is the JFK AirTrain. Realizing a 30+ year need for some form of airport rail transit, this $1.9 billion 8.1 mile railroad links the airport, car rental agencies and the Jamaica Long Island Rail Road and E J Z subway lines at the Sutphin Blvd. station. There is also a 3.3 mile spur serving the long term parking lot and the Howard Beach A subway station, and which also provides yard access (shown below). Both these branches connect to a loop (called the circulator) that encircles the airport terminals. Much of the system runs on elevated concrete guideways—the Jamaica branch running in the median, above the Van Wyck Expressway. There's also a 1,000 foot tunnel under the airport's Alpha and Bravo taxiways. AirTrain is owned and operated by the Port Authority of NY and NJ, the same agency that operates all three of the city's airports.

Rolling stock was manufactured by Canadian railcar maker Bombardier, and the spacious Mark II cars are 57' 9" feet in length and ten feet wide. Cars can be run individually or in trains of up to four cars (the longest that the 240 foot long platforms can handle). There are two doors per side, each 10' 5" wide. The fleet consists of only 32 cars.

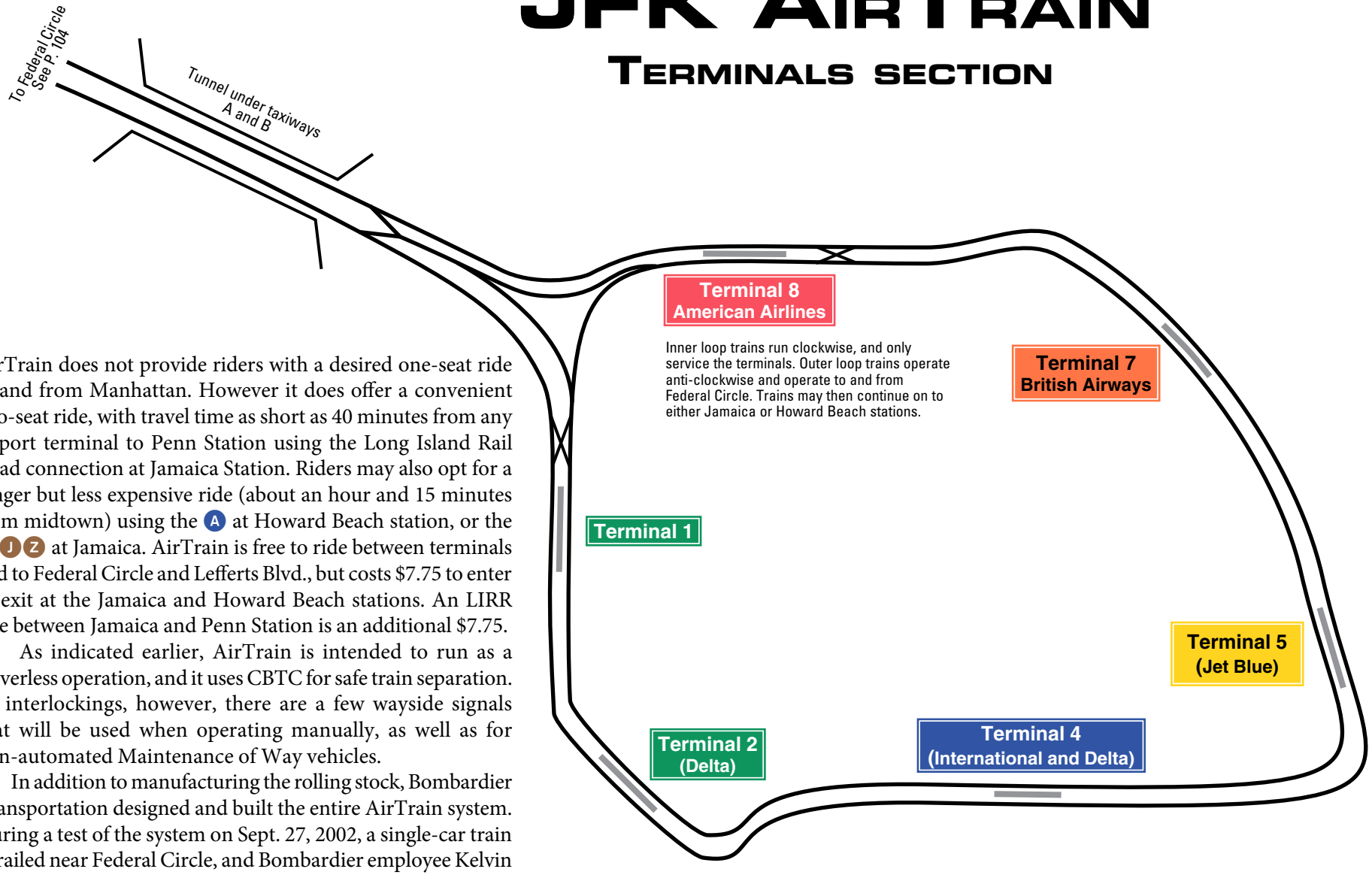
AirTrain's tracks conform to the industry-standard 4' 8½" gauge. Unlike the subway system however, power is taken from a top-contact third rail energized to 750 VDC, instead of the subway's 600 Volt system. A unique propulsion system using linear induction motors means fewer moving parts and a quieter ride for passengers.

While the system is designed for driverless operation using CBTC and ATS technologies discussed elsewhere in this book, in the case of emergency or for yard moves, cars (or combinations of cars) can be run with an operator at either end. Speeds of up to 60 MPH are possible.



JFK AirTrain

Terminals section



AirTrain does not provide riders with a desired one-seat ride to and from Manhattan. However it does offer a convenient two-seat ride, with travel time as short as 40 minutes from any airport terminal to Penn Station using the Long Island Rail Road connection at Jamaica Station. Riders may also opt for a longer but less expensive ride (about an hour and 15 minutes from midtown) using the A at Howard Beach station, or the E J Z at Jamaica. AirTrain is free to ride between terminals and to Federal Circle and Lefferts Blvd., but costs $7.75 to enter or exit at the Jamaica and Howard Beach stations. An LIRR fare between Jamaica and Penn Station is an additional $7.75.

As indicated earlier, AirTrain is intended to run as a driverless operation, and it uses CBTC for safe train separation. At interlockings, however, there are a few wayside signals that will be used when operating manually, as well as for non-automated Maintenance of Way vehicles.

In addition to manufacturing the rolling stock, Bombardier Transportation designed and built the entire AirTrain system. During a test of the system on Sept. 27, 2002, a single-car train derailed near Federal Circle, and Bombardier employee Kelvin DeBourgh Jr. was killed.

Changes: Text revised.

Glossary

Contained within this volume are numerous references to the specialized jargon used in the New York Transit System (or railroading in general).

BALL; HOMEBALL: Signal and Home Signal respectively. A train operator may radio command center and say "1536 Bravo out of Brighton at 56 ball, looking for a lineup." (Translation: a Ⓑ train, which left Brighton Beach at 3:36pm, is stopped at red home signal X-56 and needs to have the correct route set by the tower. See **Lineup** and **Home Signal**).

BUMPER BLOCK: An angular steel device placed at the end of a track to prevent a train still in motion from derailing.

CALL LETTERS: Departure time, route, departing terminal, and arriving terminal; **0836 Ⓠ Stillwell Avenue to 96th St.**

CONDUCTOR'S BOARD: An elongated, striped board placed at a point that should be opposite the conductor when the train is positioned correctly in the station. Conductors are required to point to this board before opening the doors.

CONTACT RAIL: Third (power) rail, carrying 600 Volts DC.

CONSIST: (pronounced CON'sist) A group of rail vehicles that make up a train.

CROSSOVER: A switch which crosses from one track to an adjacent track. A single crossover consists of a turnout from each track, connected together. Can be signaled 1 or 2 ways.

DERAIL: (noun) Device that will forcibly derail a train if passed. *Derails* are used to prevent cars on one track from accidentally fouling a main track, and possibly running away in the event of failed brakes. There are two types: Split-switch (a facing point turnout going nowhere) and sliding-type (it slides over the rail when the associated home signal is at danger, and slides off when clear). The only **main-line** derail in use is at Whitehall Street, southbound from B3 track, heading into the Montague Tunnel.

DIAMOND/DOUBLE/SCISSORS CROSSOVER: An X-shaped crossover between two adjacent tracks.

DOUBLE SLIP SWITCH: A combination of a crossing-at-grade and a facing-point turnout from the through route of one track to the through route of the other track, in both directions.

DWARF SIGNAL: Also known as a low signal. A small interlocked signal placed at trackside and not associated with a trip arm, usually for switching moves across an interlocking.

FOUL: One train is said to be *foul* if it is positioned in such a way that would cause a second train on an adjoining or connecting track to contact it. Typical case would be the end of a train too close to the trailing points of a switch.

GAP FILLER: Movable platforms that extend so passengers can step over the gap formed between a train and the face of curved station platforms. Presently found at Union Square on the Lexington Ave. Line and previously at the old South Ferry station and at Times Square on the Shuttle.

GENERAL ORDER (OR G.O.): Details of any specific activity or out-of-the-ordinary train movement.

HOLDING SIGNALS (HOLDING LIGHTS): Three amber lamps in view of the conductor, which when illuminated, advise that the train is to remain in the station with its doors open. When the lights are extinguished, the train may proceed.

HOME SIGNALS (HOMEBALLS): In NYC transit terminology, interlocking signals are usually referred to as Homeballs. In common railroad parlance, a home signal is the first signal at the entrance to an interlocking.

INTERLOCKING: A series of interconnected tracks, switches

Glossary

and signals, the operation of one may affect one or more others. Usually controlled from a tower and/or Punch Box.

LADDER TRACK: A lead track, typically across a yard, which allows access to numerous other tracks.

LAYUP: Storage of trains when not in service.

LEAD: (pronounced Leed): Typically the access track to a yard. ("Take 9 Lead to 54 track layup.")

LINEUP: The combination of a permissive signal and correct route needed to proceed.

MARKER SIGNAL: A fixed signal always displaying a stop and stay indication. This signal may never be passed.

MASTER TOWER: New tower replacing several smaller ones.

MURPHY TOWER: The Master Tower located in the 38th Street Yard; named in honour of Joe Murphy, an employee of that tower who was also a member of the National Guard, and was killed in the 1991 Gulf War.

OPTO: One Person Train Operation. Under OPTO, the train operator also opens and closes the doors and monitors platform conditions using a closed-circuit TV system.

PIT TRACKS: Tracks located in a shop building, which are raised on "stilts" to allow work to be performed on their underside.

POINTS: Movable parts of a track switch. Facing points are how you approach a switch (you are *facing* them). Trailing points are the opposite (you have already *trailed* through them).

PUNCH BOX: Push buttons mounted beside train cab used by operators to manually select the desired route at an interlocking.

PUT-IN: A train *put in* to service somewhere on a line. For example, an F train layed-up at Culver Yard which *runs light* and is *Put In* at Jay Street for the afternoon rush-hour.

RAIL CONTROL CENTER: Location from which the A-Division, the Canarsie and Flushing Lines, and any CBTC trains are controlled and from which most dispatchers operate. It has replaced master towers and all local towers in the control hierarchy. The RCC is located in midtown Manhattan.

RELAY: Procedure used for a train to reverse direction at a terminal.

REVENUE SERVICE: Trains in service for the purpose of carrying passengers (generating revenue for the MTA).

RIGHT-OF-WAY: Real estate upon which a rail line is situated.

RUN AROUND: To bypass standing or disabled equipment.

RUNNING LIGHT: A train is *running light* when it's operating without passengers—either to/from a yard to be *put in*.

SECTION GAP: A gap in the third rail between segments fed from different electrical substations.

SERVICE DELIVERY: The department within NYC Transit directly responsible for the movement of trains. Formerly RTO.

SLIP SWITCH: A combination of a crossing-at-grade and a facing point turnout from the through route of one track to the through route of the other track, in one direction only.

SIGNAL AT DANGER (CAUTION): A signal displaying a red (danger) or yellow (caution) aspect.

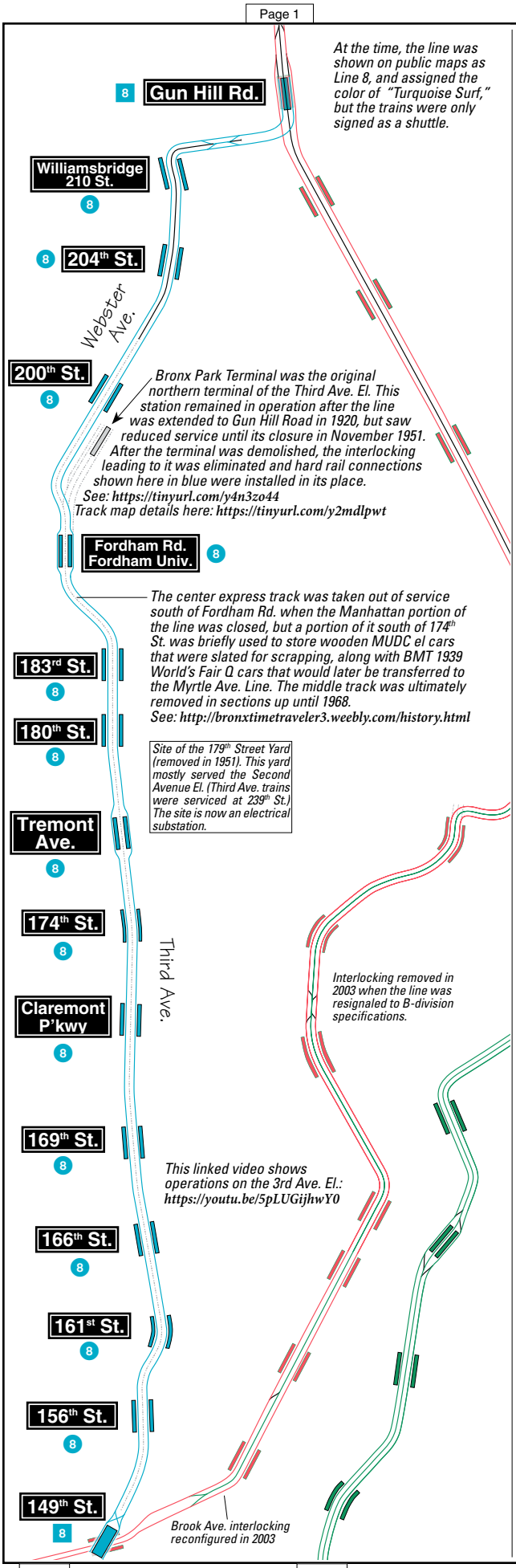
TRIP COCKS & TRIP ARMS: Automatic train stop mechanism used to apply the brakes to any train that passes a red signal.

TOWER: Room from which signals and tracks are controlled.

TURNOUT: A switch that diverges from one route to a new, separate route or where two tracks converge into one.

WHEEL DETECTOR: Mechanism which senses the speed of a train's wheels, and will trip the brakes if it is moving too fast.

WYE: Three-track arrangement that allows a train to make a three-point turn, reversing directions.



Page 5

Bronx
Third Ave. Elevated

Last train: April 29, 1973

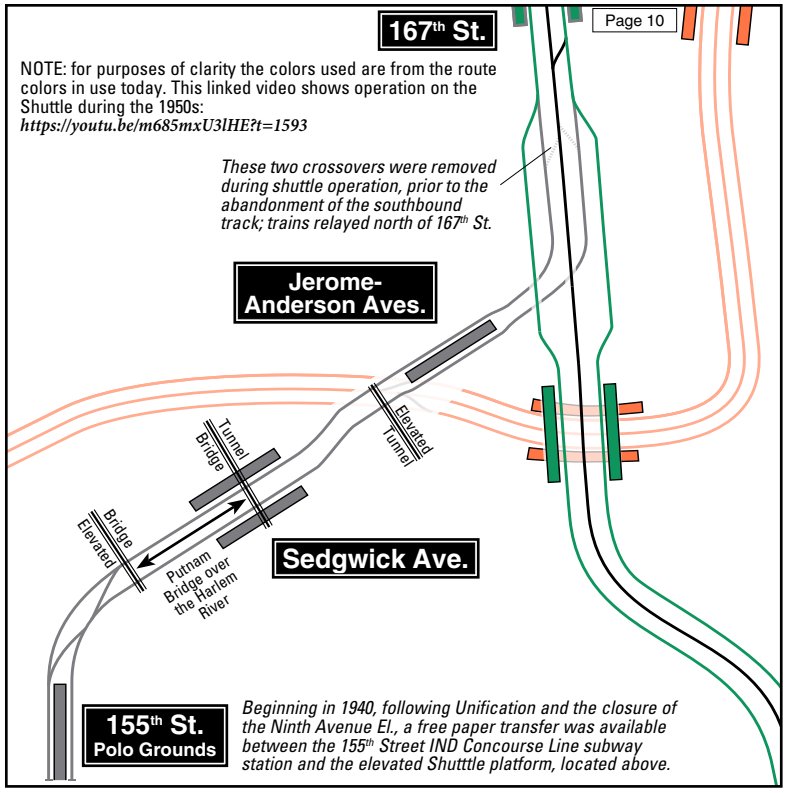
Of the four original Manhattan elevateds, only the Third Avenue Line was kept running after 1942 on the theory that it would be needed to handle the east side crowds until the proposed Second Avenue subway could be built—which wouldn't happen for another 62 years! Portions of the line were torn down after the war, and the final train rumbled over Manhattan's last elevated on May 12, 1955. A six-mile stretch of the line remained operational as a shuttle service in the Bronx for 18 years along the route depicted at left. Fate finally caught up with the Third Avenue Elevated at 12:01 am on April 29, 1973 with the last train from Gun Hill (Road).

Bronx
Polo Grounds Shuttle

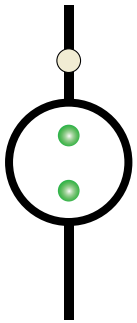
Last train: August 31, 1958

Shortly after unification in June of 1940, the push was on to dismantle Manhattan's elevateds. The Second Ave. El. north of 59th Street and the Ninth Ave. El. in Manhattan closed at 12:01 am on June 12, 1940 as part of the unification deal.

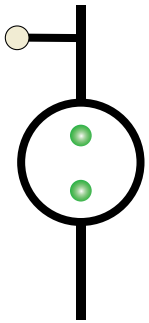
A small portion of the 9th Ave El., the "Polo Grounds Shuttle," remained—primarily to serve the NY (baseball) Giants' home stadium, running four stops between the Polo Grounds and 167th St., normally using two-car trains. After the Giants moved to San Francisco, and the N.Y. Central's Putnam Line terminal at Sedgwick Avenue closed, the line suffered dwindling ridership and was reduced to single track operation using the northbound track. It ceased operation entirely on August 31, 1958.



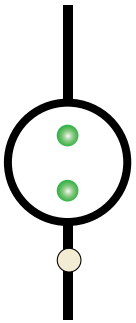
SIR Signals



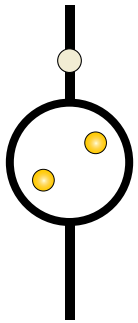
Rule 281
CLEAR
Proceed



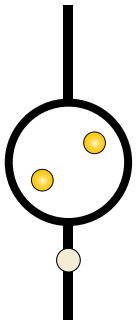
Rule 282A
APPROACH MEDIUM
Proceed Approaching next signal at Medium Speed



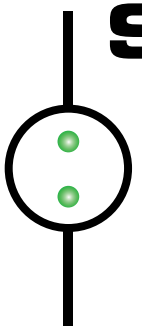
Rule 282A
MEDIUM CLEAR
Proceed: Medium Speed within interlocking limits



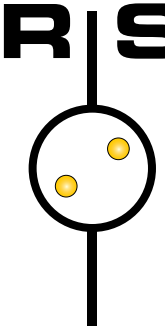
Rule 284
APPROACH
Proceed, approaching next signal prepared to stop. Trains exceeding Medium Speed must reduce to that speed



Rule 284A
MEDIUM APPROACH
Proceed at Medium Speed, approaching the next signal prepared to stop.



Rule 285
SLOW CLEAR
Proceed: Slow Speed within interlocking limits

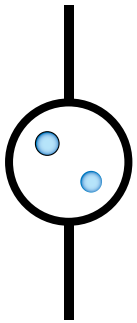


Rule 281
SLOW APPROACH
Proceed at Slow Speed, approaching next signal prepared to stop

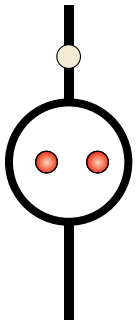
Rule 292
ADVANCE SIGNAL
Fully-equipped trains proceed governed by cab signal indications.

All other trains proceed approaching next signal prepared to stop, still obeying signal aspect displayed and/or instructions received at previous location. Trains exceeding Medium Speed must reduce to that speed.

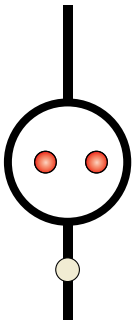
NOTE: Blue aspects shown on these pages are lunar white (white light with a bluish tint). Marker lights depicted as light yellow are regular white aspects.



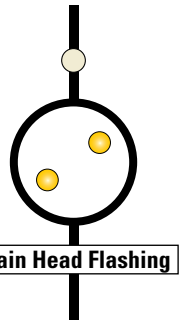
Rule 287
RESTRICTING
Fully-equipped trains proceed at Restricting Speed. All other trains stop and call dispatcher for instructions.



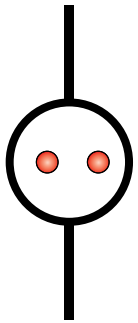
Rule 288
STOP AND PROCEED
Fully-equipped trains STOP and proceed at Restricting Speed. All other trains stop and call dispatcher for instructions.



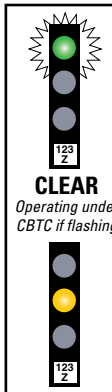
Rule 288
STOP AND PROCEED
Fully-equipped trains STOP and proceed at Restricting Speed. All other trains stop and call dispatcher for instructions.



Rule 288
APPROACH PERMISSIVE
Fully-equipped trains proceed, governed by cab signal indications. All other trains proceed approaching next signal prepared to stop. Trains exceeding Medium Speed must reduce to that speed immediately.

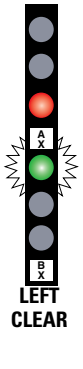


Rule 289
STOP

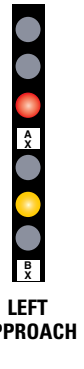


CLEAR
Operating under CBTC if flashing

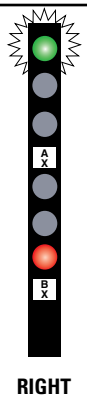
APPROACH
Repeater if flashing



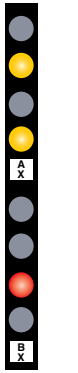
LEFT CLEAR



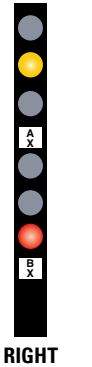
LEFT APPROACH



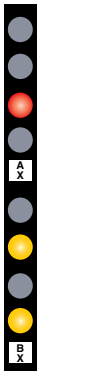
RIGHT CLEAR



RIGHT SPEED CONTROL



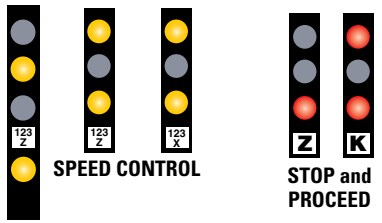
RIGHT APPROACH

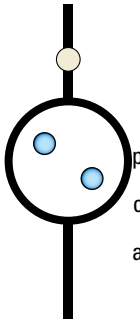


LEFT SPEED CONTROL

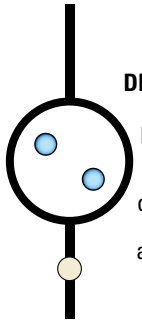
PATH Signals

PATH has converted to CBTC & PTC. Any flashing green aspect denotes proceed under CBTC rules.





Rule 290
PERMISSIVE
Fully-equipped trains proceed into occupied block, governed by cab signal indications. All other trains stop and call dispatcher for instructions.

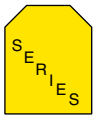


Rule 291
DIVERGING PERMISSIVE
Fully-equipped trains proceed via diverging route into occupied block, governed by cab signal indications. All other trains stop and call dispatcher for instructions.

SIR color-position signals, and their respective rule numbers, track very close to NORAC signals with only minor variances. STOP AND PROCEED indications are not actually in service on the SIR, but are provided for under Rule 288.

Common Signals and Signs

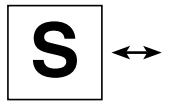
The signals and signs depicted on these pages are a representative sampling of those likely encountered on a regular basis. Not every sign and signal used on the transit system is shown.



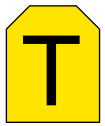
Do not exceed SERIES speed until reaching a RESUME SPEED sign.

Station platform sign for station with system telephone on platform level

Station Car Stop Sign. 6 denotes number of cars



Station Car Stop Sign for all trains. Sign may also be white-on-black.



Beginning of Time Control

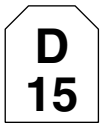
Beginning of grade timing section

Beginning of station timing section

Proceed at speed 10 denotes 10 MPH

Beginning of station timing section in approach to an ST signal with a diverging route ahead. 10 MPH

Beginning of grade timing section in approach to a GT signal with a diverging route ahead. 10 MPH



Diverging Route 15 denotes MPH

Reduce Speed (IRT ONLY) 20 denotes MPH

Radio frequency change point

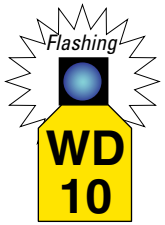
Maximum speed when running against the normal direction

NOTE: Light-blue aspects shown on these pages are actually lunar-white (white with a slightly bluish tint).

Layup Car Stop Sign
Position at which designated trains are to be stored. (Position 3 here)

Entering wheel detector area. Adjust speed and expect a diverging route.

Comply with previously-posted speed, adjust to posted speed

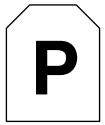


Adjust to posted speed; light will stop flashing and illuminate steadily when the train operator complies with previously-posted speed.

Maximum length train has cleared wheel detector area and permissible speed for the track section may be resumed, unless otherwise specified.

Automatic Key-by feature disabled. Contact Rail Control Center. Red background for movements against the normal direction of traffic.

Operations past this sign must be at RESTRICTED SPEED and with EXTREME CAUTION



Employee Loading Platform

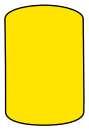
Reverse movement car stop sign for locations other than station platforms

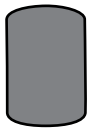
STOP
Proceed in accordance with special instructions

FOULING POINT at switches

Emergency Alarm Location

Emergency Alarm





Emergency Telephone

Conductors' board—indicates to conductors that all doors on the train are abreast of the platform.

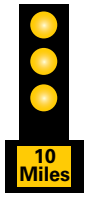
No clearance between tunnel wall and train to permit a person to safely pass or stand.

Conductor must not open doors on this side unless directed by proper authority.

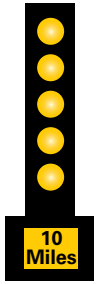
Skip-Stop signs, to alert train operators of train operating patterns on the J and Z lines in Brooklyn. Signs have been installed prior to entering, and within each station, indicating which train is to make a station stop.

Gap Filler Indicator Signal
When illuminated indicates the number of cars the doors of which may be safely opened. Conductors must NOT open doors until the signal is illuminated.

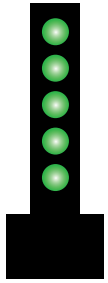
Gap filler sign located near the 10-car station car stop sign



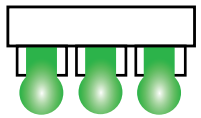
Slow speed ahead–Reduce to indicated speed.



Temporary Slow Speed. Proceed at indicated speed.



Slow Order Resume speed

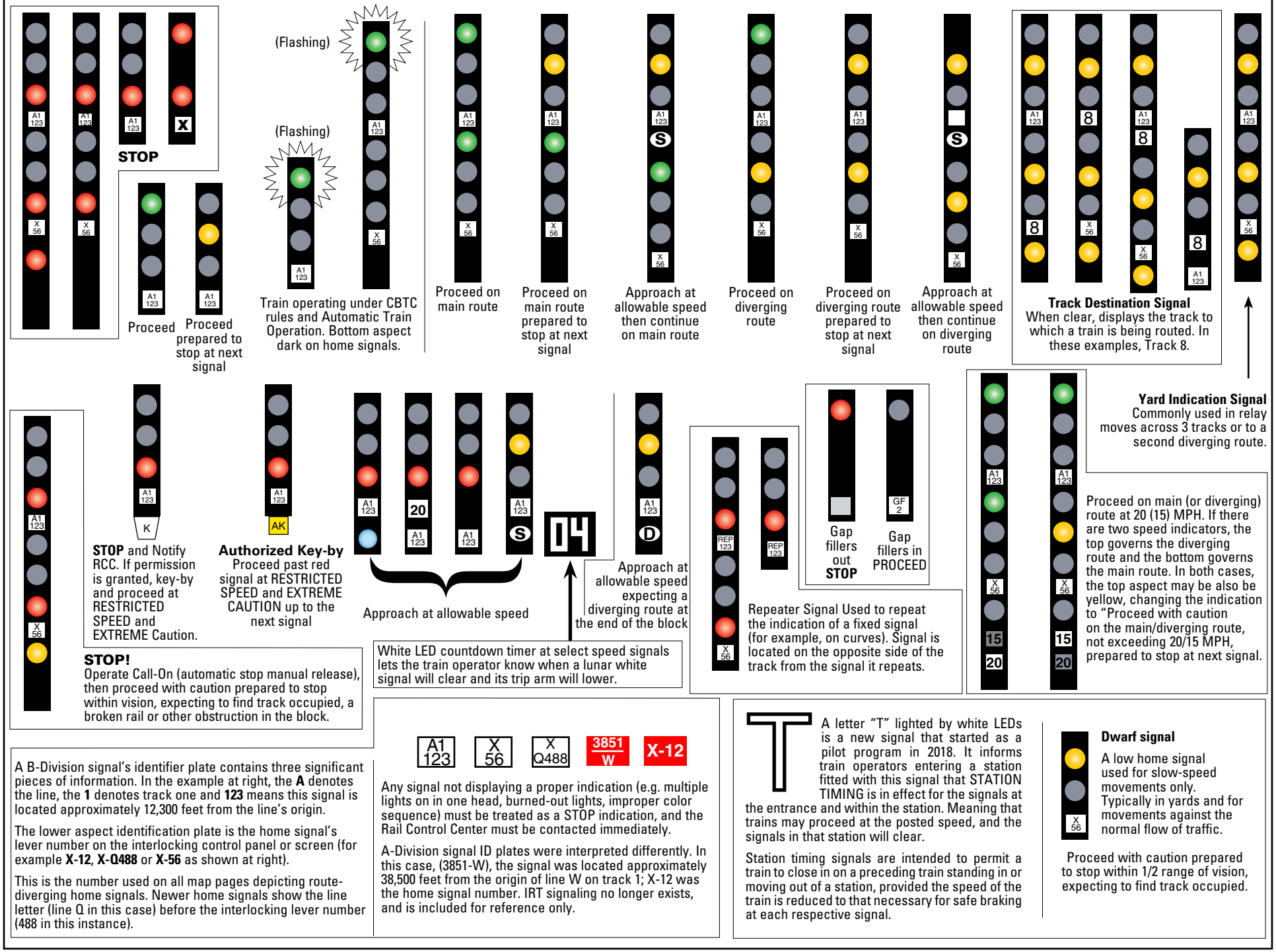


Train Starting Signal (at terminals) Train may proceed when signal illuminates.

Train Holding Signal Train may proceed when signal extinguishes.

Telephone for orders. STOP and stay. Telephone number to call for orders inserted in box.

No orders. Proceed



Tracks of the New York City Subway

Peter Dougherty

Have you ever looked out the front of a New York City subway train and wondered how all the tracks interconnect with one another? Or were you curious what information the color signal lights actually told the train operator? This book delves into the myriad of wonderful operational details that never seems to make it into any other discussion of New York's favorite underground movement!

In addition to complete maps of every main-line and yard track in the subway system today, *Tracks of the New York City Subway* is chock-full of notes and details of abandoned stations, disused tunnels, how the tracks are numbered, signal indications, radio system details, and much more. Also included are track maps of the Staten Island Railway, Grand Central Terminal, Penn Station, and the underground portions of the PATH system.

This revised edition explores all current and planned major track and signal construction projects. Whether you're a railfan, subway buff, or just a curious straphanger, you'll find *Tracks of the New York City Subway* a tremendous reference tool!