

Bus Electrification Plan and Near-term Bus Purchases

March 2022



Overview

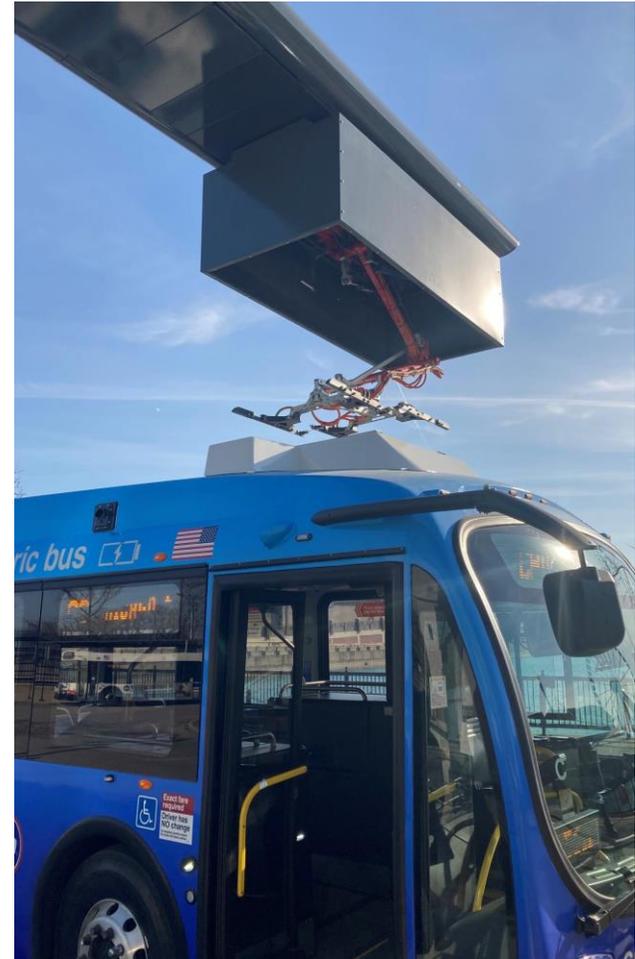
- On Tuesday, February 22, CTA released the final report for its *Charging Forward* study.
- The plan detailed in this report provides a roadmap for full electrification of CTA's bus fleet, facilities, and supporting infrastructure by 2040.
- CTA is moving deliberately and strategically to implement this plan.
- Equity considerations are at the forefront of CTA's electrification approach.
- Near-term bus purchases, both diesel and electric, support the achievement of this plan.



Electric Bus Charging Technology

Overhead pantograph charging is most appropriate for CTA's needs.

- Charging can occur in a largely automated fashion with minimal staff effort required
- Pantograph can be used for both “slow charging” and “fast charging”
- Chargers can be used both at bus garages and at on-route locations



Where to Install Charging Infrastructure

- CTA's best approach to charging electric buses is to **centralize charging at bus garages**.
 - At garages, CTA expects to use a mixture of fast charging and slow charging.
- CTA also plans to construct a limited number of supplemental **on-route fast chargers at key layover locations**.

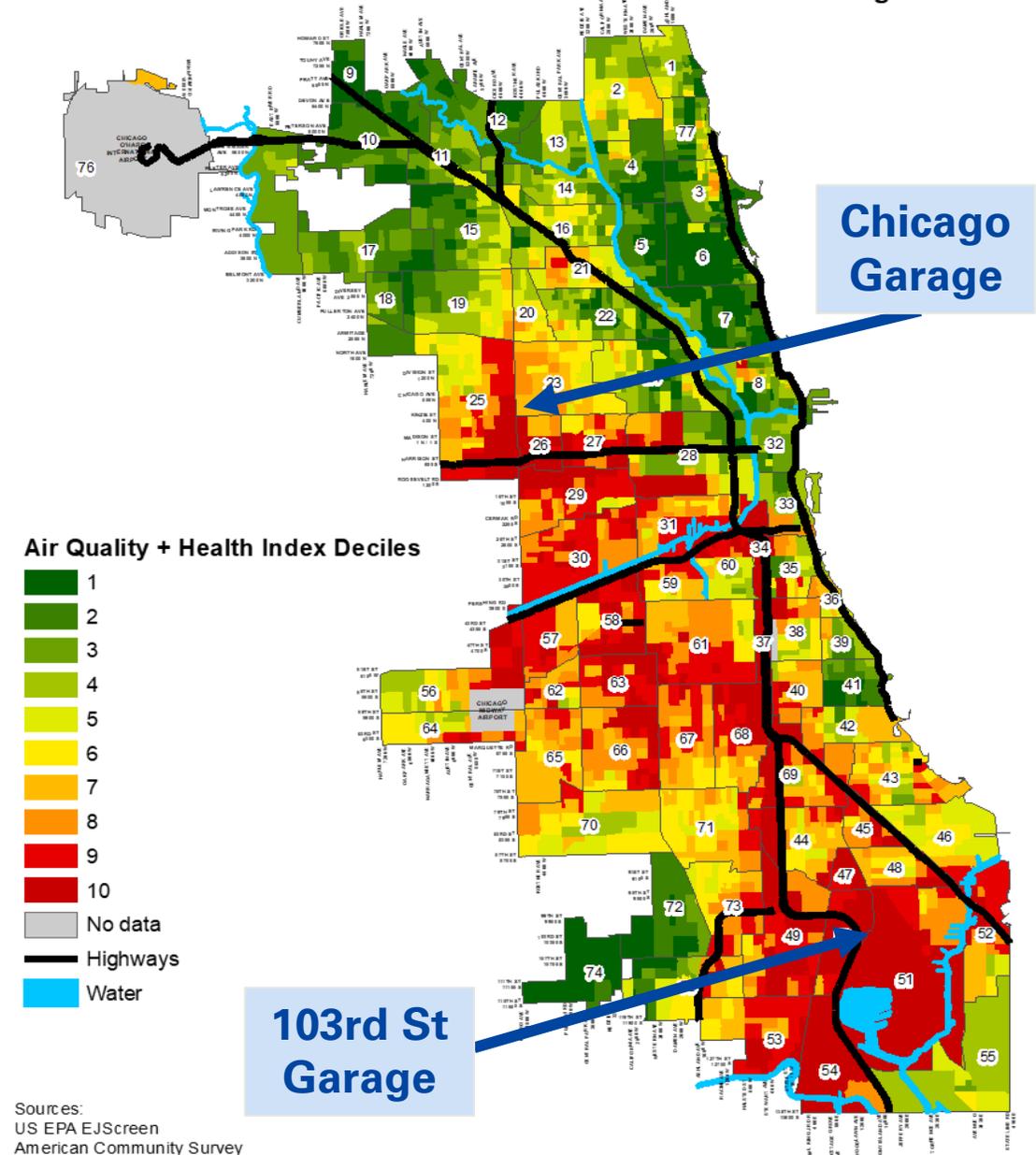


Equity and Health Benefits

As CTA scales the electric bus fleet, initial deployments will be guided by equity.

- CTA's first two target garages for bus fleet electrification are on the West Side and the Far South Side of Chicago.
- CTA selected these garages because communities in the area currently experience among the highest levels of air pollution and health vulnerability today.

Air Quality and Health Index, Chicago



Sources:
US EPA EJScreen
American Community Survey
US CDC 500 Cities
IDPH Vital Statistics
Various years combined, 2011-2017

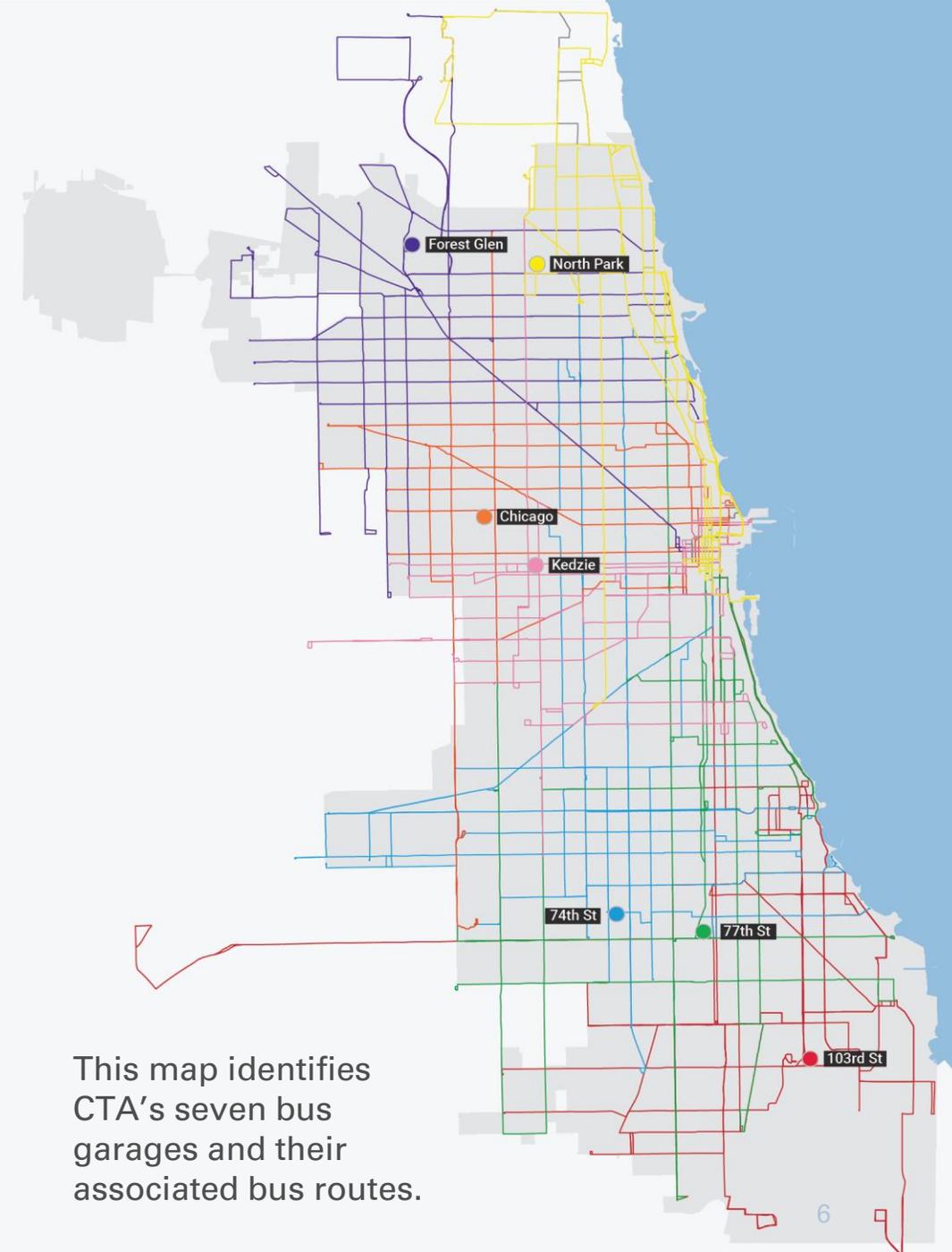
Created by Office of Epidemiology,
Chicago Department of Public Health, May 2019

Garage Electrification Sequence Based on Equity

Recommended sequencing of bus garages with equity considerations

Order	Garage	Equity Prioritization
1	Chicago	Very High
2	103rd	Very High
3	77th	Very High
4	74th	Very High
5	New Garage	TBD
6	Kedzie	High
7	Forest Glen	Low
8	North Park	Low

Further study is needed to identify the specific upgrades that should coincide with electrification at each bus facility.

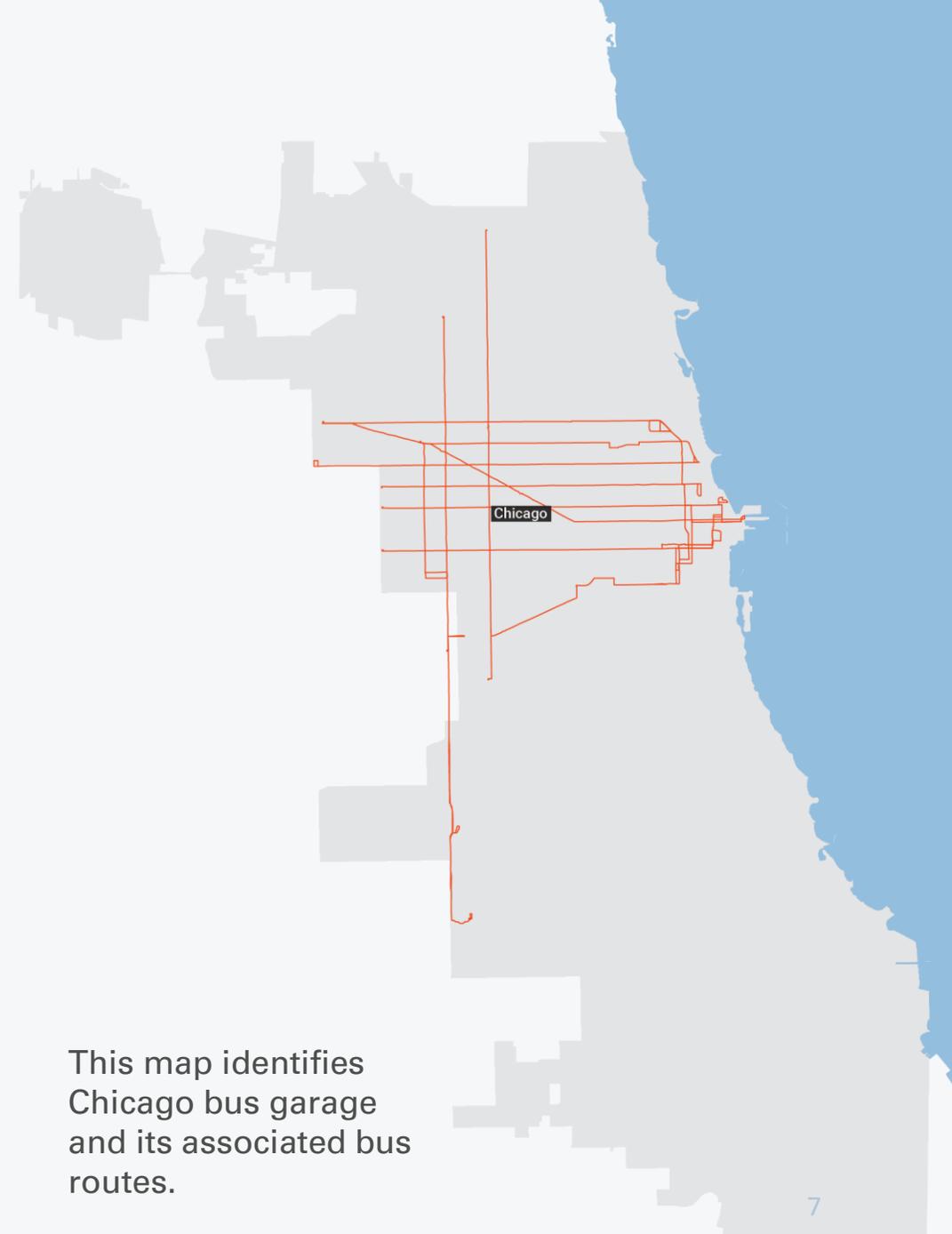


This map identifies CTA's seven bus garages and their associated bus routes.

Garage Electrification Sequence Based on Equity Chicago Garage Bus Routes

Recommended sequencing of bus garages with equity considerations

Order	Garage	Equity Prioritization
1	Chicago	Very High
2	103rd	Very High
3	77th	Very High
4	74th	Very High
5	New Garage	TBD
6	Kedzie	High
7	Forest Glen	Low
8	North Park	Low



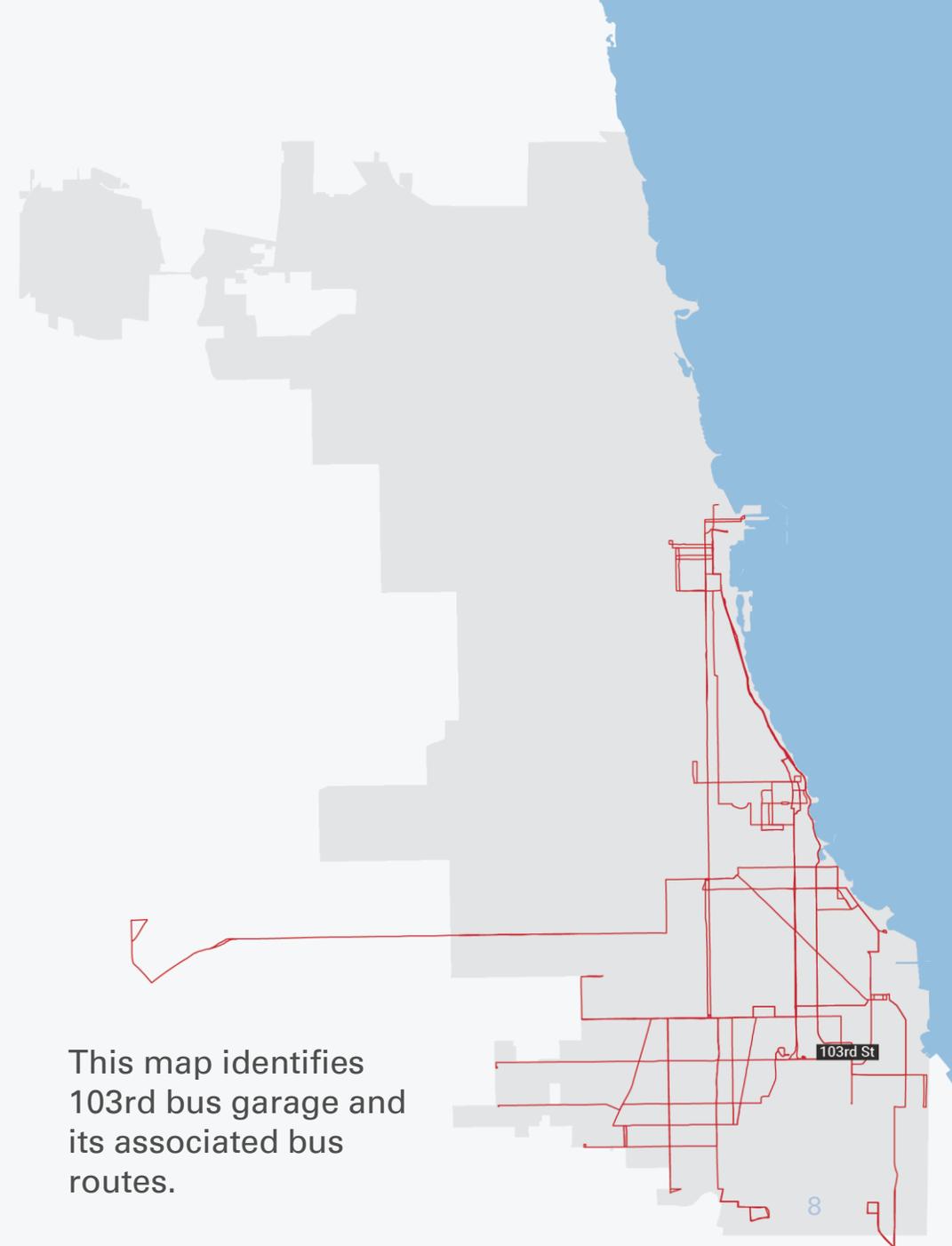
This map identifies Chicago bus garage and its associated bus routes.

Garage Electrification Sequence Based on Equity

103rd Garage Bus Routes

Recommended sequencing of bus garages with equity considerations

Order	Garage	Equity Prioritization
1	Chicago	Very High
2	103rd	Very High
3	77th	Very High
4	74th	Very High
5	New Garage	TBD
6	Kedzie	High
7	Forest Glen	Low
8	North Park	Low

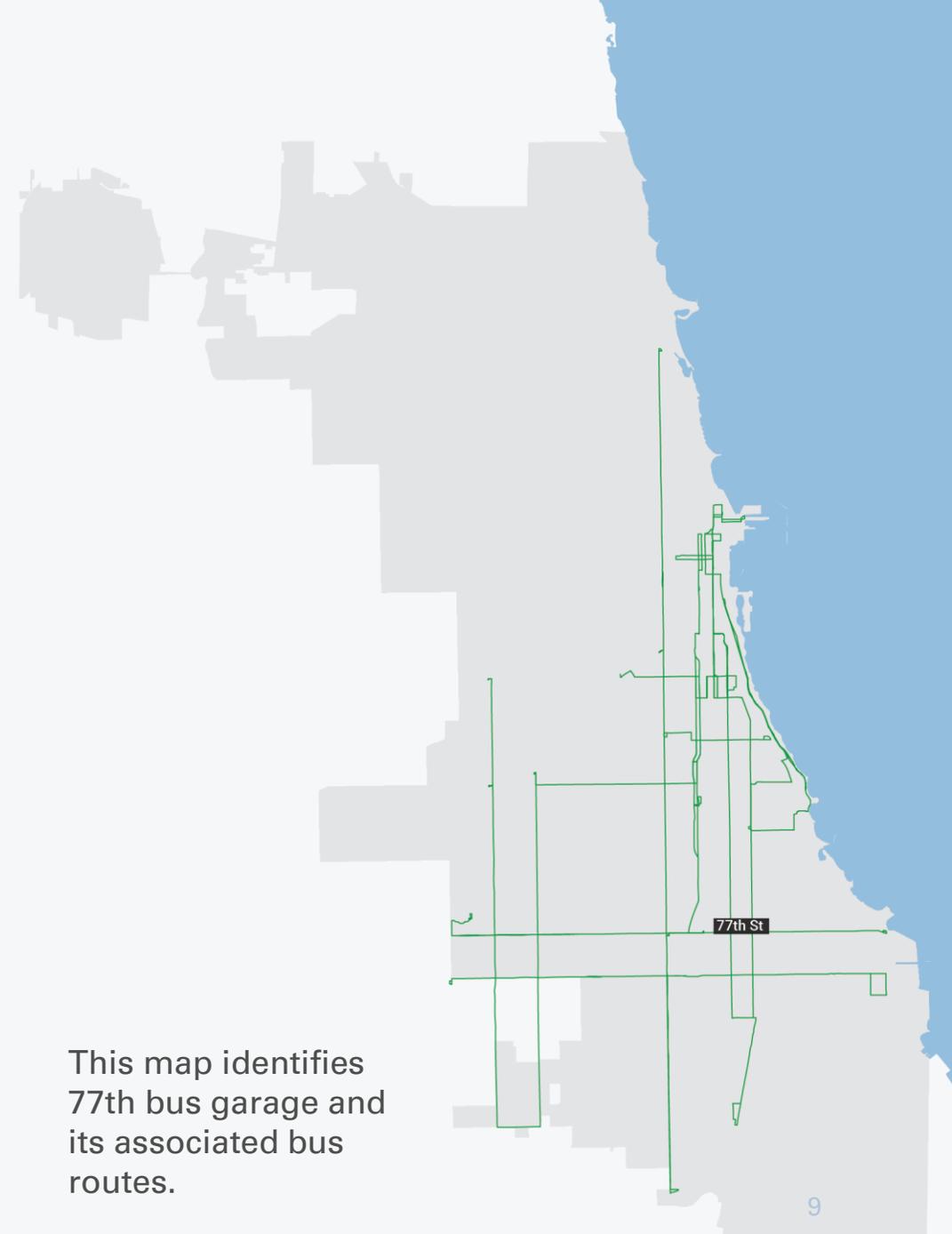


Garage Electrification Sequence Based on Equity

77th Garage Bus Routes

Recommended sequencing of bus garages with equity considerations

Order	Garage	Equity Prioritization
1	Chicago	Very High
2	103rd	Very High
3	77th	Very High
4	74th	Very High
5	New Garage	TBD
6	Kedzie	High
7	Forest Glen	Low
8	North Park	Low



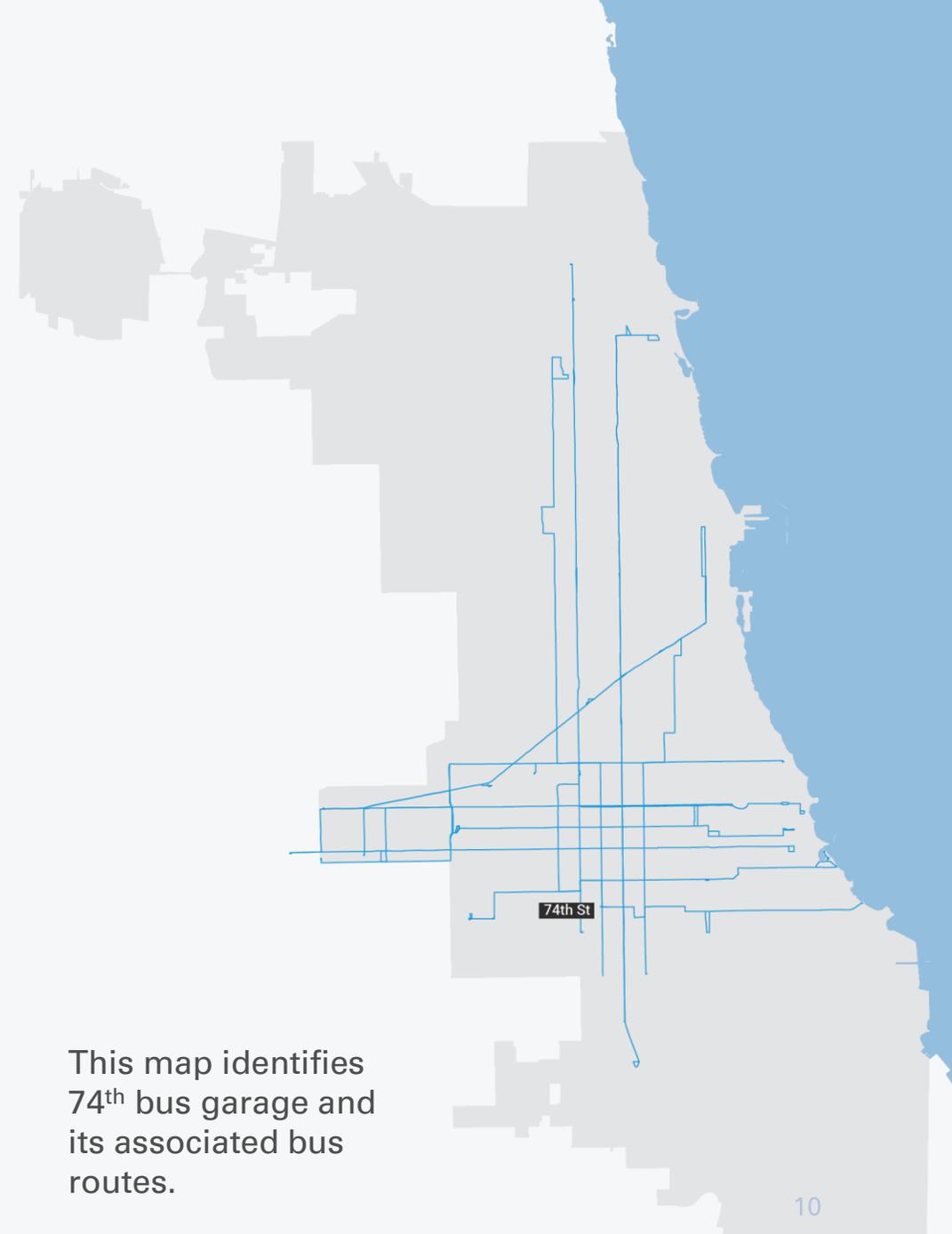
This map identifies 77th bus garage and its associated bus routes.

Garage Electrification Sequence Based on Equity

74th Garage Bus Routes

Recommended sequencing of bus garages with equity considerations

Order	Garage	Equity Prioritization
1	Chicago	Very High
2	103rd	Very High
3	77th	Very High
4	74th	Very High
5	New Garage	TBD
6	Kedzie	High
7	Forest Glen	Low
8	North Park	Low



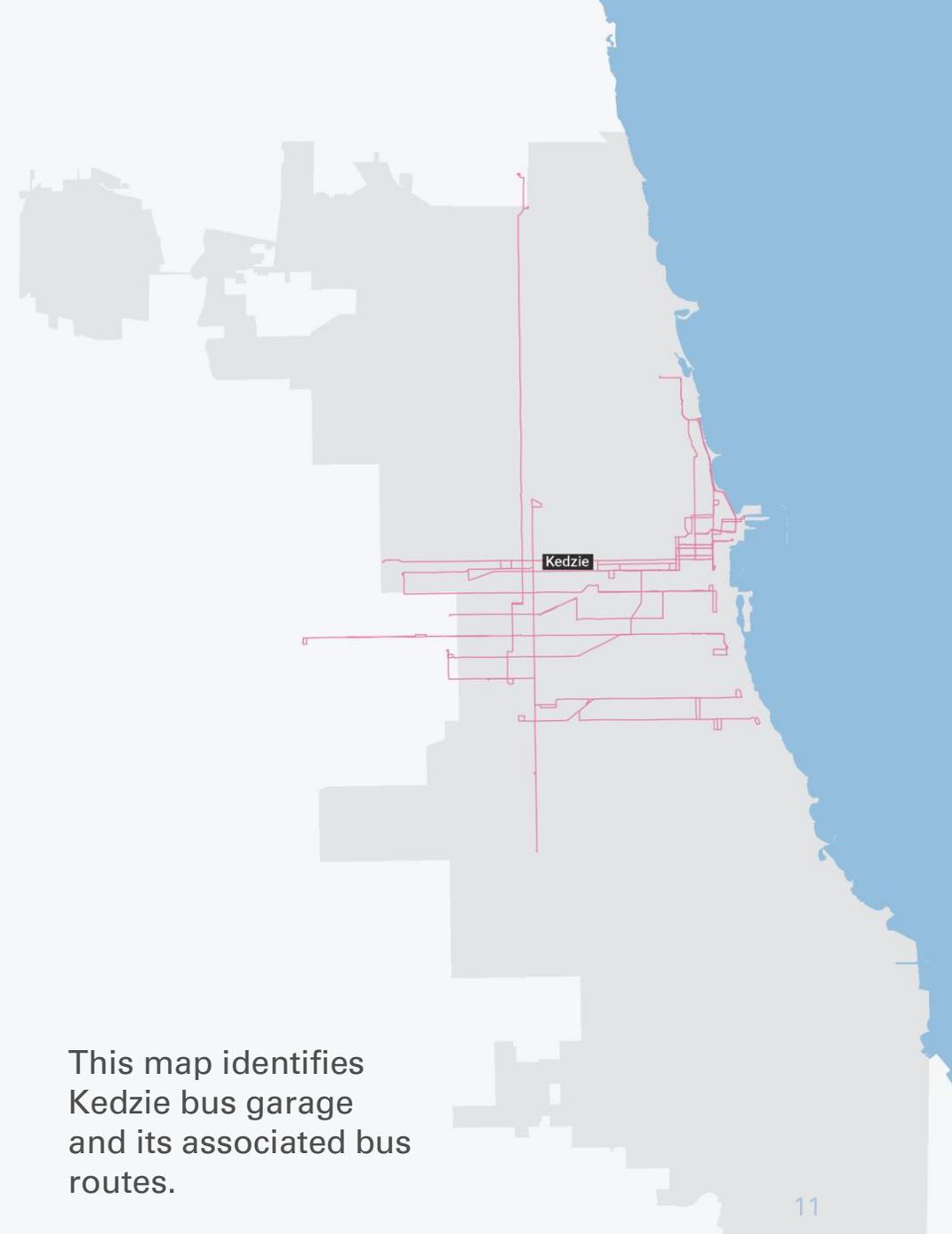
This map identifies 74th bus garage and its associated bus routes.

Garage Electrification Sequence Based on Equity

Kedzie Garage Bus Routes

Recommended sequencing of bus garages with equity considerations

Order	Garage	Equity Prioritization
1	Chicago	Very High
2	103rd	Very High
3	77th	Very High
4	74th	Very High
5	New Garage	TBD
6	Kedzie	High
7	Forest Glen	Low
8	North Park	Low

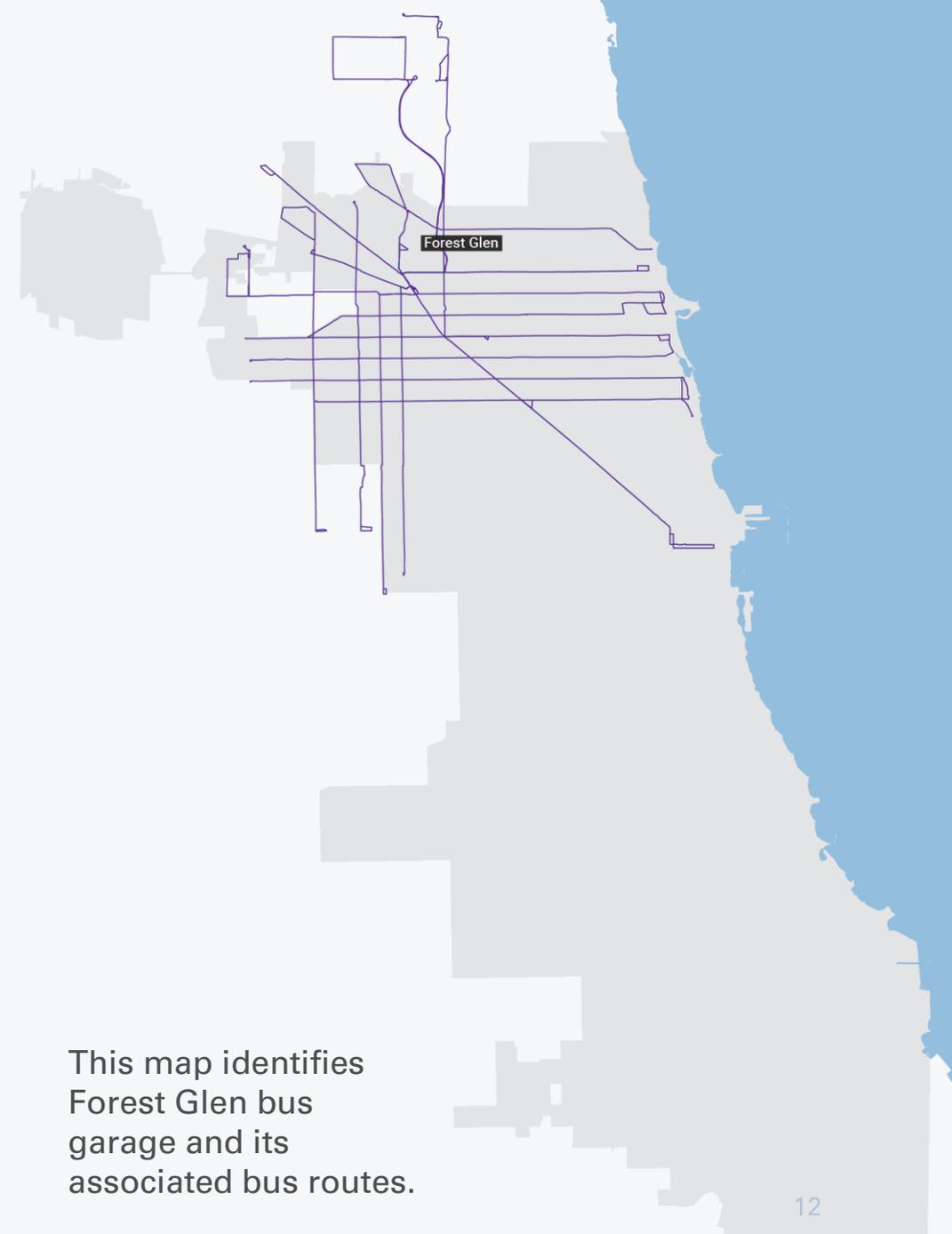


This map identifies Kedzie bus garage and its associated bus routes.

Garage Electrification Sequence Based on Equity Forest Glen Garage Bus Routes

Recommended sequencing of bus garages with equity considerations

Order	Garage	Equity Prioritization
1	Chicago	Very High
2	103rd	Very High
3	77th	Very High
4	74th	Very High
5	New Garage	TBD
6	Kedzie	High
7	Forest Glen	Low
8	North Park	Low



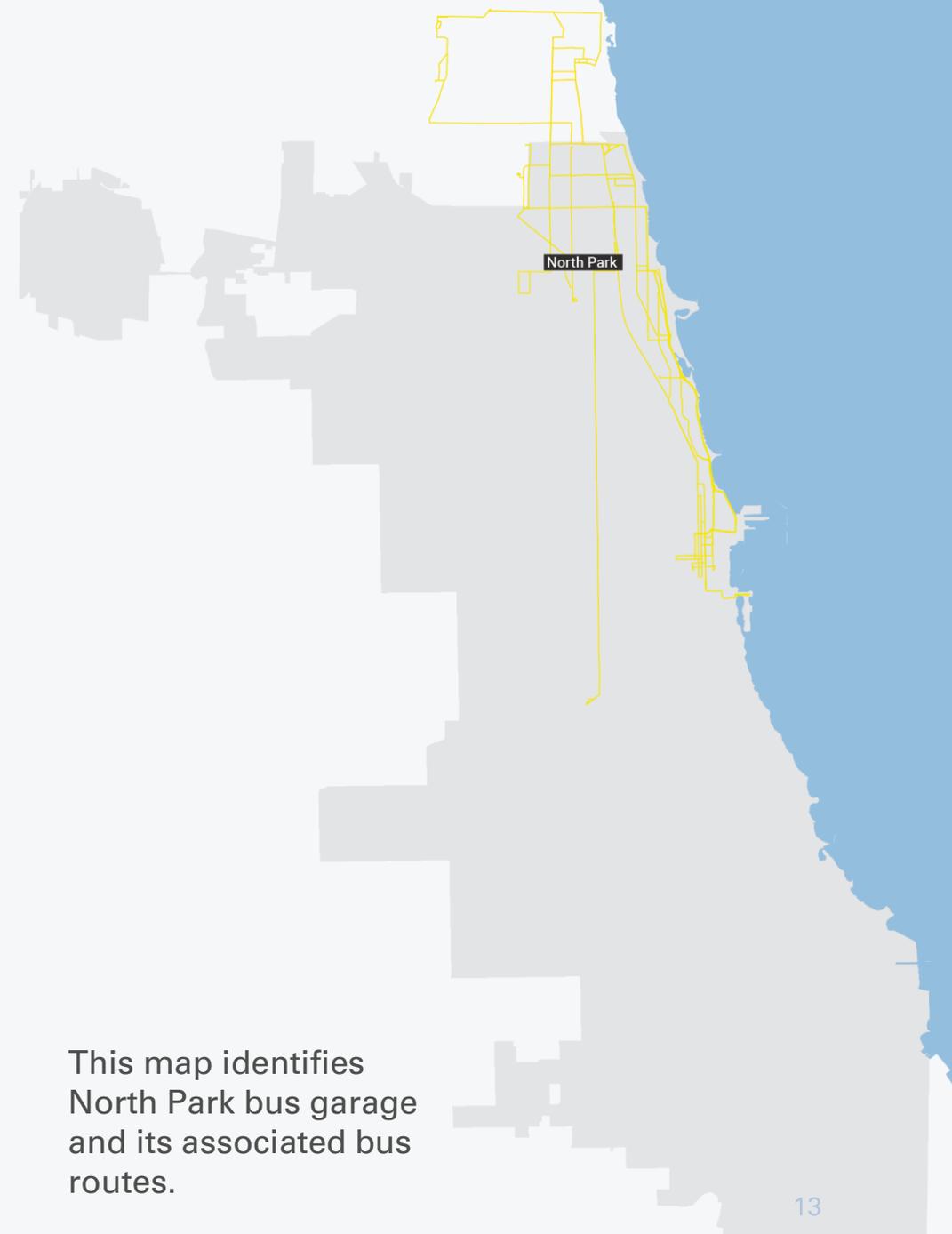
This map identifies Forest Glen bus garage and its associated bus routes.

Garage Electrification Sequence Based on Equity

North Park Garage Bus Routes

Recommended sequencing of bus garages with equity considerations

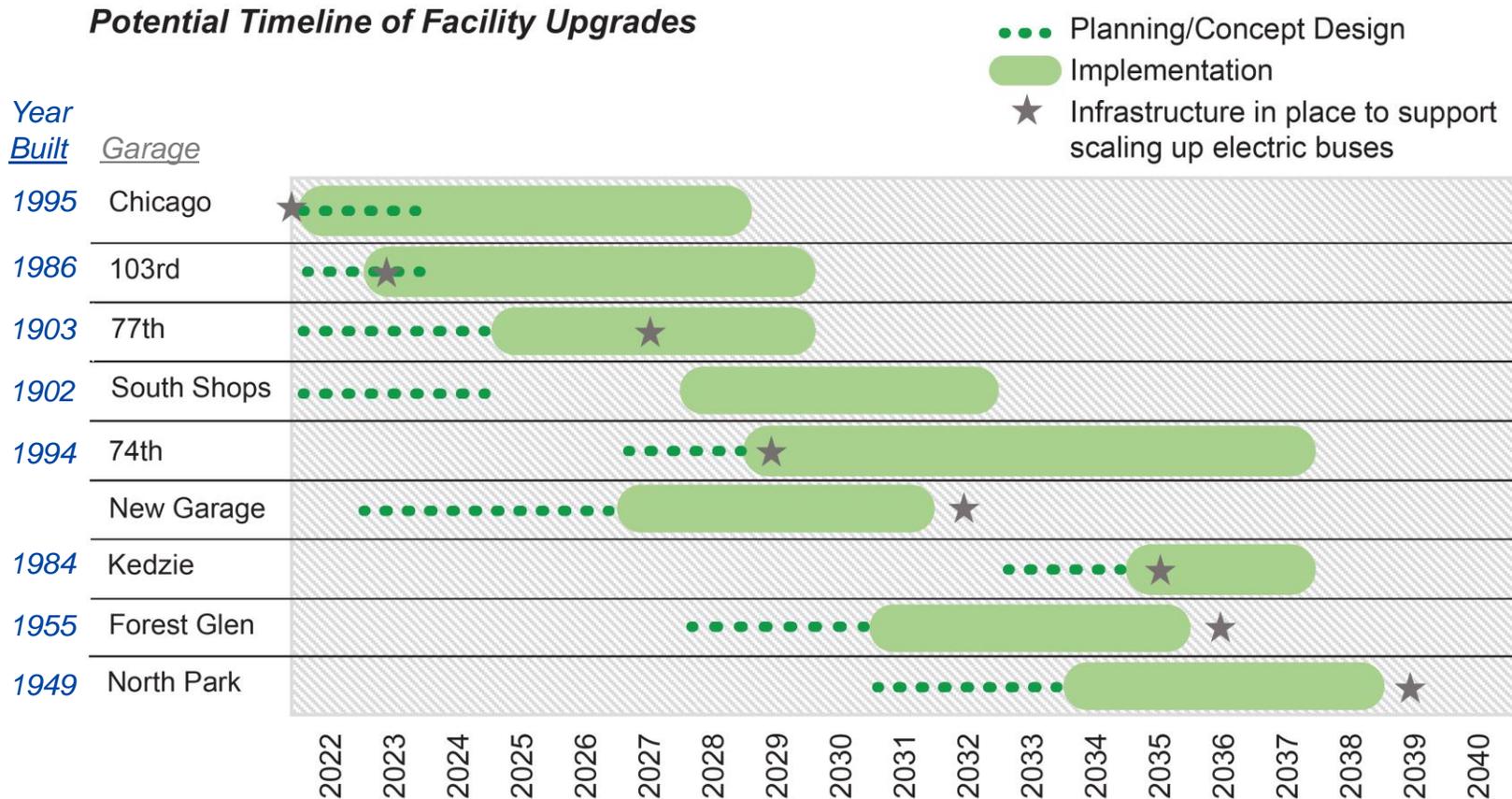
Order	Garage	Equity Prioritization
1	Chicago	Very High
2	103rd	Very High
3	77th	Very High
4	74th	Very High
5	New Garage	TBD
6	Kedzie	High
7	Forest Glen	Low
8	North Park	Low



This map identifies North Park bus garage and its associated bus routes.

Potential Transition Timeline to Meet CTA's 2040 Conversion Goal

Potential timeline of garage upgrades. Note that full garage modernization projects are shown as a five-year process that includes planning and design.

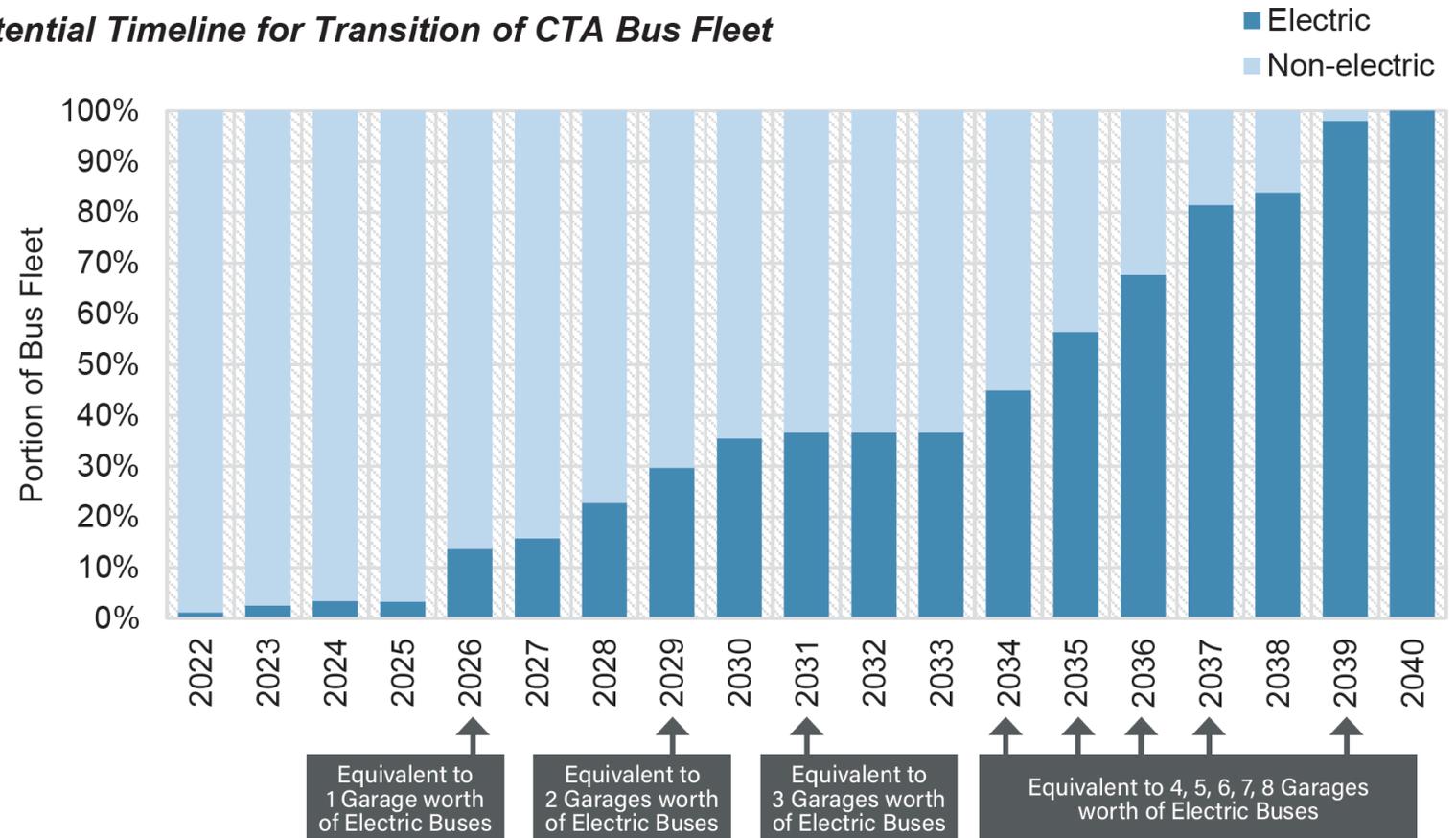


Potential Transition Timeline to Meet CTA's 2040 Conversion Goal

- Graph shows **only electric bus purchases starting in 2026**, assuming a 14-year useful life for a bus.
- Black boxes at the bottom of the graph illustrate how charging infrastructure should align with fleet growth along the transition timeline.
- In practice, multiple garages could have mixed electric and diesel fleets throughout the transition.

Graph of potential CTA bus fleet transition timeline. Figures represent purchases that would be needed to replace all buses after 14 years of age.

Potential Timeline for Transition of CTA Bus Fleet



Service Reliability Through the Transition

To maintain service reliability and to reduce environmental impacts in the near term, CTA must decrease the age of its buses.



- Today, the average age of buses in CTA's fleet is 13 years. Industry standard lifetime for a transit bus is 12 years. CTA's target bus lifetime is 14 years.
- 1,285 of the 1,839 active buses (70%) in CTA's fleet are Model Year 2008 or earlier.
- Older buses have worse fuel mileage, worse reliability, and higher maintenance costs than newer buses.
- Diesel buses purchased before 2026 and run 14 years will be retired before CTA's 2040 target for full fleet electrification.
- Limited electric bus manufacturing capacity and lack of installed charging infrastructure preclude CTA from purchasing electric buses to meet the scale of replacement necessary.

Near-term Bus Purchase Plans

In the near term, CTA's new diesel bus purchases will ensure service reliability.

- 100-bus base order delivery in mid-2022
- Change Order #1 for 100 more buses
- 400 additional options as funding enables

Simultaneously, CTA will take required steps to prepare for future larger-scale purchases of electric buses, including:

- Learning from current deployments
- Modernization of bus garages
- Upgrades to ComEd electrical service
- Installation of charging infrastructure
- Ongoing training for bus personnel



Benefits of Near-Term Bus Purchases

Replacement of CTA's oldest diesel buses with new Nova diesel buses will yield emissions and cost reductions while CTA prepares for larger-scale electric bus deployment.

- The new Nova buses are estimated to emit 12.5% less CO₂ (carbon dioxide), 80% less NOX (nitrous oxides), and 49% less PM2.5 (particulate matter) on a per-mile basis compared to the buses slated for retirement.
- The table below illustrates the new Nova Bus improvement in fuel consumption and operating cost.

CTA Diesel Bus Model	Fuel Consumption	Operating Cost
<i>New replacement buses:</i> 7900 Series – Nova	3.8 miles per gallon	\$2.42 per mile
<i>Old buses to be retired:</i> 1000 Series – New Flyer	3.0 miles per gallon	\$3.69 per mile
Improvement	26%	52%

Near-term Electric Bus Deployment Steps

By mid-2022, CTA anticipates operating a total of 25 electric buses in service.

- 2 New Flyer electric buses launched in 2014
- 6 Proterra pilot electric buses launched in 2021
- 3 Proterra IEPA/VW-funded electric buses launched in Q1 2022 (change order pending)
- 14 Proterra base-order electric buses anticipated to launch Q2 2022

Critically, CTA is also working on planning, design, and installation for charging infrastructure:

- ComEd upgrades at Chicago Garage & 103rd St Garage
- 6 overhead slow-charge pantographs at 103rd St Garage
- 2 overhead fast-chargers at Chicago Garage
- In-depth studies of power requirements and garage modernization needs



Questions?

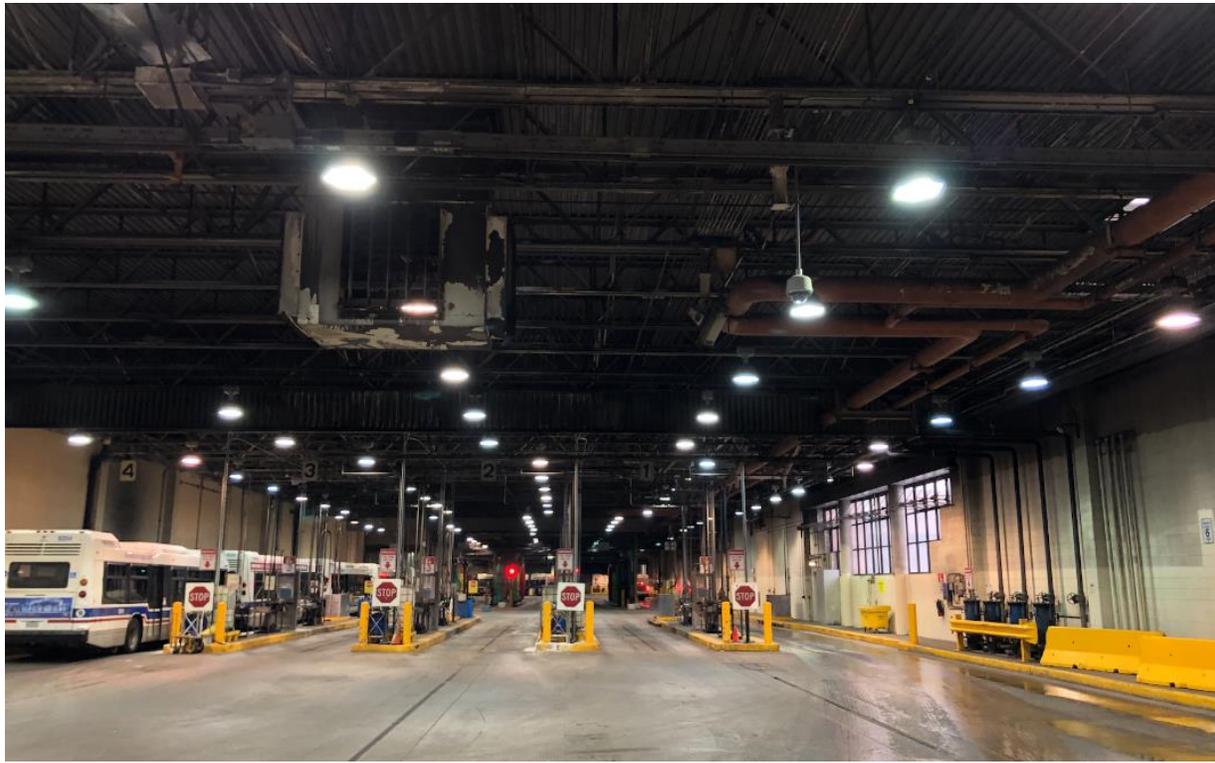


**Electric Substation for Charging Pantograph and Artwork
Chicago and Austin Bus Terminal**

Appendix

Initial locations for bus electrification: Chicago Garage and 103rd St Garage

*Chicago Garage (interior view)
Built in 1995*

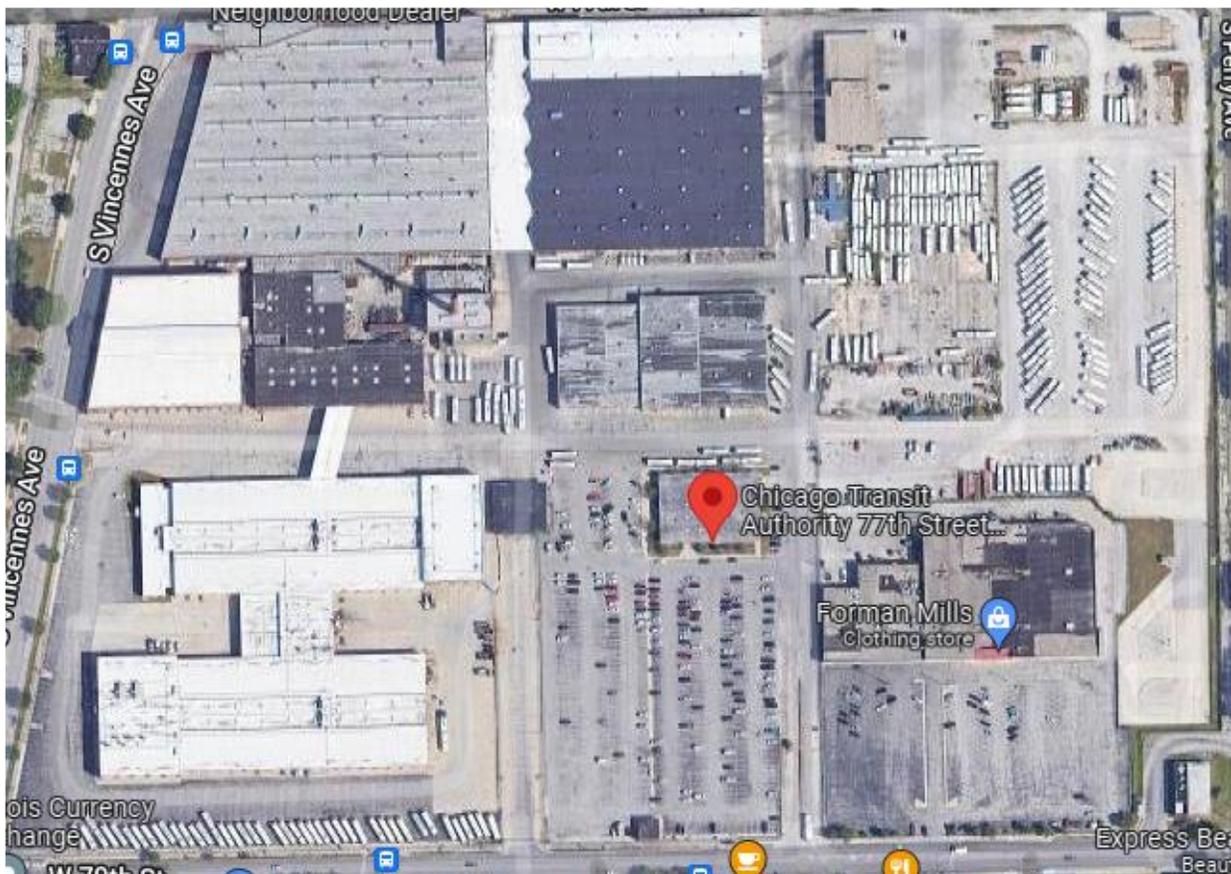


*103rd St Garage (exterior view)
Built in 1986*



First major facility modernization project: 77th St Garage and South Shops

*77th St Garage / South Shops Campus (aerial view)
Built in 1902-1903*



*77th St Garage (exterior view)
Built in 1903*

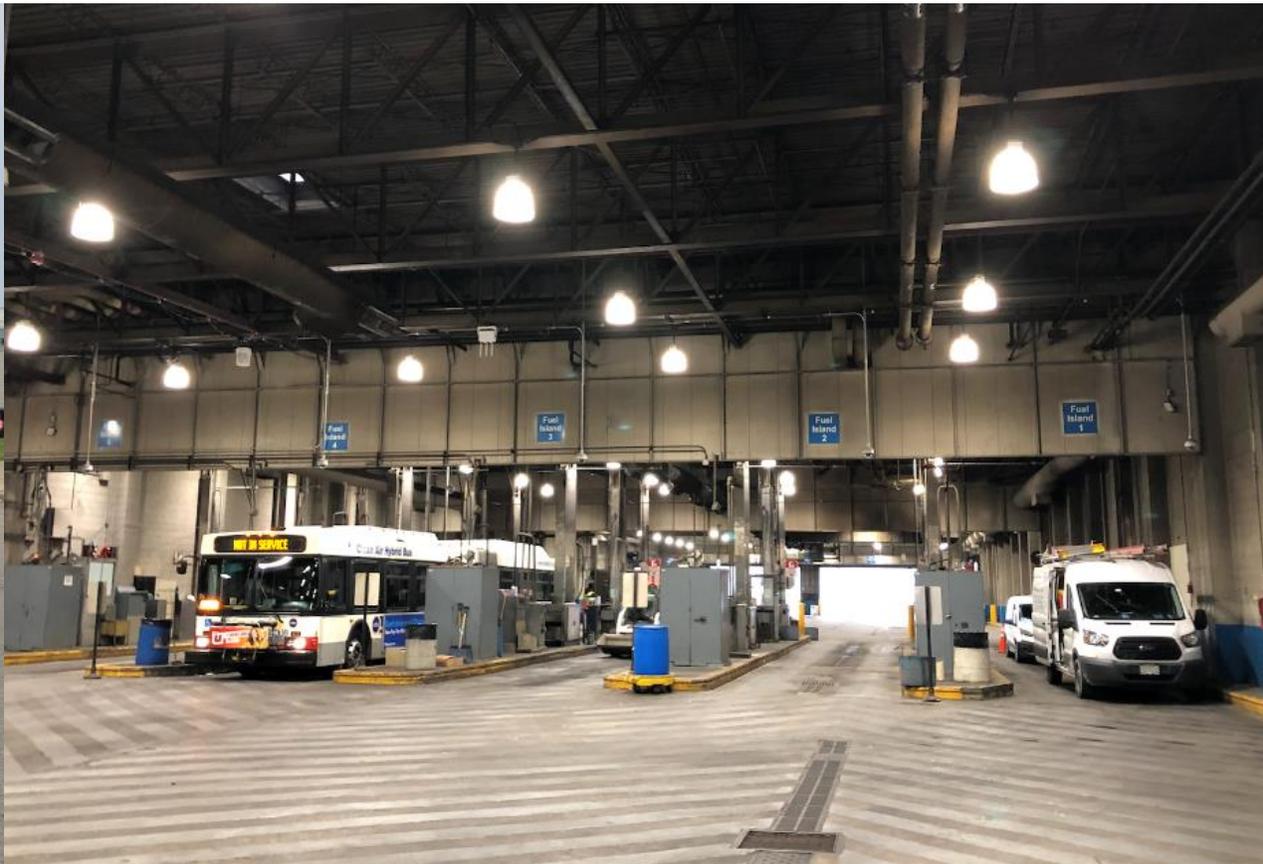


Mid-transition timeline conversions: 74th St Garage and Kedzie Garage

*74th St Garage (exterior view)
Built in 1994*

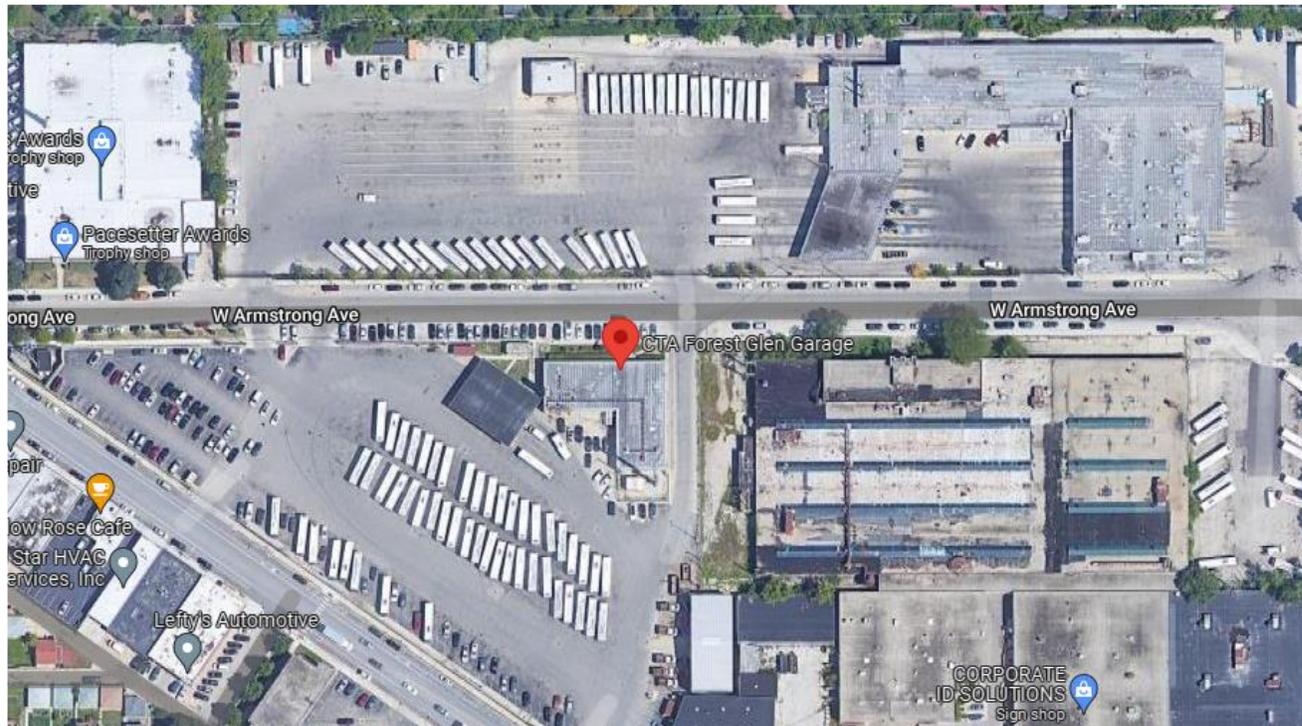


*Kedzie Garage (interior view)
Built in 1984*



Major facility modernization during 2030-2040: Forest Glen Garage and North Park Garage

*Forest Glen Garage (aerial view)
Built in 1955*



*North Park Garage (exterior view)
Built in 1949*

