



Evaluating E-Bike Deployment Strategies:  
Ownership vs. Station-Based Systems

# Metro Mobility ACT4All Final Report

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## Program Design

Metro Mobility LLC (“Metro Mobility”) studied three different electric bicycle (“e-bike”) deployment and incentive models under the Massachusetts Clean Energy Center (“MassCEC”) Accelerating Clean Transportation for All (“ACT4All”) Program to collect data on usage rates, mode replacement, and greenhouse gas emissions reduction for each. MassCEC’s ACT4All Program piloted equity-focused transportation programs that increased clean transportation access and decreased existing transportation burdens for underserved communities across the Commonwealth and provided \$1,337,000 in funding for this study.

Metro Mobility’s three e-bike programs were designed to implement and compare the following deployment models: 1) individual e-bike ownership with discount vouchers, MOR-E-BIKES, 2) individual e-bike ownership with charging station access, MOR + CHARGE, and 3) low-cost shared e-bike rentals from charging stations, E-BIKE LIBRARY. Station-based deployments were enabled by Metro Mobility’s patented ChargeLock station technology, Internet of Things (IoT) and GPS enabled e-bikes, and fleet management and rental software. Deployment locations were chosen with a focus on Environmental Justice (“EJ”) communities and Gateway Cities, and subsidies were provided to incentivize participation and e-bike usage among the priority populations of low-income residents, essential workers, those in need of transportation to access jobs, and underrepresented groups in bike and e-bike usage such as communities of color. The project team included municipalities, housing providers, employers, and Community Based Organizations (CBOs) who offered the program to their residents or employees, provided outreach to priority populations, and hosted e-bike charging stations.

## Deployment Models

### MOR-E-BIKES

The MOR E-BIKES program piloted a voucher-based discount program for personal e-bike ownership and acted as a control group to compare with alternate station-based and shared deployment models. Residents of partner communities could apply to participate with qualified applicants randomly selected and subsequently interviewed to confirm qualification and transportation needs. Participants received a Class-1 pedal assist e-bike, charger, helmet, and bike lock for the one time fee of \$25 in exchange for reporting their e-bike usage through an app. The storage, charging, maintenance and mechanical repair of these e-bikes was the responsibility of the participant. Metro Mobility provided monetary incentives for data reporting as well as support in the form of guidance for maintenance and mechanical repairs. Participants were able to contact Metro Mobility for support throughout the project period.

### MOR + CHARGE

The MOR + CHARGE program piloted personal e-bike ownership with access to a ground-level ChargeLock station near participants’ place of residence for secure storage and charging. For a one-time fee of \$25, participants were provided a Class-1 pedal assist electric bike, helmet, access to a ChargeLock charging station installed by Metro Mobility, and ongoing maintenance of the e-bike during the program. E-bikes were GPS-enabled and network connected to

automatically report usage and route data. Participants unlocked and controlled their assigned e-bike through a mobile app provided by Metro Mobility which additionally surveyed users about their trip purpose and mode replacement. Bikes were equipped with a built-in cable lock, allowing them to be secured to bike racks or poles when away from the station, and enabling trips to places of work, stores, or any destination. When returning home, participants plugged the bike in at the ChargeLock station to lock and charge. The program sought to reduce the burden of e-bike ownership for participants by removing the need for indoor storage and charging, a significant barrier for residents of apartment buildings and multi-unit dwellings.

### **E-BIKE LIBRARY**

The E-BIKE LIBRARY program piloted a low-cost station-based shared e-bike system with all-day round-trip rentals and a discount program for income-qualified users. E-bikes were available for rent through the Metro Mobility mobile app at a market rate of \$12 per day (or \$1 to start + \$0.15/minute for shorter rides), and at a discounted rate of \$1 per day for income-qualified users. Bikes were equipped with a built-in cable lock for securing to bike racks or poles when away from the station. Unlike traditional point-to-point bikeshare, E-BIKE LIBRARY bikes can be used for commuting anywhere without the need for a station at the destination. The e-bike remains rented when locked away from the station, allowing riders to make multiple trips throughout the day. Upon return to the station, the user plugs the ChargeLock cable from the station into the e-bike, which locks it to the station, begins charging the battery, and ends the rental automatically. The always-charging round-trip nature of the program significantly reduces operations costs compared to traditional bikeshare. Some deployment partners chose to restrict E-BIKE LIBRARY access to a qualified group of users rather than making the e-bikes available to the public. Access to e-bikes at Massachusetts General Hospital (MGH) were limited to approved employees, and e-bikes at Just-a-Start's Rindge Tower Apartments were available only to residents of the apartment complex.

### **Key Findings**

Across all program models, Metro Mobility e-bikes were ridden a total of 77,136 miles by participants, demonstrating strong demand for e-bikes as a viable mobility option. The vast majority of reported usage was either Commuting (51.0%) or Errands (27.3%), indicating e-bikes were primarily used for essential travel. 40.1% of all e-bike miles replaced ICE vehicle trips, resulting in meaningful CO<sub>2</sub>e emissions reductions over the course of the project.

In comparing deployment models, the data shows consistently higher utilization for station-based and shared e-bikes compared to traditional ownership models. Station-based e-bikes (MOR + CHARGE and E-Bike Library), achieved approximately three times (3X) more trips per bike deployed than traditional ownership (MOR E-BIKES). Station-based e-bikes also accumulated significantly more mileage per bike on average. Station-based MOR + CHARGE e-bikes were ridden approximately two times (2X) more miles than MOR E-BIKES and shared station-based E-Bike Library bikes were ridden approximately four times (4X) more miles. E-Bike Library bikes, which were open to the public, were still utilized largely by priority population members, with 66% of all trips taken by income-qualified discount users.

Examining cost per Lb CO<sub>2</sub>e avoided, shared E-BIKE LIBRARY bikes produced significantly more GHG reduction per USD than ownership models. Projecting these costs and savings for programs at scale predicts that shared charging station-based e-bikes provide an estimated 10X the CO<sub>2</sub>e avoidance per USD invested compared to traditional ownership incentives.

## Partners

Metro Mobility worked with the following entities as deployment partners, hosting ChargeLock stations on their property and making e-bikes available to their residents and/or employees.

- City of Lawrence
- Trinity Financial / Arlington Point Apartments, Lawrence
- CMJ Management / Harbor Point Apartments, Dorchester
- Medford Housing Authority
- WinnCompanies / Bowdoin Apartments, Malden
- City of Quincy
- Massachusetts General Hospital (MGH)
- Preservation of Affordable Housing (POAH) / The Loop at Mattapan Station
- Just a Start / Rindge Tower Apartments, Cambridge
- Massachusetts Bay Transportation Authority (MBTA) - *Phase 2 Solar Station*
- LAZ Parking / Motor Mart Garage - *Phase 2 Delivery Station*

MOR E-BIKES were distributed to participants in these same communities or in the same region to compare utilization under similar conditions. Metro Mobility also worked with additional Community Based Organizations to promote the MOR E-BIKES program during the application process and advertise the availability of the E-BIKE LIBRARY program throughout the project.

## Timeline

### Phase 1

The project kicked off in April of 2022 with outreach and marketing to solicit participant applications, sourcing and preparation of e-bikes and charging station hardware, and site selection for MOR + CHARGE and E-BIKE LIBRARY stations.

The first e-bikes under the MOR E-BIKES program were distributed to participants in June 2022 and continued on a rolling basis until February 2023. Later reallocation of funds between program models allowed additional MOR E-BIKES to be distributed in June and July of 2024. Phase 1 included a total of 75 MOR E-BIKES.

MOR + CHARGE stations were installed in June and September of 2022, after which participants from the host communities were selected on a rolling basis, with final e-bikes deployed and assigned to participants in July 2024. The MOR + CHARGE program initially included 20 e-bikes, but at the request of one station host, 5 e-bikes were converted to E-BIKE LIBRARY and made available for rent to the general public.

The first E-BIKE LIBRARY stations were installed and opened to the public in October 2022, and after a brief pause in operations during winter 2022/2023, rental operations and additional station installations continued throughout the project period as additional sites were approved. Phase 1 included 80 E-BIKE LIBRARY bikes with the final station opening in May 2025.

**Phase 2**

In February 2024, add-on funding from MassCEC was approved to enable an expansion of the project, adding additional MOR E-BIKES and two special-purpose E-BIKE LIBRARY deployments; 1) e-bikes for delivery use, and 2) ChargeLock Solar, the first solar-powered e-bike charging station in Massachusetts.

Thirty-five (35) additional MOR E-BIKES were distributed to participants throughout Phase 2 with the final e-bikes delivered in August 2024. One ChargeLock station and 5 e-bikes for delivery use were installed in downtown Boston in August 2025 after a lengthy site selection process that examined potential partnerships with restaurants, shared-use commercial kitchens, municipalities, and private property owners. The ChargeLock Solar station and 5 LIBRARY e-bikes were also installed in August 2025 at the Davis MBTA Red Line stop following an extensive permitting and approval process with the MBTA that included station redesigns to comply with installation requirements.

E-Bike Quantities by Deployment Model		
MOR E-BIKES	MOR + CHARGE	E-BIKE LIBRARY
110	15	90

**Outreach and Applications**

Metro Mobility worked closely with deployment partners and area CBOs to market the programs available in each region and recruit, screen, and select participants. Outreach for the ownership programs, MOR E-BIKES and MOR + CHARGE, aimed to build a pool of interested applicants and directed users to an online application form. Outreach and marketing for E-BIKE LIBRARY programs were ongoing throughout the project and focused on driving app downloads, rentals, discount applications, and repeat usage among priority populations.

When possible, outreach leveraged existing communication channels of project partners to maximize reach and engagement. Outreach methods included:

- Direct mailings
- Email newsletters
- Social media posts
- Website news/blog posts
- Physical fliers in public and community spaces
- On-site events and e-bike demonstrations
- Press campaigns

Based on known demographics and feedback from project partners, all outreach materials and application forms were made available in both English and Spanish. Outreach prompted potential participants to visit a URL or use a QR code to access the application form or rental app, or to contact Metro Mobility for more information. CBO partners suggested an option for participants to respond via text message in order to reduce barriers to engagement. Materials included a contact email address and phone number which supported SMS/text message responses, after which Metro Mobility replied with program info and links to relevant resources.

## Application Process

### Ownership Applications

The application form for ownership programs was hosted on [ebikesforall.org](http://ebikesforall.org) alongside basic program information, and collected:

- Name and contact
- Community affiliation or place of residence
- Intended e-bike use (commuting, errands, job search/training, recreation)
- Baseline transportation habits and car ownership
- Housing type
- Demographic data (age, gender, race/ethnicity, income, employment status, education, primary language)

A portion of these demographics for applicants and participants are included below in the Data Summary section.

For ownership models, applicants were screened using three primary eligibility criteria:

1. **Intended Use:** Applicants who indicated recreation as their primary intended use were excluded, as the program's goal was to provide e-bikes for transportation use.
2. **Income:** Eligibility was generally set at or below 65% of Area Median Income (AMI), though any form of government assistance could be used to verify income, so the threshold varied by location and verification method.
3. **Age:** Applicants were required to be 18 or older.

To ensure an equitable application process, demographics such as race, gender, or education were not considered in the selection process. Initially, applicants that met the eligibility criteria above were randomly selected for participation. However, early deployment revealed that some selected participants lacked genuine transportation need or willingness to participate in required reporting. As a result, the selection process evolved to include more in-depth screening interviews. These interviews assessed transportation needs, intended usage, and willingness to comply with tracking and reporting requirements.

### Library Discount Applications

The majority of E-BIKE LIBRARY bikes were available to anyone to rent by downloading the free Metro Mobility E-Bike Share app. However, an application process was required to receive either: a) discounted pricing, or b) access to private Library fleets such as those available only to MGH employees or residents of the Rindge Tower Apartments. Every user registering in the app was provided the opportunity to fill out these applications and users could additionally access the discount application at any time through the app menu. These applications collected the same intended e-bike use, baseline transportation, and demographic data as the ownership application outlined above so that applicants across all program models could be compared. For discount approval, only income was considered for eligibility. For private fleet access, applicants were required to verify residency or employee status.

### Eligibility and Verification

To support the program goal of increasing transportation access for low-income populations, \$1 all-day E-Bike Library rentals were offered to individuals with household incomes at or below approximately 65% of AMI. Applicants were asked to provide income verification in the form of proof of participation in any income-qualified government assistance program. Documentation of enrollment in the following programs was accepted for verification:

- EBT / SNAP (Electronic Benefits Transfer / Supplemental Nutrition Assistance Program)
- Department of Transitional Assistance (DTA) benefits
- Fuel Assistance (LIHEAP)
- Housing Choice Voucher (Section 8)
- MassHealth
- Pell Grants
- SSI / SSDI (Supplemental Security Income / Social Security Disability Insurance)
- WIC (Women, Infants, & Children Nutrition Program)
- Public Housing Residency (Local Housing Authority)

Qualifying income levels can vary based on the program, region, and household size, so all applicants reporting a household income near (or below) the state AMI received an email outlining the verification process. After valid verification documents were received, discount status was activated on the participant's rental app account.

### E-Bike and Station Hardware

The project deployed Class-1 pedal-assist electric bicycles designed specifically for shared mobility and equipped with Metro Mobility's proprietary IoT, built-in cable-lock, and ChargeLock technology for station compatibility. Class-1 e-bikes provide motor assistance up to a speed of 19 mph only when the rider is pedaling, allowing the drive system to amplify the rider's effort while maintaining the feel and control of a conventional bicycle. This improves accessibility for riders who may be hesitant to cycle due to hills, distance, or physical exertion while maintaining safe operating speeds and handling.

The e-bikes were built with “share-ready” specifications, including reinforced frames and robust components designed to withstand heavier daily use than consumer e-bikes. Each bike included integrated front and rear lights powered by the main battery, a large cargo basket for carrying groceries or personal items, and a built-in cable lock for securing the bike while away from the station. The Metro Mobility IoT and custom firmware enable locking/unlocking over Bluetooth or via commands from a remote server, as well as the automatic reporting of vehicle location, trip distance, battery state of charge, and operational status.



Metro Mobility’s patented ChargeLock™ stations provide locking and charging with a simple cable-based design that eliminates many of the pitfalls of traditional bikeshare docks. Riders simply plug the charging cable from the station into the e-bike when returning it, which simultaneously secures the bike, begins charging the battery, and ends the rental. Unlike traditional docks that are built for a single vehicle type, ChargeLock’s multi-purpose cables can accommodate any vehicle design. The flexible cables create an easier and more reliable user experience than traditional docks where aligning the vehicle with the locking mechanism can be challenging. The simple design of ChargeLock also allows for extremely low-cost stations that can be installed easily and scaled quickly. With just 4 touch points on the ground, ChargeLock stations can be installed on any surface including grass or gravel and do not require a flat poured concrete pad.

By combining automatic charging, integrated locking, and station-based storage, the system reduces theft risk, eliminates the need for manual battery swapping, and significantly lowers operational costs compared with traditional bike-share systems that require vehicle redistribution or costly operations for charging or battery swapping.



## Software and Data Collection

For station-based deployment models (MOR + CHARGE and E-Bike Library), the program utilized Metro Mobility’s proprietary software platform for fleet management, user access, and data collection. MOR + CHARGE participants used the [Metro Mobility E-Bike Owner](#) app which provided control of their assigned e-bike and surveyed riders before each ride about the purpose of their trip and mode replacement. E-Bike Library riders used the [Metro Mobility E-Bike Share](#) app, which allows users to locate stations on a map, rent e-bikes, manage payment and wallet balance, contact support, and apply for discounts. The app also surveyed users for trip purpose and mode replacement before each rental, creating a comparable data set across deployment models. Metro Mobility’s fleet management dashboard additionally allowed the operations and customer support teams to respond to support tickets, visualize trip data, and monitor bike locations, charging status, and system activity in real time.

Each station-based e-bike was equipped with a custom IoT device developed by Metro Mobility with GPS and network connection to automatically transmit operational data to Metro Mobility servers. This includes location, speed, lock status, and state of charge. These updates are triggered both on timed intervals and when the e-bike travels a specified distance, allowing the system to automatically record trip route, distance, and duration without relying on rider input or mobile device permissions. These automatic updates, combined with in-app survey results, guarantee highly reliable and accurate data for every trip. The recorded trip distances could then be combined with mode replacement survey results to calculate precise GHG emissions reductions for each trip.

The MOR E-BIKES ownership model relied on the OpenPATH platform developed by the National Renewable Energy Laboratory (NREL) to track participant travel behavior. This system primarily depends on self-reported or user-initiated trip logging, which resulted in inconsistent participation and incomplete datasets among some participants. Even with monetary incentives available to participants for consistent reporting, most riders failed to regularly report or label trips or stopped doing so after a month or two. As a result, the OpenPATH data was less comprehensive than the data collected through the Metro Mobility system. Repeated efforts

were made throughout the project to encourage trip reporting among MOR E-BIKES participants, develop new outreach strategies, and offer incentives with limited success. After discussing with MassCEC administrators, the data that was collected from participants was used to estimate usage for the entire participant pool for the remainder of the project.

### Trip Visualization

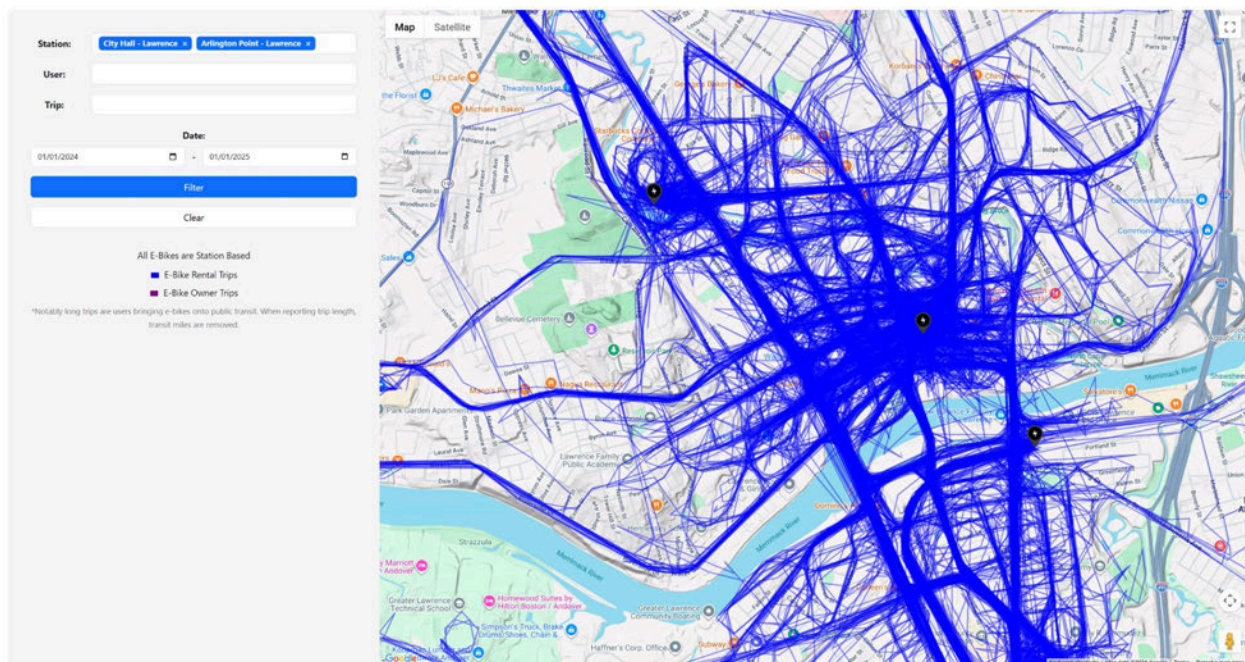
Map visualizations provide a unique way to understand both the exact routes where e-bikes are ridden and their ultimate destinations. This is useful for finding outliers in data to identify potential issues, understanding individual participant behavior and transportation needs, and analyzing the impacts of bike infrastructure. Metro Mobility’s software platform automatically generates a map of each trip upon completion and exports the GPS info to a database which can be used to create aggregate maps of any dataset.

This route data has been made available to project partners and Metro Mobility continues to share it with municipalities, planners, and state agencies in order to assist with future transportation planning.

### Interactive Trip Explorer

In the fall of 2023, Metro Mobility completed development of a web-based interactive Trip Explorer which allows for visualization of anonymized trip data from all station-based e-bikes on an interactive map. The map is automatically updated each day with new trip data and can be filtered by station, date range, user ID, or trip ID.

The Trip Explorer is publicly accessible at: <https://www.metromobility.io/trip-explorer>.



## Deployment and Education

MOR E-BIKES participants received their e-bikes through direct delivery from Metro Mobility at a designated community distribution location. Staff provided in-person onboarding with basic setup of the e-bike and accessories, assistance installing the necessary mobile apps, and an overview of program requirements and safe riding practices. Hands-on training covered operation of the e-bike, battery charging procedures, locking methods, and basic maintenance. The training also included a supervised test ride in a controlled area to ensure participants were comfortable operating the e-bike before riding independently. Printed and digital educational materials were provided to reinforce safe riding practices and program requirements.

The MOR + CHARGE program followed a similar onboarding process but incorporated the use of the ChargeLock stations, built-in cable lock, and the Metro Mobility Owner app. Participants received their assigned e-bike from Metro Mobility and were guided through the app installation and registration process. Training included how to use the app to start a trip, lock and unlock the e-bike while away from the station, and properly secure and charge it at the station. Participants received safety instruction, supervised test rides, and educational materials covering riding techniques and equipment operation.

Deployment of the E-BIKE LIBRARY model focused on installing ChargeLock station infrastructure and preparing the system for public use rather than distributing individual e-bikes to participants. This process is covered in more detail in the subsequent Site Selection and Partner sections. Once stations and e-bikes were installed and activated, users could access the system by downloading the Metro Mobility E-Bike Share mobile app, scanning the QR code on an e-bike, and entering payment information for a rental. Participant education was delivered primarily through in-app guidance, help pages, and signage at the stations. These materials provided instructions on unlocking and returning bikes, safe riding practices, helmet use, and other operational guidance. This approach allowed the program to deliver essential safety and operational education while supporting a self-service rental system.

## Data Summary

### Participant Data

	Applicants	Participants
<b>MOR E-BIKES</b>	1,923	110
<b>MOR + CHARGE</b>	1,923	15
<b>E-Bike Library</b>	967	409 (Priority Population)
		630 (Total Unique Riders)

Note: The same applicant pool was used for both MOR E-BIKES and MOR +CHARGE deployment models.

E-Bike Library Priority Population participants have completed verification of income level or MGH employment. Rentals are open to the public so, an even greater number of riders likely meet Priority Population demographics but did not complete verification.

### Participant Demographics

Metric	Qualifier	Data
<b>Age</b>	18-24	14.2%
	25-34	28.3%
	35-44	30.2%
	45-54	14.2%
	55-64	9.6%
	65+	3.5%
	Average Age	38
	Minimum Age	18
	Maximum Age	69
<b>Gender</b>	Male	56.2%
	Female	43.8%
	Non-Binary or Other	0%

<b>Race</b>	Asian or Pacific Islander	12.2%
	Black or African American	13.3%
	Hispanic or Latino	35.9%
	Native American or Alaskan Native	0.00%
	White or Caucasian	32.0%
	Multiracial or Biracial	4.4%
	A race/ethnicity not listed here	2.2%
<b>Household Income</b>	Less than \$15,000	28.33%
	\$15,000 - \$24,999	16.67%
	\$15,000 - \$24,999	15.56%
	\$25,000 - \$34,999	12.78%
	\$35,000 - \$49,999	7.22%
	\$75,000 - \$99,999	7.78%
	\$100,000 - \$149,999	2.78%
	\$150,000 and above	8.89 %
	Note: Reported household incomes above the discount qualification threshold reflect participation by MGH employees who qualify as Priority Population Essential Workers and are therefore not subject to income eligibility requirements.	
<b>Primary Language</b>	English	82.86%
	Spanish	9.71%
	Somali	0.49%
	Chinese (Cantonese and Mandarin)	0.49%
	Portuguese	1.46%

## Ride Data

As detailed in the Data Collection Methods section, ride data for the station-based MOR + CHARGE and E-Bike Library programs was collected automatically through onboard GPS/IoT devices and the Metro Mobility software platform, with required in-app prompts ensuring complete trip data. In contrast, MOR E-BIKES relied on participant self-reporting through the NREL OpenPATH app, resulting in less consistent data collection. After MOR E-BIKES participants stopped self-reporting, usage was estimated for the remainder of the project by extrapolating averages from previously reported data and seasonal trends from other riders.

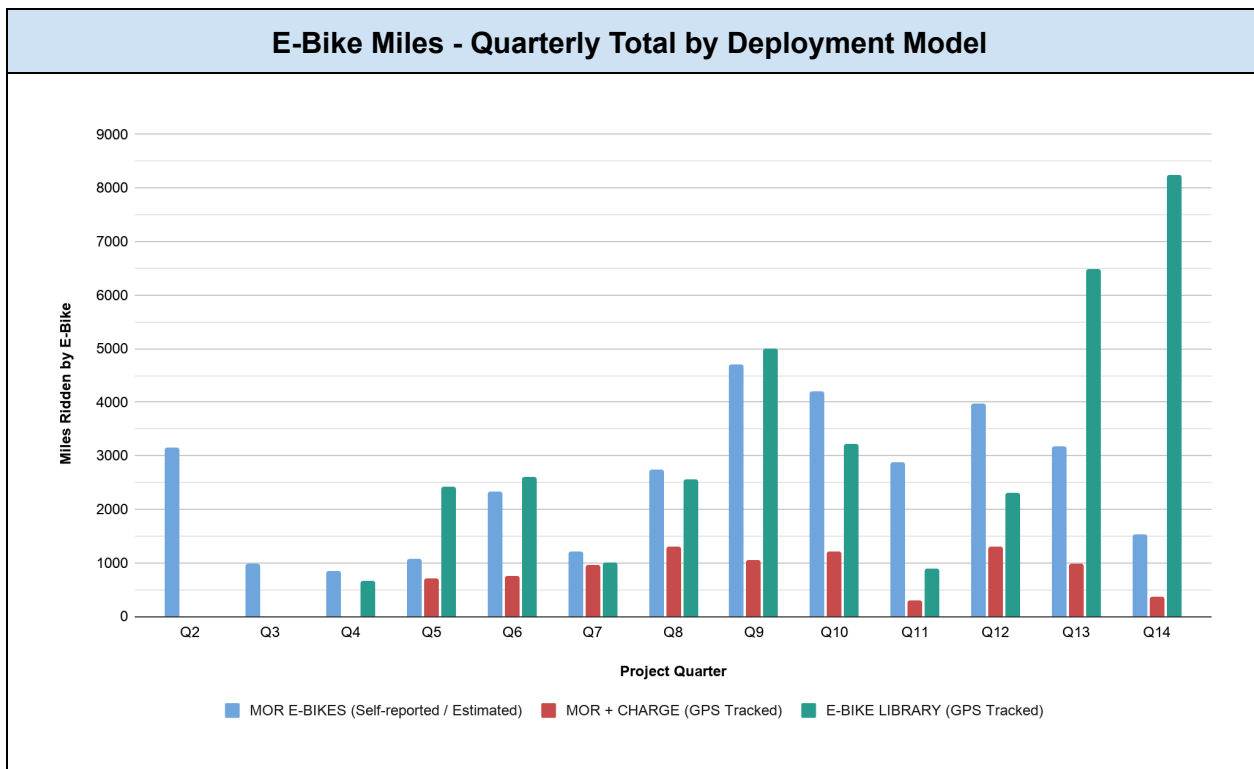
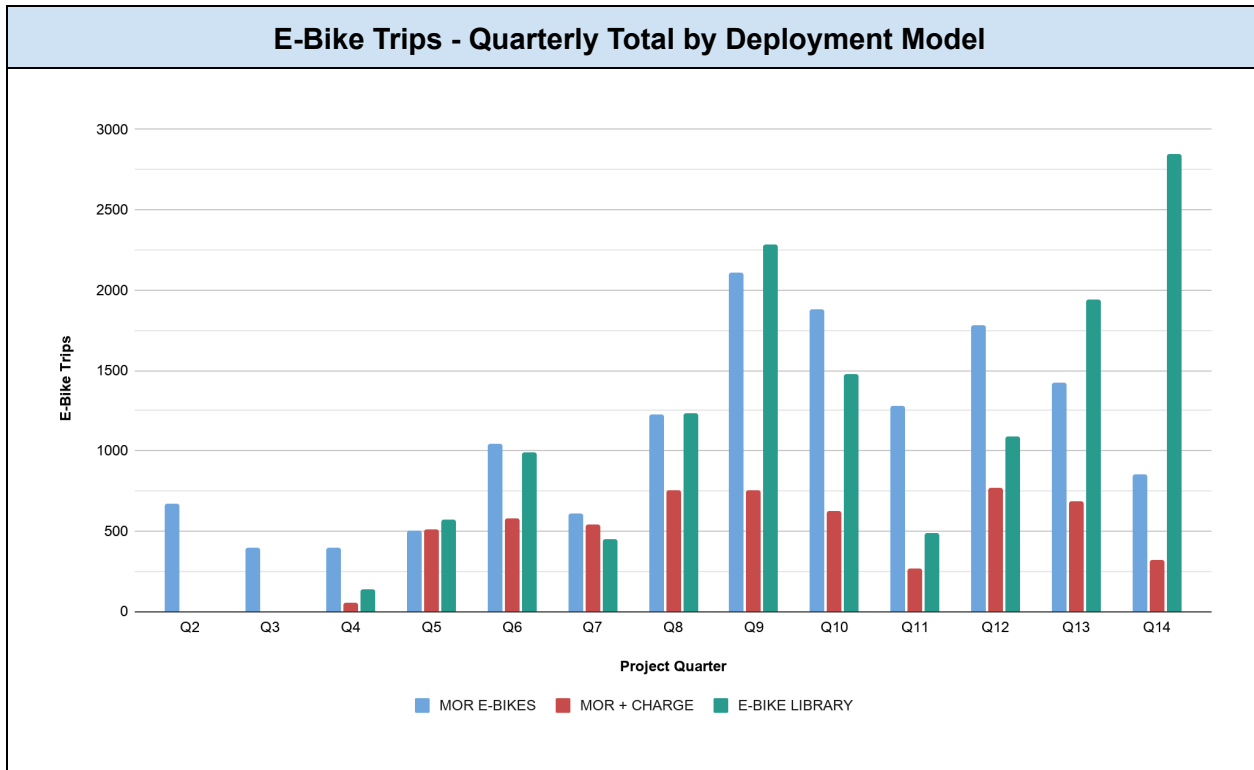
MOR E-BIKES	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
<b>Trips</b>	-	671	393	400	505	1044	607	1224	2106	1881	1278	1782	1426	855
<b>Miles Traveled</b>	-	3163.7	987.2	835.7	1065.8	2332	1204.2	2737.6	4703.4	4200.9	2874.3	3979.8	3183.8	1522.9

MOR + CHARGE	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
<b>Trips</b>	-	-	-	55	511	576	542	754	757	627	270	773	684	317
<b>Miles Traveled</b>	-	-	-	-	717.3	746.0	950	1296.4	1058.3	1202.4	292	1298.3	979.33	366

E-BIKE LIBRARY	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
<b>Trips</b>	-	-	-	140	574	991	449	1237	2,281	1,474	484	1090	1938	2849
<b>Miles Traveled</b>	-	-	-	657.8	2419.8	2597.9	1013.8	2567.5	5007.2	3226.7	889.7	2315.9	6489.1	8252.9

Total Project Ridership Metrics			
	Trips*	Miles*	Lbs CO2e Avoided**
<b>MOR E-BIKES</b>	14,172	32,791.3	20,064.6
<b>MOR + CHARGE</b>	5,866	8,906	2,857.5
<b>E-BIKE LIBRARY</b>	13,507	35,438.3	16,675.4
<b>TOTAL</b>	<b>33,545</b>	<b>77,135.6</b>	<b>39,597.5</b>

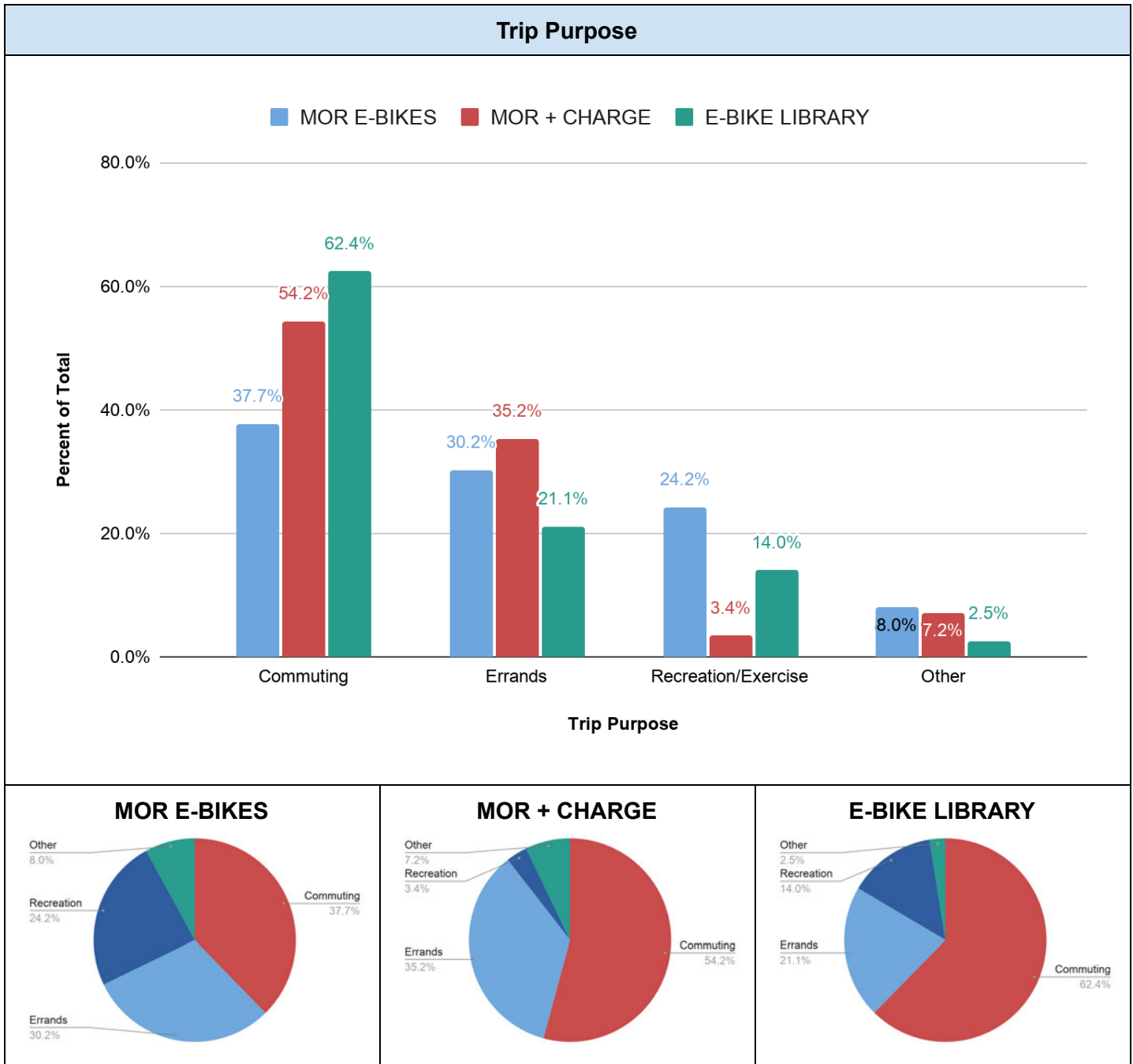
\*The number of available e-bikes for each deployment model varied over time. See “Station Based Usage vs. Traditional Ownership” below for comparative metrics based on monthly available e-bikes.  
 \*\*CO2e Avoided was calculated using only trips where users reported ICE mode replacement.



E-Bike Library trips and mileage generally increased throughout the project (with expected seasonal fluctuations). Stations installed later in the project, particularly the delivery and solar stations which were located in high-traffic areas, showed especially strong utilization. In contrast, trips and mileage for MOR E-BIKES and MOR + CHARGE ramped up in the early phases of the project as participants received their e-bikes, then leveled off and declined in later quarters. When an e-bike is assigned to a single user, it is more likely to go unused if that individual’s circumstances change with for example, a shift in commute due to new employment or relocation, changes in lifestyle, or simply finding that regular e-bike use is not a long-term fit. Shared systems, by comparison, remain available to a broader pool of users and can sustain higher utilization even as individual riders cycle in and out.

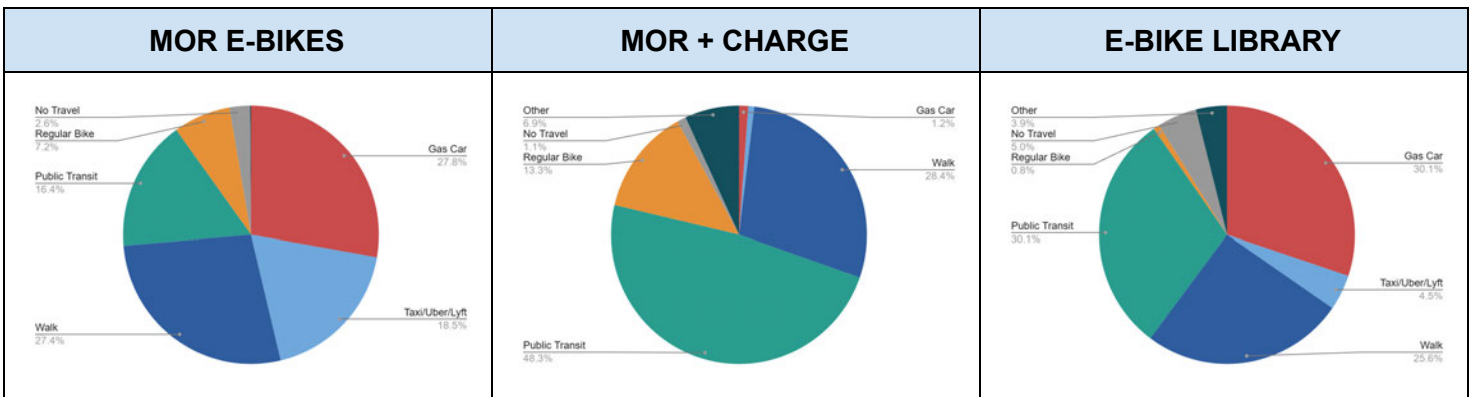
Differences in deployment timing and fleet availability across the three models should be considered when interpreting quarterly trips and mileage. The MOR E-BIKES and MOR + CHARGE programs were largely distributed during the first half of the project, and once assigned, those e-bikes remained consistently available to their respective participants. In contrast, the E-Bike Library system expanded gradually over the course of the project as station approvals were completed and new locations came online. As a result, overall availability for the Library model increased over time, though the number of active e-bikes at any given point varied due to factors such as station rollout timing, routine maintenance, seasonal adjustments, and the transition of some sites beyond their funded reporting period. To better understand utilization on a per-bike basis, see the section below, “Station-Based Usage vs. Traditional Ownership”, which presents comparative metrics normalized by the number of e-bikes available each month.

Average Trip Length in Miles	
<b>MOR E-BIKES</b>	2.17
<b>MOR + CHARGE</b>	1.48
<b>E-BIKE LIBRARY</b>	2.68



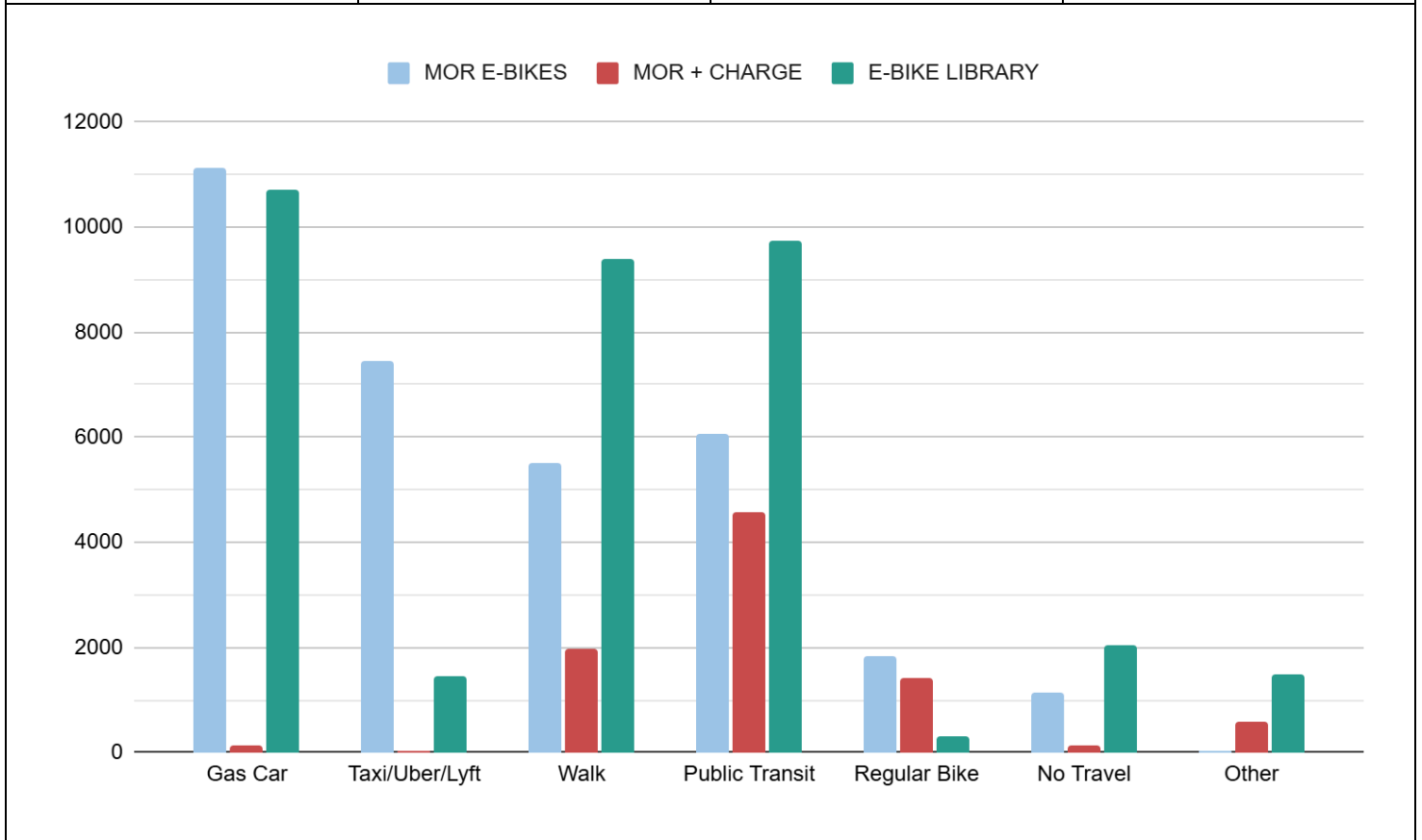
Across all deployment models, Commuting was the most commonly reported trip purpose, followed by Errands, indicating that the program met the needs of participants by primarily supporting essential transportation-related travel. MOR E-BIKES showed the highest rate of recreational riding, with 24.2% of trips categorized as Recreation. In contrast, station-based deployment models showed a stronger focus on transportation, with combined Commuting and Errands accounting for 83.5% of E-Bike Library trips and 89.4% of MOR + CHARGE trips.

Mode Replaced by E-Bike Travel (% of Total Trips)			
	MOR E-BIKES	MOR + CHARGE	E-BIKE LIBRARY
Gas Car	27.8%	1.2%	30.1%
Taxi/Uber/Lyft	18.5%	0.7%	4.5%
Walk	27.4%	28.4%	25.6%
Public Transit	16.4%	48.3%	30.1%
Regular Bike	7.2%	13.3%	0.8%
No Travel	2.6%	1.1%	5.0%
Other	0.1%	6.9%	3.9%



Lower rates of car-mode replacement among MOR + CHARGE participants is likely due to the small sample size and low rates of car ownership and access among affordable housing residents, who comprised this participant group.

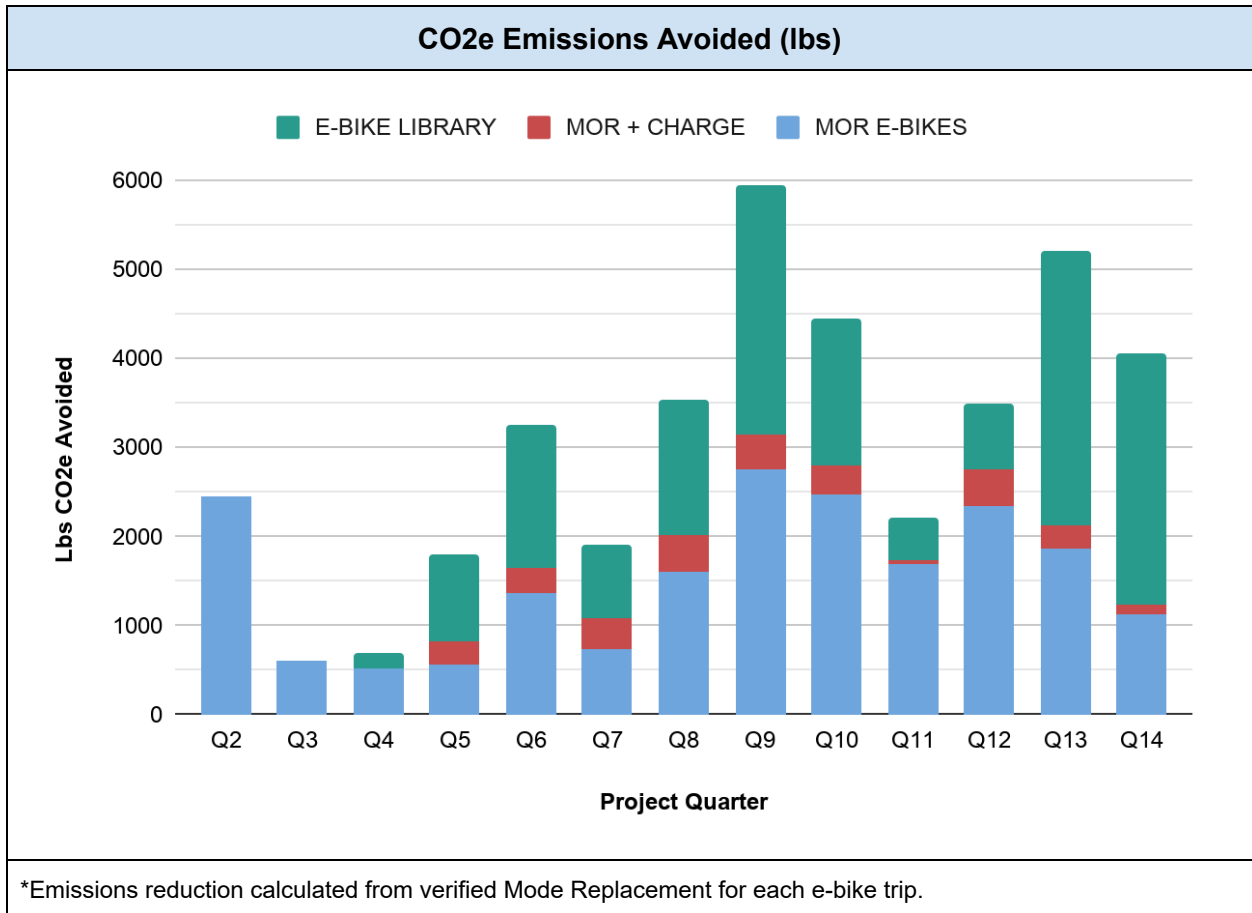
Miles by Replaced Mode			
	MOR E-BIKES	MOR + CHARGE	E-BIKE LIBRARY
<b>Total E-Bikes Deployed</b>	<b>110</b>	<b>15</b>	<b>90</b>
<b>Gas Car</b>	11,135.5	129.0	10,721.9
<b>Taxi/Uber/Lyft</b>	7,438.3	39.5	1,453.5
<b>Walk</b>	5,514.5	1,964.8	9,383.3
<b>Public Transit</b>	6,072.8	4,566.2	9,737.2
<b>Regular Bike</b>	1,849.4	1,427.1	318.2
<b>No Travel</b>	1,137.3	129.5	2,047.9
<b>Other</b>	29.3	571.8	1,477.4



Time Savings Over Replaced Mode	
Deployment Model	Hours Saved
MOR E-BIKES	1,734.6
MOR + CHARGE	739.8
E-BIKE LIBRARY	2,837.4
<b>TOTAL</b>	<b>5,311.8</b>

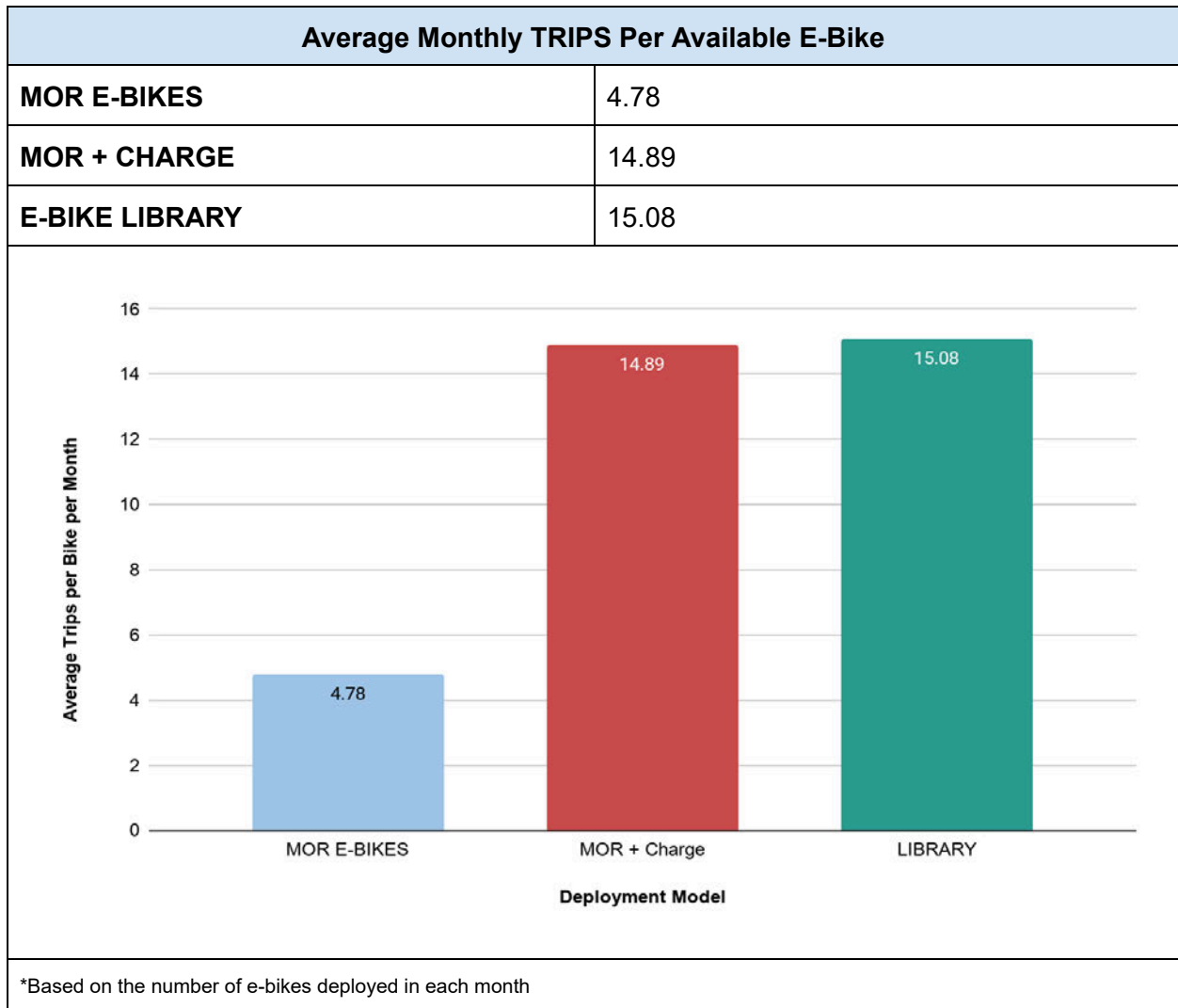
\*Estimated from average e-bike speed vs. average speeds for walking, non-electric bicycle, and reported MBTA bus speeds.

E-bike use resulted in substantial cumulative time savings across all deployment models from faster travel compared to walking, conventional cycling, and bus transit, which translates directly to quality of life improvements for participants.

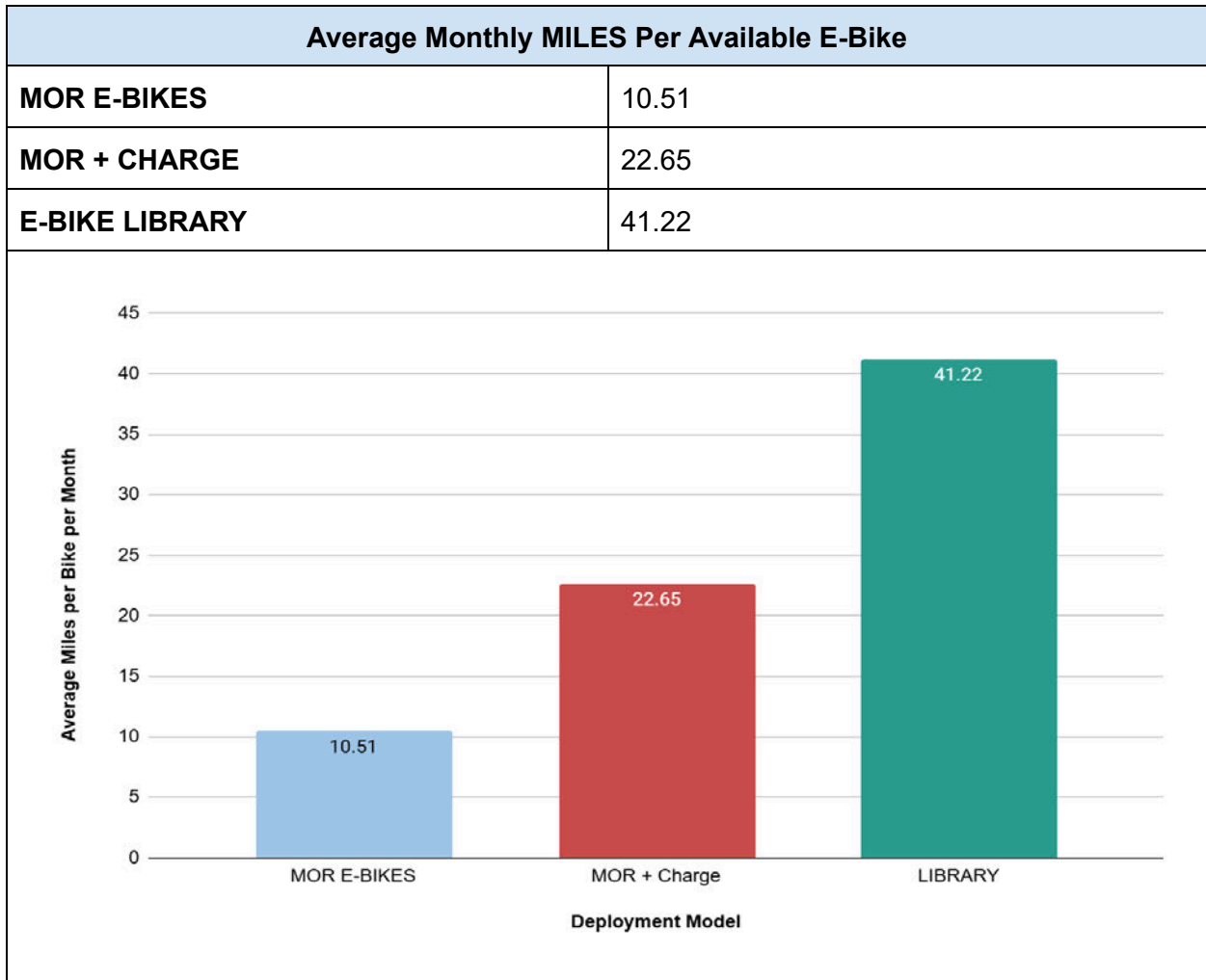


These CO2e reduction estimates are grounded in reported mode replacement data rather than generalized assumptions, providing a highly accurate reflection of real-world impacts compared to typical estimation methods.

## Station Based Usage vs. Traditional Ownership

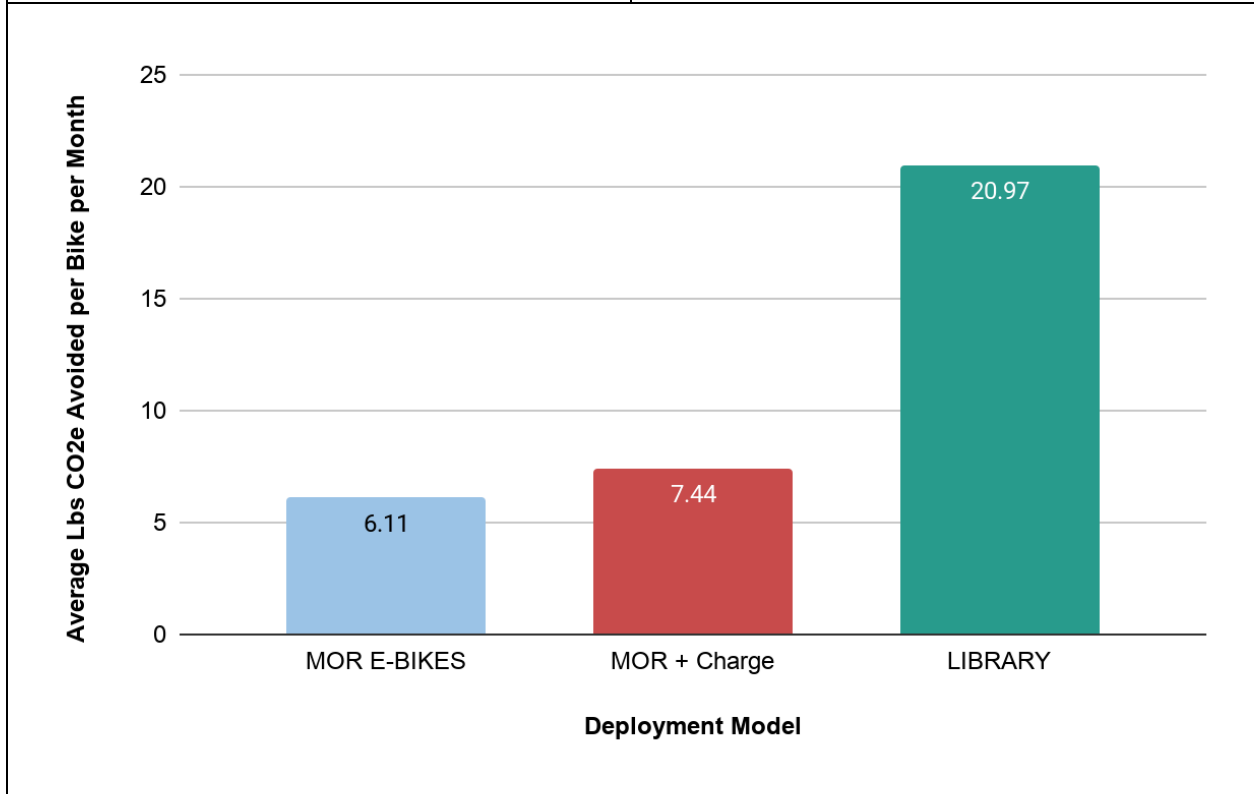


Station-based deployment models saw approximately three times (3X) the amount of trips per e-bike deployed compared with traditional e-bike ownership. This higher utilization is driven by the convenience of having e-bikes available at ground level, fully charged, and securely stored at a dedicated docking station, allowing users to simply get on and ride whenever they need. In contrast, traditional e-bike ownership requires individuals to store bikes indoors (often challenging or impossible in apartments or multi-unit dwellings), manage charging, and handle maintenance themselves, which creates additional barriers to use.



On average, station-based e-bikes were ridden significantly more miles than individually owned e-bikes. MOR + CHARGE bikes were ridden over two times (2X) the number of miles as MOR E-BIKES, and E-Bike Library shared e-bikes were ridden approximately four times (4X) as many miles as MOR E-BIKES. This reflects not only the removal of common barriers to use, such as storage, charging, and maintenance, but also the inherently higher utilization of shared vehicles, which can be used continuously by multiple riders throughout the day. As a result, each station-based e-bike delivers substantially greater transportation value and impact per unit deployed, reinforcing the efficiency and scalability of shared, charging-station-based systems compared to traditional ownership models.

Average Monthly CO <sub>2</sub> e Avoided Per Available E-Bike	
MOR E-BIKES	6.11
MOR + CHARGE	7.44
E-BIKE LIBRARY	20.97



## Cost Effectiveness of CO2e Reduction

Pilot Program Estimated Cost of CO2e Avoided (Over Grant Period of 36 Months)			
	MOR E-BIKES	MOR + CHARGE	E-BIKE LIBRARY
<b>Capital Investment per E-Bike/dock</b>	\$2,500.00	\$5,000.00	\$5,000.00
<b>CO2e Avoided per Bike (36 months)</b>	219.96	267.84	754.92
<b>USD per Lb CO2e Avoided</b>	\$11.37	\$18.67	\$6.62

The expected life cycle of this hardware is significantly longer than 36 months. The cost of CO2e reduction (USD per Lb CO2e Avoided), was calculated for the grant period based on the capital investment for e-bikes, station hardware, and installation. Operations and maintenance costs can be offset by rental revenue and are therefore not included in these calculations.

For a similar program at scale, the per e-bike and per station hardware costs will decrease significantly from pilot scale. The projected CO2e avoidance per USD for a scaled program is estimated below based on this economy of scale and a vehicle lifespan of 10 years. Shared E-bike Library bikes are expected to maintain ridership levels throughout their 10 year lifespan, while individual owners of private e-bikes are expected to discontinue use after 5 years on average due to changes in lifestyle, employment, commuting needs, etc. This was observed in this project, with a high rate of ownership e-bikes going unused after an initial ridership period.

At-Scale Projected Cost of CO2e Avoided (Over 10 Year Period)			
	MOR E-BIKES	MOR + CHARGE	E-BIKE LIBRARY
<b>CO2e Avoided per Bike (10 years)</b>	366.6	446.4	2,516.4
<b>USD per Lb CO2e Avoided</b>	\$5.46	\$3.14	\$0.56

\*Projections do not include additional CO2e reduction resulting from widespread e-bike use which would reduce traffic congestion and lead to fewer: 1) cars idling in traffic, 2) road maintenance vehicles, 4) road repair vehicles, 5) road construction vehicles, 6) police vehicles.

When considering the cost of CO2e reduction, it should be noted that e-bikes represent a multi-objective public investment where CO2 reduction is only one outcome. E-bike investment

also funds transportation access for underserved residents, first/last-mile transit connections, reduced household transportation costs, health benefits from active mobility, congestion and parking relief, reduced collision mortality rates from lower-speed travel, and resilience through distributed electrified transport.

When comparing individual ownership incentives with shared e-bike programs, two important differences should be considered:

1) Underutilization: A shared E-Bike Library bike is continually utilized by different riders and remains available for use throughout its lifespan. In contrast, an individually owned e-bike from subsidized distribution or incentive programs is more likely to experience periods of inactivity (“mothballing”) if the recipient’s needs or travel patterns change. When this occurs, the potential transportation and CO2e reduction benefits of that e-bike are not fully realized.

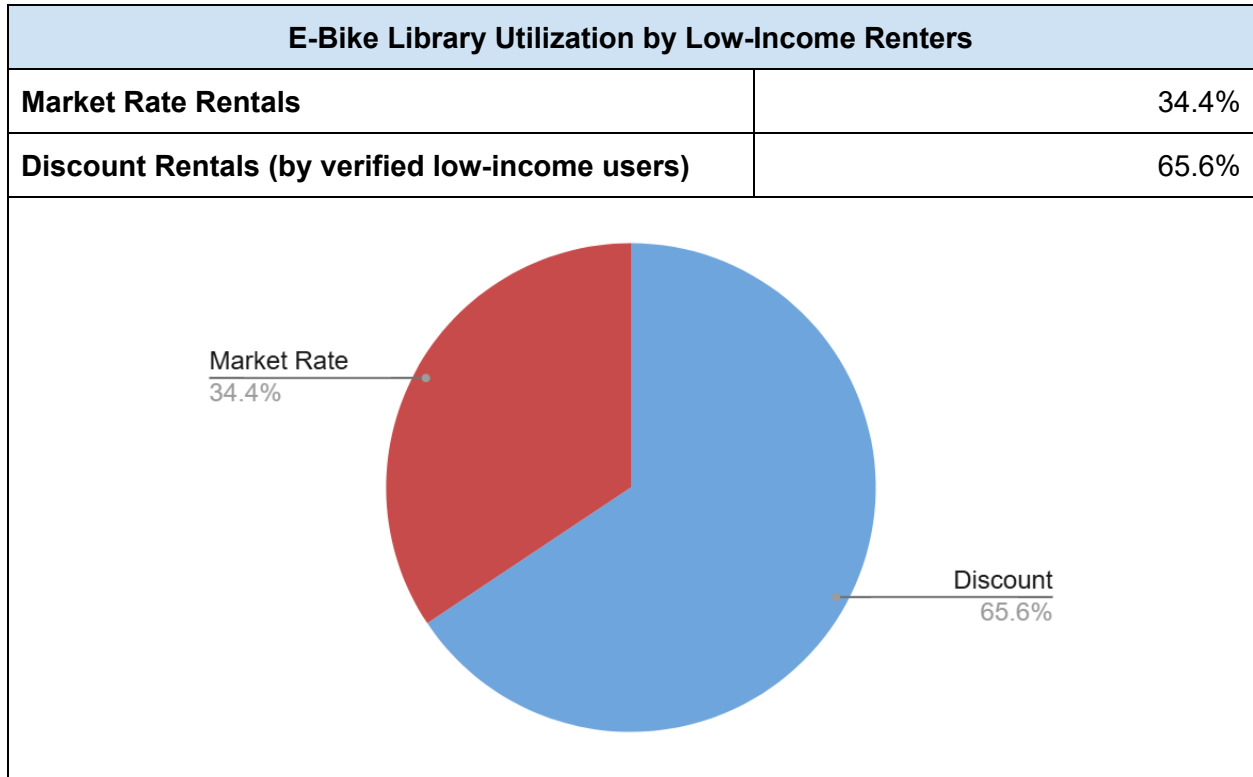
2) Effect of “Free” or Highly Subsidized Distribution: Providing a heavily subsidized or no-cost e-bike can generate strong initial demand, but does not ensure sustained utilization. This concept is well documented in behavioral economics, where demand is shown to increase disproportionately when items are offered for free. A similar pattern was observed during this project, where some MOR E-BIKES participants showed limited use after receiving their e-bikes. A strict screening process for applications improved but did not eliminate this behavior and similar manual screening would likely not be feasible for an at-scale incentive program.

## Maintenance

This section summarizes quarterly maintenance events for the MOR + CHARGE and E-Bike Library programs, capturing only repair-related or unscheduled operational visits outside of routine service such as weekly or bi-weekly cleaning, lubrication, and tire inflation. MOR E-BIKES followed a traditional ownership model, so participants were largely responsible for their own maintenance. While Metro Mobility provided some maintenance for participants, the maintenance handled independently by participants could not be tracked, so this model is excluded to avoid understating total maintenance activity. It should also be noted that shared e-bike systems using ChargeLock stations and round-trip rentals require significantly fewer operational visits than traditional bikeshare systems, which depend on frequent manual battery charging or swapping, and vehicle redistribution between stations.

Maintenance Events by Quarter															
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	TOTAL
MOR + CHARGE	-	-	0	0	8	10	12	16	16	10	4	6	3	4	89
E-BIKE LIBRARY	-	-	0	7	12	14	14	18	18	24	11	10	30	41	199

## Priority Population Ridership



While the MOR E-BIKES and MOR + CHARGE programs served exclusively income-qualified participants due to their eligibility requirements, the publicly accessible E-Bike Library model provides a unique measure of how effectively the program reached priority populations with a public rental system. A majority of all E-Bike Library rentals were taken by verified income-qualified discount users, who accounted for 65.6% of total rentals, while 34.4% were taken by standard market rate users. It is likely that an even greater share of total users met priority population criteria but did not complete income verification, or qualified through other ACT4All priority population categories such as essential workers, individuals needing transportation to access employment, and members of racial minority populations.

This distribution indicates that the program successfully served its intended audience by making affordable transportation available through the \$1 all-day discount rate. The high share of usage by income-qualified riders also demonstrates strong demand for e-bikes among low-income users and confirms that when cost barriers are reduced, e-bikes can serve as a practical and widely adopted transportation option.

## Background

### Partner and Site Selection

Deployment partners were selected based on the goal of serving priority populations. Metro Mobility worked with municipalities, housing authorities, property owners, community-based organizations, and employers that had direct relationships with residents or workers who could benefit from increased transportation access. Partner selection prioritized those located in Environmental Justice communities, Gateway Cities, and areas with limited transportation access. Station-based programs required partners with property and appropriate space for ChargeLock station installations and a potential user base of priority population residents or employees. Partners also played an important role in promoting the program, assisting with participant recruitment, and in some cases serving as local points of contact for users, so entities with existing communication and outreach channels proved effective in this regard.

#### Site selection

After deployment partners were identified, the site selection process focused on determining the most appropriate station installation locations within their available properties. In cases where partners managed multiple potential properties or facilities, such as municipalities or housing authorities, Metro Mobility worked with them to review several candidate locations and narrow the deployment area based on factors such as population density, first-mile/last-mile challenges, existing bike infrastructure, and expected ridership potential. Once a general property or campus was selected, on-site assessments were conducted to identify the precise location for the station. For partners with a single property, such as the Harbor Point Apartments, the process began at this stage, evaluating possible locations on the property itself. During final site selection, multiple locations at each property were considered to balance visibility and convenience for users with practical installation considerations such as available space, electrical access, and construction requirements.

The final approval process varied greatly depending on the deployment partner, often including input from multiple stakeholders such as owners, property managers, planning departments, DPWs, landscapers, and electricians. In some cases, the initially chosen site was not feasible due to technical considerations, or was withdrawn from the process as partners opted out of the program, necessitating a new site selection or the reallocation of stations to other communities. A summary of these activities is outlined below.

### Partner Summaries

#### City of Quincy

The City of Quincy was a partner beginning in the project application phase and ultimately hosted a 10-e-bike ChargeLock station on city property at the intersection of South Street and Southern Artery (Route 53). In collaboration with the Quincy Department of Traffic, Parking, Alarm, and Lighting (TPAL), Metro Mobility evaluated numerous potential locations throughout

the city before selecting the final site. Candidate locations included municipal properties, Quincy Housing Authority communities, and privately owned affordable housing sites such as The Moorings at Squantum Gardens, Wollaston Manor, Arthur H. Tobin Towers, Faxon Commons Apartments, and Quincy Commons Apartments. After site visits and discussions with city staff, the intersection of South Street and Southern Artery was selected because it provided a centrally accessible municipal location where installation could be coordinated directly with the city and where nearby residential developments, including Faxon Commons, Kendrigan Place, and Quincy Point, could serve as a primary user base for the station. Working closely with the Quincy Department of TPAL and the city Traffic Engineer allowed the installation to proceed efficiently and without significant delays for approval and permitting.

### **CMJ Management / Harbor Point**

Metro Mobility worked with CMJ Management to both install an E-Bike Library station at their Harbor Point Apartment complex in Dorchester and deploy MOR E-BIKES to select residents. After sharing the MOR E-BIKES program details and application form through resident newsletters, qualified participants were selected and e-bikes were delivered at group onboarding events. Concurrently, Metro Mobility worked with CMJ ownership and facilities to identify a location within the Harbor Point property for a 10-bike ChargeLock station. After group site visits to assess multiple locations both inside the resident parking garage and along the harborwalk path, a location on North Harbor Point Drive next to the tennis courts was ultimately chosen. Located in the complex's central courtyard, the location provided equitable access for all residents and could be connected to electrical service through existing conduit used for lighting. Because Harbor Point is a privately managed residential complex, CMJ Management served as the sole approving stakeholder, allowing installation to proceed quickly once ownership approved the location.

### **Medford Housing Authority**

Metro Mobility collaborated with the Medford Housing Authority (MHA) to identify appropriate deployment sites within MHA-managed housing communities for one MOR + CHARGE station and one E-Bike Library station. MHA manages eight housing communities in Medford, six of which primarily serve senior residents. The two family housing communities, the Willis Avenue Apartments and La Prise Village, were selected due to their higher concentration of working-age residents likely to use e-bikes for transportation. Metro Mobility conducted site visits with MHA staff to review possible installation locations within each property, including areas near playgrounds, common green spaces, and maintenance buildings which offered easy access to power. Ultimately, both stations were sited near the Manager's Offices, which provided convenient access to electricity through MHA-controlled meters and allowed staff to monitor the stations, helping reduce the risk of vandalism or theft. Outreach to residents was coordinated with MHA and included direct mailings to all residents, on-site fliers, automated phone messages, and email communications to ensure residents were aware of the new transportation option and the availability of discounted rentals. The entire process was aided by MHA being a particularly accommodating and communicative partner willing to coordinate closely with Metro Mobility and residents to ensure the program was a success.

### **City of Lawrence**

Metro Mobility partnered with the City of Lawrence for both MOR E-BIKES, which were distributed to individual residents, and the E-Bike Library program which installed stations at two sites in the city. Metro Mobility worked with the City of Lawrence Planning Department and Mayor's Health Task Force to promote the MOR E-BIKES program and to identify potential E-Bike Library sites at affordable housing and municipal owned properties. City staff suggested several candidate locations which Metro Mobility assessed for installation feasibility, user demographics, and potential demand. The first selected site was the Loft Five50 apartments at 550 Broadway, an affordable housing complex near the Spicket River Greenway and Methuen Rail Trail. After property management expressed interest, Metro Mobility provided a proposal with location options, but ownership ultimately declined participation. Through continued collaboration with city officials, the program was introduced to Trinity Financial, the owners of the Arlington Point Mills, a 102-unit affordable housing community also located along the Greenway. Management was excited to host the e-bikes as an amenity for their residents and working with a private property owner allowed the installation to proceed quickly.

A second station location was developed in collaboration with the city at Lawrence City Hall. This station was initially intended to operate as a MOR + CHARGE station, providing access to city hall employees. Before launch, the city requested that the station be converted to E-Bike Library to provide access to the public. Approval was obtained through the city's Budget Committee and City Council, after which installation could proceed. Due to the small-scale pilot nature of the installation, a standard municipal procurement process was deemed unnecessary.

### **City of Malden**

Metro Mobility collaborated with the City of Malden and local CBOs to deploy MOR E-BIKES to Malden residents, and worked with the city to identify an affordable housing partner for a MOR + CHARGE station. Metro Mobility evaluated potential station locations at Malden Housing Authority properties and at the Bowdoin Apartments, a 226 unit affordable housing development managed by WinnCompanies. Potential sites were identified at each and presented to management. The Malden Housing Authority Board of Commissioners ultimately declined to proceed with the project. WinnCompanies was excited to provide e-bikes as an amenity to their residents, and as a private entity in control of the property, allowed the installation to proceed without additional permitting or approvals. Additional site visits with the Bowdoin Apts Facilities Manager and the selected electrical contractor were necessary to obtain final approval. Outreach to residents was coordinated with WinnCompanies to solicit applications with e-bikes being delivered to selected participants throughout the following year.

### **Boston Housing Authority**

The Boston Housing Authority (BHA) was an initial project partner and extensive efforts were made to gain approval for E-Bike Library stations at several of their properties. While there was enthusiasm from both parties who worked towards providing the program to residents, the project was ultimately blocked by the BHA Legal Department which required unattainable insurance coverage for Metro Mobility and any subcontractors working on the station installation or maintenance. After approximately 27 months and hundreds of hours spent planning and

preparing for a BHA program, including surveys to residents, mailers to gauge interest and collect baseline transportation data, site visits to 10+ properties to assess station locations, meetings with property managers, and negotiations with BHA management and their legal department, the e-bikes planned for BHA were reallocated to other communities.

### **Massachusetts Bay Transportation Authority (MBTA)**

Metro Mobility partnered with the MBTA in hopes of installing E-Bike Library stations at two MBTA subway stops. After nearly two years seeking approval for sites and repeated challenges with communication, licensing, and site requirements, the focus shifted to installing a single solar-powered E-Bike Library station with the MBTA under Phase 2 of the project. The initial site selection process and subsequent approval for the solar-powered station required a significant amount of work due to the high level of oversight and required licensing from the MBTA. This featured greater than expected insurance requirements, design changes to meet engineering guidelines, review and certification from outside engineering firms, and unexpected fees for licensing and occupancy that were not included in the project budget.

Metro Mobility began site selection by assessing all MBTA stations in Environmental Justice areas in Greater Boston. Initial discussions with the MBTA narrowed this list and site visits were conducted which identified potential locations at Back Bay, Davis, Malden Center, and Oak Grove. Metro Mobility worked with MBTA representatives to select Davis and Malden Center and identify acceptable installation locations on each property. In March of 2022, an MBTA License application was submitted to Greystone Real Estate Advisory Group, the real estate consultant to the MBTA that handles licensing for all companies that wish to access MBTA owned property or work within the MBTA's Zone of Influence (ZOI). This application contained descriptions and diagrams of the proposed work and required payment of non-refundable "Administrative Fees" and "Design & Construction and Structural Review Fees". While the MBTA originally cited 60 - 90 days for application processing, initial feedback was not received until 6 months after the submission and included a request from MBTA Parking Ops to change the installation locations. This required a revised application which "restarted the canvassing timeline" for review.

After no progress and limited communication from the MBTA over the next year, Metro Mobility secured a meeting with the MBTA Deputy Director of Active Transportation and Station Access in December 2023. They revealed new potential issues with the revised application locations and suggested a new location at Davis and/or a site at Back Bay station. They believed a new site approved by their team would allow the License to be granted. Metro Mobility made additional site visits to assess these new locations and identified a new acceptable location at Davis. However, discussions with the Director of Energy Programs at MBTA revealed that connecting the e-bike station to power, which would require work with the MBTA electrical shop, could delay the project another 6 months to 1 year due to their backlog.

Concurrently, Metro Mobility was seeking a location for the ChargeLock Solar station under Phase 2 of the project. Therefore, it was proposed to install the solar-powered E-Bike Library station at Davis to avoid the MBTA electrical shop delays and allow collaboration with the MBTA

within the project timeline. In September of 2024, the MBTA provided a draft License Agreement and after a brief negotiation of insurance requirements, the agreement was executed in November 2024. Metro Mobility began to prepare for installation but was informed that a Workplan must be submitted to the MBTA Transit Oriented Development (TOD) Department and approved before work could begin. The subsequent Workplan and construction review process is covered in the ChargeLock Solar section below.

### **Preservation of Affordable Housing (POAH) / The Loop at Mattapan Station**

Metro Mobility partnered with POAH to install E-Bike Library bikes at The Loop at Mattapan Station, a new affordable housing complex at the Mattapan MBTA stop. The property is long term leased from the MBTA and was therefore subject to the same MBTA License application, fees, and approval process outlined above. However, since the property is controlled by POAH, fewer stakeholders were involved in site selection and the MBTA License was approved 1 year and 2 months after submission.

The Loop development was in the final stages of construction during site selection, so Metro Mobility worked with the construction team and landscape architect to integrate the station location with the landscape design plan. Planning the ChargeLock station installation at this early stage also allowed electrical conduit to be installed before the sidewalks were completed, reducing the labor necessary during final install. After the MBTA License was approved, executing the license agreement was delayed by MBTA insurance requirements and included unexpected license fees and ongoing occupancy fees. These fees were not included in the project budget and are just one of several project costs that were higher than originally anticipated resulting in increased cost share for Metro Mobility.

### **Rosie's Place**

Rosie's Place was an initial project partner and planned to distribute MOR E-BIKES to employees and/or clients in need of transportation. Rosie's Place is a multi-service women's community center in Boston that offers housing, advocacy, legal assistance, and education. As a non-profit community organization with limited resources, there were issues with workload requirements for the administration at Rosie's and they ultimately decided not to participate.

### **Mass General Hospital**

Metro Mobility partnered with Mass General Hospital (MGH) to provide an E-Bike Library fleet to hospital employees serving the priority population of essential workers and providing a low-cost commuting option to reduce single-occupancy vehicle trips to the campus. The project planned for one station location which was selected in coordination with MGH Commuter Services and the MGH Planning and Construction Department and was placed in a highly visible area on N Grove Street by the employee bike cage. After site selection, installation experienced delays due the construction department concurrently planning a \$2 billion expansion at the main campus and the MGH legal and risk management teams requiring greater than expected insurance coverage. In order to move forward, Metro Mobility expanded their insurance policy to meet MGH requirements which added excess cost outside of the project budget and increased

Metro Mobility cost-share. After site visits and coordination with the MGH Construction Dept, Metro Mobility installed the station in November of 2023.

Outreach and recruitment were conducted through MGH internal communication channels, including employee newsletters and postings on the MGH intranet, which invited employees to sign up for the program through the Metro Mobility E-Bike Share app. E-bike access was limited to employees by requiring registration and verification of an approved MGH email extension.

The reallocation of e-bikes planned for Boston Housing Authority allowed for a second MGH station to be installed at the Charlestown Navy Yard (CNY) campus in May 2025. Site selection was again coordinated with MGH Commuter Services and the building management team for the CNY properties. A site inside the employee parking garage at 199 13th Street was selected which placed the station in a protected area next to the employee bike cage. With an existing agreement in place with MGH, the installation of the second station proceeded without delay.

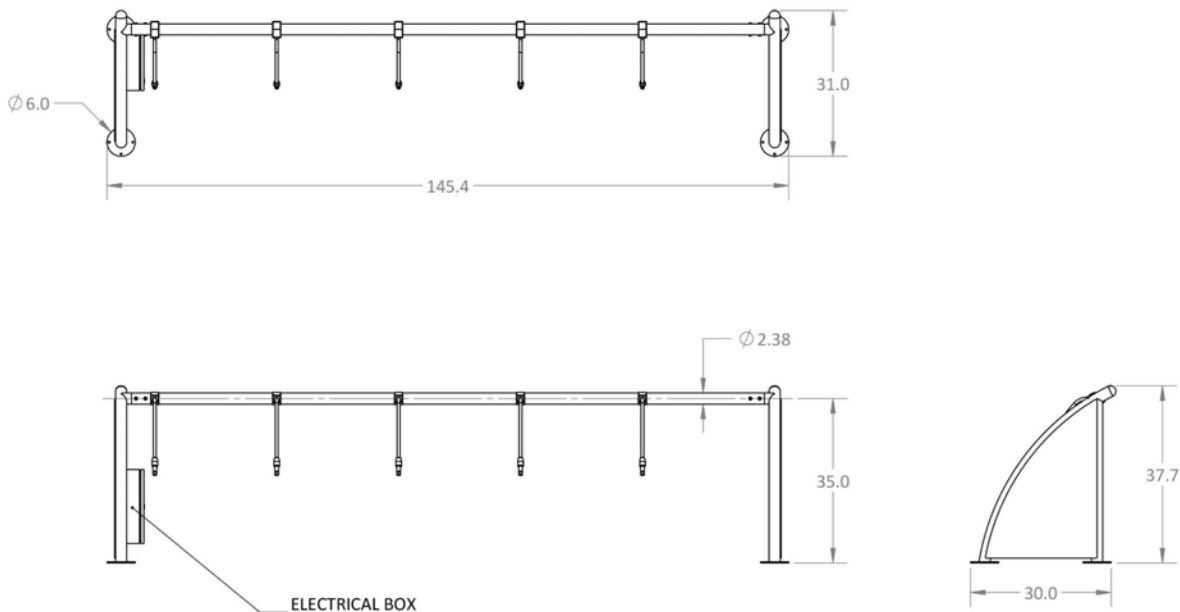
### **Just A Start / Rindge Tower Apartments**

Metro Mobility began exploring the installation of an E-Bike Library with Just A Start in late 2024 after the reallocation of the bikes intended for BHA was approved. Just A Start is a non-profit affordable housing developer that provides a variety of social services to residents including career training, youth education programs, and financial coaching. Site selection focused on their Rindge Tower Apartments, a 273 unit affordable housing complex in Cambridge, MA. Metro Mobility worked closely with the Project Manager for Just A Start, and two Property Managers from Wingate Companies to identify possible locations. Multiple site visits were conducted with property management and the electrical contractor to finalize the installation plan. As with other private property sites, extensive permitting was not necessary and installation proceeded quickly once final approval was granted by ownership. A simple site host agreement was executed to allow the installation and the e-bikes were deployed and made available to residents in June 2025. Resident outreach to promote the program was conducted in collaboration with the Just a Start Resident Services Coordinator and included a mailing to all residents, email newsletters, and postings on web-based resident information boards.

## Station Installation

ChargeLock stations are fully assembled at Metro Mobility’s Massachusetts production facility prior to delivery, allowing them to arrive on site ready for installation. The first stage of installation is physically mounting the station. After a site is approved, the Metro Mobility Operations team prepares the installation area which may entail grading, clearing space for the station footprint, or relocating landscaping elements. Next, the station is delivered and secured to the ground using appropriate anchors depending on the surface conditions. For hardscape surfaces such as concrete, pavement, or brick, this typically involves drilling into existing material to install specialized anchor bolts. Unlike traditional bikeshare docking stations, the unique cable-based design of ChargeLock stations allows for installation on grass, dirt, or gravel. ChargeLock stations do not require a floor to align the docking which minimizes infrastructure and eliminates the need for a poured concrete pad or perfectly flat ground surface. For installation on these unpaved surfaces, small pre-formed concrete blocks are placed to provide ballast when mounting.

The second stage of the process involves the electrical connection, which is completed by a licensed electrical contractor coordinated by Metro Mobility or the host property. The contractor typically installs conduit and wiring from a nearby electrical panel or existing building circuit to provide power to the station, ensuring that the installation meets local electrical codes and safety standards. Depending on the site, this may involve drilling into a building to access an electrical panel, connecting to an existing lighting circuit, or installing dedicated wiring to support the station. Once electrical work is complete, Metro Mobility performs final system testing to confirm that the stations are charging bikes correctly before the station is placed into service.



Example of concrete mounting (The Loop at Mattapan Station):



Example of grass mounting (Harbor Point Apartments):



## ChargeLock Solar

Phase 2 of the ACT4All project introduced ChargeLock Solar, the first off-grid version of Metro Mobility’s ChargeLock charging station designed to operate entirely on renewable energy. Unlike previous stations that required connection to the electrical grid, the ChargeLock Solar system integrated an overhead solar panel array and onboard battery storage, allowing the station to generate and store its own power for e-bike charging. The system was designed to produce enough electricity to reliably charge multiple e-bikes each day while maintaining two to three days of backup energy storage, ensuring continued operation during periods of limited sunlight. The solar panels are mounted above the station in a canopy configuration that both generates power and provides protection from the weather to the e-bikes.

Phase 2 funding was approved in early 2024 after which time manufacturing and assembly of the ChargeLock Solar station began at Metro Mobility’s production facility. The station was completed and test assembled in the summer of 2024 concurrent with site selection efforts. Metro Mobility assessed several locations with existing and potential new project partners including the City of Lawrence, Merrimack Valley Transit, the City of Malden, and Just A Start. After discovering that the plans for a grid-connected station at the Davis MBTA subway station would be further delayed by the MBTA electrical shop, Metro Mobility proposed ChargeLock Solar for the site. This allowed collaboration with the MBTA to proceed without the challenges of grid connection and utilized a pre-approved location for ChargeLock Solar.

While the off-grid design addresses many of the challenges associated with grid connection and has the potential to reduce installation costs and expand the range of feasible locations, the final approval process with the MBTA remained lengthy due to their construction oversight procedures and the presence of the MBTA tunnel cap beneath the installation site.

After receiving the signed MBTA License in October 2024, more than two and a half years after the original license application was submitted, Metro Mobility began preparing the necessary workplans, engineering documentation, and installation procedures required by the MBTA Transit Oriented Development (TOD) team. The MBTA assigned an internal project manager and required multiple formal work plans detailing both the preliminary site inspection and the final installation process. These plans were submitted, revised to match MBTA templates, and circulated among internal MBTA stakeholders for review. During this period, the MBTA also established a “Bill of Collections” account to track staff time and project review costs associated with the installation which were later billed to Metro Mobility. This additional unexpected cost further increased Metro Mobility project cost share.

Throughout the first half of 2025, Metro Mobility performed additional site visits and coordinated with MBTA TOD to refine the installation plans. The process required several rounds of design revisions and engineering review. In particular, the MBTA requested modifications to the station mounting approach to avoid any excavation beneath the station for footers, prompting the development of a new above-ground concrete ballast system designed to resist wind and overturning forces. Metro Mobility engineers updated the design accordingly, produced revised drawings, and incorporated additional features requested by the MBTA such as a drip edge on

the solar canopy. The MBTA also required that the structural design be reviewed and stamped by an independent licensed Professional Engineer, who verified wind loading, structural stability, and compliance with relevant codes including NFPA 130. After submitting the final stamped engineering package and revised workplans in late May 2025, the MBTA accepted the plan in early June and scheduled a pre-installation coordination meeting with Metro Mobility and MBTA construction staff to finalize logistics.

ChargeLock Solar, the first solar-powered e-bike charging station in Massachusetts, was installed at the Davis Square MBTA station in Somerville, Massachusetts in June 2025. The MBTA required that any construction activity affecting the public right of way occur outside of revenue hours, so the Metro Mobility team began work at approximately 3:00 AM in order to complete the delivery and workzone setup before the MBTA station opened to transit riders at 6:00 AM. The Metro Mobility installation team installed concrete footers to support the station structure, assembled the station frame, mounted the solar panels, installed the onboard battery system, and connected the electrical components before bringing the system online. The location, adjacent to the Holland Street subway entrance and the Somerville Community Path, provides a new first-mile/last-mile transportation option for MBTA riders traveling through Davis Square and connects riders with local biking infrastructure.

Beyond providing e-bike service, the ChargeLock Solar pilot is intended to generate operational data on solar power generation, storage battery utilization, and ridership patterns through the station and the IoT-enabled e-bikes connected to it. This data will help evaluate the feasibility of fully off-grid micromobility charging infrastructure and inform future deployments across Massachusetts and other regions. By combining renewable energy generation with station-based e-bike sharing, the ChargeLock Solar station demonstrates a scalable approach to expanding micromobility access while reducing the environmental footprint of transportation infrastructure.

Following installation and system testing, ChargeLock Solar was formally introduced to the public during a ribbon-cutting event held at Davis Square on August 21st, 2025. The event brought together project partners and state leaders, including Massachusetts Secretary of Transportation Monica Tibbits-Nutt, MassCEC, MassDEP, and Somerville Mayor Katjana Ballantyne, to highlight the role of innovative micromobility and clean energy technologies in expanding access to sustainable transportation. The event marked the launch of Massachusetts' first solar-powered e-bike charging and rental station and demonstrated the potential for off-grid micromobility infrastructure to support transit connectivity across the Commonwealth.



## Delivery Station

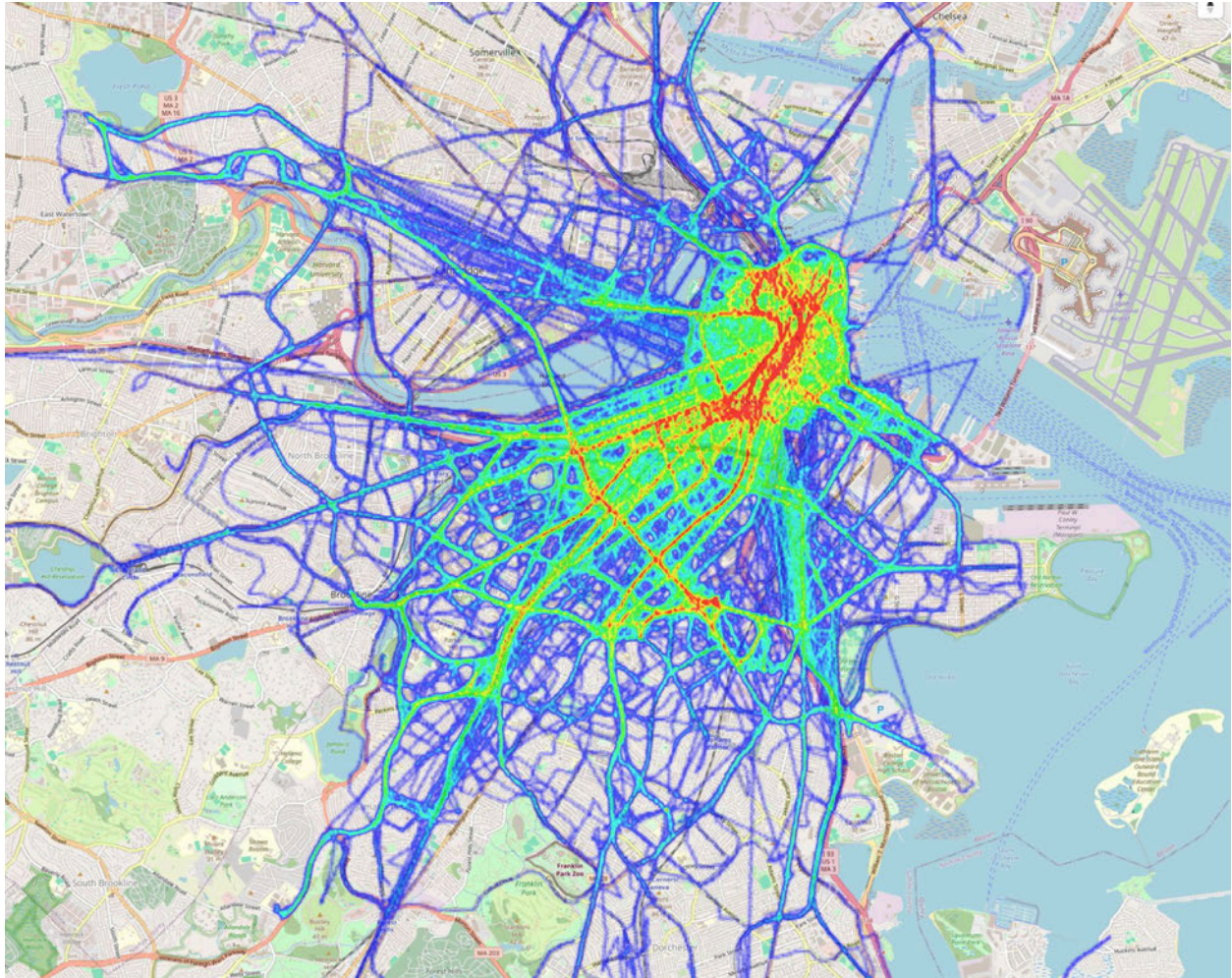
Phase 2 of the project included an E-Bike Library Delivery Station designed to demonstrate how delivery workers for gig-based courier services, such as Uber Eats or DoorDash, could use e-bikes as an alternative to automobiles. In greater Boston, most food delivery trips are currently completed by car, which contributes to traffic congestion and frequent double-parking in dense commercial areas. The goal of the delivery pilot was to encourage a shift toward e-bikes, which are often faster for short urban trips, easier to park, don't contribute to traffic congestion, and produce no GHG emissions. Early planning for the station involved discussions with Uber and the Boston Transportation Department, along with analysis of delivery activity in the city to identify neighborhoods with the highest concentration of restaurants and courier demand. Based on this analysis, Metro Mobility initially focused on potential deployment areas around the Boston neighborhoods of Copley, Fenway, Downtown Crossing, Roxbury Crossing, and Allston.

To identify a suitable host site within these areas, Metro Mobility conducted outreach to restaurant owners, shared cloud kitchens, commercial property managers, and real estate firms, performing phone calls, emails, and in-person visits to evaluate candidate locations and explain the program. The team eventually also explored commercial parking garages which could accommodate stations in dense urban environments, maintaining access for the public where sidewalk space is limited. This approach can allow stations to be placed near clusters of restaurants while providing secure space for ChargeLock stations.

Ultimately, Metro Mobility partnered with LAZ Parking to host the delivery station at the Motor Mart Garage at 201 Stuart Street in Boston, located near Downtown Crossing, an area with high restaurant density and frequent delivery demand. The station is also in close proximity to Copley Square and Boylston street which the City of Boston and Uber Eats identified as a priority area to address delivery-related traffic. The station became the first shared e-bike deployment in Massachusetts specifically intended to serve delivery workers. After installation, Metro Mobility conducted targeted outreach to known delivery riders and provided promotional materials to contacts at Uber Eats, encouraging couriers to try the station and evaluate e-bikes as an alternative to car-based deliveries. Early rider interviews and trip survey data indicated that delivery work quickly became the primary use case for the station, confirming that the selected location successfully captured the intended user group.

The first 6 months of Delivery Station operation spanned the winter of 2025 / 2026. Despite the cold weather, which led to decreased ridership at other Library stations across the network, the Delivery e-bikes at 201 Stuart St continued to see the highest rental rate and miles ridden per bike of any Metro Mobility station.

**Trip Route Heatmap from 201 Stuart Street Delivery Station:**



## Insights

### Participant Impact

#### Benefits Beyond Emissions Reduction

The program impact extends far beyond emissions reduction, delivering tangible improvements in mobility, accessibility, and economic opportunity to participants. E-bikes provided residents with the ability to travel well beyond their immediate neighborhoods, opening up greater access to employment opportunities, education, healthcare, and essential services. This was particularly impactful for low-income participants with limited access to private vehicles or who live in areas with inadequate public transit coverage. In these cases, e-bikes helped bridge first-mile/last-mile gaps and served as a primary mode of transportation where traditional options were unavailable. E-bike Library bikes were also frequently used for delivery work, creating an accessible source of income for riders with minimal barrier to entry or overhead cost. Riders could begin earning through delivery work without the need for costly vehicle ownership, fuel, insurance, and maintenance expenses.

Participants also benefited from meaningful time savings compared to other modes of transportation. E-bikes are significantly faster than walking and conventional bicycles, while also offering a more direct, door-to-door alternative to public transit which often involves transfers and wait times. For many users, this translated into shorter and more predictable travel times for daily trips. The pedal-assist functionality also served to make biking more accessible to individuals of varying fitness levels and physical abilities, allowing non-cyclist to enjoy the benefits of greater mobility and improved health through active transportation.

#### Program Participant Feedback:

*"I want to say thank you for giving me the opportunity to participate in the e-bike program. It makes my travel safe, time saving and I'm saving on expenses. I dearly appreciate it."*

*"The bikes are very easy to use and have helped so much with my commute, especially with the gas prices nowadays. I'm looking forward to using the bike as much as possible."*

*"The bike is great! I'll be investing in winter riding gear so I can ride all year long. Thank you again. I'm gonna spread the word as much as I can on this program!"*

*"I rode my bike this morning to do my errands. The EBike is my savior to go to my appointments and the grocery store. I just wanted to say Thank You so much. I really depend on you guys and you're amazing. I wanted to be sure you know that."*

*"I wanted to take a moment to express my heartfelt gratitude. Not only have I been using the e-bike for leisurely outings, but I've also incorporated it into my daily routine. I now commute to work and explore the city whenever I have the chance."*

*“I am immensely grateful for the e-bike. I hope to continue exploring the wonders of cycling and enjoy the freedom it provides.”*

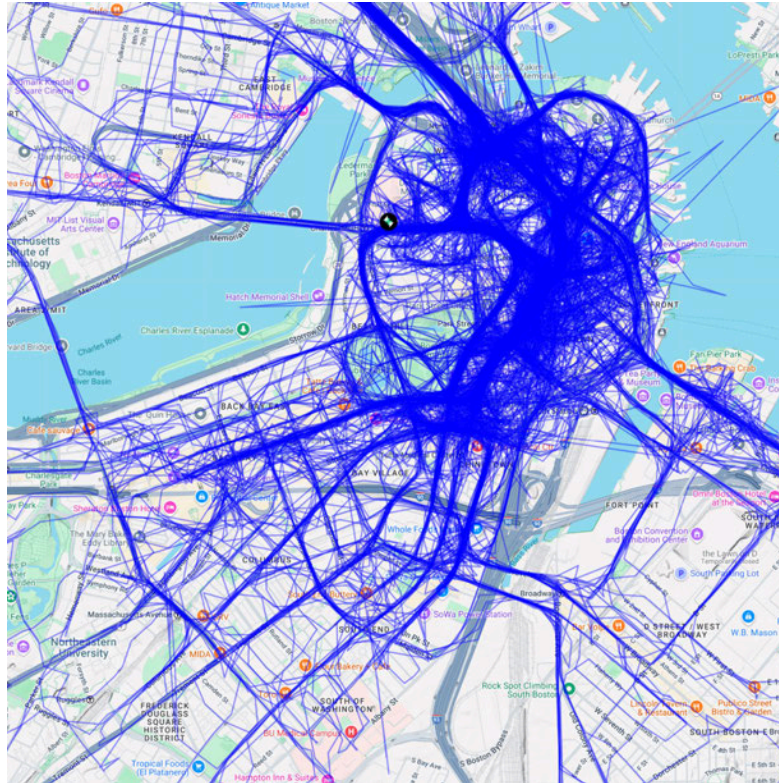
*“We truly value your support and collaboration on this E-Bike program in Lawrence. I am thrilled to hear the program is going well.”*

*- Project Officer, City of Lawrence Mayor’s Health Task Force*

## Featured Participants

### Luis Montes de Oca

Luis is one of the most avid users of the E-Bike Library system utilizing e-bikes for both transportation and delivery work. He rides in both Lawrence and Boston, sometimes incorporating e-bike travel into multi-modal commutes on the MBTA Commuter Rail. In just over a year, Luis rode a total of 5,078 miles by e-bike. With e-bike deliveries primarily replacing car deliveries, we estimate that he alone saved GHG emissions by 4,478 lbs in that time.



## Col Tulien

Col is a regular delivery rider primarily utilizing e-bikes from the E-Bike Library stations at 201 Stuart St., Davis, and Harbor Point. He logged 2,864 miles during a 6 month period in the summer and fall of 2025.



## Scalable Infrastructure

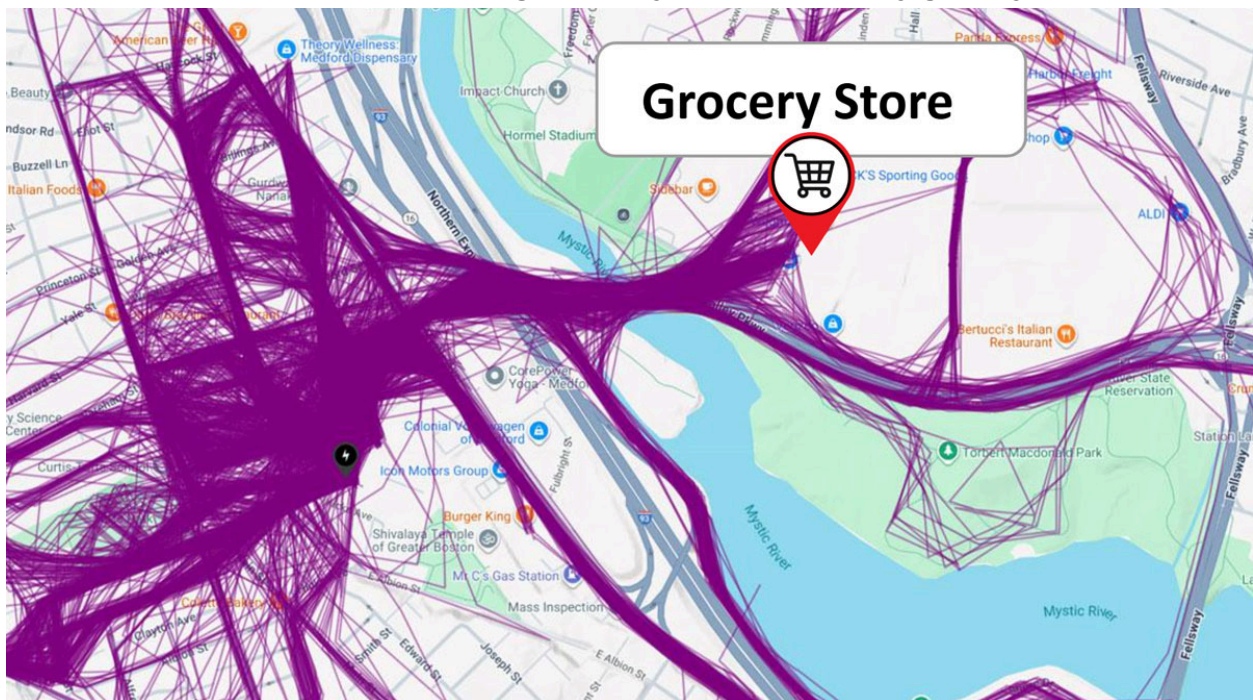
At a systems level, the ChargeLock e-bike station technology demonstrated how micromobility can be deployed rapidly and cost-effectively compared to traditional transportation infrastructure. Unlike heavy rail, light rail, or bus systems, which require substantial capital investment, dedicated facilities, specialized vehicles, and long planning and construction timelines, ChargeLock stations can be installed with minimal infrastructure and operational overhead. This allows for faster deployment, greater flexibility in siting, and the ability to scale incrementally, making it a practical and efficient solution for expanding transportation access in underserved communities.

## Mapping Insights

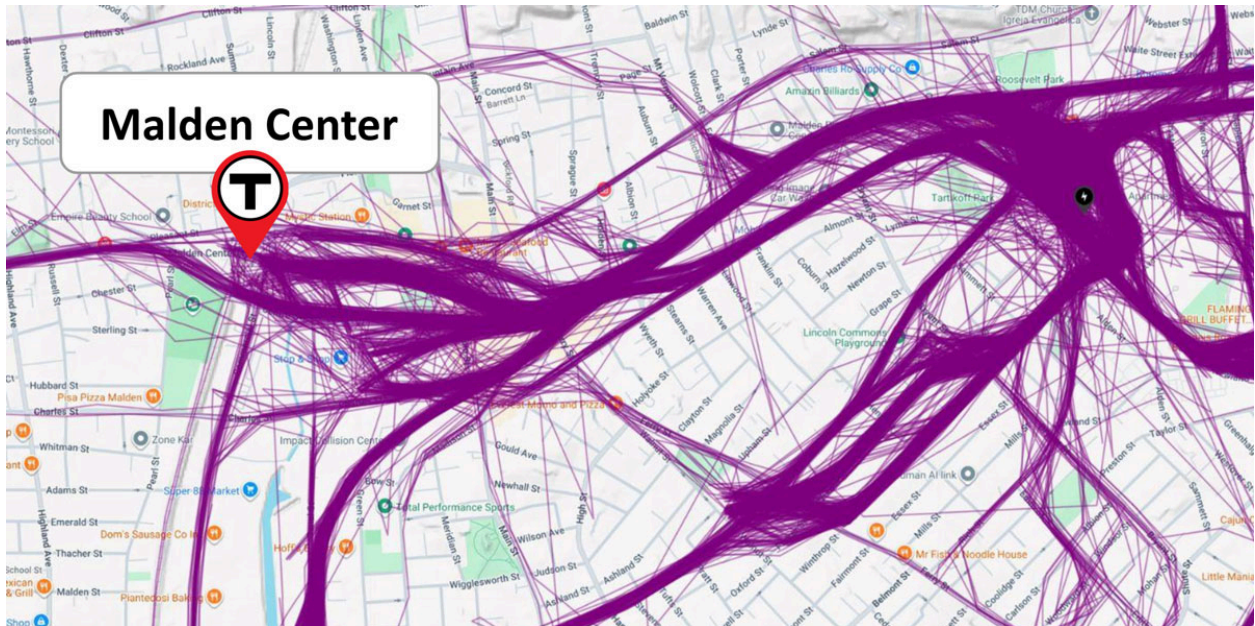
Metro Mobility e-bikes generate high-resolution GPS route data that provides insights into travel behavior that are not available from traditional point-to-point bikeshare systems. Because each trip is continuously tracked rather than only recording start and end locations, the data reveals how riders actually move through streets, paths, and trails. This route information allows analysis of how riders interact with existing bike infrastructure, including whether trips align with designated bike lanes or divert to alternative routes. This can highlight both effective infrastructure and the gaps where new facilities might be needed, offering real-world evidence for municipal planning decisions.

In addition to route data, the system captures the precise locations of interim destinations. Unlike traditional bikeshare, a built-in cable lock on each Metro Mobility e-bike allows users to securely park at any bike rack or pole during a rental. These lock events and locations are transmitted by the vehicle IoT and recorded by Metro Mobility software, revealing a more complete picture of trip purpose and behavior. Analysis of this data showed grocery stores as common repeat destinations, indicating that e-bikes can help alleviate food deserts by allowing easier travel to grocery stores and increasing access to healthy foods. MBTA subway stations were also frequent destinations, demonstrating that the e-bikes were providing a first-mile / last-mile solution and increasing access to transit for longer trips.

### Example, Trips from Medford Housing Authority station to nearby grocery store.:



**Example, Trips from Bowdoin Apartments station to Malden Center MBTA stop.:**



These insights were made accessible through the Metro Mobility Trip Explorer platform, allowing project partners and municipalities to visualize and filter trip routes in an interactive web app. By sharing this data, Metro Mobility seeks to support local and regional transportation planning efforts and help stakeholders better understand how micromobility integrates with existing infrastructure. The findings directly informed a strategic emphasis on transit connectivity in subsequent deployments and contributed to Metro Mobility’s partnerships with Regional Transit Authorities to further explore e-bikes as a first-mile / last-mile solution.

## Challenges and Lessons Learned

The Metro Mobility ACT4All project encountered manageable challenges with technical implementation, participant engagement, and institutional coordination. However, learnings from the project also illustrated clear strategies for overcoming these barriers in future deployments while also highlighting the advantages of station-based e-bike systems compared to traditional ownership models.

### Data Collection

One of the most consistent challenges was data collection from MOR E-BIKES, which required participants to allow tracking through the NREL OpenPATH app and self-report trip purpose and mode replacement. Many participants found the tracking requirements burdensome or intrusive, resulting in participants abandoning their reporting efforts. Collected data was used to extrapolate estimated ridership for the remainder of the project, but this challenge clearly illustrated a key learning: station-based systems with integrated IoT and automated data collection provide far more reliable, accurate, and comprehensive insights regardless of user behavior. The MOR + CHARGE and E-Bike Library programs collected precise GPS route data for each trip and required trip purpose and mode replacement surveys to be completed before e-bikes would unlock, guaranteeing complete data. Future programs can avoid the limitations of the MOR E-BIKES program entirely by utilizing GPS enabled and IoT connected vehicles.

### Operations

Operational challenges included high levels of maintenance, customer support, and occasional theft or vandalism during periods of high ridership. Seasonal variability further impacted both usage and operations with winter weather reducing ridership and introducing additional maintenance such as snow removal and frequent bike cleaning and repair. These seasonal changes are expected when operating a program in New England and illustrate the need for program designs that account for the deployment environment. The operational challenges encountered in this project are not barriers to scaling, but are predictable characteristics of shared micromobility programs that can be managed through proper planning, adequate operations budgets, and proactive maintenance schedules.

### Site Selection and Approval

Challenges with site selection and approval also underscored the importance of partner selection and flexible site planning. Securing approvals for station installation, particularly with large institutional partners, was often time consuming and was sometimes blocked by insurance or legal requirements. These experiences demonstrated the value of identifying multiple backup locations and maintaining a pipeline of potential hosts which can allow deployments to proceed even when individual sites encounter delays. It is believed that these challenges are partly the result of deploying a first-of-its-kind shared e-bike and charging system where site hosts did not have an established protocol for this type of partnership and had no comparable program to reference or model. However, the successful installation and operation of stations through this project has already streamlined coordination with municipalities and property owners in subsequent efforts, as Metro Mobility can now point to a proven, real-world case study when engaging new potential partners.

## Labor

The project also revealed that labor and administrative requirements were higher than initially anticipated resulting in higher than budgeted cost-share for Metro Mobility. A significant portion of this effort was driven by the data collection, reporting, and compliance requirements associated with the grant program itself, and with these systems and processes now established, future deployments can be executed more efficiently. In practice, scaling a similar program to deliver the same transportation, equity, and environmental benefits would be more cost-effective as it would leverage existing technology and would not have the same administrative burden.

## Unexpected Benefits

A final key lesson learned was the extent of project benefits beyond greenhouse gas emissions reduction. While emissions reduction was a primary project goal, the program revealed meaningful impacts in areas such as travel time savings, improved access to public transit through first-mile/last-mile connections, new income opportunities through delivery use, and increased access to essential services such as grocery stores in areas affected by food deserts. These outcomes highlight the broader value proposition of micromobility systems and reinforce their role as a comprehensive transportation.

## ChargeLock Solar: Off-Grid Deployment Insights

The ChargeLock Solar pilot provided a critical opportunity to validate the performance and viability of off-grid micromobility infrastructure in a real-world setting. As the first solar-powered ChargeLock station and the first off-grid e-bike charging system deployed in Massachusetts, the project demonstrated that a properly sized solar array and integrated battery storage system can reliably support daily e-bike charging demand without a grid connection. Metro Mobility closely monitored system performance from August 2025 through March 2026, capturing data across seasonal variations in solar generation, including reduced daylight hours and low sun angles during winter months. Despite these constraints, the system consistently maintained sufficient energy to support continuous operation of a five e-bike station, with only temporary interruptions occurring when snowfall fully covered the panels.

The pilot also provided important design and deployment insights. While the system performed reliably, the structural design of the solar canopy was determined to be more robust than necessary, leading to increased installation complexity and cost. Future iterations will incorporate a more lightweight structure and optimized canopy height to reduce engineering requirements and streamline installation. Overall, the ChargeLock Solar system successfully validated the feasibility of off-grid charging for shared micromobility, confirming its potential to expand deployment opportunities in locations where grid access is limited, cost-prohibitive, or infeasible. With these learnings incorporated, the technology is now well-positioned for broader commercialization.

## Delivery Station: Site Selection and Use Case Validation

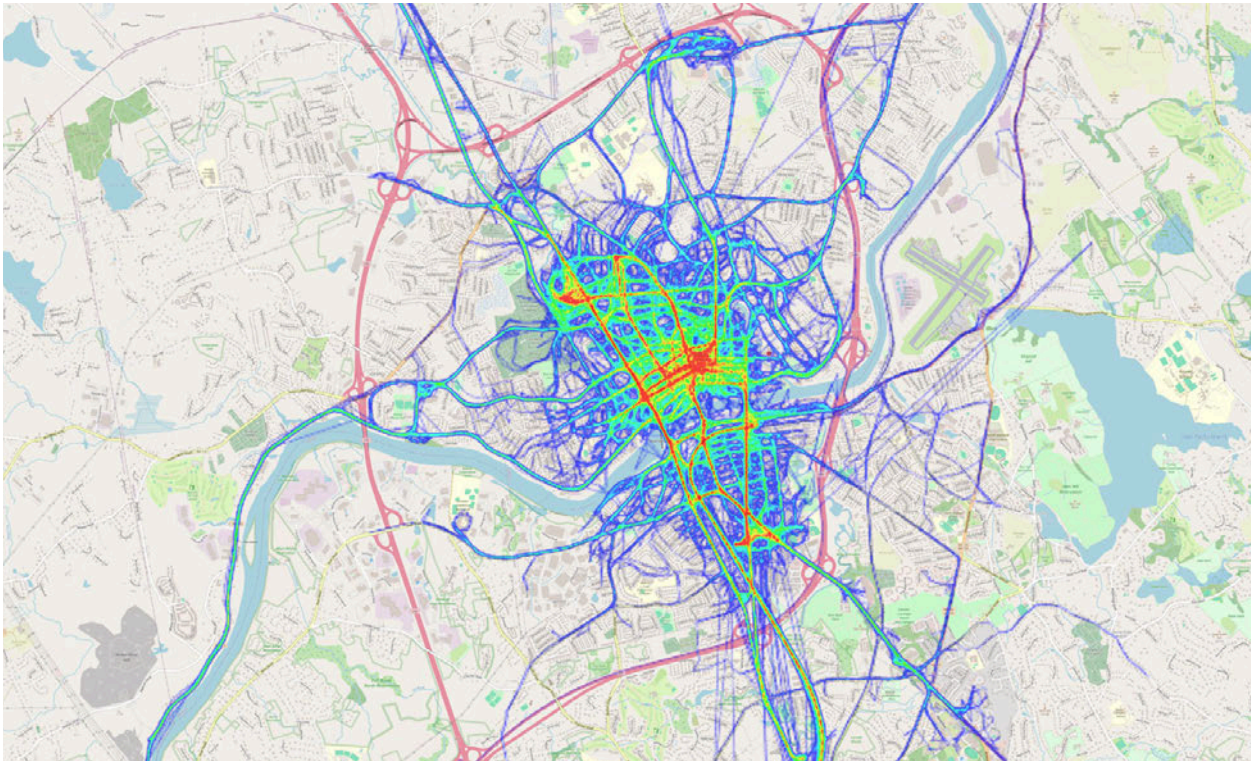
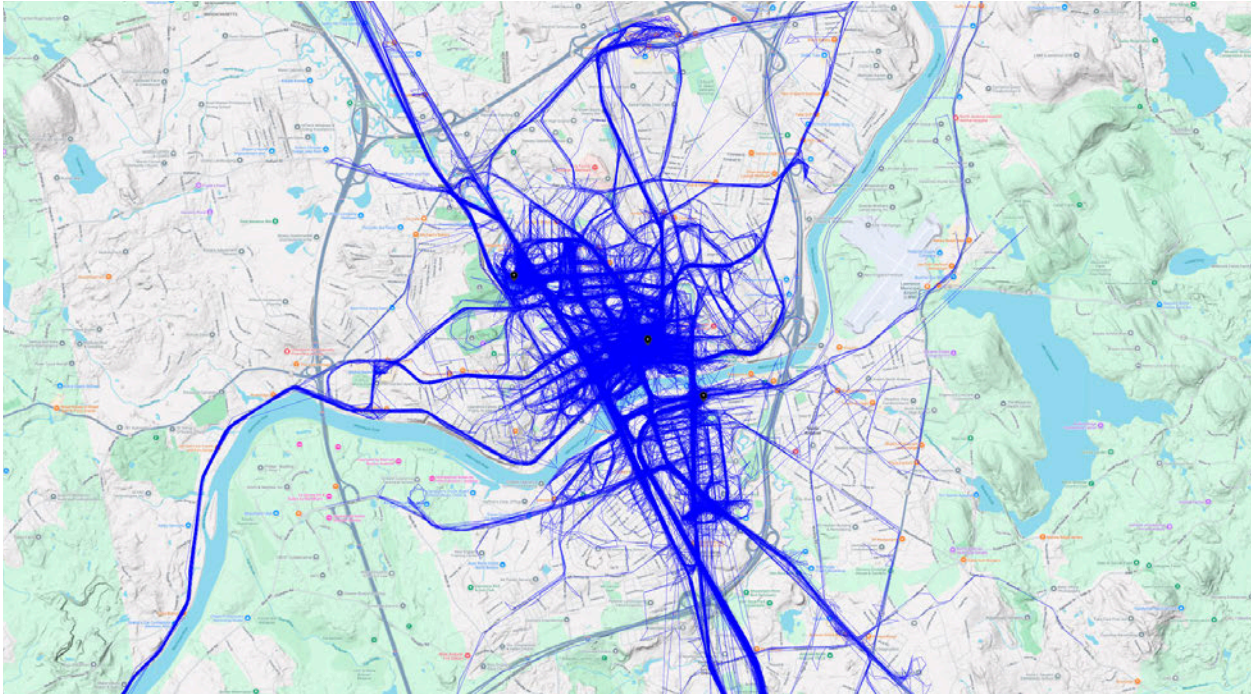
The delivery-focused E-Bike Library station provided valuable insights into both site selection for delivery use and the strength of demand for micromobility in last-mile logistics. During the site selection process, outreach to restaurant owners and food service workers revealed strong interest in having nearby e-bike access for delivery use. However, in dense urban environments, these businesses typically have limited control over outdoor space or building frontage, meaning that station installation would require coordination with municipalities which can add complexity with licensing and permitting, or commercial property owners who may have less incentive to participate. This highlighted the importance of identifying partners with both site control and alignment with program goals, as well as maintaining flexibility with alternative locations.

Once deployed, the delivery station demonstrated exceptionally strong and sustained demand. The station at 201 Stuart Street in Boston quickly became the most active E-Bike Library site in the program during its first six months of operation, with the vast majority of trips associated with delivery activity. Notably, ridership at this location remained high even during winter months, when usage typically declines across other stations. This sustained utilization indicates that delivery work represents a highly resilient use case for e-bikes, less sensitive to seasonality than recreational or commuting trips, and reinforces the potential for e-bikes to replace car-based deliveries in dense urban areas.

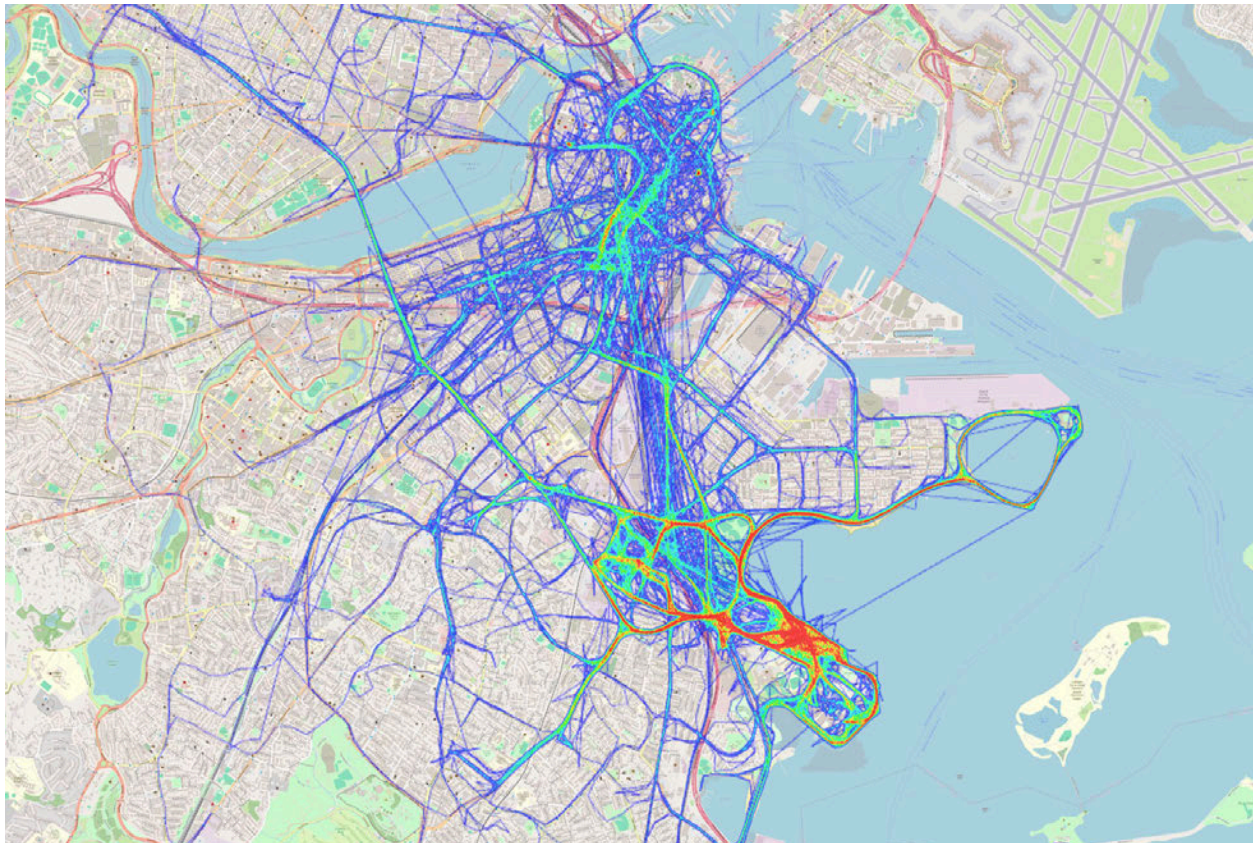
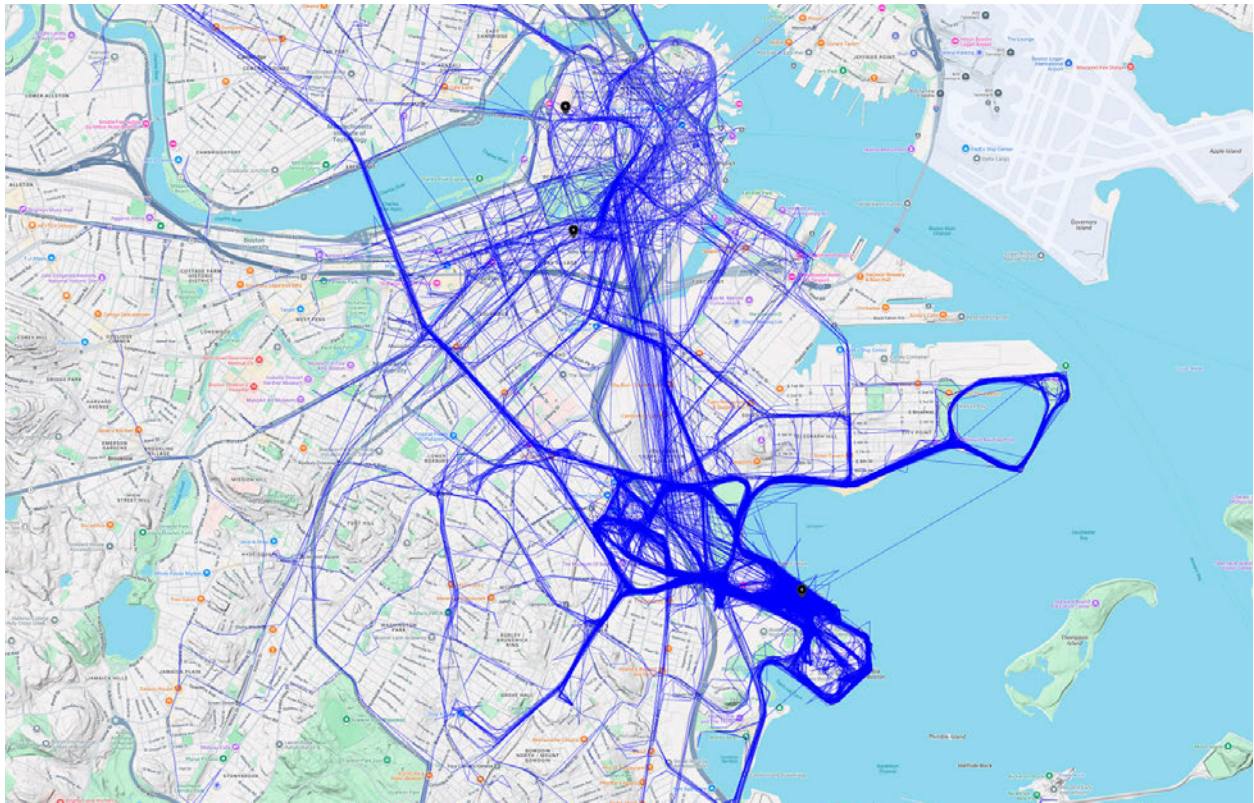
## Station-Based E-Bike Route Mapping

This section presents aggregated route maps and travel heatmaps derived from GPS data collected across station-based e-bikes from the MOR + CHARGE and E-Bike Library models.

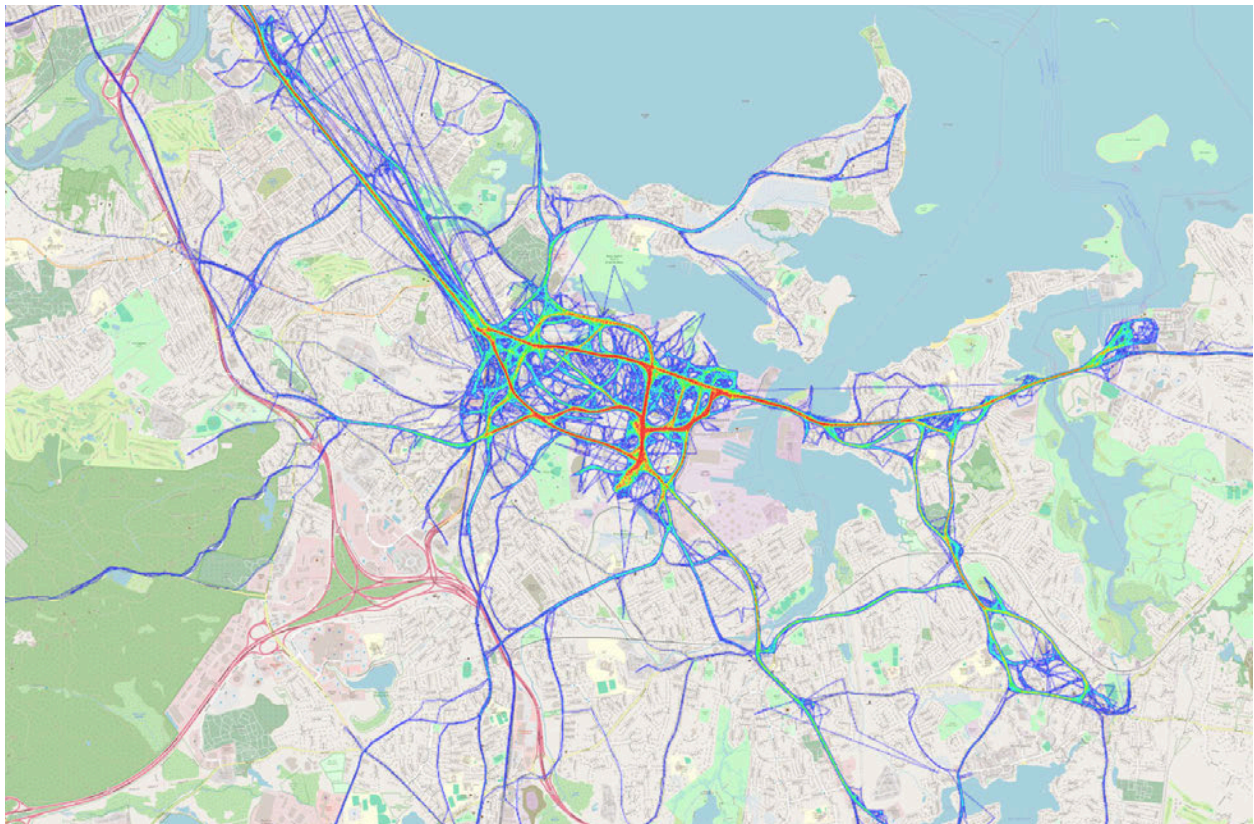
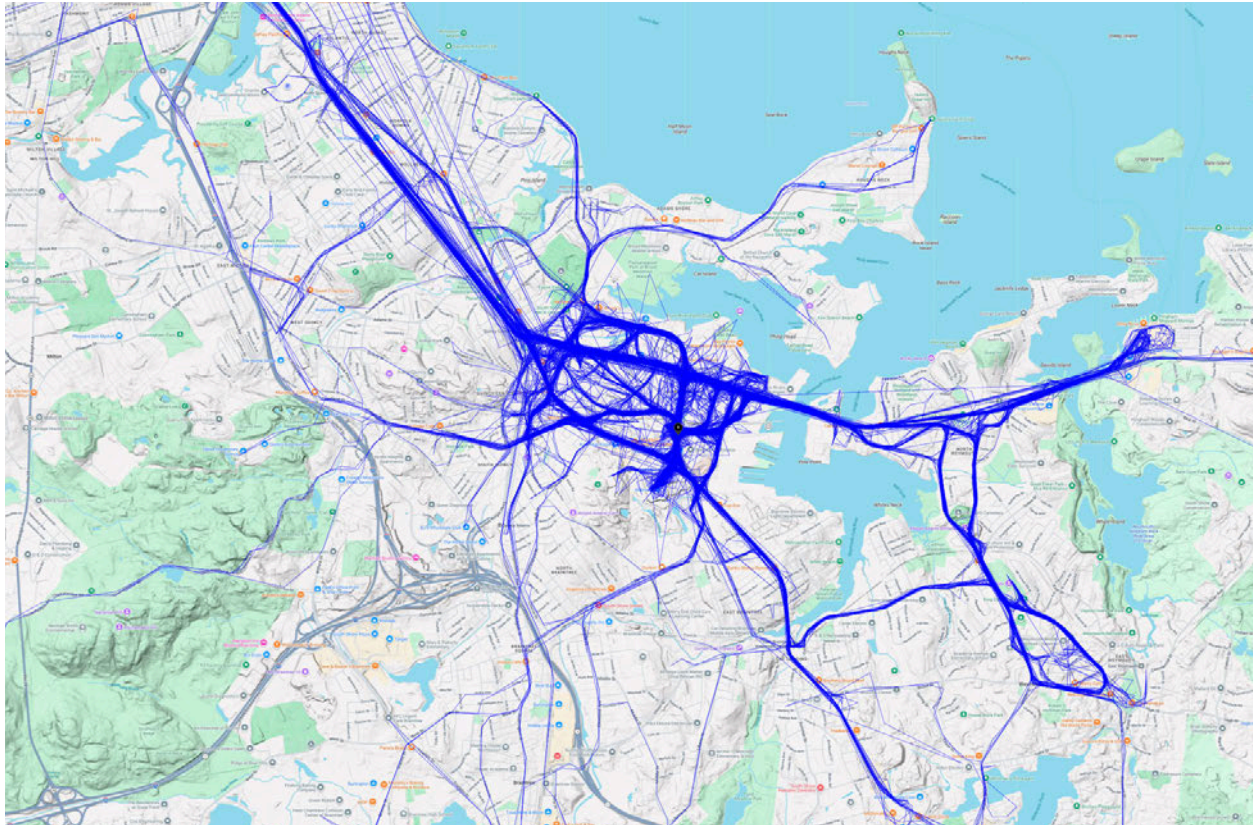
### City of Lawrence (E-Bike Library)



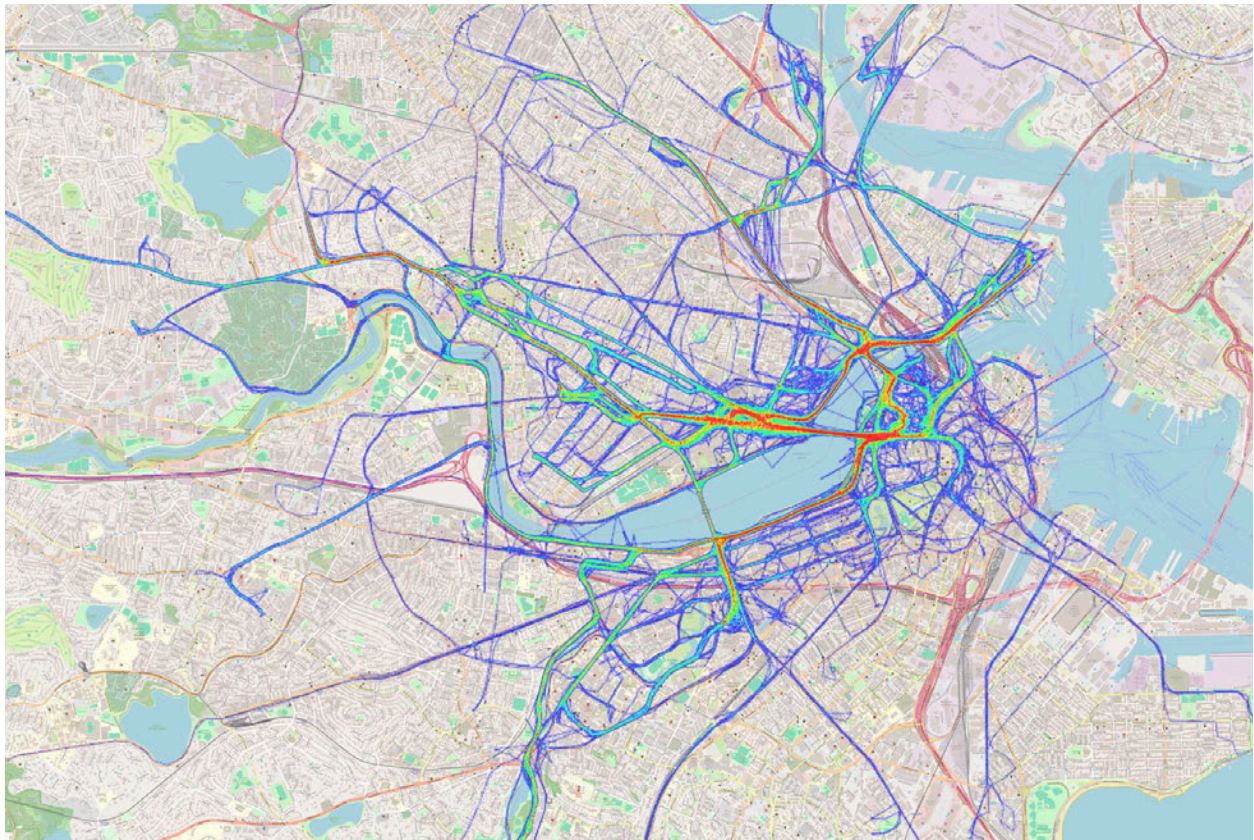
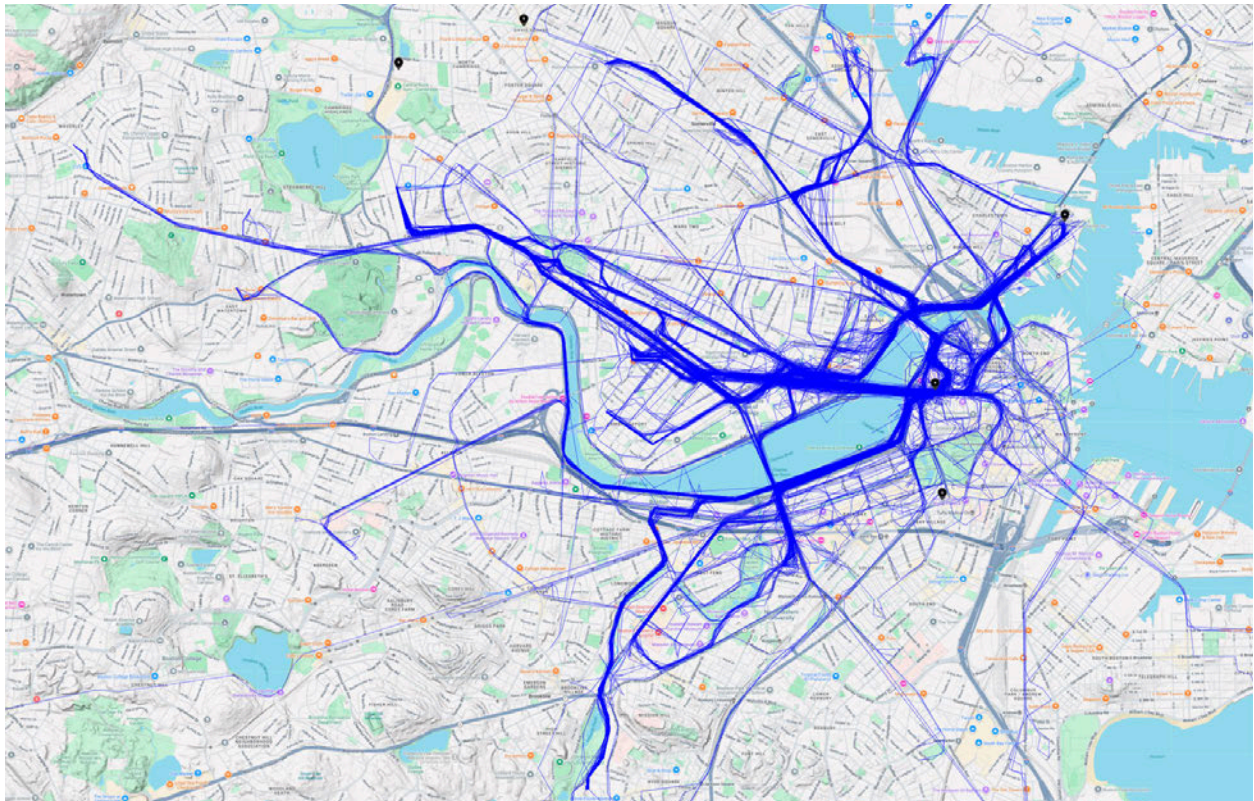
### Harbor Point Apartments (E-Bike Library)



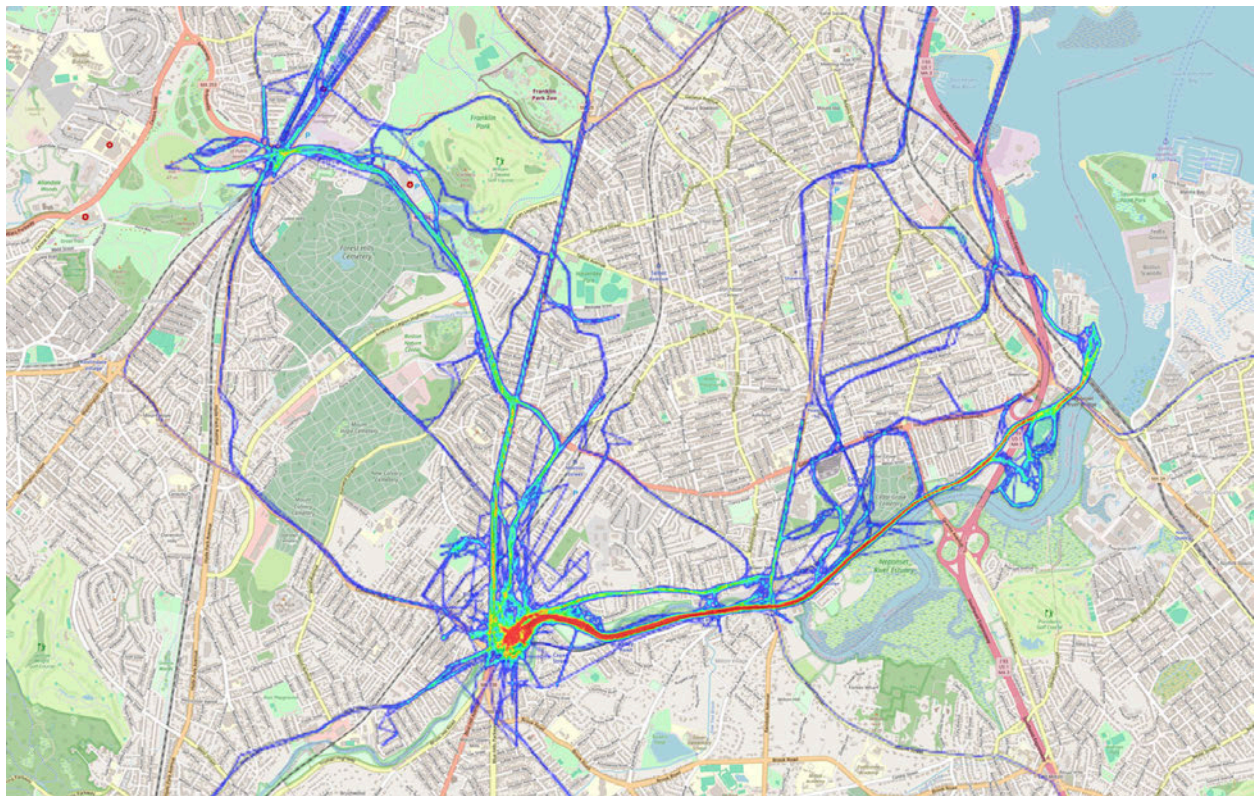
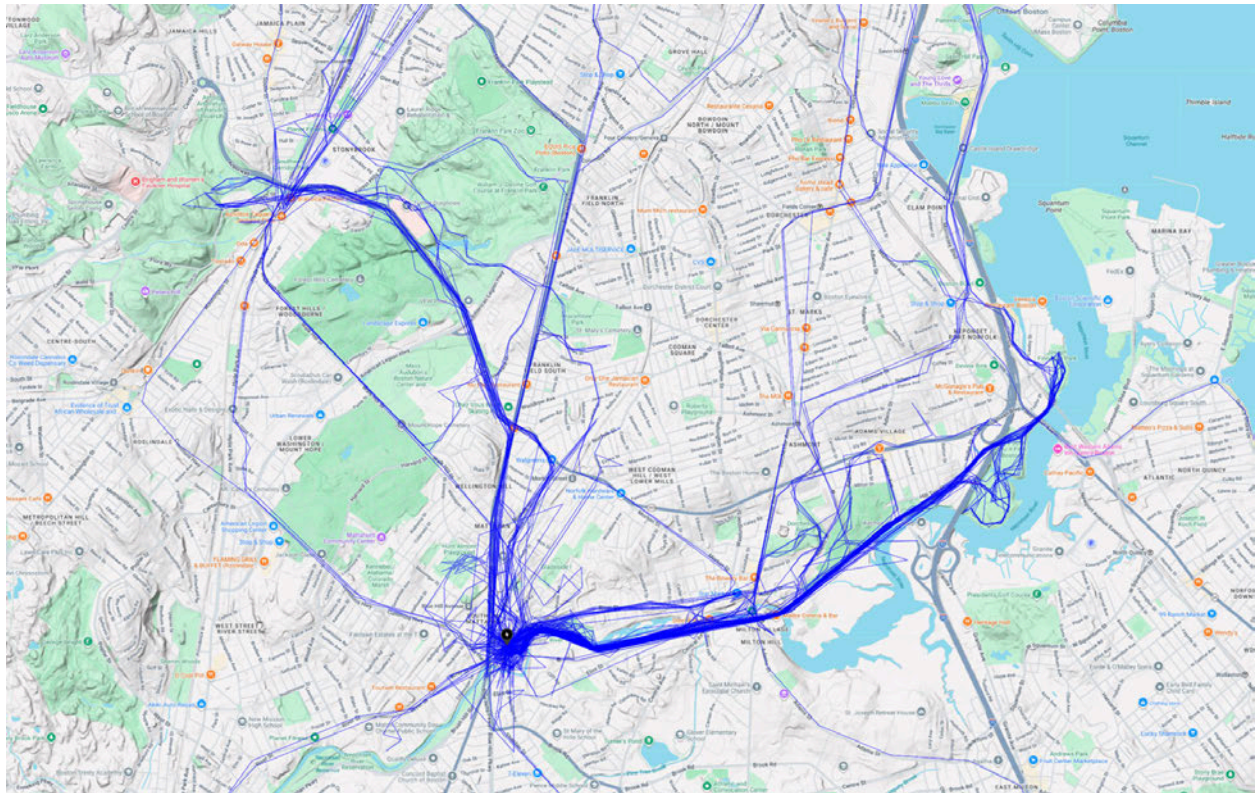
### City of Quincy (E-Bike Library)



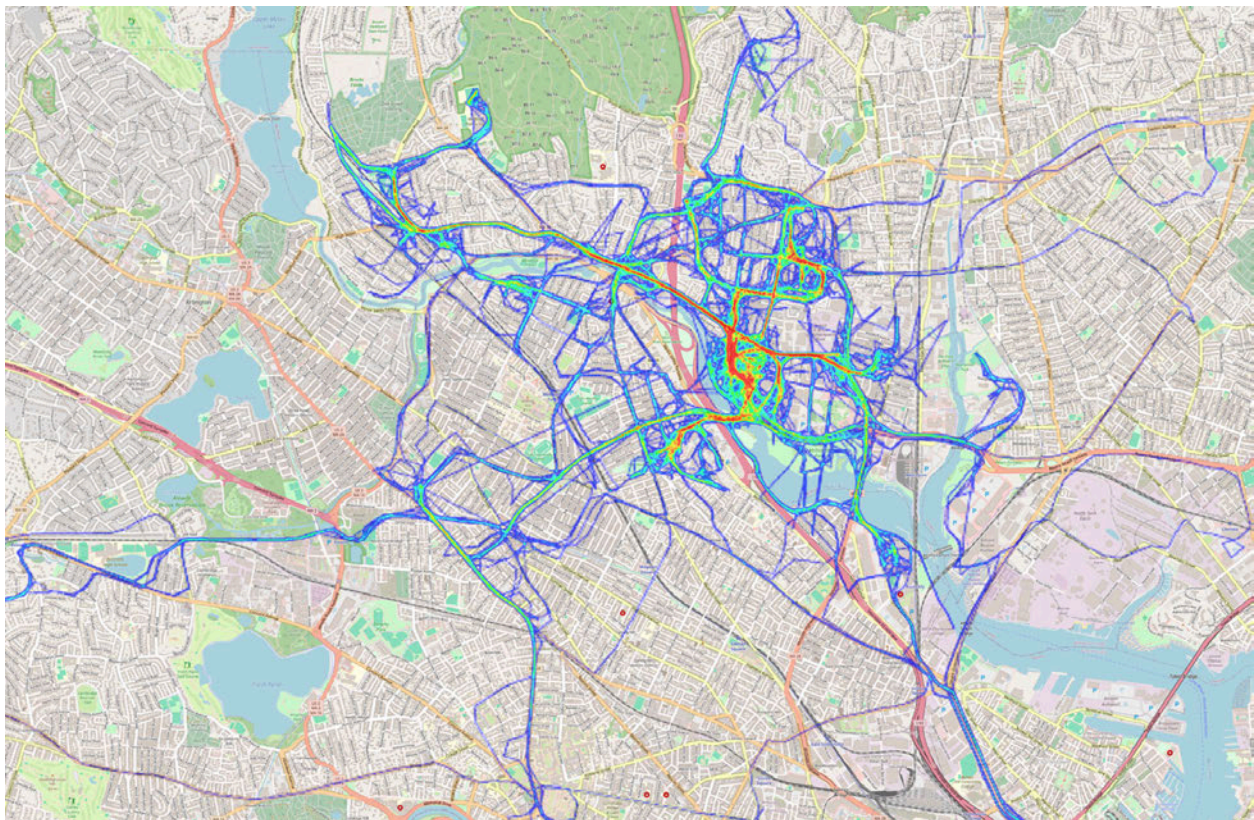
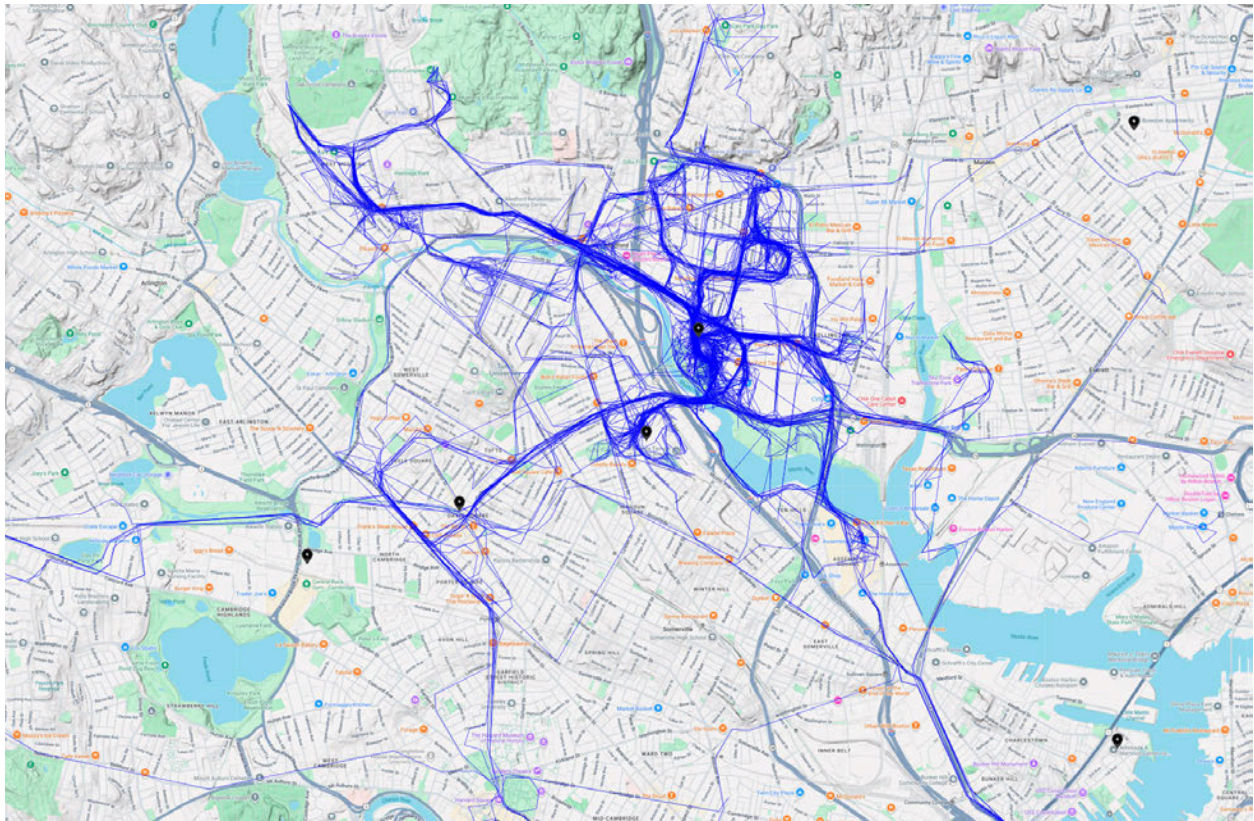
### Massachusetts General Hospital (E-Bike Library)



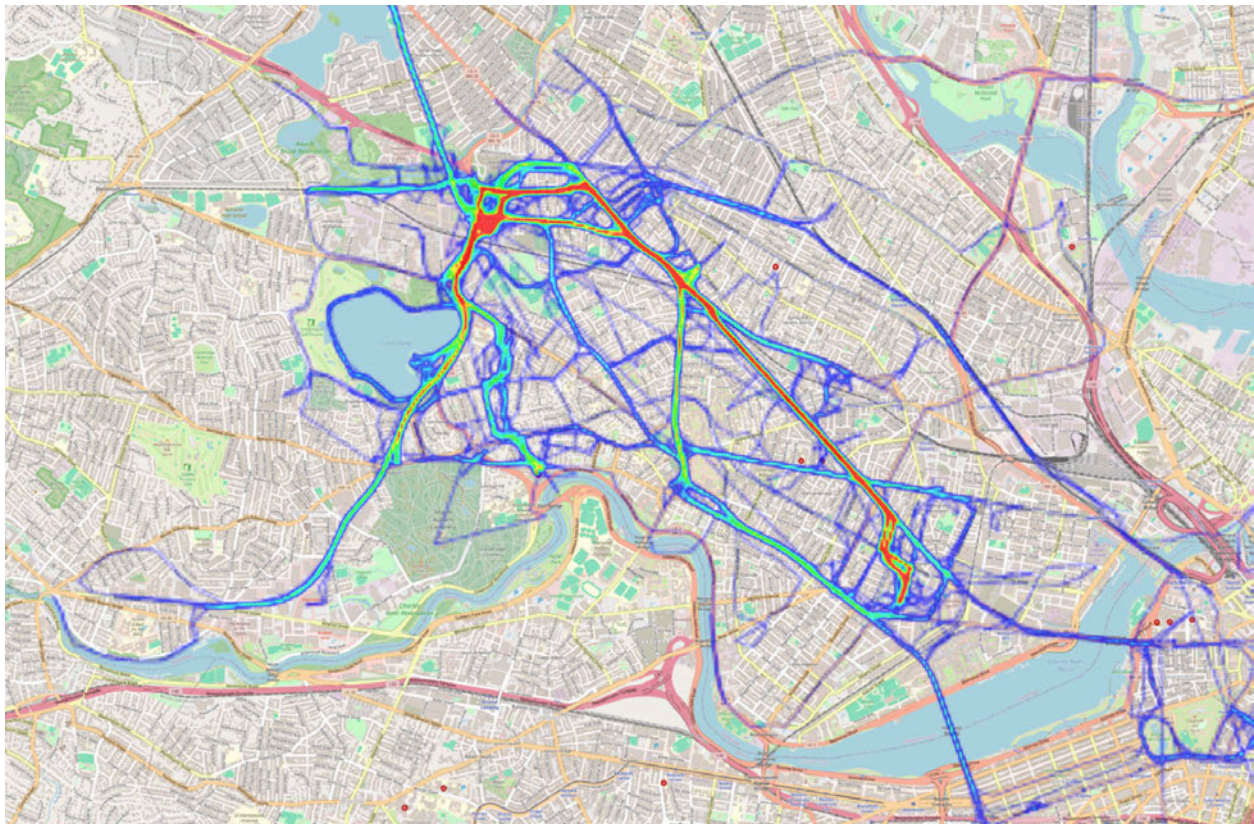
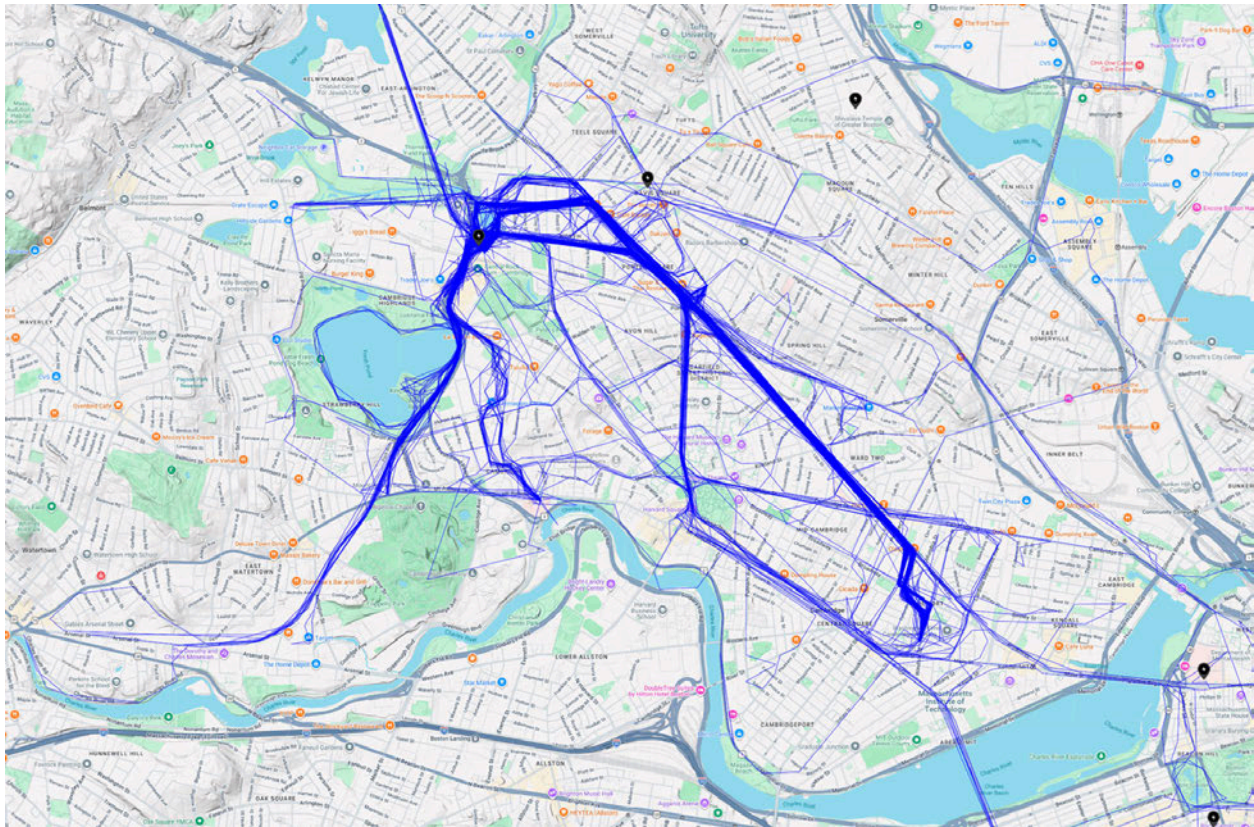
### The Loop at Mattapan Station (E-Bike Library)



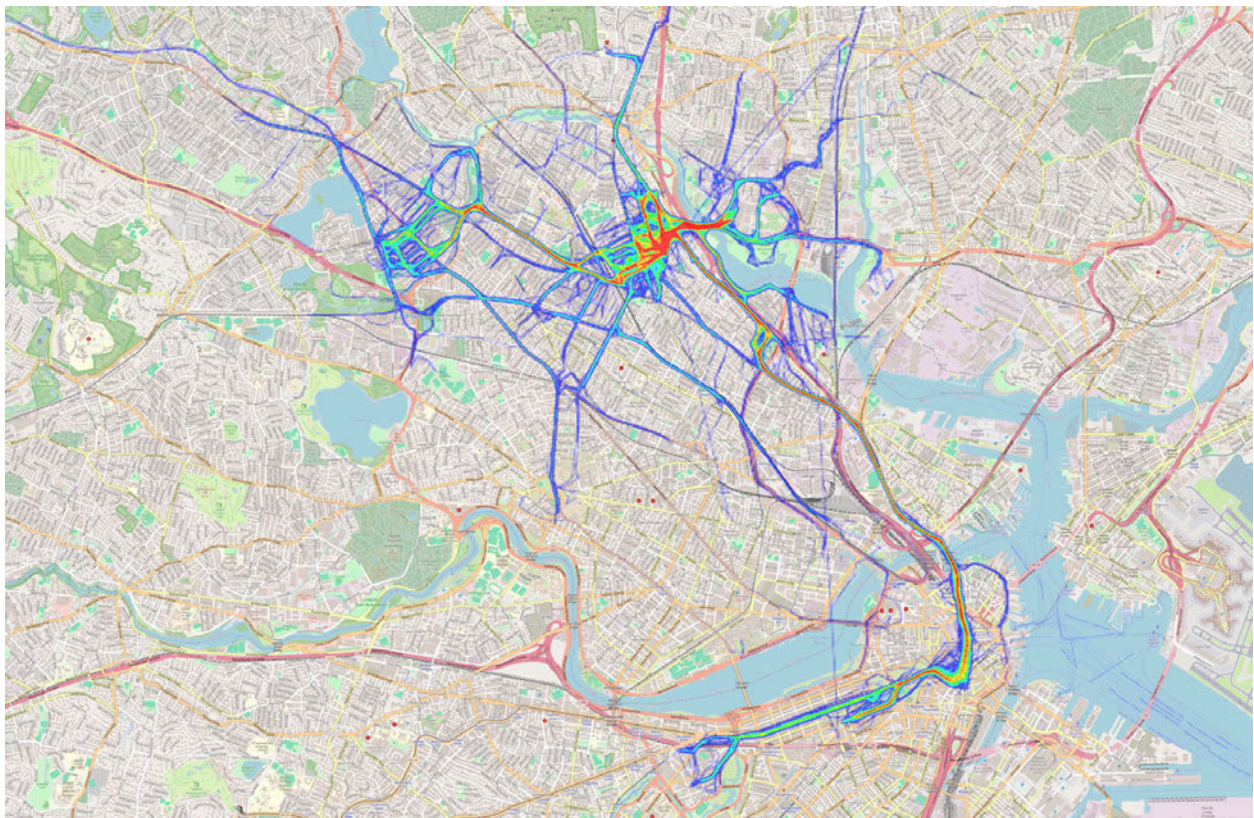
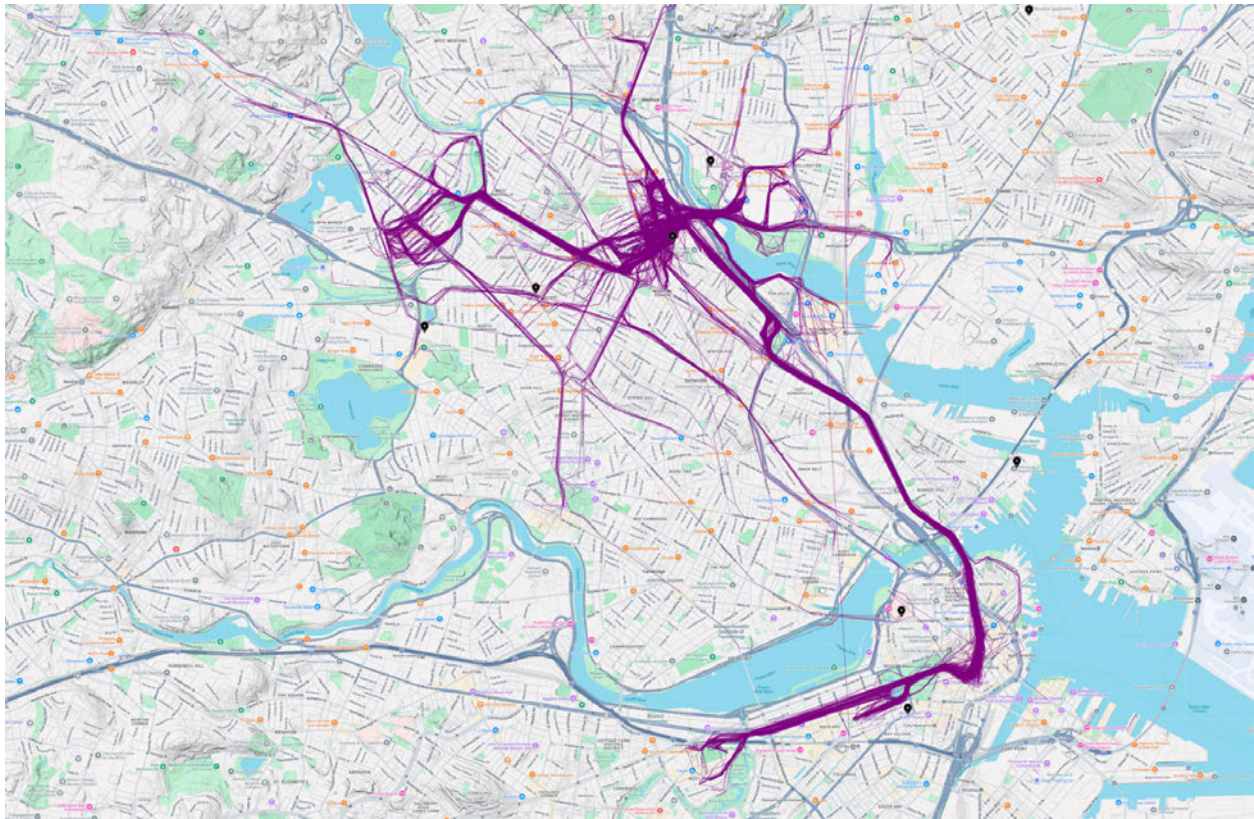
### Medford Housing Authority 1 (E-Bike Library)



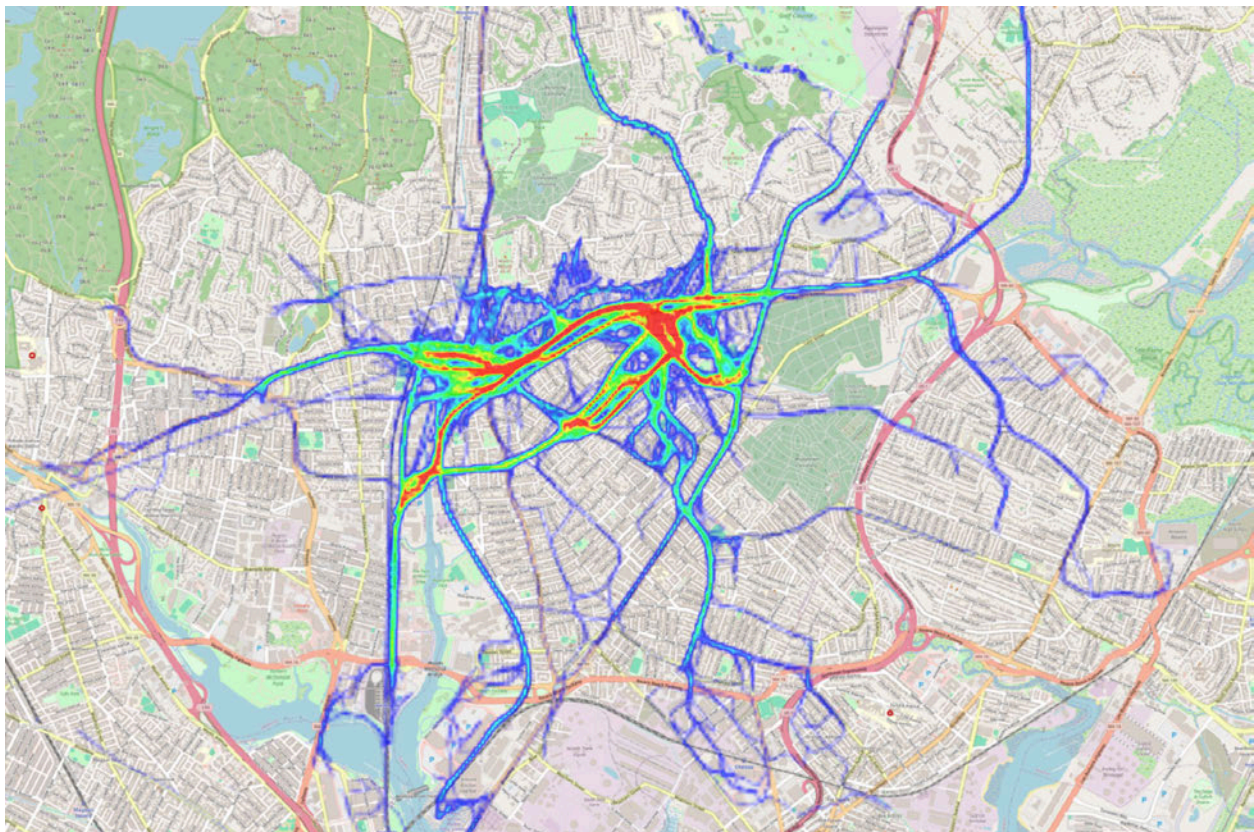
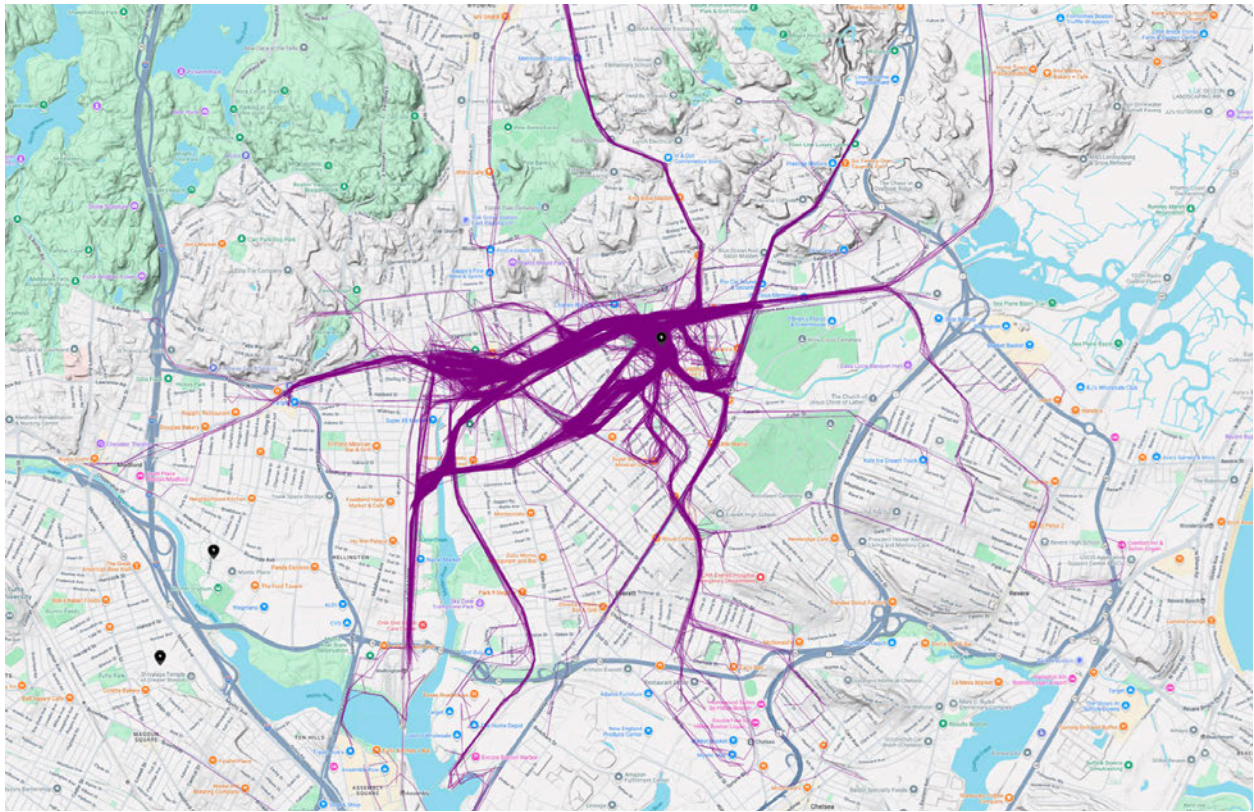
### Rindge Tower Apartments, Cambridge (E-Bike Library)



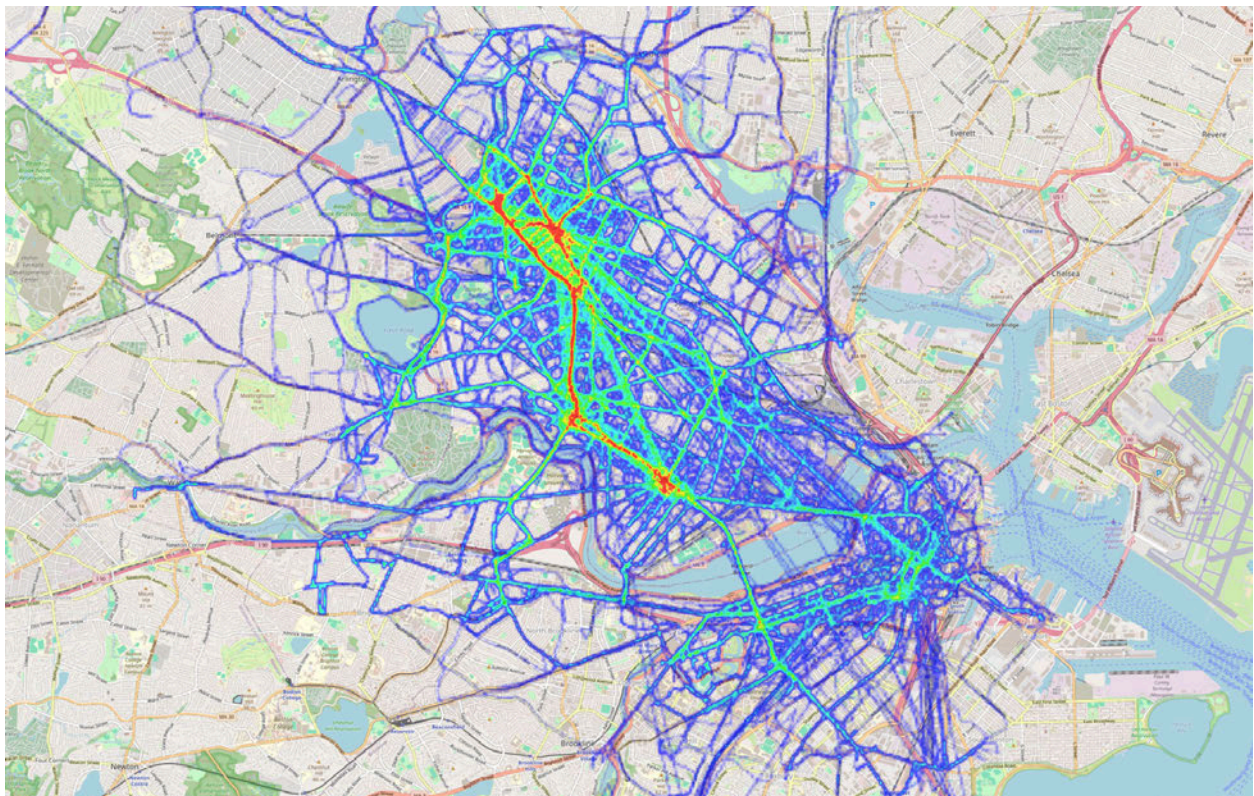
### Medford Housing Authority 2 (MOR + CHARGE)



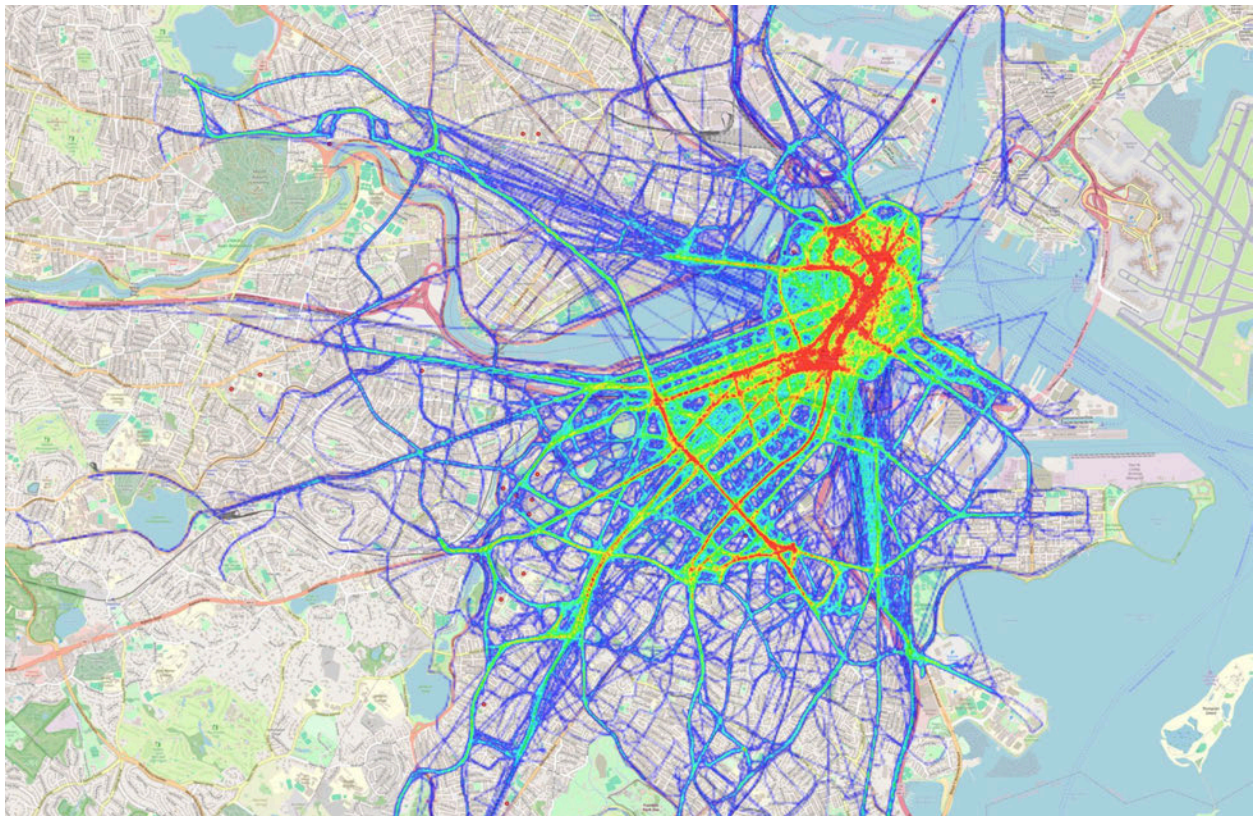
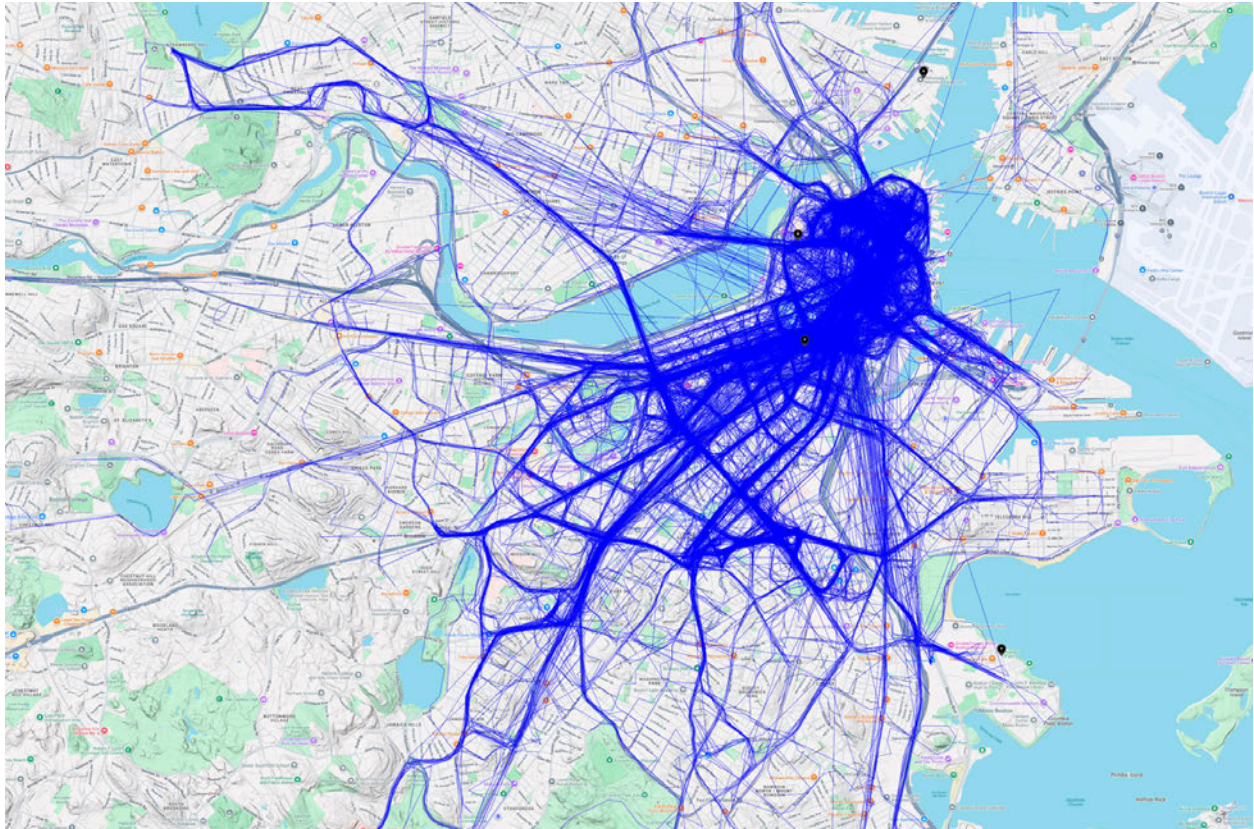
### Bowdoin Apartments, Malden (MOR + CHARGE)



### Davis MBTA / Solar Station (E-Bike Library - Phase 2)



### 201 Stuart Street, Boston (E-Bike Library - Phase 2 Delivery Station)



## Press

The Metro Mobility ACT4All e-bike project was covered by several press outlets including major newspapers, business journals, and industry publications.

### The Boston Globe

<https://www.bostonglobe.com/2024/10/24/metro/new-very-affordable-bike-share-rent-bike-buck/>

**The Boston Globe**

## A new (very) affordable bike share: Rent a bike for a buck

By **Rachel Umansky-Castro** Globe Correspondent, Updated October 24, 2024, 10:33 a.m.

### Fast Company

<https://www.fastcompany.com/91202979/how-massachusetts-is-making-e-bike-rentals-actually-affordable>

**FASTCOMPANY**

10-07-2024 | DESIGN

## How Massachusetts is making e-bike rentals actually affordable

E-bike rental prices have spiked over the years. Now, Massachusetts has a plan to bring the cost down.

### Boston Business Journal

<https://www.bizjournals.com/boston/news/2024/09/19/metro-mobility-electric-bike-rentals-low-income.html>

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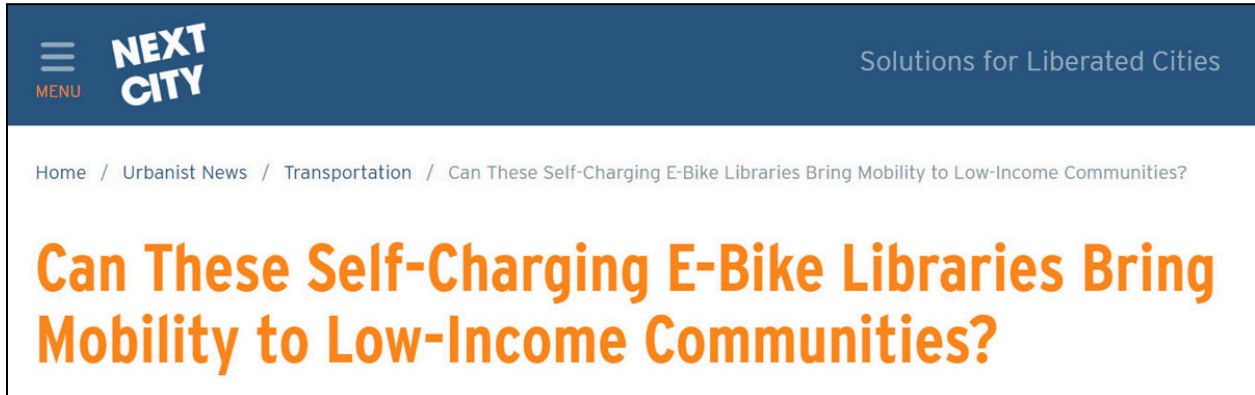
**BOSTON  
BUSINESS JOURNAL**

Transportation

## Local e-bike startup offers \$1-a-day rentals in low-income Mass. communities

**NextCity**

<https://nextcity.org/urbanist-news/self-charging-e-bike-libraries-metro-mobility-massachusetts>



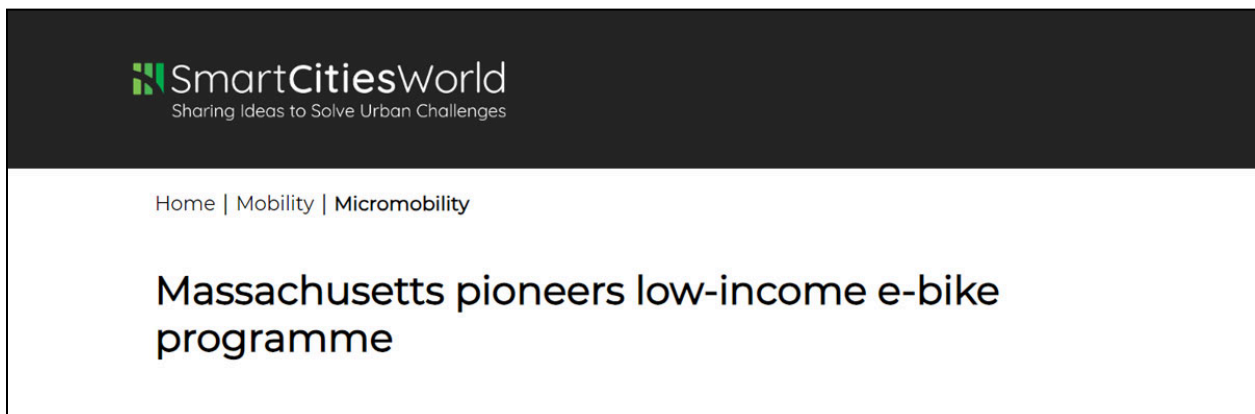
**Streetsblog**

<https://mass.streetsblog.org/2024/10/16/new-cambridge-company-aims-to-lower-the-cost-of-e-bike-rentals>



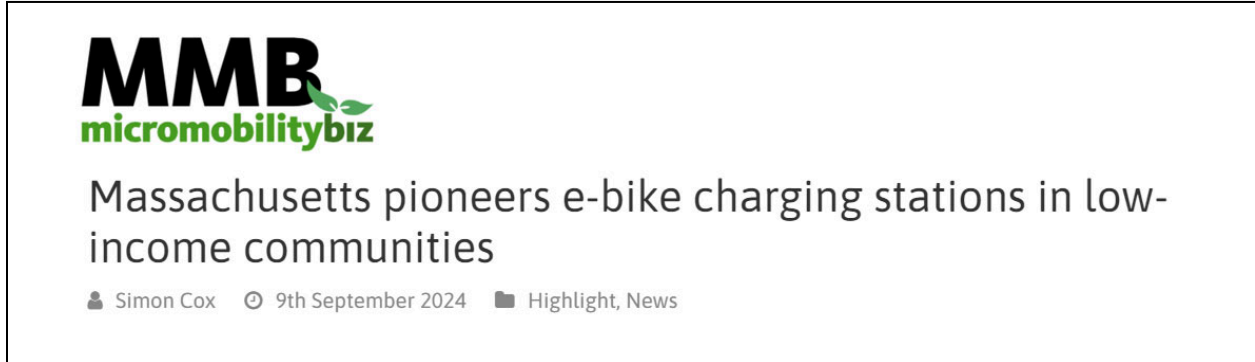
**Smart Cities World**

<https://www.smartcitiesworld.net/micromobility/massachusetts-pioneers-low-income-e-bike-programme-10683>



**Micromobility Biz**

<https://micromobilitybiz.com/massachusetts-pioneers-e-bike-charging-stations-in-low-income-communities/>



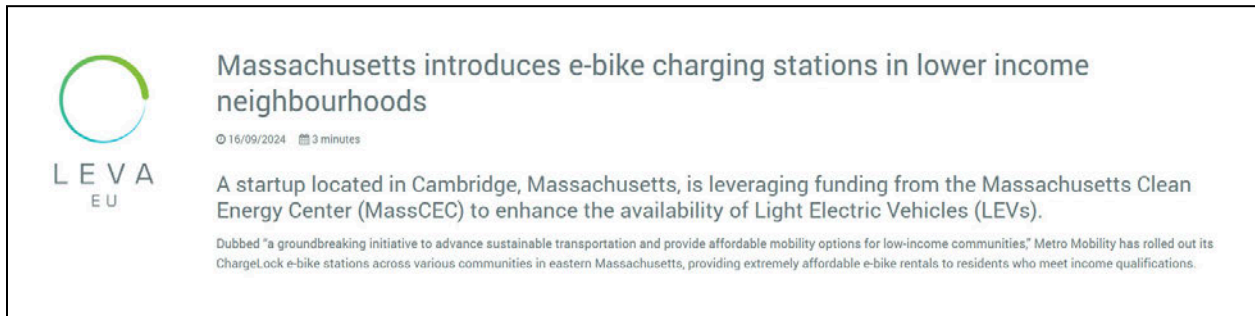
**MMB**  
micromobilitybiz


Massachusetts pioneers e-bike charging stations in low-income communities

Simon Cox 9th September 2024 Highlight, News

**LEVA EU (Light Electric Vehicle Association Europe)**

<https://leva-eu.com/massachusetts-introduces-e-bike-charging-stations-in-lower-income-neighbourhoods/>



 LEVA EU

Massachusetts introduces e-bike charging stations in lower income neighbourhoods

16/09/2024 3 minutes

A startup located in Cambridge, Massachusetts, is leveraging funding from the Massachusetts Clean Energy Center (MassCEC) to enhance the availability of Light Electric Vehicles (LEVs).

Dubbed "a groundbreaking initiative to advance sustainable transportation and provide affordable mobility options for low-income communities," Metro Mobility has rolled out its ChargeLock e-bike stations across various communities in eastern Massachusetts, providing extremely affordable e-bike rentals to residents who meet income qualifications.

**Bicycle Retailer and Industry News**

<https://www.bicycleretailer.com/industry-news/2025/08/22/massachusetts-opens-its-first-solar-powered-e-bike-charging-rental-station>



**Bicycle Retailer**  
and INDUSTRY NEWS

INDUSTRY NEWS ANNOUNCEMENTS RETAIL NEWS OPINION NEW PRODUCTS RECALLS CLASSIFIEDS EVENTS

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**Massachusetts opens its first solar-powered e-bike charging, rental station**

**BostInno**

<https://www.bizjournals.com/boston/inno/stories/news/2025/08/22/massachusetts-first-solar-powered-e-bike-charging.html>



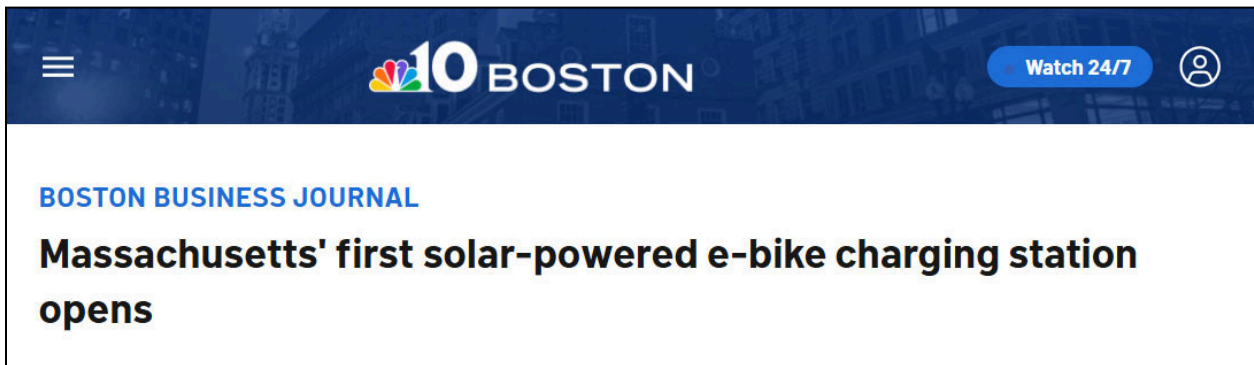
**CitiesToday**

<https://cities-today.com/solar-energy-powers-new-e-bike-hub-in-massachusetts/>



**NBC10Boston**

<https://www.nbcboston.com/boston-business-journal/massachusetts-first-solar-powered-e-bike-charging-station-opens/3795093/>



**Smart Cities World**

<https://www.smartcitiesworld.net/micromobility/somerville-ma-launches-solar-powered-e-bike-station-11901>



**Somerville Times**

<https://www.thesomervilletimes.com/archives/142305>



**Streetsblog**

<https://mass.streetsblog.org/2025/08/22/solar-powered-docking-station-for-e-bike-rentals-opens-in-davis-square>

