# *TECHNICAL MEMORANDUM*

**DATE:** **November 21, 2024**
**TO:** **Boston Region Metropolitan Planning Organization**
**FROM:** **Sophie Fox and Rosemary McCarron, Central Transportation Planning Staff**
**RE:** **Lab and Municipal Parking Study (Phase II)**

This memorandum presents and summarizes the results of the Federal Fiscal Year (FFY) 2024 Unified Planning Work Program (UPWP) study #14001, the Lab and Municipal Parking Study Phase II. The work scope for this study was approved by the Boston Region Metropolitan Planning Organization (MPO) board on February 15, 2024.

## 1 INTRODUCTION

The Boston region is experiencing a boom in laboratory and life sciences development. The life sciences industry in the region is not only growing in terms of its workforce and the number of new developments, but it has begun to spread from long-standing hubs such as Kendall Square in Cambridge to a diverse set of areas across the region. The Metropolitan Area Planning Council (MAPC) and Central Transportation Planning Staff (CTPS) have heard from numerous stakeholders, especially municipal planners, across the region that there is a need for rigorous research to determine parameters for parking regulation for such developments.

In FFY 2023, CTPS and MAPC collaborated on the Lab and Municipal Parking Study Phase I, a research study to assess regional parking supply and demand at commercial and mixed-use developments, with a particular focus on lab and life science facilities. Through market research and conversations with municipal planners, property developers, and other stakeholders, CTPS learned that there is often a discrepancy between parking requirements as designated by a municipality's zoning ordinance, what the market purportedly dictates as a necessary amount of parking, and the amount of parking that is typically used at a property, often leading to properties where parking is oversupplied. The stakeholder interviews also highlighted transportation demand management (TDM) strategies that are being implemented at properties across the region to lower the dependence on single-occupancy vehicle commutes, as well as

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methods used to utilize parking space more efficiently, such as repurposing empty space, creating more mixed-use properties, and opening parking up to the public. CTPS leveraged this information to build upon this work and further explore parking at specific sites in the Boston region.

CTPS gathered available parking use data, surveyed property managers, and completed on-site parking studies to further explore parking use at specific lab and life science sites in the Boston region. CTPS and MAPC developed a methodology to collect and analyze data about lab and life science facilities to measure actual parking supply and demand and determine which factors influence parking demand at these types of properties. This memorandum details the data collection methodology that was used in the study, including what worked and what can be improved upon in future parking studies.

The data collection efforts yielded less data than anticipated. This limited the certainty with which we were able to make claims about the relationship between different variables and make specific recommendations to policymakers about changes they should make to parking policy. Despite this, our preliminary findings about parking usage at lab and life sciences properties align with previous parking-related research in the Boston region, such as MAPC's Perfect Fit Parking Study. Two of the factors that most strongly correlate with parking demand are supply and transit accessibility. Properties with the largest supply of parking per 1,000 square feet tend to have some of the highest demand values by area, but also some of the lowest utilization rates and emptier lots. Properties in areas outside of the urban core, where transit systems and infrastructure are less robust, also tend to have less efficient use of parking. These results are promising, and with further data collection and analysis, they can lead to stronger determinations about the factors that impact parking usage in the region.

# 2 DATA COLLECTION

## 2.1 Property Manager Survey Development and Distribution

CTPS developed a survey for property managers of lab and life science facilities to gather information about the building use and occupancy, the parking supply, parking cost and parking demand patterns of tenants and their employees, and TDM strategies in place at these properties. See Appendix A for a list of survey questions.

The intent of the survey was to develop a database to use for subsequent analysis and to identify potential locations for on-site parking count observations. CTPS distributed the survey to a wide range of contacts, using a variety of methods. Efforts to engage with property managers at lab and life science facilities included outreach to the following:

- Property management companies
- Lab and life science developers
- Municipal planners
- Transportation management associations (TMAs)
- A Massachusetts-based biotechnology trade organization

We sent the survey out by email, through platforms including LinkedIn, and called property managers directly. CTPS reached out to more than 140 contacts to encourage participation in the study. Despite this extensive engagement effort, there was limited participation in the survey.

In total, we received completed survey data for 10 lab and life science facilities. Of the properties surveyed, three properties had less than 75 percent of their floor area occupied or in use. Because these buildings have significant vacancy, the parking utilization rate was difficult to interpret, and these properties were excluded from further analysis.

## 2.2 On-Site Parking Counts at Properties

CTPS used the surveys to identify locations for collecting on-site parking counts to estimate the number of vehicles parked at each facility at times when parking utilization is typically at its peak. Data collectors visited the sites during the peak hours on the busiest day of the week as specified in the survey and confirmed with the property manager. The data collectors walked through the parking structures and recorded the number of vehicles parked at that time. They made note of the number of personal vehicles, commercial vehicles, bikes, and more. For some of the properties, data collectors were able to complete multiple rounds of accounts. In those cases, the maximum counts were kept for the analysis. Of the seven potential properties identified through survey responses, CTPS was granted permission to complete on-site parking counts at four of them, two in Watertown and two in Waltham.

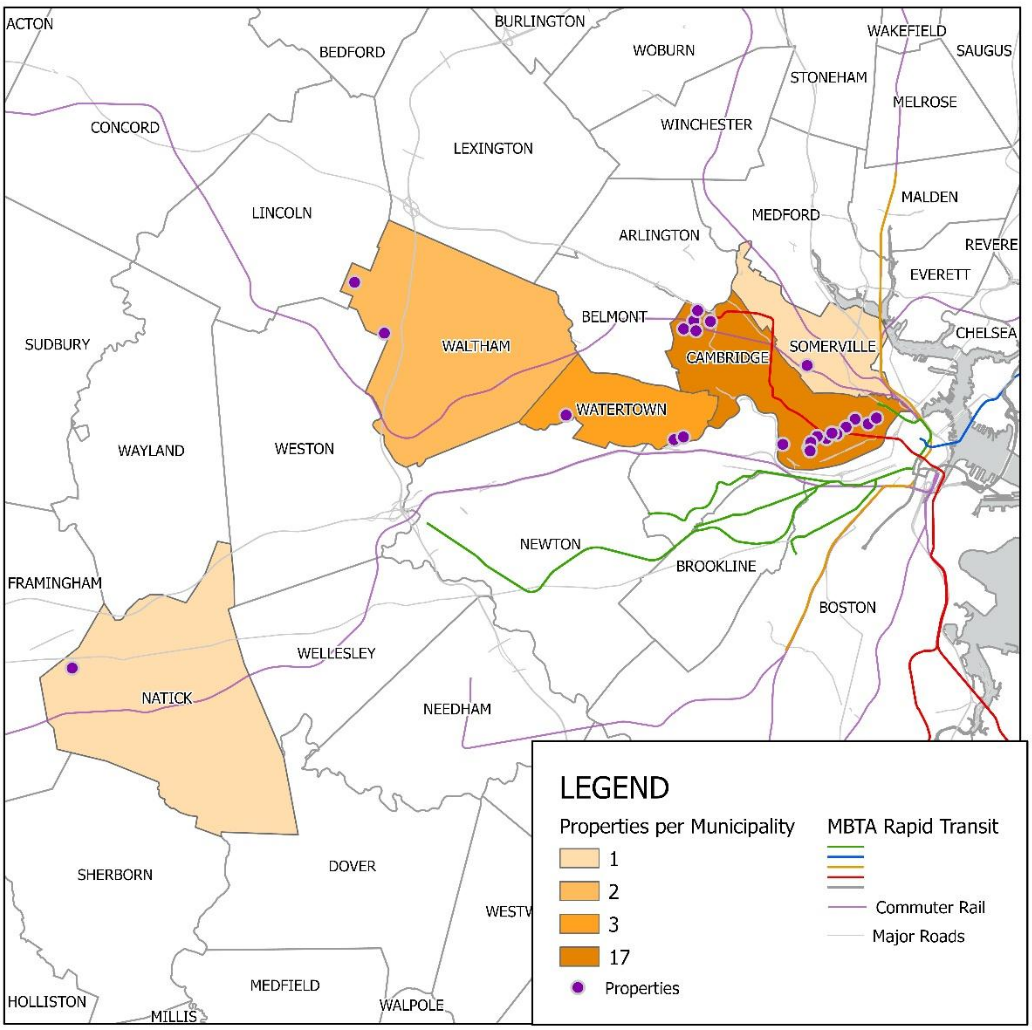
## 2.3 Cambridge Parking Data

Due to the limited dataset generated through the survey and on-site data collection, CTPS engaged the City of Cambridge to obtain parking demand data that properties are required to report to the City through its Transportation Demand Management program. The City requires that these properties measure the number of vehicles that enter and exit the parking structures per hour over a 48-hour period to determine the maximum number of parking spaces occupied. The City of Cambridge provided parking data from 18 properties with laboratory space. All the properties had more than 75 percent of the floor area occupied or in use. One of the properties had a much greater parking supply ratio than the other properties due to a shared parking arrangement with adjacent businesses. Because of the difficulty assigning parking spaces to a specific business at this property it was excluded from our analysis.

## 2.4 Dataset Development

Combining the data collected by CTPS and the City of Cambridge resulted in a dataset of 24 lab and life science facilities. Though the goal was to collect data across a range of municipalities, participation in the study was limited to a small number of municipalities and the largest city in the region, Boston, is not represented in the dataset. The majority of properties included in the dataset are located in the City of Cambridge. The other municipalities represented are Natick, Somerville, Waltham, and Watertown. We were only able to obtain some of the necessary information for the Somerville property, and we are missing information about the property's parking supply and built square footage. The Somerville property was excluded from analyses that use that data. The number of properties per municipality is shown in Figure 1 below:

**Figure 1**
**Properties Included in Phase II**




Source: CTPS.

One of the primary goals of this study was to measure parking demand at lab and life science facilities in the Boston region and explore factors that may influence how much parking is used. To explore this question, we looked at the following characteristics of each facility:

Parking Characteristics

- Parking Supply per 1,000 square feet (sf): the total number of parking spaces divided by the square footage of the facility
- Parking Demand per 1,000 sf: the number of occupied spaces divided by the square footage of the facility
- Parking Utilization: the number of parking spaces occupied divided by the total number of parking spaces

*Transportation Characteristics*

- Distance to the nearest rapid transit stop
- Distance to the nearest commuter rail stop
- Distance to the nearest bus stop
- Walk Score, Bike Score, and Transit Score
- Transit Ratio: the relative accessibility of the facility by transit versus by vehicle measured using the Conveyal platform
- Bicycle Ratio: the relative accessibility of the facility by bicycle versus by vehicle measured using the Conveyal platform

We were able to obtain the building square footage and the number of parking spaces from the surveys and from the data shared by the City of Cambridge. The number of parking spaces occupied was based on on-site counts for 21 of these sites:17 from Cambridge, two from Watertown, and two from Waltham. The remaining three properties (in Somerville, Natick, and Watertown) did not have on-site counts of the number of spaces occupied, but an estimated range of the peak parking utilization from the property manager survey. To be conservative, we assigned a parking utilization equal to the maximum of the range for these properties. For example, if a property manager indicated in the survey that they typically see 25-50 percent occupancy at their property, we assigned that property a 50 percent parking occupancy value.

To place the parking in the context of other available transportation choices, CTPS included the accessibility of the properties by different travel modes. Specifically, we focused on walking, biking, and public transit as alternate modes. We used Walk Score and Bike Score[1] data to quantify pedestrian- and bike-friendliness of the areas surrounding the properties. For transit, we used both

[1] Walk Score, "Get your Walk Score" (2024). https://www.walkscore.com/score/.

Transit Score and proximity to bus, rapid transit, and commuter rail stops pulled from MassGIS data layers to evaluate transit access to the properties.

# 3 RESULTS

The following subsections will delve deeper into these different characteristics and which ones correlate most strongly with parking demand.

## 3.1 Parking Supply and Parking Use

In MAPC's Perfect Fit Parking Study, one of the factors that most explained the variation in parking use at residential properties was parking supply. In this phase of the Lab and Municipal Parking Study, CTPS explored the relationship between parking supply and parking use at lab and life science properties and found similar trends.

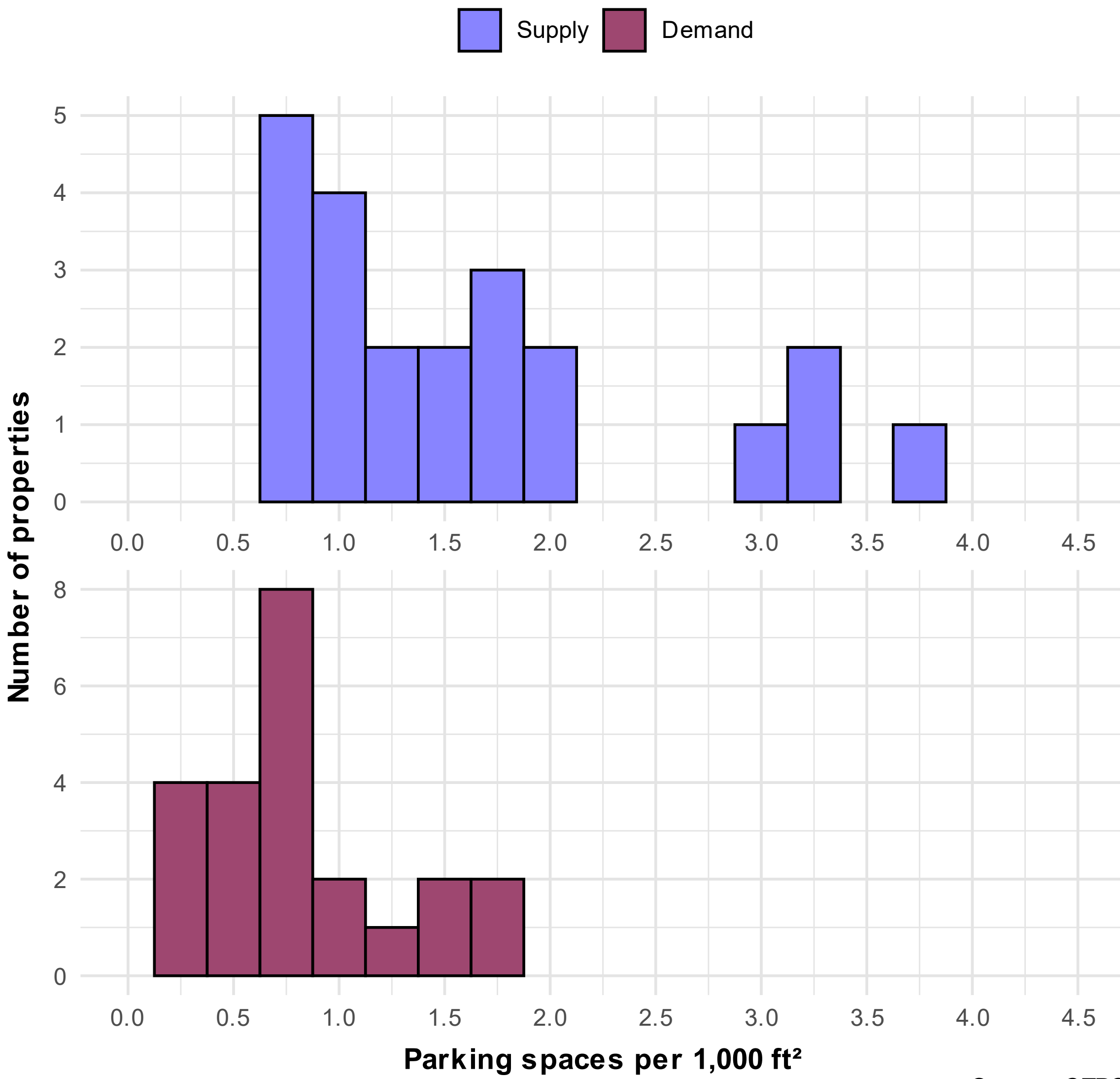
### *Methods*

CTPS calculated ratios for the total number of parking spaces supplied and the total number of spaces occupied during the data collection period versus the built square footage of the properties, as provided by property managers or the City of Cambridge. To determine the number of spaces supplied and occupied from the property manager survey, CTPS summed the number of surface lot, garage, electric vehicle, off-site, visitor, and accessible spaces allocated to and occupied at each property.

### *Findings*

Figure 2 illustrates the distribution of the supply and demand of parking spaces per 1,000 square feet for the 24 properties in our dataset. While the range of values for supply varies greatly, from less than one space to more than four spaces per 1,000 square feet of gross floor area, most properties in this study had less than one vehicle parked per 1,000 square feet and none of the properties had more than two vehicles parked per 1,000 square feet. The minimum, maximum, and average values for supply and demand are in Table 1.

**Figure 2**
**Distribution of Supply and Demand per 1,000 Square Feet**




Source: CTPS

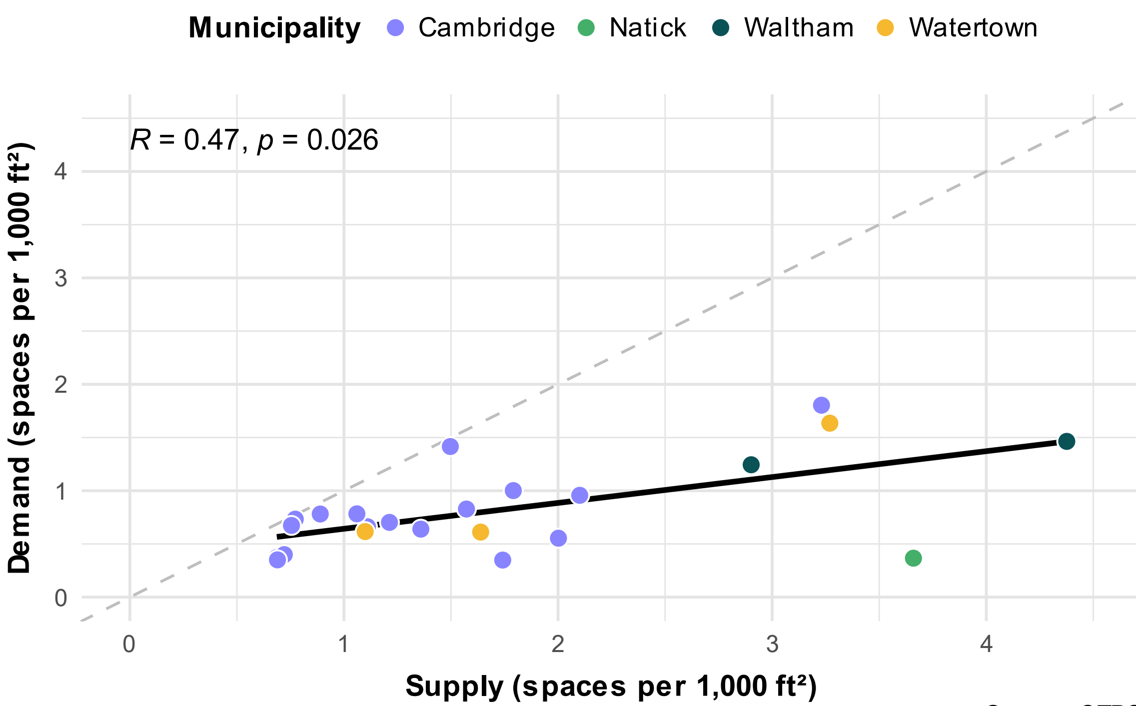
**Table 1**
**Summary Statistics for Supply and Demand**

| Parking Spaces per 1,000 square feet | Minimum | Maximum | Average |
|---|---|---|---|
| Supply | 0.69 | 4.38 | 1.75 |
| Demand | 0.35 | 1.80 | 0.82 |

Source: CTPS.

There is a positive relationship between supply of parking and demand for parking by area, which aligns with the Perfect Fit Parking Study finding that the more parking supplied, the more people park (Figure 3). However, the relationship is not one to one. As the parking supply per square foot grows, the parking use grows at a slower rate, leading to lower parking utilization at sites with a large parking supply.

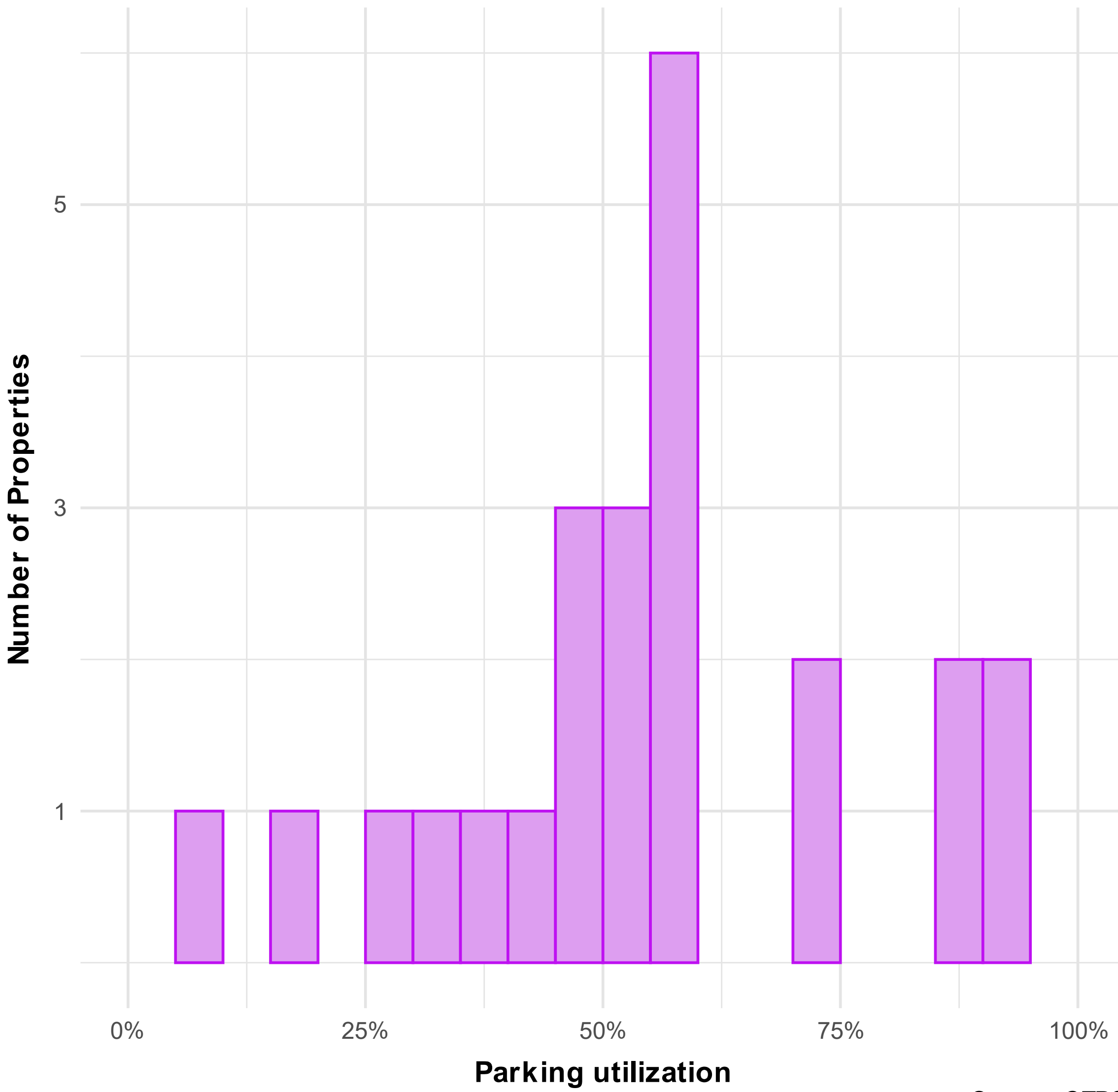
**Figure 3**
**Supply versus Demand per 1,000 Square Feet**




Source: CTPS

To follow up on this finding, CTPS directly explored the relationship between the supplied parking spaces and the percent of those parking spaces that are utilized. Figure 4 presents the distribution of the parking utilization rates for the properties in the dataset. The distribution shows many properties with lower utilization rates, with only a few measured at more than 75 percent utilized. None of the properties that we studied were observed to be at full capacity.

**Figure 4**
**Distribution of Parking Utilization Rate**




Source: CTPS

When comparing the parking supply per 1,000 square feet with the utilization rate, we observed a negative relationship (Figure 5). This suggests that while the demand for parking grows as supply grows, it does not grow at the same rate as supply, leading to emptier parking lots as more parking is provided. For the trends shown in both Figures 3 and 5, the Spearman rank correlation test[2]—which is used to determine the significance of two non-normally distributed variables with small sample sizes—found that the correlation coefficients were statistically significant at a 95 percent confidence level, meaning that we are 95

[2] Laerd Statistics, "Spearman's Rank-Order Correlation," 2018. https://statistics.laerd.com/statistical-guides/spearmans-rank-order-correlation-statistical-guide-2.php.

percent confident that there is a statistically significant relationship between these two variables. The test for this analysis and others discussed throughout the results were performed using the ggpubr package in R.

**Figure 5**
**Supply versus Parking Utilization Rate**

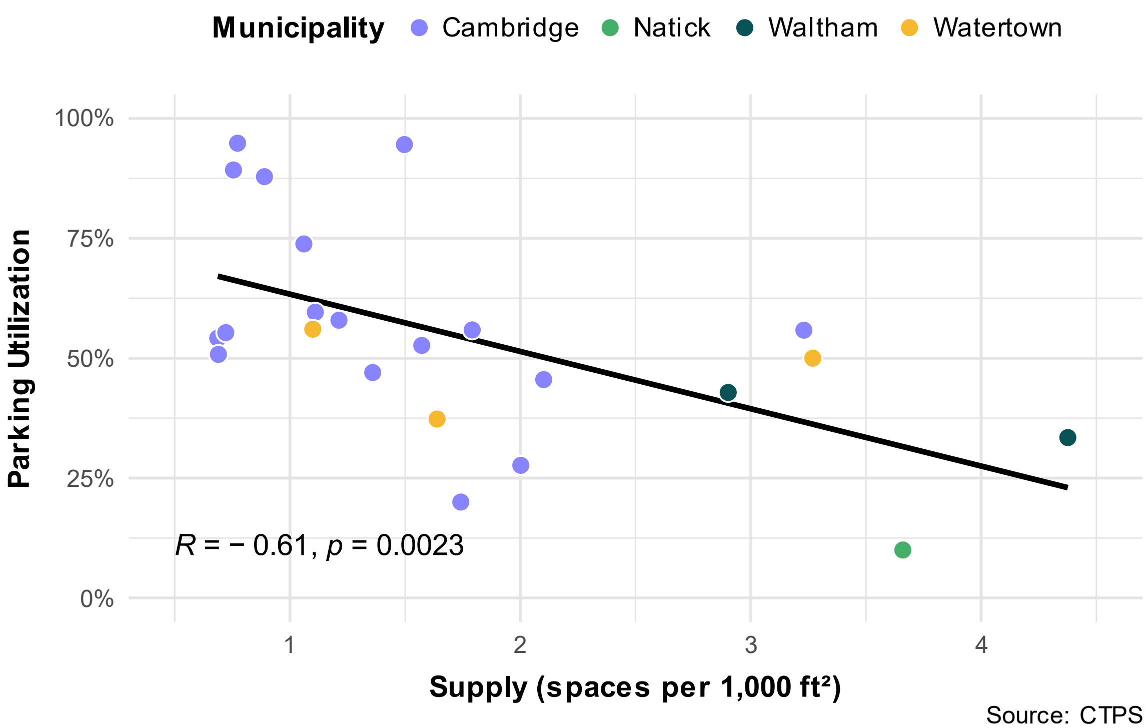
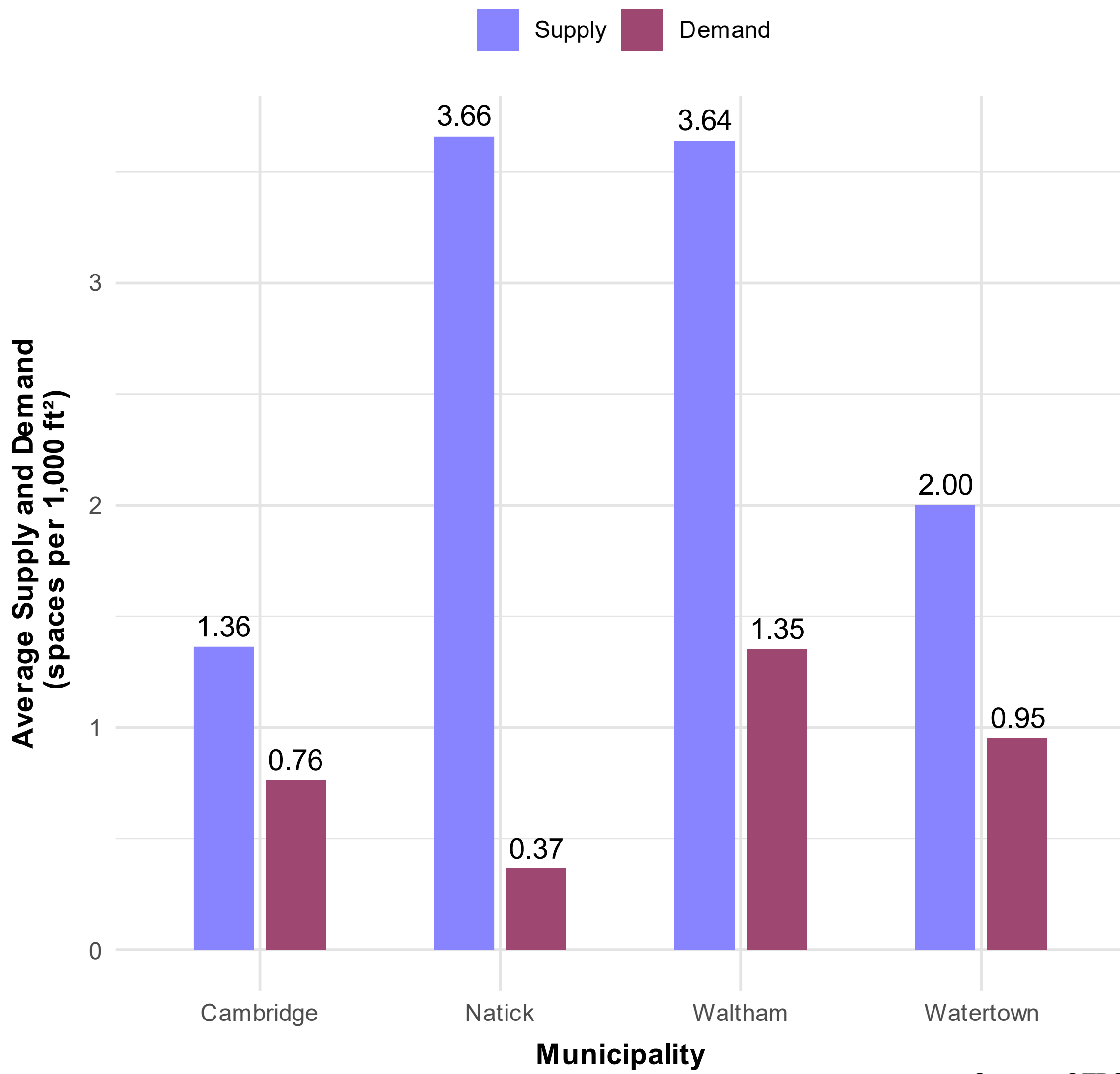



Figure 6 illustrates the average supply and demand for parking per 1,000 square feet for each municipality represented in the dataset. Many of the properties that had the lowest utilization rates are located further from the urban core, such as Waltham and Natick. These municipalities also tend to have some of the highest parking requirements. Municipalities with lower parking minimums or, as in the case of Cambridge, parking maximums tend to have higher occupancies.

**Figure 6**
**Average Supply and Demand by Municipality**




Source: CTPS

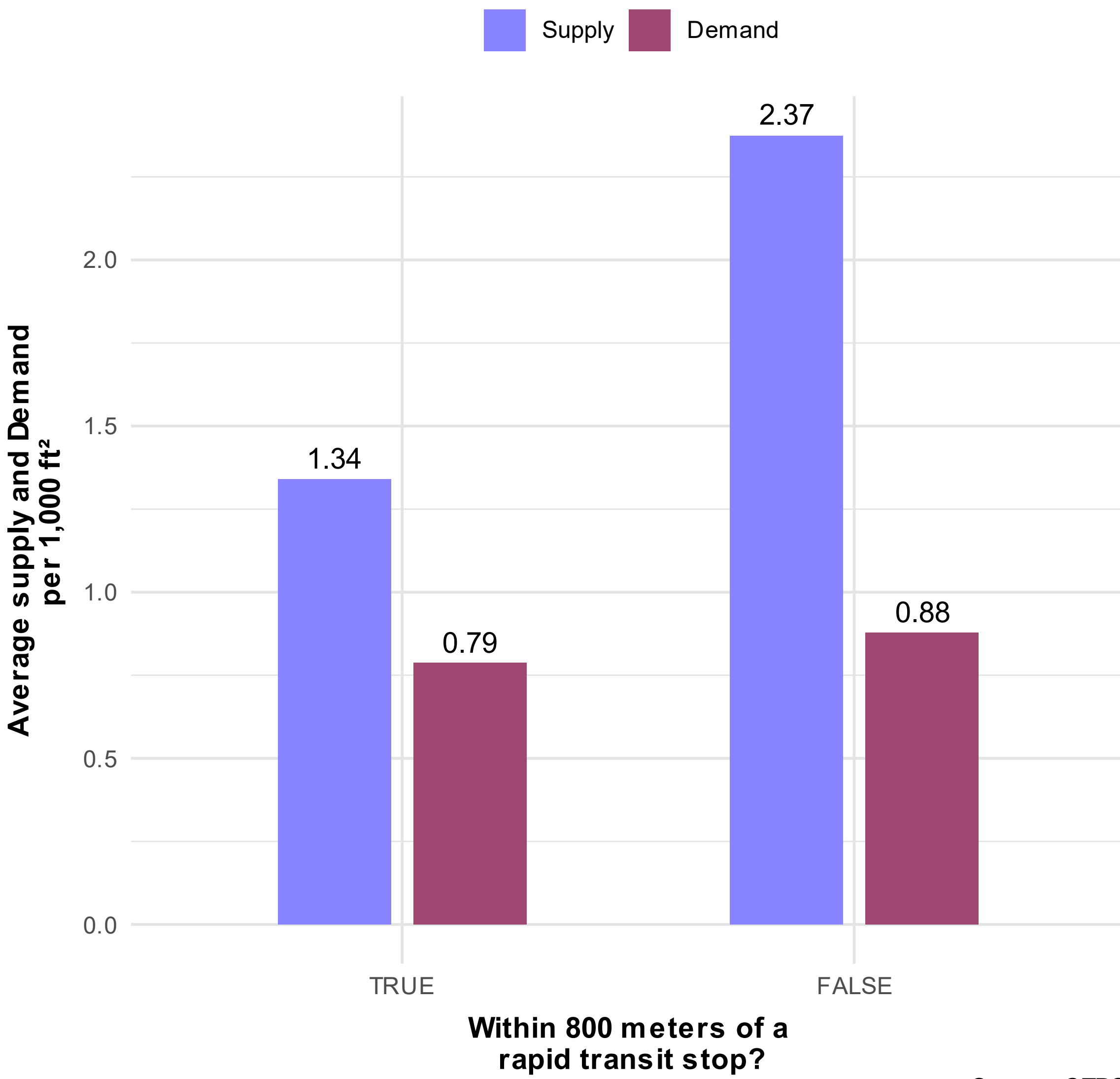
## 3.2 Transit Accessibility

In the Perfect Fit Parking Study, another factor that explained variation in residential parking demand was job accessibility by transit. The study found a relationship between parking use and the number of jobs accessible from the residential property in a 30-minute transit trip. Finding the number of jobs accessible would not be relevant for this study. Instead, CTPS explored the relationship between transit accessibility and parking use at these specific lab and life science employment locations.

### *Transit Proximity*

For the first part of this analysis, we used the MassGIS transit network to determine the distance from each facility to the nearest rapid transit, commuter rail, and bus stop. Figure 7 presents the average parking supply and demand of properties by whether they are within 800 meters, or about a 10-minute walk, of a rapid transit stop. In our dataset, there were 14 properties that were within the 800-meter buffer, and 10 that were not. The data indicate that properties located more than 800 meters away from a transit stop supply much more parking on average than those that are within walking distance, but the difference in parking demand is very small. This suggests that proximity to transit alone might not be the best predictor of whether people drive to these sites.

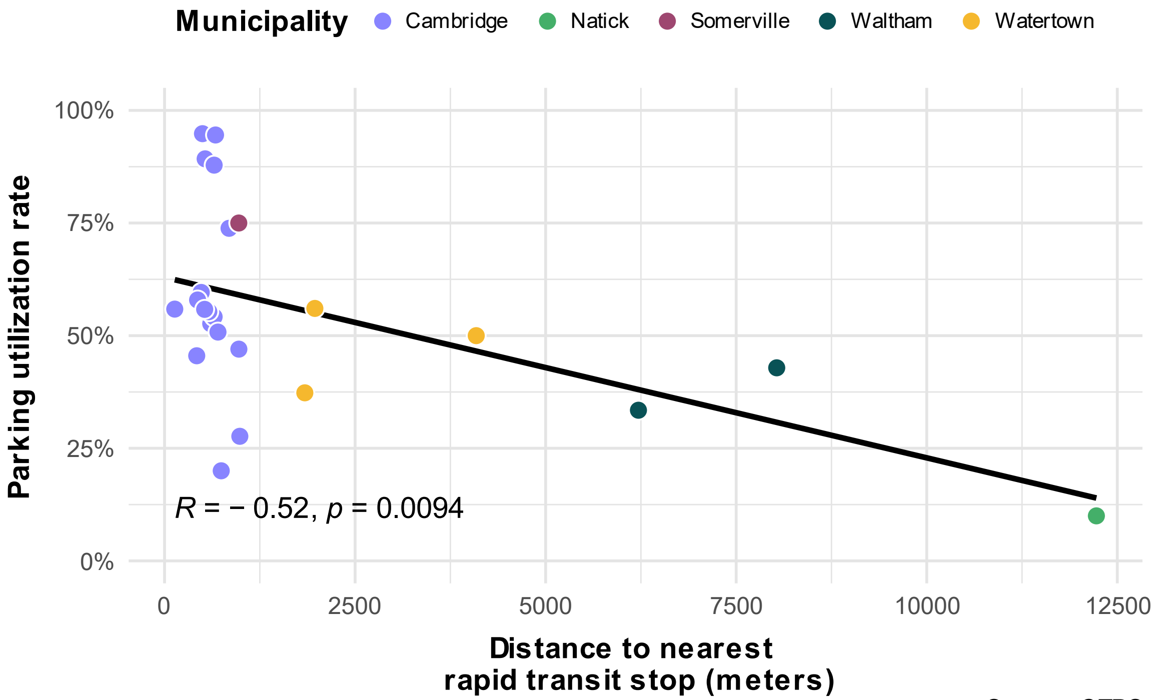
**Figure 7**
**Average Supply and Demand by Proximity to Transit**




Source: CTPS

This trend is also apparent when comparing the distance to the nearest rapid transit stop and parking utilization rate. As the distance increases, the percentage of the parking supply that is occupied diminishes. The amount of parking that is occupied by area does not vary significantly with distance; so, this pattern must be caused by an increased supply, more of which is sitting empty the farther from rapid transit a property is located. Of the three transit modes explored in this study—rapid transit, commuter rail, and bus—only rapid transit was found to vary significantly with utilization, as shown in Figure 8. There were no strong trends between any of the modes and parking demand per 1,000 square feet.

**Figure 8**
**Proximity to Rapid Transit versus Utilization Rate**



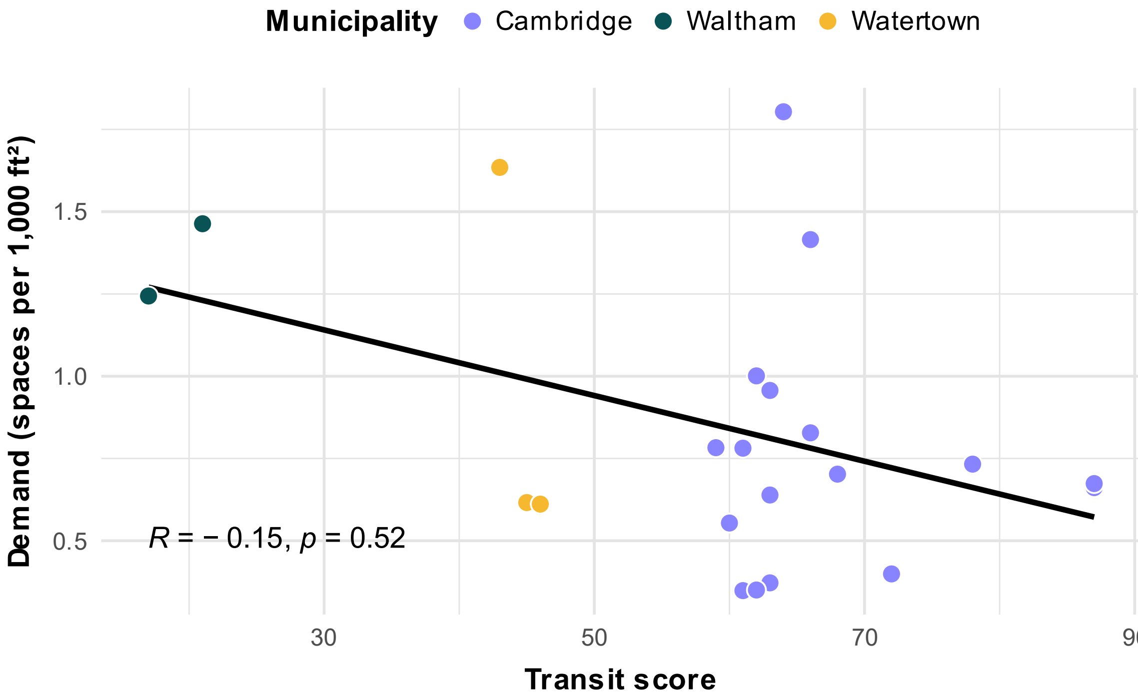

Source: CTPS

### *Transit Score*

While proximity to a transit stop provides some insight into transit accessibility, it does not account for the frequency, span, and interconnectedness of the proximate transit services. To begin to address this, CTPS used Walk Score to assign a Transit Score, a quantitative estimate of transit accessibility, to each property in the data set. Transit Score ranges between zero and one hundred, with the larger values indicating better transit environments for riders, and takes into account frequency and mode as well as proximity.[3] Figure 9 below illustrates the relationship between Transit Score and demand. Transit Score is not available for the town of Natick, so the Natick property was excluded from this analysis.

[3] Walk Score, "Walk Score Methodology" (2024). https://www.walkscore.com/methodology.shtml.

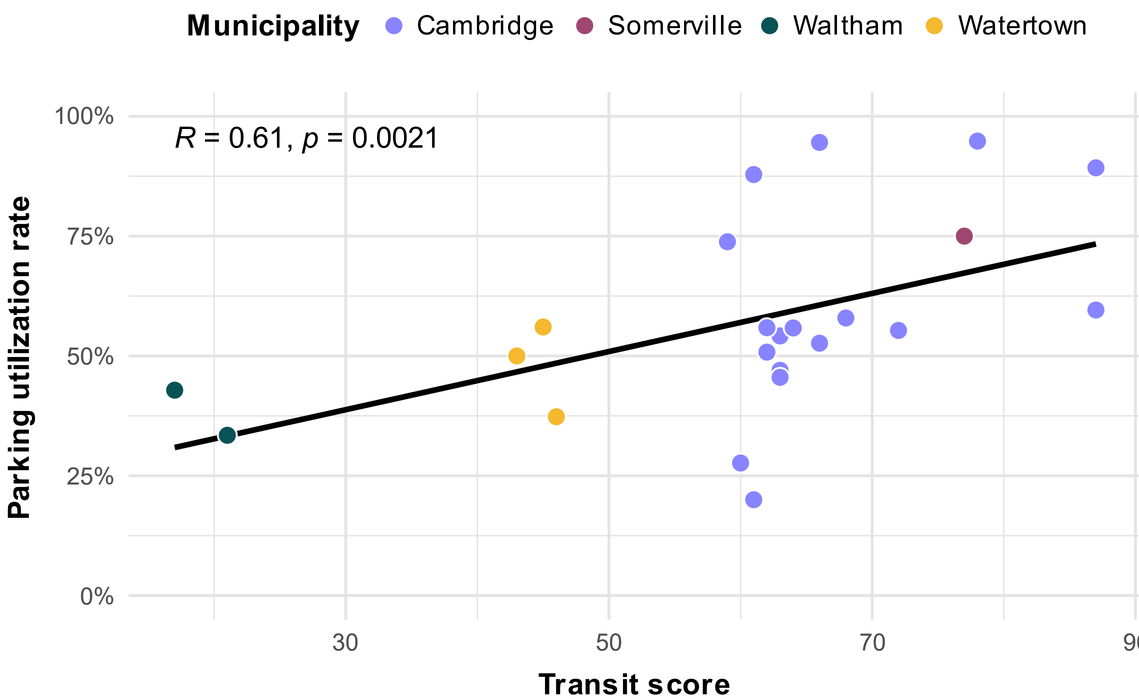
**Figure 9**
**Transit Score versus Demand per 1,000 Square Feet**




Source: CTPS

While the relationship between the variables was not found to be statistically significant in our dataset, there seems to be a slight downward trend where properties with higher transit scores tend to have fewer people driving to them. On the other hand, Transit Score does correlate significantly with the parking utilization rate, as shown in Figure 10. The relationship between the two variables is positive; as Transit Score increases, the parking at properties tends to be fuller. This is most likely driven by Transit Score's significant relationship with parking supply per 1,000 square feet, where there are fewer spaces provided at properties with higher scores. In this sample of properties, while Transit Score might not be a good predictor of the parking demand at a property by area, it is a good predictor of the percent of the supplied parking that is actually in use.

**Figure 10**
**Transit Score versus Utilization Rate**



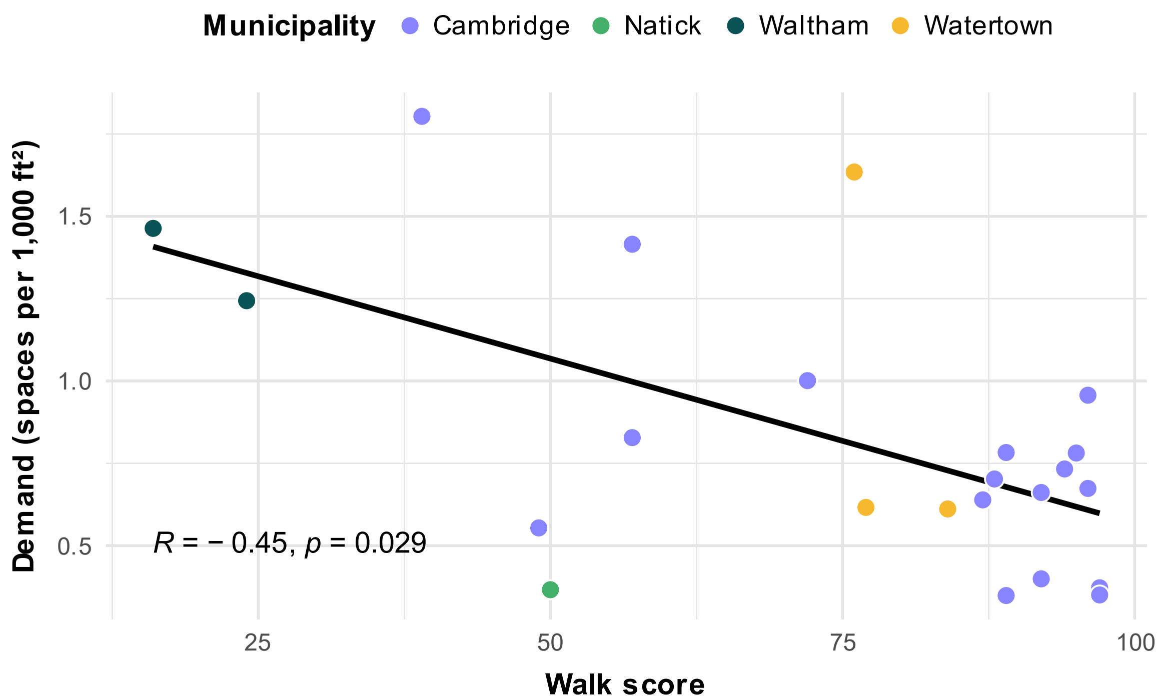

Source: CTPS

### *Walk Score and Bike Score*

In addition to Transit Score, a Bike Score and Walk Score were assigned to each property in the dataset. Walk Score was found to correlate significantly with parking demand per 1,000 square feet and parking utilization (Figure 11), with the same directionality as the Transit Score. (Unlike Transit Score and Walk Score, Bike Score did not correlate with parking demand per 1,000 square feet or parking utilization percentage. It did trend in the same general direction of the two other measures.)

Despite the correlation, it is safe to assume that the majority of workers traveling to these properties do not live within walking distance, and that transit and biking are more feasible commuting modes for most people. However, from our conversations with stakeholders in the first phase of this study, we learned that sometimes if other destinations such as restaurants or gyms are difficult to reach on foot from a property, the property might include these places on-site as amenities in hopes of attracting employees to work in person instead of choosing to work from home or at a more walkable location. Walking might not be a typical commute for the majority of workers, but the walkability of the surrounding area could have a large impact on people's decision to commute.

**Figure 11**
**Walk Score versus Demand per 1,000 Square Feet**




Source: CTPS

## 3.3 Conveyal Analysis

While the presence of nearby transit stops is an important metric through which accessibility to a property can be determined, it does not tell the entire story. When speaking to municipal representatives in the first phase of this study, we heard about how limited connections to the rapid transit network made the proximity of transit services almost irrelevant. In order to build upon the Transit Score and address the discrepancy between the proximity to transit stops and the accessibility and convenience of reliable and robust public transportation, we decided to supplement the analysis using a destination access analysis in Conveyal.

Conveyal is a web-based analysis tool that is used to demonstrate how people are connected to destinations through different modes of travel. Through this tool, we can determine how many people in the Boston region can access a lab property during peak commuting hours. We used Conveyal to quantify how many people could reach the facilities in our study by car and by transit. In addition, given recent growth in bicycle infrastructure and bicycle-friendly amenities provided by employers, we evaluated bicycle accessibility as well.

### *Methods*

To determine how accessible these properties are by those across the region hoping to commute to work, we used the Conveyal platform to quantify the number of people who can reach these locations via various commuting modes. Measuring accessibility for every property in our database was not feasible within the scope of this study. Regional Conveyal analyses were conducted on a subset of seven properties from our dataset that were broadly representative of the larger dataset.

Seven properties were chosen:

1. Northern Cambridge
2. Southern Cambridge
3. Somerville
4. Waltham
5. Western Watertown
6. Eastern Watertown
7. Natick

Two properties in Cambridge were chosen. The Northern Cambridge property is near Alewife Station and has fewer overall transit opportunities than the Southern Cambridge property, which is in the Kendall/MIT area. The Eastern Watertown property is close to a few bus stops, while the Western Watertown property, despite being farther away from the bus, is adjacent to a commuter rail station. The remaining three properties represent the three other municipalities present in our dataset.

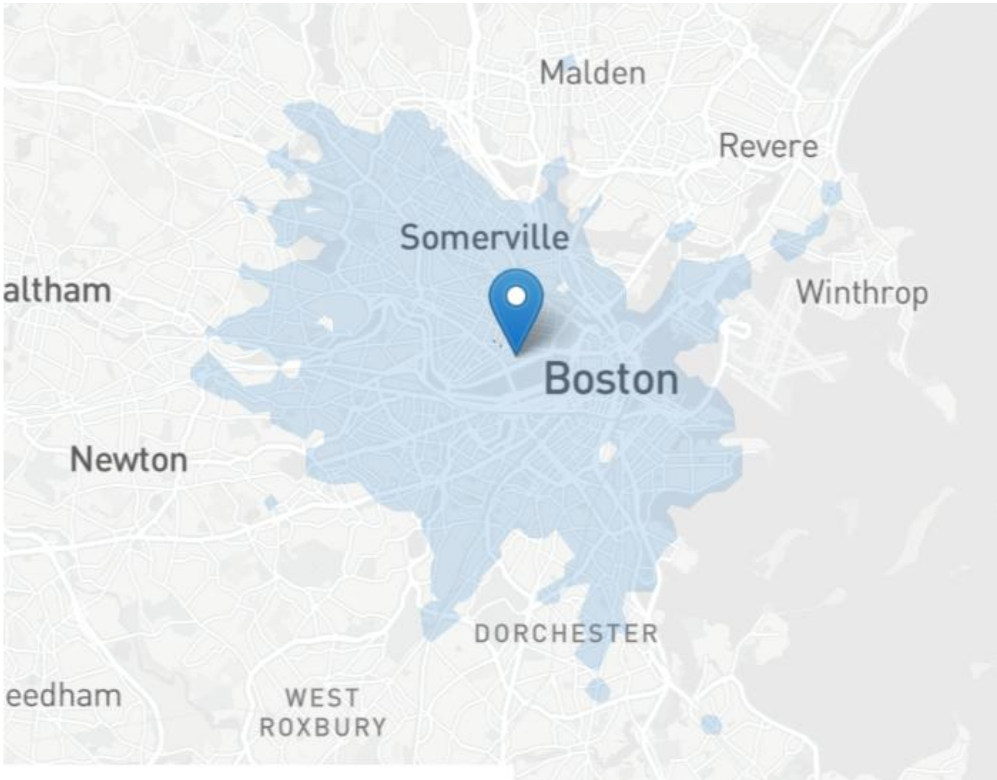
We considered three different scenarios:

- 45-minute driving trip
- 30-minute biking trip
- 45-minute transit trip

An assumption was made that those making biking commutes would most likely not be willing to spend as much time biking as they would driving or commuting on transit. A 45-minute driving and transit trip is consistent with other Conveyal work conducted by CTPS, and 30 minutes was seen as an appropriate and comparable time limit for biking.

Figure 12 is an example of a Conveyal analysis, highlighting, in blue, the area from which a person can reach a property within a 45-minute transit trip.

**Figure 12**
**Example Single-Point Transit Access Analysis from Conveyal**




Source: Screenshot from Conveyal.

We quantified the number of people who could access the site by transit and by bicycle during the weekday AM peak period and compared those numbers to the number of people who could reach the destination by car. Below are the two equations we used to measure access:

$$transit\,ratio = \frac{\#\,of\ people\ who\ can\ access\ property\ within\,a\ 45\ min\,transit\ trip}{\#\,of\ people\ who\ can\ access\ property\ within\,a\ 45\ min\,driving\ trip}$$

$$biking\,ratio = \frac{\#\,of\ people\ who\ can\ access\ property\ within\,a\ 30\ min\,bike\ ride}{\#\,of\ people\ who\ can\ access\ property\ within\,a\ 45\ min\,driving\ trip}$$

These analyses will give us insight about the transportation context in which these properties are situated and allow us to compare across properties.

### *Findings*

Table 2 below details the number of people that can reach each property by the different modes, the biking ratio, and the transit ratio. As the properties are closer to the urban core of the region, where we have seen there tends to be less demand for parking per 1,000 square feet, the number of people who can reach them by biking and transit increases. At the same time, the number of people who can reach by driving decreases. As a result, the percentage of drivers who can also reach them by transit and the percentage of drivers who can also reach them by biking tends to increase. For the properties in Natick, Waltham, and west Watertown, the vast majority of commuters can only reach the properties by driving. Even so, at least half of the parking spots at these properties are typically vacant.

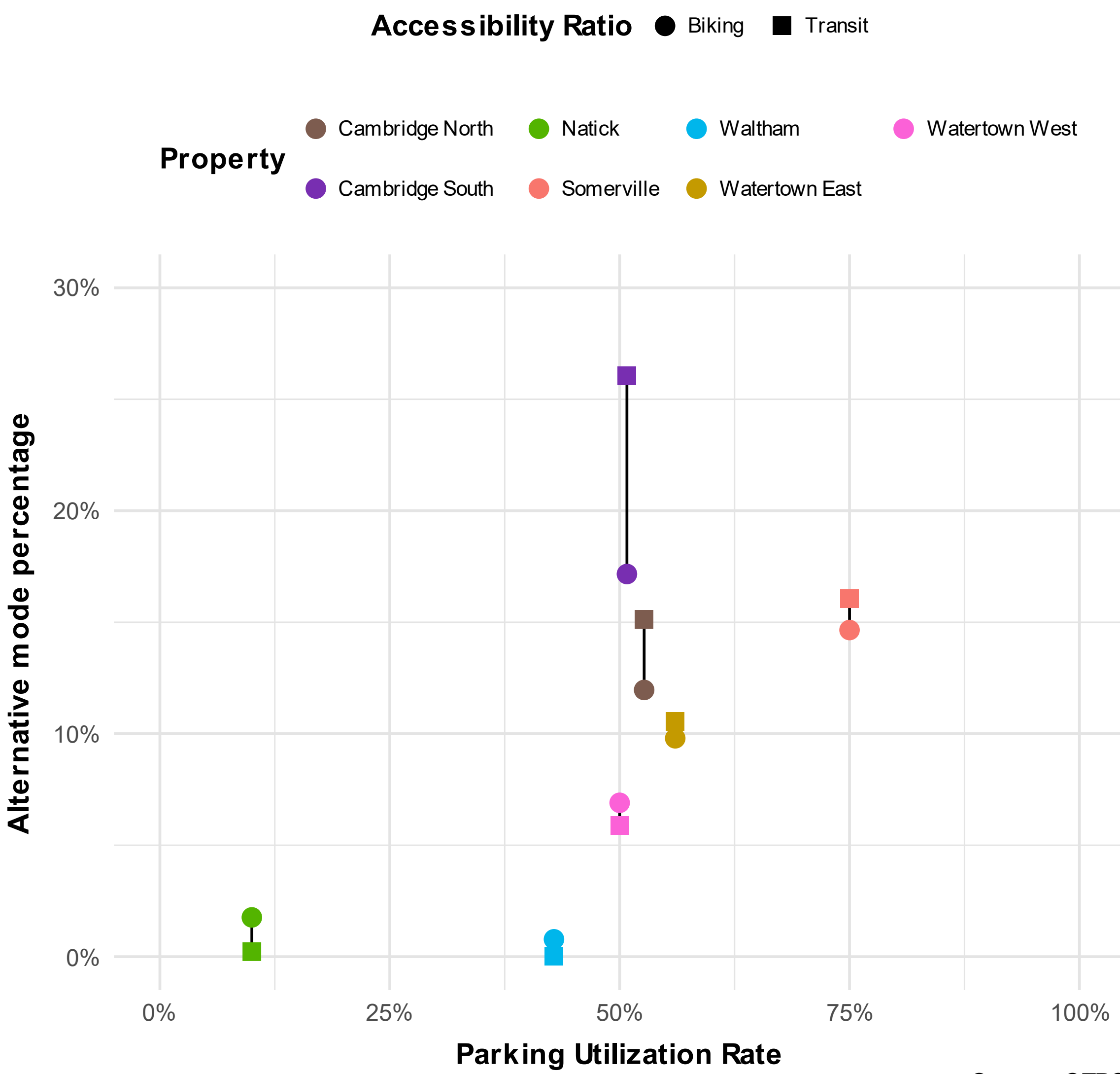
**Table 2**
**Conveyal Results**

| Property | Population That Can Reach Property by Mode | | | Alternative Mode Percentage | | | |
|---|---|---|---|---|---|---|---|
| | **Biking** | **Transit** | **Driving** | **Biking Ratio** | **Transit Ratio** | **Parking Utilization Rate** | **Spaces in Demand per 1,000 Square Feet** |
| Somerville | 337,198 | 369,790 | 2,301,594 | 14.65% | 16.07% | 75.0%* | |
| Natick | 44,535 | 5,671 | 2,527,021 | 1.76% | 0.22% | 10.0%* | 0.37 |
| Waltham | 21,603 | 452 | 2,771,032 | 0.78% | 0.02% | 42.9% | 1.24 |
| Watertown West | 169,894 | 144,697 | 2,461,978 | 6.90% | 5.88% | 50.0%* | 1.63 |
| Watertown East | 234,738 | 252,867 | 2,396,592 | 9.79% | 10.55% | 56.0% | 0.62 |
| Cambridge North | 278,121 | 351,921 | 2,325,023 | 11.96% | 15.14% | 52.7% | 0.83 |
| Cambridge South | 422,383 | 641,109 | 2,461,052 | 17.16% | 26.05% | 50.8% | 0.35 |

Notes:
Utilization rates denoted with an asterisk were found by taking the upper bound of the range provided by the property manager.
The Somerville property is missing information about spaces in demand per 1,000 square feet.
Source: CTPS.

Figure 13 below shows the relationship between the biking ratio and the transit ratio for each property. A few interesting trends are presented in this figure. First, for the properties in Cambridge, Somerville, and Watertown East, the transit ratio exceeds the biking ratio. These properties are located in urban areas. For the other properties, the biking ratio exceeds the transit ratio. Furthermore, when comparing the two Watertown properties, Watertown East, which is close to several bus stops, had a larger transit ratio and population that can reach the property by transit than Watertown West, which only has a computer rail stop nearby. Finally, Cambridge South and Natick have similar, very low parking demand values. However, the Cambridge property has much larger transit and biking ratios, as well as a higher parking utilization rate. This indicates that while the two properties are using similar amounts of parking normalized by area, the Natick property is providing much more parking than is needed.

**Figure 23**
**Conveyal Results Scatter Plot**




Source: CTPS

## 3.4 TDM Policy Review

Through our interviews with stakeholders, we learned about the transportation demand management strategies in place at different lab and life sciences properties across the region. TDM plans help promote the use of non-single-occupancy-vehicle travel to and from properties. These plans can include a wide range of strategies that property managers implement and maintain for tenants of their properties. In our survey, we asked property managers about the TDM strategies that have been implemented at their properties. Out of the seven survey responses we received from managers of properties outside of Cambridge, only the three in Watertown have TDM plans in place. All three properties belong to the Watertown TMA, which has implemented a variety of strategies such as shuttle service, electric vehicle charging stations, bicycle parking and shower facilities, and access to common use e-scooters. Based on our conversations with the City of Cambridge, we assume that most, if not all, of the Cambridge properties in our dataset have TDM measures in place.

We did not have sufficient data to evaluate the impact of TDM strategies on parking demand at lab and life science facilities. Given the relative maturity of the City of Cambridge's TDM program, we requested access to a sample of the TDM plans. The City shared three TDM plans from properties that are within about a half mile from each other, in the Kendall/MIT area of the city. This has historically been one of the hotbeds of the region for life science development, and there are many other properties in our dataset that are from this area. The plans covered over two decades of the TDM program; one issued in 1999, one in 2019, and the final one in 2021. We compared the three plans to see what has changed over time, how the COVID-19 pandemic might have influenced newer plans, and what strategies others can borrow for their own plans.

### *Findings*

The overall goal of TDM strategies is to lower the percentage of single-occupancy vehicle (SOV) trips to a location. Over time, the goal set for SOV mode share for trips to a lab facility has decreased. The 1999 plan's goal was to lower the SOV mode split to 59 percent. In 2019, that goal was lowered to 36 percent SOV for office and Research and Development (R&D) employees. In the 2021 TDM document, the SOV mode split for R&D employees was decreased even further to 27 percent. While it might not be completely accurate to directly compare the numeric values of the three goals set in these documents since they are from different properties that have their own distinct conditions, there is enough alike about them to ascertain an overall trend toward supporting lower SOV commute trips to lab facilities.

Other TDM strategies that have been implemented and grown over time include the following:

**Shuttle Service:** Shuttle service described in these plans went from only running during peak hours to running all day with varying headways depending on the time period. The more recent plans include partnerships with other shuttle services, such as EZRide and MIT and Harvard shuttles. The COVID-19 pandemic resulted in reduced service on these shuttles according to the 2021 plan.

**Transportation Information:** All three plans detailed strategies for getting more information to employees about alternative modes of travel. This information can come in the form of newsletters, web pages with maps of transportation services and schedules, and, in the case of the two more recent plans, annual transportation events where people learn about incentives to use different travel methods. For all three plans, these tasks are the responsibility of a transportation coordinator that has a relationship with the Charles River Transportation Management Authority.

**Transit Subsidies/Parking Costs:** All three plans offer discounted transit passes for employees, with the benefits increasing over time. These benefits, along with having parking costs for employees, work to create a financial incentive for people to choose biking, walking, carpooling, or another commuting method.

**Biking**: All three documents included plans to include long- and short-term bike parking at the properties, as well as showers and locker facilities. The newest plans also included methods for integration with the Bluebikes bike share system, such as a gold-level membership for employees and funding for a Bluebikes station near the property. Additionally, the 2021 plan has charging stations for e-bikes and e-scooters.

**Rideshare:** The 1999 TDM plan included provisions of a select number of spaces in preferential locations to be reserved for rideshare. The more recent plans also included discounted Zipcar memberships for employees, similar to the discounted transit and bike share memberships.

**Other Strategies:** Other strategies that were mentioned throughout the three TDM plans include staggering work hours and offering telecommuting options, working with the Office of Workforce Development to encourage employment opportunities for Cambridge residents, and, in the case of the 2021 plan, providing daycare services for employees.

**Monitoring:** All three TDM plans included requirements for annual or biannual monitoring in the forms of parking counts, mode split surveys, and more. It is important to have feedback about the efficacy of the above TDM measures in order to understand what is working and make adjustments if needed.

# 4 DISCUSSION

Through our data collection and analysis efforts, we were able to identify a few trends about parking usage at lab and life sciences properties in the Boston region. Examining the on-site parking demand counts revealed that most properties had fewer than one car parked per 1,000 square feet, and none had more than two cars parked per 1,000 square feet. The average parking supply was 1.75 parking spaces per 1,000 square feet, more than double the average parking demand of 0.82 cars per 1,000 square feet. Facilities with a larger parking supply had more spaces occupied per 1,000 square feet, implying that providing ample parking can encourage driving, but the sites with the greatest parking supply tended to have the lowest parking utilization. None of the sites we evaluated had fully occupied parking.

Of the factors explored in this study, parking supply and transit accessibility in the form of a Transit Score most strongly correlate with parking utilization. Properties in areas with more robust and frequent transit systems tend to more efficiently use the parking space provided, while those in areas where transit is not provided tend to oversupply parking, leading to emptier lots.

As illustrated in the Conveyal analysis, for accessing many properties in exurban areas, driving is the most feasible commuting option for a vast majority of commuters. Even though only a small proportion of people in the region could reach these sites by transit or by bicycle, the demand for parking was less than two cars per 1,000 square feet.

Taken together, these findings suggest that many of the parking spaces provided at lab and life science facilities are never utilized, particularly in areas outside of the urban core. Across the 24 properties in our dataset, we estimate that there is 1.25 million square feet of unused parking, assuming about 300 square feet per space.[4] Where parking is oversupplied, there is an opportunity to adapt the space for other uses. In the first phase of this study, we heard about developers repurposing unused parking areas as recreational spaces and for placement of solar panels.

## *Limitations*

As detailed in the data collection section, despite extensive efforts to engage potential survey respondents, we were unable to generate a complete and robust dataset, which limits the power of this study's results. While we were able to find a few statistically significant trends in the data, these should only be treated as

[4] Bill Kavanagh, "Mixing It Up: Financing and designing the most efficient and effective mixed-use projects," *International Parking Institute* (April 2015). https://www.parking.org/wp-content/uploads/2016/01/TPP-2015-04-Mixing-It-Up.pdf.

initial findings. These findings support currently held beliefs about the relationships between parking usage and various environmental and policy factors, but further data collection and analysis should be done before making any definitive claims about these relationships. There were additional factors, such as parking cost, that we believe might relate significantly to parking demand, but we did not have enough information to parse out their impacts.

There are a variety of plausible reasons why our survey did not get the desired number of responses. Property managers of lab and life science facilities are a very specific population that is difficult to target. The survey required that they provide some detailed information that they did not have at their fingertips, and there was no material benefit to them for their participation in the study. Even the property managers we were able to reach by phone were largely unwilling to complete the survey questions while on the call. Another obstacle was that many of our contacts, especially the municipal representatives that we talked to in the first phase of the study, were eager to support the study but did not always have connections with people who could provide us with the property-specific information that we needed. We suspect that many of the property managers might have been interested in the study and its outcomes but did not have the time or ability to participate to the extent that was needed.

Through this survey collection process, we saw the manifestation of trends that had come up in the research from the first phase of the study. The technical memorandum titled *Lab and Municipal Parking Study (Phase I): Research on parking supply and demand at lab and life sciences developments in the region* discusses how Massachusetts is one of the states with the largest amount of growth in the life sciences workforce in the country. There was a 96.5 percent increase in biopharma employment from the passing of the Massachusetts life sciences initiative in 2008 to 2022. When expanding to include 2023, it amounts to a 110 percent increase.[5]

In the first phase of the study, we also discussed that the industry is expanding geographically as well. By the end of 2022, there were 61.9 million square feet of lab and Good Manufacturing Practice (GMP) space in Massachusetts, with the number expected to increase by 14 to 17 million square feet by the end of 2025.[6] We discussed how this growth is occurring at unprecedented rates not only in the core life sciences strongholds in the region, such as Boston and Cambridge, but also in other areas such as Waltham, Watertown, and Somerville.

[5] MassBio, 2023 Industry Snapshot, “Massachusetts Biopharma Industry Employment” (2023). https://www.massbio.org/wp-content/uploads/2023/09/FINAL-2023_IndustrySnapshot.pdf.
[6] MassBio, 2023 Industry Snapshot, “Total Life Sciences and GMP Inventory” (2023). https://www.massbio.org/wp-content/uploads/2023/09/FINAL-2023_IndustrySnapshot.pdf.

However, we also discussed that in recent years demand for lab space has not maintained the same growth rate as it had during the earlier days of the COVID-19 pandemic while supply continued to grow. As a result, large amounts of proposed lab space could be delayed or put on hold, and it might be harder to find tenants to fill the space that has been built. Through our outreach with property managers and developers, we saw hints that this might be the case. In addition to the properties with low occupancy, we spoke to multiple property managers whose properties were not yet completed or who were still working to acquire tenants.

The obstacles that we faced in our data collection efforts, while impacting the outcomes of this phase of the study, can inform future research on this topic. Future studies that depend on property manager knowledge and participation will need a concerted effort to build relationships between the MPO and these community members. The MPO already has connections with municipal planners, TMAs, and others who were helpful in building up background knowledge; but when it came time to gather specific data about properties, we were not able to draw upon those connections to get the information we needed. Future research methodologies should consider that properties may not be fully leased and attempt to understand how building vacancies influence parking.

### *Policy Implications*

Though this study demonstrates that parking is oversupplied at lab and life science facilities, reducing the amount of parking built in new facilities is a multidimensional challenge. In the first phase of this study, we learned that developers tend to be more market-driven when making decisions about parking. These decisions often lead to a disconnect between the amount of parking being built and what is actually necessary. In our conversations, the responsibility for this phenomenon was laid on multiple different actors: municipalities for not being on the same page as developers; financers for being unwilling to finance a development unless they believe there is sufficient parking; and developers for using large amounts of parking as an incentive to attract tenants to their properties.

Some municipalities, such as Cambridge and the Boston, use parking maximums, rather than minimums, to limit the provision of excess parking. Woburn and Somerville employ special zoning districts to reduce parking supply in business districts or areas well served by transit. The Boston Region MPO and the municipalities it encompasses should continue to collect data on parking use. This research and future studies that help quantify the mismatch between the parking supply and utilization can help support lower parking provision in future development.

As TDM programs expand throughout the region, municipalities can require this parking data collection to help deepen our understanding of parking supply and demand. The City of Cambridge requires that developments subject to its TDM ordinance collect information on parking utilization and have a robust system to store and catalog that data. In the future, CTPS could develop ways to support other municipalities in efforts to collect parking data and add to our regional understanding of parking policy.

Additional research could help support refined parking policy. Follow-up studies could include an analysis of the impacts of repurposing excess parking or introducing shared parking. To understand the effect of reduced parking supply from the developer's perspective, future research could provide an economic analysis on the financial impacts of providing less parking on tenant retention, rental income, and resale values.

# 5 CONCLUSION

The data that we were able to collect and the analyses we performed provided a great starting point for understanding parking at lab and life sciences properties. In our limited sample, we did not observe any instance in which the on-site parking was fully occupied. The average demand for parking in our dataset was less than half of the average supply. Properties with the largest supply of parking per 1,000 square feet tend to have some of the highest demand for parking by area, but also some of the lowest utilization rates. This suggests that there is an oversupply of parking at these facilities. Our understanding of parking supply and demand can be deepened by further research to explore with more confidence the factors that influence parking behavior.

Appendix

## CIVIL RIGHTS NOTICE TO THE PUBLIC

**Welcome. Bem Vinda. Bienvenido. Akeyi. 欢迎. 歡迎**

You are invited to participate in our transportation planning process, free from discrimination. The Boston Region Metropolitan Planning Organization (MPO) is committed to nondiscrimination in all activities and complies with Title VI of the Civil Rights Act of 1964, which prohibits discrimination on the basis of race, color, or national origin (including limited English proficiency). Related federal and state nondiscrimination laws prohibit discrimination on the basis of age, sex, disability, and additional protected characteristics.

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Boston, MA 02116
Phone: 857.702.3700
Email: civilrights@ctps.org

For people with hearing or speaking difficulties, connect through the state MassRelay service, www.mass.gov/massrelay. Please allow at least five business days for your request to be fulfilled.

# APPENDIX A: PROPERTY MANAGER SURVEY

Q1 Property Manager

- ○ Your name (1) ________________________________________________
- ○ Company (2) ________________________________________________
- ○ Title (3) ________________________________________________
- ○ Phone (4) ________________________________________________
- ○ Email (5) ________________________________________________

Q2 Property Name

________________________________________________________________

Q3 Property Address

- ○ Street (1) ________________________________________________
- ○ City/Town (2) ________________________________________________
- ○ Zip code (3) ________________________________________________

Q4 Current building occupancy (percent)

| | 0 10 20 30 40 50 60 70 80 90 100 |
|---|---|
| Occupancy () | [slider] |

Q5 Are there noticeable peak hours when the parking spaces at the facility are most occupied?

- ◯ Yes (2)
- ◯ No (1)
- ◯ Unsure (3)

---

*Display This Question:*

*If Are there noticeable peak hours when the parking spaces at the facility are most occupied? = Yes*

Q5a At what time(s) of day are parking spaces most occupied?

________________________________________________________________

---

Q6 How much of the available parking is **occupied** on a typical day?

- ◯ Less than 10% (1)
- ◯ 10%–25% (2)
- ◯ 25%–50% (3)
- ◯ 50%–75% (4)
- ◯ 75%–90% (5)
- ◯ More than 90% (6)

Q7 Which day(s) of the week are the busiest when it comes to parking? Select all that apply

- ▢ Monday (1)
- ▢ Tuesday (2)
- ▢ Wednesday (3)
- ▢ Thursday (4)
- ▢ Friday (5)

---

Q8 Does parking usage vary based on time of year? If so, please explain the patterns you have noticed.

________________________________________________________________

Q9 What shifts are typically staffed at this facility? (select all that apply)

- ▢ 1st shift (typical business hours) (1)
- ▢ 2nd shift (late evening hours) (2)
- ▢ 3rd shift (overnight/early morning hours) (3)
- ▢ No distinct pattern (4)
- ▢ Other (please specify) (5) __________________________________________________

---

Q10 How are parking costs managed at this property? (Select all that apply)

▢ Parking is included in tenant leases (3)

▢ Parking is unbundled from tenant leases (4)

▢ Employees pay to access on-site parking (5)

▢ Unknown (6)

▢ Other (7) ________________________________________________

---

*Display This Question:*

*If How are parking costs managed at this property? (Select all that apply) = Parking is included in tenant leases*

Q10a Please provide more detail about how parking is paid for at this site.

________________________________________________________________

---

Q12 Is the parking for this property shared among multiple tenants?

○ Yes (5)

○ No (6)

---

*Display This Question:*

*If Is the parking for this property shared among multiple tenants? = Yes*

Q12a Please provide more detail about how parking is allocated to the different tenants.

________________________________________________________________

---

Page Break

Q13 Is on-site parking ever available to the public?

- Yes (5)
- No (6)

---

*Display This Question:*

*If Is on-site parking ever available to the public? = Yes*

Q13a Please provide information about how and when the public can access on-site parking at this property.

________________________________________________________________

Q14 What infrastructure and transit services support people getting to this property without using a private automobile? Select all that apply.

- Shared-use paths for walking/biking (6)
- Sidewalks and safe crosswalks (7)
- Bike lanes (1)
- Bus (2)
- MBTA rapid transit (Red, Green, Orange, Blue, Silver lines) (3)
- Commuter Rail and/or Ferry (4)
- Shuttles (public, transportation management association, or private) (8)
- Other (please specify) (5) __________________________________________________

---

*Display This Question:*

*If What infrastructure and transit services support people getting to this property without using a... = MBTA rapid transit (Red, Green, Orange, Blue, Silver lines)*

Q14a Which MBTA rapid transit line(s) provide service near the property? Select all that apply.

- ▢ Red Line (1)
- ▢ Green Line (2)
- ▢ Orange Line (3)
- ▢ Blue Line (4)
- ▢ Silver Line (5)

---

Q15 Transportation Demand Management (TDM) plans work to reduce single-occupant vehicle commute trips. Examples of TDM strategies include transit subsidies, shuttle service, and bikeshare passes.

---

Q16 Are there any TDM strategies in place at this property?

- ○ Yes (5)
- ○ No (6)

---

*Display This Question:*

*If Are there any TDM strategies in place at this property? = Yes*

Q16a Which strategies? (Select all that apply)

- ▢ Shuttle service (1)
- ▢ Transit subsidy (2)
- ▢ Bikeshare subsidy (3)
- ▢ Membership in a Transportation Management Association (TMA) (4)
- ▢ On-site TDM coordinator (5)
- ▢ Parking fees (6)
- ▢ Bike parking spaces (7)
- ▢ Carpool program (8)
- ▢ Electric vehicle charging stations (9)
- ▢ Other (please specify): (10) ________________________________________________

---

*Display This Question:*

*If Which strategies? (Select all that apply) = Membership in a Transportation Management Association (TMA)*

Q16b What is the name of the TMA that serves this property?

________________________________________________________________

---

*Display This Question:*

*If Are there any TDM strategies in place at this property? = Yes*

Q16c Please explain how these strategies have impacted parking at the site, if at all.

________________________________________________________________

Q17 How well have the loading zones worked for tenants at your site?

- ◯ Not well at all (there have been many issues) (1)
- ◯ Moderately well (there have been a few issues) (2)
- ◯ Very well (there have been practically no issues) (3)

---

Q18 Please elaborate on the effectiveness of loading zones at your site.

________________________________________________________________

Q19 Total gross floor area of this property in square footage

________________________________________________________________

---

Q20 What is the area breakdown of the property in square footage?

- ◯ Lab (1) __________________________________________________
- ◯ Office (2) __________________________________________________
- ◯ Other Uses (specify) (3) __________________________________________________
- ◯ Empty (4) __________________________________________________

---

Q21 How many parking spaces are provided for tenants/employees?

- ○ Surface Lot (1) ________________________________________________
- ○ Garage (2) ________________________________________________
- ○ Bicycle (3) ________________________________________________
- ○ Electric Vehicles (4) ________________________________________________
- ○ Loading Zones (5) ________________________________________________
- ○ Off-site Parking (6) ________________________________________________
- ○ Other (please specify) (7) ________________________________________________

Q22 Is there anything else you want us to be aware of about parking at this site?

________________________________________________________________