Evaluation Framework for City of Cambridge Quick-Build Cycling Safety Ordinance Projects

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About This Memo

This memo proposes a framework for evaluating quick-build separated bike lane projects installed by the City of Cambridge during the implementation of the Cycling Safety Ordinance (CSO). Evaluating past projects will help the City determine whether projects are achieving the goals of the CSO, how streets are operating with changes, and if any adjustments are necessary. These reports will also help the City identify lessons to incorporate in future project design and communications.

This evaluation framework may be changed as the City identifies new data sources.

Version history:
This is Version 1 of the evaluation framework, updated March 12, 2024.

Quick-Build Projects vs. Construction Projects

This framework is focused on the evaluation of "quick-build" projects led by Traffic, Parking, and Transportation Department staff. These projects do not involve significant construction or making changes to the width or shape of the road. Examples of quick-build separated bike lanes can be found on Hampshire Street, Brattle Street, and parts of Mass Ave.

Full roadway reconstruction projects ("construction projects") include more extensive changes to the design of the street in addition to adding bike lanes. They might include updates to underground utilities, stormwater infrastructure improvements, adding additional crossings and/or raised intersections, and streetscape enhancements with plantings, trees, and/or public art. Examples of full construction projects include the Inman Square Intersection Improvements Project and River Street Reconstruction. These projects will be evaluated separately.

Purpose of Evaluation

Each quick-build Cycling Safety Ordinance project undertaken by the Traffic, Parking, and Transportation Department will undergo an evaluation. The purpose of these evaluations will be to determine:

- Whether projects are advancing the City's safety, health, and climate goals.
- How projects are advancing the goals of the Cycling Safety Ordinance.

In our evaluations, we will establish objective measures of effectiveness of the CSO projects. The evaluations will assess the tradeoffs of each project by comparing benefits and costs. If the benefits are greater than the costs, the project is a success.

The City has identified goals for its bicycle network. These are listed in the table below, along with the source of the goal. The last column of the table explains the data we will use to evaluate each goal.

Goal	Goal Origin(s)	Data
Eliminate transportation-related fatalities and serious injuries	• Cycling Safety Ordinance • Vision Zero • Community Health Improvement Plan • Envision Cambridge • Cambridge Bicycle Plan	Crash data
Make a significant shift toward bicycling as a sustainable transportation mode A lower percentage of trips are taken by single-occupancy vehicles Increase active transportation opportunities	• Cycling Safety Ordinance • Cambridge Bicycle Plan • Envision Cambridge • Climate Action Plan • Community Health Improvement Plan • Cambridge Public Schools Wellness Policy • Vehicle Trip Reduction Ordinance • Parking and Transportation Demand Management Ordinance	Cyclist counts School trip mode surveys Motor vehicle counts Pedestrian counts Micromobility device counts Post-project surveys: questions on mode shift

Goal	Goal Origin(s)	Data
Create a transportation system that is safe for and accessible to users of all ages, abilities, and identities Design and operate safe streets for all users	• Cambridge Bicycle Plan • Envision Cambridge • School Wellness Policy • Vision Zero	Cyclist counts Child cyclist counts Pedestrian counts Post-project surveys: questions on perceived safety and how people with disabilities, older adults, and children are impacted by the project School trip mode surveys
Improve efficiency and reliability for bus users	• Cycling Safety Ordinance • Envision Cambridge	Transit rider counts MBTA travel time analysis
Improve safety for pedestrians	• Cycling Safey Ordinance • Vision Zero • Envision Cambridge • Pedestrian Plan	Crash data Pedestrian counts Post-project surveys: questions on mode shift, perceived safety

There are several goals that the City has identified for our bicycle network that we cannot evaluate on a project-level basis. These goals, and information on how we're tracking our progress, are listed below:

Goal	Goal Origin(s)	Progress Tracked Via:
Build a connected network of separated bike lanes across the city	- Cycling Safety Ordinance - Cambridge Bicycle Plan - Envision Cambridge	Annual Cycling Safety Ordinance Progress Reports
Reduce transportation-related greenhouse gas emissions	- Climate Action Plan - Envision Cambridge - Vehicle Trip Reduction Ordinance - Parking and Transportation Demand Management Ordinance - Cambridge Net Zero Transportation Plan	Cambridge's greenhouse gas emissions inventory

See Appendix I for information about Bike Data Reports and the Cycling Safety Ordinance Economic Impact Study, which will also be used to evaluate the Cycling Safety's Ordinance's impact.

Evaluation Work Plan

The Traffic, Parking, and Transportation Department will lead the evaluation process for quick-build separated bike lane projects, with assistance from Community Development and Public Works staff.

The table below includes information on what data the City plans to collect and report for each project. For some projects installed before 2024, we may not have the immediate "before" data outlined in this report. In those cases, the City will look for comparable metrics to use as baseline data.

The City may add other relevant data and information along with the metrics outlined below.

Already-completed quick build projects

	Mid-Mass Ave Safety Imp. Project (Fall 2021)	Mass Ave – Dudley St to Alewife Brook Pkwy Project (Fall 2021)	South Mass Ave Corridor Safety Imp. Project (Spring 2022)	Porter Sq Safety Imp. Project (Summer 2022)	Garden St Safety Imp. Project (Fall 2022)	Brattle St Safety Imp. Project (Fall 2022 – Summer 2023)	Hampshire St Safety Imp. Project (Fall 2023)
Evaluation release date estimate*	Fall/Winter 2024	Fall/Winter 2024	Spring 2025	Summer 2025	Fall 2025	Summer 2026	Fall 2026
Project summary	✓	✓	✓	✓	✓	✓	✓
Crash data (before and after installation)	✓	✓	✓	✓	✓	✓	✓
Bike counts (before)	Identifying "before" data	✓	✓	✓	✓	✓	✓
Bike counts (after)	✓	✓	✓	✓	✓	✓	✓
Bluebikes trip data (before and after)	✓	✓	✓	✓	✓		✓
Pedestrian counts (before)							✓
Pedestrian counts (after)	✓	✓	✓	✓	✓	✓	✓
Vehicle counts (before)							✓
Vehicle counts (after)	✓	✓	✓	✓	✓	✓	✓
Vehicle speeds (before)							?
Vehicle speeds (after)	✓	✓	✓	✓	✓	✓	✓

	Mid-Mass Ave Safety Imp. Project (Fall 2021)	Mass Ave – Dudley St to Alewife Brook Pkwy Project (Fall 2021)	South Mass Ave Corridor Safety Imp. Project (Spring 2022)	Porter Sq Safety Imp. Project (Summer 2022)	Garden St Safety Imp. Project (Fall 2022)	Brattle St Safety Imp. Project (Fall 2022 – Summer 2023)	Hampshire St Safety Imp. Project (Fall 2023)
Parking inventory (before and after)	✓	✓	✓	✓	✓	✓	✓
Parking utilization (before)							
Parking utilization (after)	✓	✓	✓	✓	✓	✓	✓
Parking meter revenue (before and after)	TP+T is investigating the feasibility and utility of gathering this data for each project. Parking data is not available for individual meters, and payment "zones" may not coincide well with project areas.						
Parking violations (before)	✓	✓	✓	✓	✓	✓	✓
Parking violations (after)	✓	✓	✓	✓	✓	✓	✓
Bus rider counts (before and after)	✓	✓	✓	✓			✓
MBTA travel time analysis	?	✓	?	?			?
School trip mode surveys					✓ (if available) Graham & Parks		✓ (If available) Cambridgeport School
Post-project general survey	✓	✓	✓	✓	✓	✓	✓
Post-project business survey	✓	✓	✓	✓			✓
Post-project intercept survey	We are working to determine the best areas to conduct intercept surveys						
Conclusion: Takeaways and observations	✓	✓	✓	✓	✓	✓	✓

Quick-build projects currently being designed:

	Main Street Safety Improvement Project	Mt. Auburn Street at Aberdeen Avenue Intersection Safety Improvement Project	Safety Improvement Project on Cambridge Street
Project summary	✓	✓	✓
Crash data (before and after installation)	✓	✓	✓
Bike counts (before)	✓	✓	✓
Bike counts (after)	✓	✓	✓
Bluebikes trip data (before and after)		✓	✓
Pedestrian counts (before)	✓	✓	✓
Pedestrian counts (after)	✓	✓	✓
Vehicle counts (before)	✓	✓	✓
Vehicle counts (after)	✓	✓	✓
Vehicle speeds (before)	✓	✓	✓
Vehicle speeds (after)	✓	✓	✓
Parking inventory (before and after)	✓	(No parking changes for this project)	✓
Parking utilization (before)	✓		✓
Parking utilization (after)	✓		✓
Parking meter data (before and after)	TP+T is investigating the feasibility and utility of gathering this data for each project.		
Parking violations (before)	✓	✓	✓
Parking violations (after)	✓	✓	✓
Bus rider counts (before and after)		✓	✓
MBTA travel time analysis		✓	✓
School trip mode surveys		✓ (if available) Cambridge Street Upper School, King Open School	
Post-project general survey	✓	✓	✓
Post-project business survey	✓	✓	✓

	Main Street Safety Improvement Project	Mt. Auburn Street at Aberdeen Avenue Intersection Safety Improvement Project	Safety Improvement Project on Cambridge Street
Post-project intercept survey	✓		✓
Conclusion: Takeaways and observations	✓	✓	✓

Appendices

Appendix I: Other Cycling Safety Ordinance-Related Evaluations

Citywide bike data: The evaluation framework outlined in this memo focuses on individual projects. Project-based evaluations will be supplemented by data collection and reports on citywide conditions that evaluate the state of the bicycling network in the city as a whole. In the "Bicycling in Cambridge Data Report 2023", published in October 2023, the City shares key data and measures the progress we are making towards our 2020 Bicycle Plan Update goals, as well as overall City goals such as those of Vision Zero. Future updates to the Cambridge Bicycle Plan will also include this citywide data. These analyses will better indicate the state of the network than individual project evaluations. Learn more at www.cambridgema.gov/bike.

Effects of bike lanes on Cambridge businesses: The Community Development Department's Economic Impact and Development Division will gather and report on economic data, with a goal of understanding whether any conclusions can be drawn relating to the effects of the bike lane network on Cambridge businesses. The Cycling Safety Ordinance Economic Impact Study is a separate process from these project evaluations. Learn more at www.cambridgema.gov/econimpactstudy.

Appendix II: Possible Data Sources

The City will use several sources of data to report the metrics described above. Eash data set is unique, with its own strengths and weaknesses. This section describes the potential sources for each metric. For most projects installed before Fall 2023, we do not have "before" data for some metrics. In those cases, we will look for other data sources to make a comparison.

Number of People Biking
- New manual peak-hour cyclist counts: Manual counters can make observations that automatic traffic recorders cannot, including the number of child cyclists and counts of people riding on the sidewalk.

- 48-hour automatic traffic recorders: These can gather 24/7 data, while manual counters are usually limited to peak-hour counts.
- Permanent automatic counters that the City has in place.
- Historic data from annual bike count locations.
- Bluebikes usage data from stations within the project area.

Number of Pedestrians

- 48-hour automatic traffic recorders placed in at least one location in the project area. Locations for before and after counts should be the same.

Transit Rider Counts and MBTA travel time analysis

- We will request ridership numbers and travel time data from the MBTA to complete this analysis.

Motor Vehicle Counts

- 48-hour automatic traffic recorders placed in at least one midblock location in the project area. Locations for before and after counts should be the same.

Motor Vehicle Speeds

- 48-hour automatic traffic recorders placed in at least one midblock location in the project area. Locations for before and after counts should be the same.

The speed of vehicles on the road can tell us if drivers are following the speed limit in our project area and indicate if the design of the street is encouraging people to drive at safe speeds. Running, or operating, speed can be expressed as a median speed or 85th percentile speed.

Crash Data

- Massachusetts Department of Transportation Crash Data Portal
- Cambridge Police Department Crash Reports

Timing

To get a statistically significant assessment of crashes, we generally need three years of pre-project data and three years of post-project data. For the purposes of assessing quick-build projects, we will use three years of pre-project crash data. If we

report the crash data less than three years after the project, the results will likely not be statistically significant. However, changes in the most frequent types of crashes could be a preliminary indicator of how the project is indicate how the project is impacting safety on the street. The COVID-19 pandemic impacted travel patterns worldwide starting in 2020. All types of travel decreased as people stayed home and the timing and destinations of trips changes. We still don't understand the permanent impacts of COVID-19 on travel patterns. Because of that uncertainty, if the "before" data includes years during the pandemic, the City should add pre-2020 crash data to the analysis.

What to include

Crash report data should compare pre-project crashes to post-project crashes. These should include numbers of reported crashes and, if possible, the severity (no injury, possible injury, non-incapacitating injury, incapacitating injury) and types of reported crashes.

Parking Utilization

The City or a contractor will count the total spaces in the project area, map them by type, and track whether each space is occupied. Parking utilization information will be tracked on two or more days and averaged to obtain a representative figure. The City will take care to ensure that observations are conducted on "typical" days (weekdays with fair weather, schools in session, no snow present, and no street cleaning scheduled). Observations would made be in midday and evening, at the same time each day.

Parking inventory information

We will report the total spaces in the project area by regulation type before and after the project. ("Regulation type" may include loading zones, meters, resident parking, accessible parking, etc.)

Parking violation data

The City will use our parking ticket database to examine the parking violations before and after the project.

Parking meter data

TP+T is investigating the feasibility and utility of gathering this data for each project. Cambridge's digital parking meter payments are grouped by zone, rather than by space. If a zone falls within the project boundaries, and doesn't include many parking meters outside of the project boundaries, we may be able to draw a conclusion from comparing before-and-after project parking meter app payments.

Cambridge Public School Getting to School Surveys

The City is seeking more information on whether the results of Cambridge Public Schools' Getting to School surveys can be published and used to evaluate CSO projects.

Appendix III: Survey Questions

In addition to collecting the data above, the City will conduct surveys to learn more about how people are reacting to changes made as part of Cycling Safety Ordinance projects. We will wait at least six months after the project is installed to launch a post-project survey, to give people time to get used to the new layout.

Surveys may help us determine changes to user behavior, public perception on the street's safety, and any small changes we can make to make it easier to travel on the street.

After each project, we will conduct an online survey, advertised widely in the project area through methods including physical signage, City emails, and updates on the City website. Physical signage along the street will include QR codes leading people to surveys. The survey will also be made available in a paper format by request and/or at in-person events.

General and Intercept Survey Questions
- Demographic questions: Age, gender, race/ethnicity, residence
- Why do you usually come to this street?
    - Live nearby
    - Work in area
    - Attend school nearby
    - Shopping or accessing other services
    - Bringing a child or family member to school/activities
    - Commute through here
    - Own a business nearby
    - Tourist/here for the first time
- How do you get to the street? (select all that apply) *Intercept survey version: How did you get here today?*
    - Walking
    - Biking
    - Other micromobility device (scooter, etc.)

- o Assistive mobility device (wheelchair, mobility scooter, walker, etc.)
  - o Transit
  - o Ridehail
  - o Driving
- *Intercept survey only: What Cambridge neighborhood are you coming from?*
- If they chose:
  - o Biking: What kind of bike do you usually use? (select all that apply)
    - Bike that I own – Non-electric bike
    - Bike that I own – Electric bike
    - Bike that I own – Cargo bike
    - Bike that I own – Tricycle or quadracycle
    - Bluebike- electric
    - Bluebike – non-electric
    - Other
  - o Other micromobility device: What kind of device do you use? (select all that apply)
    - Electric scooter
    - Non-electric scooter (kick scooter)
    - Skateboard
    - Onewheel or electric unicycle
    - Hoverboard or electric skateboard
    - Mobility scooter
- Do you use an assistive mobility device? (Select all that apply)
  - o Wheelchair or mobility scooter
  - o Walker
  - o Support cane
  - o Crutches/forearm crutches
  - o Service dog for hearing assistance
  - o Service dog for mobility assistance
  - o White cane or similar
  - o Other

- Do you travel through this area with children?
    - Yes
    - No
- How often do you travel through the project area by each mode?

	Daily	Several Times per Week	Once a Week	Several Times a Month	Monthly	Occasionally (less than once a month)	Never or almost never
Walking							
Biking							
Transit							
Drive							
Ridehail (Uber/Lyft/taxi)							
Micromobility device (electric scooter, one-wheel, etc.)							
Assistive mobility device (Wheelchair, white cane, etc.)							
Other							

- Have the changes on this street influenced how often you are here?
    - Yes, I visit this street more often than before
    - Yes, I visit this street less often than before
    - No, the changes had no impact on how much I travel here
    - Not Applicable (example: new resident)

- What would you rate your overall comfort when you travel through the project area by...

	Very comfortable	Comfortable	Neutral	Uncomfortable	Very uncomfortable	Not applicable
Walking						
Biking						
Taking transit						
Driving						
Ridehail (Uber/Lyft/ taxi)						
Using a micromobilty device (electric scooter, onewheel, etc.)						
Using an assistive mobility device (wheelchair, white cane, etc,)						

- How would you rate your ability to access your destination when you travel to the project area by...

	Very easy to get to my destination	Easy to get to my destination	Neutral	Difficult to get to my destination	Very difficult to get to my destination	Not applicable
Walking						
Biking						

Taking transit						
Driving						
Ridehail (Uber/Lyft)						
Using a micromobility device (electric scooter, onewheel, etc.)						
Using an assistive mobility device (wheelchair, white cane, etc.)						

- If the answer to "Do you travel through this area with children?" is "yes"
    - What age(s) are the children you travel with? (Select all that apply)
        - 0 to 2 years old
        - 3 to 4 years old
        - 5 to 7 years old
        - 8 to 10 years old
        - 11 to 13 years old
        - 14 to 17 years old
    - How do your children travel on the street? (Select all that apply)
        - Ride in my car
        - Ride with me on my bike
        - Ride their own bikes
        - Walk

- Use a scooter
- Use an assistive mobility device (wheelchair, etc.)
- Travel in a carrier/stroller
- Ride public transportation
- Ride a school bus

o After this project, how would you rate your comfort level traveling **with your children** in each mode:

	Much more comfortable	More comfortable	The same	Less comfortable	Much less comfortable	Not applicable
Walking						
Biking (child is on an adult's bike)						
Bike (child is riding their own bike)						
Riding public transportation						
Driving						
Other						

- What do you think of the current street design?
    o Very satisfied
    o Satisfied
    o Neutral
    o Dissatisfied
    o Very dissatisfied
    o No opinion
    o (*Note: Report the answers to this question altogether and broken up by travel mode*)
- Why?

- Do you have any suggestions for ways we can improve this area?
- Add contextual questions from the project -- did we improve issues that people raised during the project's engagement process?

Business Survey Questions

In corridors with five or more businesses, we may choose to conduct a business survey. Questions will be written in consultation with Cambridge's Economic Opportunity and Development Division.

This survey will be available online and by paper, and City staff will visit businesses in-person to inform them about the survey and advertise it through our email lists.

This will not be the same as the City's ongoing CSO Economic Impact Study, which includes a survey asking businesses about the effects of nearby bike lanes on revenue. Instead, this survey will include questions focused on:

- Business type
- Number of employees
- How they and their employees get to work
- Effect of the project on their ability to receive deliveries
- Space to suggest changes to parking or loading regulations (ex: changing one-hour meters to two-hour meters, adding a short-term loading zone)