

Proposing a Bike Points Wayfinding Network

Bike points are numbered intersections connected by well-signed bike routes. Together, they form a wayfinding network that can piggy-back on Cambridge’s current and future bicycle facilities. They are already a popular and low-cost form of infrastructure in extensive use in the Netherlands.¹

Bike points improve safety. They improve quality of life. They are extremely appropriate for Cambridge.^{2,3} **And they are extremely cheap.** This case study makes an argument for including a bike points wayfinding network in the Cambridge bicycle plan, and estimates a \$33,000 material cost to implement.

Problem

Google Maps biking directions are confusing and unnecessarily dangerous. Google’s biking directions are better than nothing. However, people who do manage to follow their complicated routes are likely to find themselves riding through dangerously crowded streets and intersections, ignoring Cambridge’s existing bike facilities. In addition, people following Google Maps biking directions will at several points along their journey need to stop, pull out their phones, and orient themselves before continuing. Sometimes people stop in the street to look at their phones. Sometimes people look at their phones in the street, but do not stop.⁴

People new to bicycling do not know what streets are safe to cycle. In Cambridge, limited wayfinding systems help, but can be significantly improved by adopting European/Dutch best practices.

¹ A map of the Dutch bike points network is at anwb.nl/fietsroutes/fietsknooppuntenplanner

² As the Cambridge Bicycle Plan 2020 states, the Bicycle Network Vision “imagines a more complete set of connections” of the sort that bike points could provide.

³ See the appendix for the European Commission’s Guidance for Bicycle Signage and Wayfinding Measures and their relevance to Cambridge.

⁴ A person biking with their phone out is more likely to be looking at a mapping application than at text messages. In a 2020 Australian study, 27.6% of cyclists reported reading or adjusting bike maps at least “occasionally” while riding. 16.9% participants reported entering new destinations into navigation systems, and 14.5% of participants reported reading text messages. doi.org/10.1016/j.jth.2019.100793

Solution

A bike points wayfinding system can help unify the Cambridge cycling network. In the Netherlands, bike points and related wayfinding systems⁵ make navigation easy. Direction signs guide people safely from key-location to key-location, routing them away from busy and dangerous streets and towards existing bike infrastructure. Between key-locations, small but well-placed signs tell people where to turn and assure them that they are on the right paths to their destinations.⁶

Bike points lower the barrier to local cycling for the “interested but concerned” cyclists who make up around 60% of urban populations.⁷ Incoming students use them to navigate around their new city. Tourists use them to explore the area’s attractions. Restaurants and ice cream parlors use them as economic anchors, locating their stores nearby. Retirees use them to remain active. And everyone uses them for recreation.

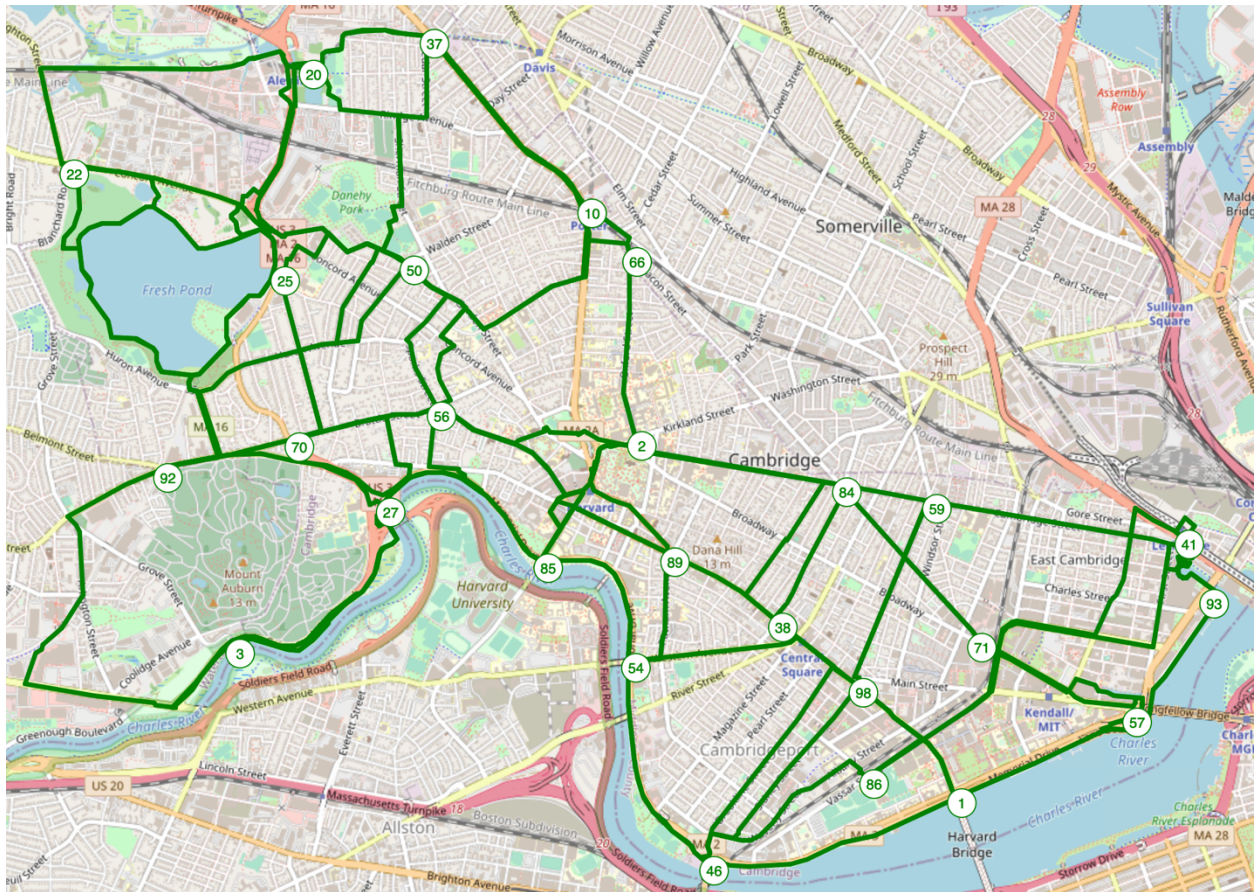
Bike points can help unite the disparate parts of Cambridge’s cycling network, lower the barrier to cycling, and allow people to travel between and within cities with only a few numbers in mind. They make streets safer, make trips faster, encourage connectedness, attract and retain residents, and support local businesses along their routes.

⁵ Since its introduction in 2006, the Dutch bike points network is so popular that it has been emulated for urban walking paths, hiking trails, and even horseback and horse and buggy routes, and even expanded into parts of Germany. In many parts of the Netherlands, bike points have entirely replaced the older and better established “paddelstoel” signage system, which started in 1919.

⁶ People do occasionally need look at their phones’ maps, but the amount of information they need to memorize is much less. (See the appendix for a comparison.) As a result, people need to look at their phones less, navigation is easier, and streets are safer. Anecdotally, over the course of a recent bike tour, I found biking in the Netherlands to be 30-40% faster than biking in Germany or France, largely because I rarely had to stop to look for directions and backtrack.

⁷ Dill, J. , and N. McNeil, “Revisiting the Four Types of Cyclists: Findings from a National Survey.” *Transportation Research Record: Journal of the Transportation Research Board*, 2016.
doi.org/10.3141/2387-15

Sample Map



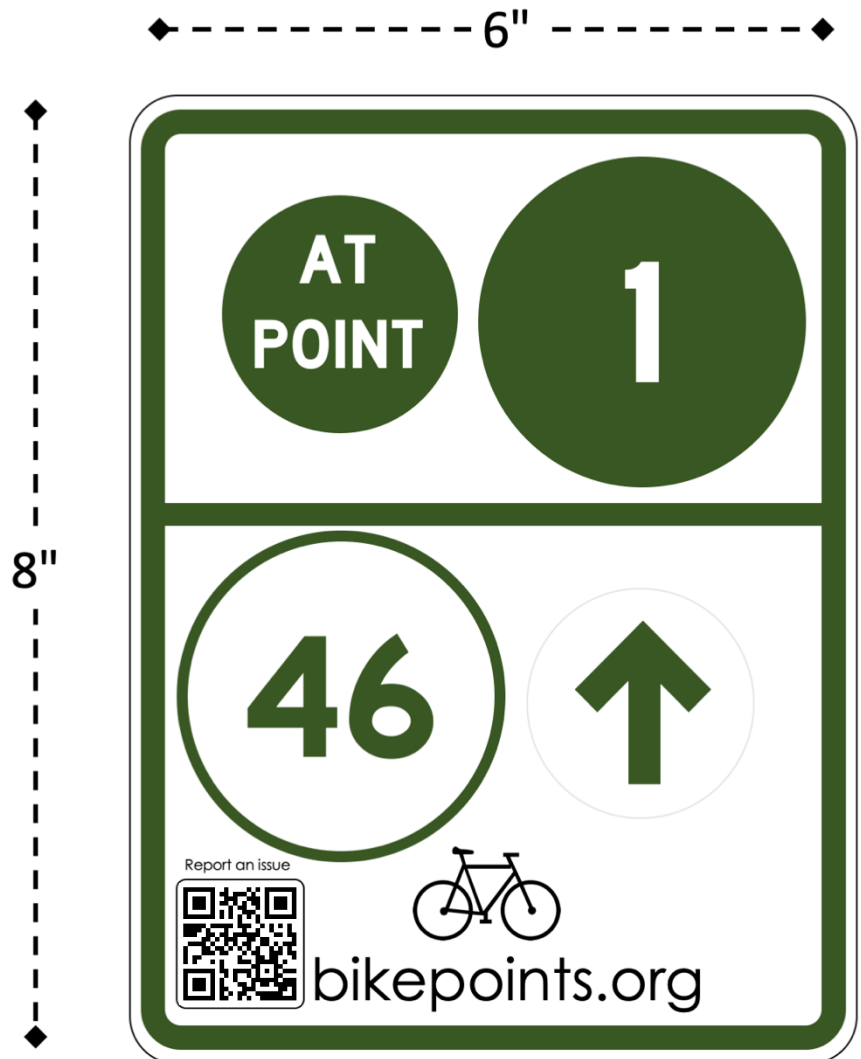
Notes:

1. This is a sample map of Cambridge containing 27 bike points.
2. **This map takes existing and planned bicycle infrastructure into account**, supplementing quick-build and other projects to make a network of bike-able streets obvious to the casual bicyclist.
3. **Directions on this map are easier for people to remember than their Google Map equivalent.** See the appendix for an example.
4. **This map requires input from cyclists and adjustment by city planners.** The technology behind the map allows it to be easily worked on. In locations where bicycle infrastructure is planned but not complete, the map will need to be changed later.
5. **You can see an interactive map at bikepoints.org.**

Sample Sign (Small)

Notes:

1. **Green circles** indicate the current bike point.
2. **White circles** combined with an arrow indicate upcoming points. Arrows are placed on the right side by default, except for left turn arrows, which are placed on the left
3. **Low cost stickers** are used for numbers, arrows, and QR codes. Signs and stickers are printed in bulk to lower costs.
4. **QR codes** are meant to track sign positions, help people report misplaced arrows, and allow people to plan their route with an online map. Each sign receives a unique QR code. The city periodically receives data on signage issues. A website mockup is included on a later page.



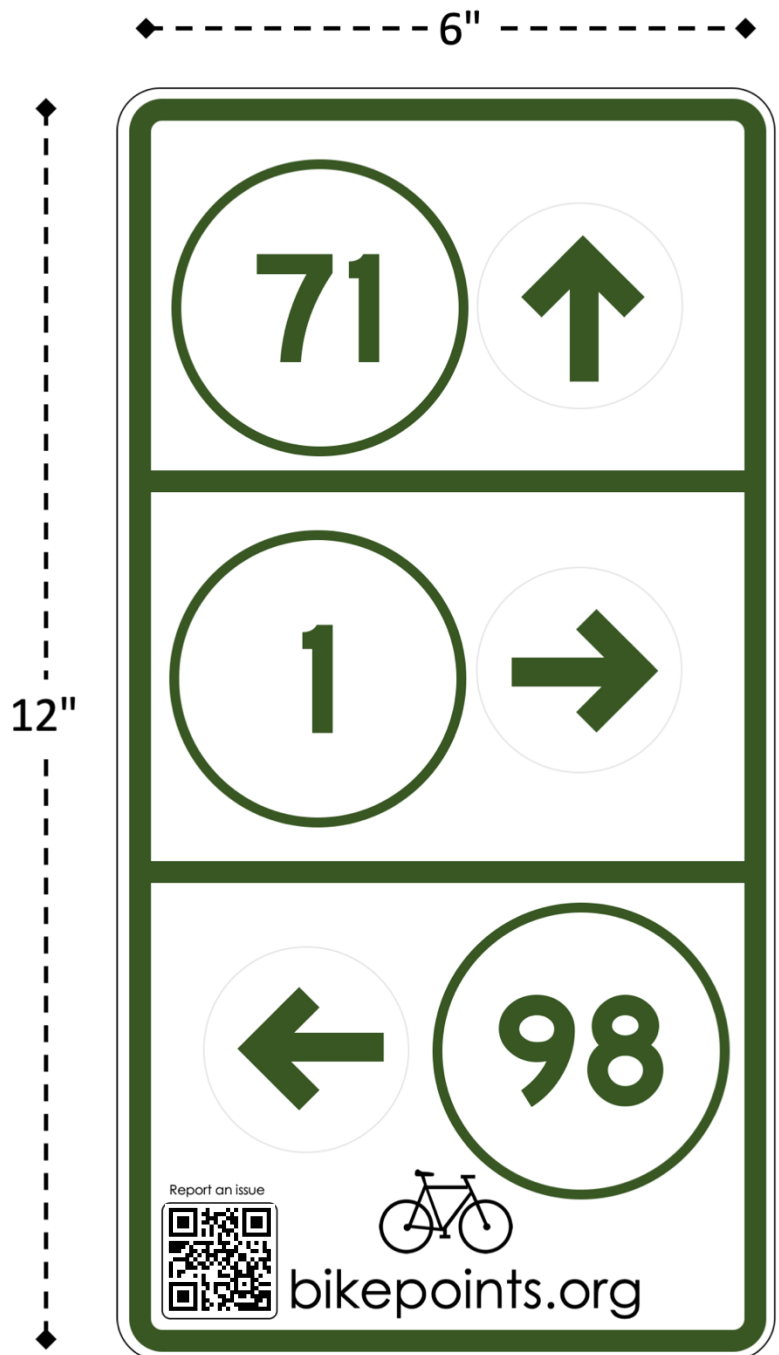
This sign would be placed on the southwestern side of point 1 on the previous map, indicating that the bicyclist can continue straight down Memorial Drive Park towards point 46.

Sample Sign (Large)

Notes:

1. Signs come in two sizes, helping minimize costs.
2. Temporary arrow stickers are used for construction and detours.
3. Highway Gothic font is used for sign text, except for “bikepoints.org” and “report an issue,” which use Century Gothic.
4. These signs are similar to the Dutch design, which the author finds to be easier to follow and cheaper to implement than the Belgian and German designs. In addition, the Dutch design is significantly more popular.

This sign would be placed on the northeast-bound side of Vassar Street approaching Mass Ave. It indicates that the cyclist can continue straight towards point 71, turn right towards point 1, or turn left to point 98.



Sample Website

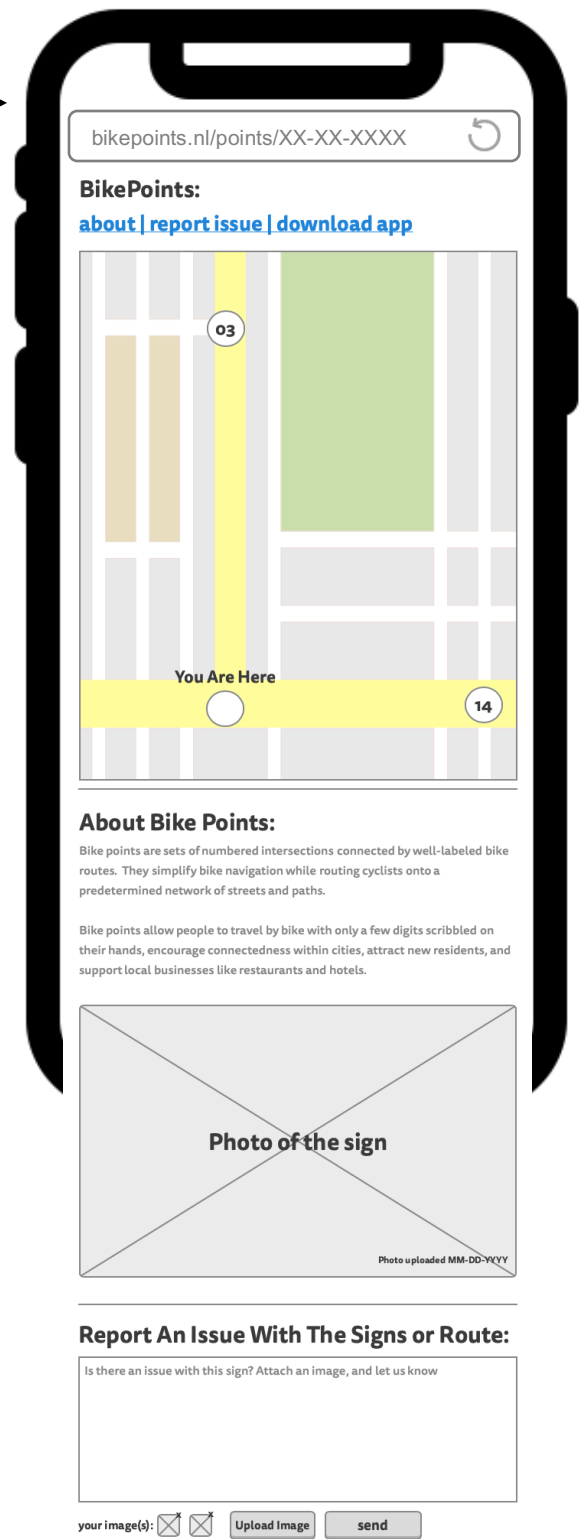
Notes:

1. This is a mockup of the website that a sign QR code will link to.
2. QR codes are primarily used to create a database of sign locations and issues with them such as incorrectly positioned arrows. In a well-performing system, people on bikes would use QR codes infrequently.
3. There is a local bike point map for casual users, but this is not the primary purpose of the QR code.
4. Public utilities can record the location of a sign by uploading a geo-tagged photo.
5. Users can download a bike points mapping application

This website is still currently under construction.

For the city, QR codes are an easily and cost-effective way to solicit structured feedback on sign placement without the overhead of the Cambridge city app or 311.

(iPhone X and Reload images by Nikita Kozin and Shashank Sing respectively, both from the Noun project)



Cost Breakdown

The proposed route includes 27 bike points requiring 106 signs to direct users through intersections, and 422 signs to indicate turns. This gives 528 total required signs, which can be rounded up to 800 signs for good measure.

Signs are in two standard sizes (6" x 12" and 6" x 8"), customized on location with three to seven reflective stickers each. At an average of 5 stickers per sign, we estimate 4,000 stickers.

Signs are attached to existing sign poles, minimizing the number of new poles that need to be installed. The number of new poles to be installed is estimated at 20.

Reflective-bead aluminum signs of similar size cost between \$11 and \$16 per piece. Vinyl reflective stickers required to customize the signage cost roughly \$4 each. Street sign poles cost roughly \$100 each.⁸

Wayfinding maps are part of the Dutch design. The proposed system, however, is a prototype in which points may still be added or removed. As a result, any signs installed at this stage may quickly become obsolete. They are excluded from the initial estimate.

Due to data constraints, installation costs are not estimated.

<u>Item</u>	<u>Unit Cost (\$)</u>	<u>Quantity</u>	<u>Material Cost (\$)</u>
Small Sign	11	400	4,400
Large Sign	16	400	6,400
Mounting Equipment	5	800	4,000
Sticker	4	4,000	16,000
Street Sign Poles	20	100	2,000
Wayfinding Maps	1000	0	0
Total Material Costs			32,800

⁸ Prices are sourced from safetysign.com, roadtrafficsigns.com, alibaba.com, and a number of other unaffiliated online retailers. At wholesale quantities, the City of Cambridge will likely secure better prices.

About the Author

This document was written by me, Albert Carter, an activist, programmer, data scientist, and bicyclist living in Berlin, Germany and Nijmegen, Netherlands, with editing help from another former Cambridge resident, Alexander Crompton. I am former employee of MIT CSAIL and MIT IDSS⁹, and have been programming for over 10 years. During eight of the past 10 years, I lived in Cambridge or close to it, and I maintain deep connections to Cambridge and the greater Boston region. I am also frequently a “person on a bike.”

For me, bike points began as an interesting data science project. I am interested in continuing the project, providing data on where signs would likely be needed, and developing the website for it.

Why Cambridge?

Cambridge has a conscientious population, a large number of people who want to use bikes safely and an engaged community of transit activists.

In Cambridge, I know the streets, have friends, and have plans to visit. If Cambridge were to implement this project, I would be glad to experience the results and to troubleshoot issues first hand.

I believe that bike points would make the 2020 Cambridge Bicycle Plan more coherent by empowering “interested but concerned” cyclists to make the best use of new and planned bike facility improvements.

My hope is that a successful pilot project with the City of Cambridge will prove the concept’s feasibility in the US and generate interest in future bike point infrastructure.

Albert Carter,

A handwritten signature in black ink, appearing to read 'Albert Carter', with a long horizontal line extending to the right.

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⁹ CSAIL: Computer Science and Artificial Intelligence Lab, IDSS: Institute for Data, Systems, and Society

Appendix: A Sample Ride

Instructions for a sample bicycle ride from Lechmere Station to Fresh Pond

Bike Points Instructions can be written on a scrap of paper or, the back of a hand, or memorized.	Google Maps Instructions will require multiple stops to look at the phone, send their user on dangerous stretches of road, depend on street signs that may not exist, and contain instructions to turn onto unnamed paths.
41, 59, 84, 2, 56, 25	1. Head southeast on MA-28 S toward East St (361 ft) 2. Turn right onto East St (95 ft) 3. Slight right onto Cambridge St (2.0 mi) 4. Turn right at Quincy St (66 ft) 5. Turn left (0.3 mi) (onto what? This is in the extremely confusing Harvard Science Center area) 6. Turn left toward Massachusetts Ave (13 ft) (what if the user doesn't know where Massachusetts Ave is?) 7. Turn right onto Massachusetts Ave (0.6 mi) 8. Turn left onto Linnaean St (0.4 mi) 9. Turn right onto Garden St (0.6 mi) 10. Turn right onto Field St (0.1 mi) 11. Slight left onto Bay State Rd (0.1 mi) 12. Turn left at New St (105 ft) 13. Slight right onto Concord Ave (253 ft) 14. Turn left (85 ft) (where?) 15. Turn right (0.2 mi) 16. Turn left (0.2 mi) 17. Turn right

Appendix: European Commission Considerations for applicability of signage and wayfinding

(emphasis added)



Signage and wayfinding can be beneficial in cities with both low and high levels of cycling. Where low levels are experienced, the measure can help raise awareness and encourage uptake of cycling. Where little infrastructure is available, navigation software may be more appropriate.



Signage and wayfinding may be useful in cities with particularly hilly terrain or other access-affecting urban layout issues/features which would benefit from making clear alternative routes for people who cycle.



Signage/wayfinding is likely to be beneficial in cities considered to be a tourist destination in order to ensure that visitors to the city are able to successfully navigate the city by bicycle.

This will also benefit people who occasionally or regularly cycle who are unfamiliar with parts of the cycle network, the whole network, or the most appropriate routes for bicycles (including students and other population groups).



Costs associated with the development and provision of a comprehensive signage network within a city will vary depending on the size of city and style of signage/materials used. Funding associated with maintenance of route/network signage will also be required on an ongoing basis.



The time and human resources required to implement bicycle signage will vary depending on the size of the city and extent of route/network signage. The time associated with maintenance of route/network signage will also be required on an ongoing basis.

European Commission Guidelines guidance for cycling projects, section 3.5: Signage and Wayfinding, Accessed 30 Sept, 2020 https://ec.europa.eu/transport/themes/urban/cycling/guidance-cycling-projects-eu/cycling-measure/signage-and-wayfinding_en