



Source: Hubway Media Kit

Biking To A Healthier Boston

Assessing Potential Locations for New Hubway Construction in and around Boston
By Julia Appel | Fundamentals of GIS | Spring 2016



Introduction:

The Hubway biking share program began in the city of Boston in 2011. Over 3,000 people purchased annual memberships, and Boston residents logged 133,761 miles on 610 Hubway bikes between July 28th and November 30th. Bike forward four years later, to 2015, and over 13,000 residents of Boston, Cambridge, and Brookline have taken over 1 million Hubway trips, biked over 2.5 million miles on 1,500 Hubway bikes from 155 different stations. On April 30th, 2016, Hubway recorded its 4 millionth ride.

In 2015, Hubway riders burned **108,489,602** calories, and saved **1,715,650** pounds of CO₂ emissions.

Hubway provides a cost effective, healthful, and low environmental impact mode of transportation for many residents of the Greater Boston Area. Clearly the program has increased access to transportation for many city residents, and those who run it – the city governments of Boston, Cambridge, and Brookline – are interested in expanding it (they have already made such progress!).

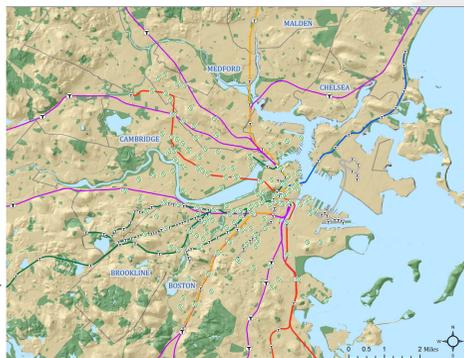
	2011	2015
Rides taken (all)	142,289	1,139,310
Annual Members	3,203	13,248
Cities Served	1	3
Number of Hubway bikes	610	1,500
Number of Hubway terminals	61	>155
Miles traveled	133,671	2,523,014
Cost	\$85	

Figure 1. Hubway growth, 2011 - 2016

Using data from Hubway on the precise geolocation of existing bike terminals, as well as from the MBTA on T and Commuter Rail routes and stations, and US Census data, I am seeking to find the next prime location for Hubway expansion.

Status quo transportation: Where are the gaps?

Residents of Boston have a number of options when it comes to transportation, for either pleasure or commuting purposes. The Massachusetts Bay Transportation Authority (MBTA) operates the Commuter Rail, subway, ferries, and busses. (For the purposes of this analysis I have chosen to focus on subway and Commuter Rail lines and stations.) Hubway bikes can fill in gaps in transportation for people who lack access to an existing T or Commuter Line route, prefer biking to other forms of transportation, or would be well-served by access to a Hubway bike that compliments an existing train ride.



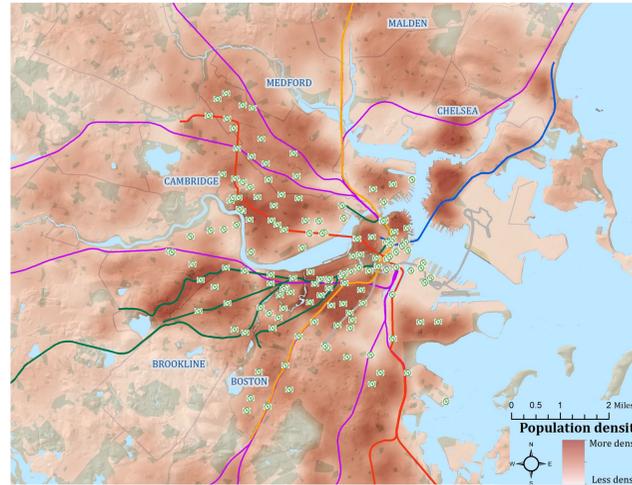
Map 1. Status quo transportation options

This analysis makes three assumptions in determining which new locations will best serve the population of Greater Boston:

- 1) The Hubway bike share program should serve the most number of people
- 2) New Hubway terminals need to be within a 30-minute ride of existing Hubway terminals
- 3) Hubway terminals close to T/Commuter Rail stops may serve two types of riders: those who compliment train rides with Hubway, and those who just use Hubway bikes

Analysis:

This analysis looks at the following three criteria in assessing locations for potential new Hubway terminal construction: population density, areas within a comfortable 30 minute (3-mile) bike ride of existing Hubway terminals, and proximity to an existing T or Commuter Rail stop.



Map 2. Population density within a 400 meter buffer

How far can you go? Measuring distances:

I considered only those locations within a 3-mile bike ride of existing Hubway locations, because Hubway rides can only last 30 minutes without the rider accruing extra charges; 6 miles/hour represented a reasonably conservative estimate for bike speed in an urban or suburban area.

The model in Map 3 takes into account distance from an existing Hubway, Commuter Rail, and T stations, and population density in determining suitability for new Hubway terminals. Higher population density, and proximity to a T or Commuter Rail station receive a higher score, as those criteria maximize potential use. Proximity to an existing Hubway receives a lower score, as does new construction near existing terminals risks over saturation of Hubway bikes and misallocation of resources in new construction.

Score	Distance from (in miles)			(People/400 m)
	Hubway terminal	T Station	Commuter Rail	
Poor	0 - 0.25	1-3	1-3	n/a
Bad	0.25 - 0.5	n/a	n/a	0 - 2,000
Fair	n/a	0.5 - 1	0.5 - 1	2,000 - 5,000
Good	0.5-1; 2-3	0.25 - 0.5	0.25 - 0.5	5,000 - 10,000
Excellent	1-2	0 - 0.25	0 - 0.25	>10,000
No Data	>3	>3	>3	n/a

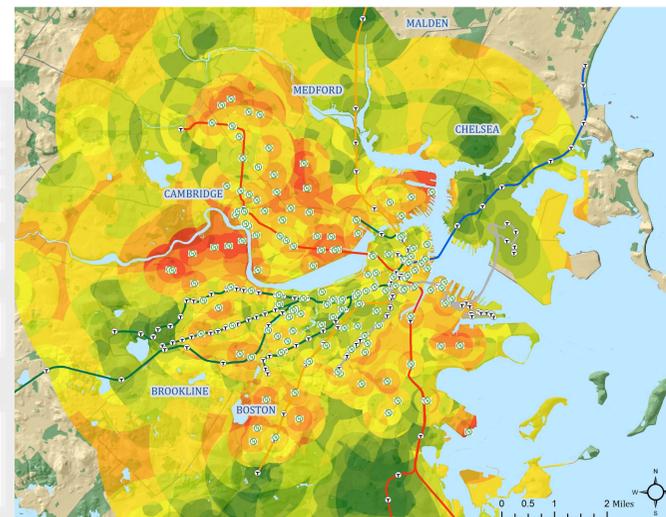
Figure 2. Scoring scheme for Hubway expansion model

Supplementing the Ride & Filling in Gaps

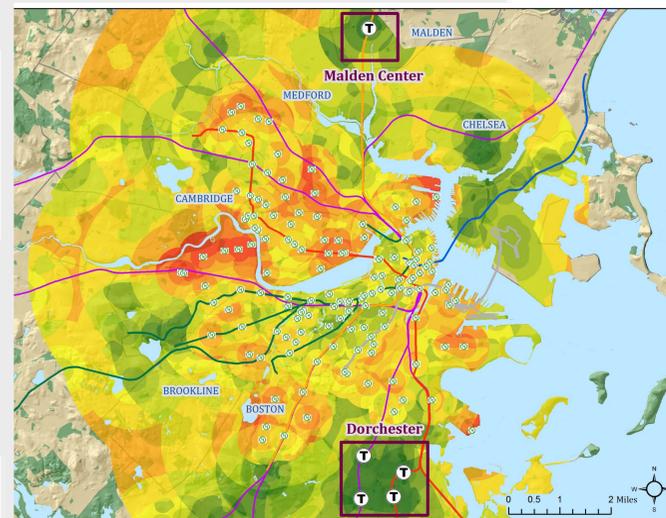
The final criteria for assessing new Hubway locations is to look at locations where Hubway bikes can serve a dual purpose of providing transportation options for people who do not currently use public transportation, and providing a compliment to existing transportation. 117 of the 142 Hubway stations in the model are within a 400 meter buffer of a T or Commuter Rail station. Thus, it seems reasonable that new Hubway construction would continue the trend. There are 77 T and Commuter Rail stations that do not currently have Hubway terminals near them, so there are 77 opportunities for Hubway to fill in current transportation gaps. The two boxes shown in Map 4 are population dense areas within the 3-mile buffer, that would provide a complimentary form of transportation to current T and Commuter Rail riders.

Where are the people? Mapping population density:

Map 2 models population density by applying a focal function to Census block population counts, using a circular neighborhood with a 400 meter radius. 400 meters represents about a 5 minute walk at an average speed of 2-3 miles per hour. That distance is an appropriate granularity for distance in this case: it is about the farthest I would expect that many people would want to walk to get to a Hubway bike.



Map 3. Full model assessing potential new places for Hubway Construction



Map 4. T/Commuter Rail stops best suited for new Hubway Construction

Breaking Ground: Where to build

There are two areas I recommend exploring to find feasible options for Hubway constructions: one in **Dorchester**, between the two Red Line and Commuter Rail stations, and one in **Malden**, outside the Malden Center T and Commuter Rail stops. The chart below shows the aggregated score (taken from the model shown in Figure 2) for each of the six current transit stations in the well-suited areas.

Best locations for new Hubways

Station	Current transit	Line	Score (out of 20)
Fields Corner, Dorchester	T	Red line	18
Shawmut, Dorchester	T	Red line	18
Four Corners/Geneva Ave., Dorchester	Commuter Rail	Fairmount	18
Talbot Ave., Dorchester	Commuter Rail	Fairmount	18
Malden Center, Malden	T	Orange line	18
Malden Center, Malden	Commuter Rail	Haverhill	18

Figure 3. Scores of the six best-suited transit stations

Talbot Ave. & Washington St., Dorchester



Source: Google Street View



Exchange St. & Commercial St., Malden



Source: Google Street View



Legend:

- Hubway stations
- T/Commuter rail stations
- Red Line
- Green Line
- Orange Line
- Blue Line
- Silver Line
- Commuter Rail

Sources:

All maps projected using NAD1983 (2011) Massachusetts State Plane Mainland
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