



SOMERVILLE UNION SQUARE SOCIAL EQUITY REPORT

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LOCUS



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A vibrant outdoor festival scene, likely a fair or market, with a cobblestone path. In the foreground, a young boy in an orange shirt and black pants is running towards the camera, holding a small red and yellow object. To his left, a woman in a teal jacket is standing next to a green baby stroller that has a large, clear, dome-shaped bubble attached to its front. Above the stroller, another large, multi-colored bubble floats in the air. The background is filled with people of various ages, including a man in a grey shirt and brown pants, a woman in a green vest, and a man in a blue shirt. There are lush green trees and a white tent in the background. A blue banner with the word "Introduction" is overlaid on the right side of the image.

Introduction

Introduction

The pace of change in the City of Somerville, Massachusetts is accelerating dramatically. The anticipated expansion of the Massachusetts Bay Transportation Authority's Green Line light rail is poised to be a catalyst for millions of square feet of new development in surrounding neighborhoods like Union Square. While development of this scale will meet the growing needs of the city, it presents a common dilemma: promoting economic growth while maintaining the neighborhood's local character and affordability for their local residents and businesses.

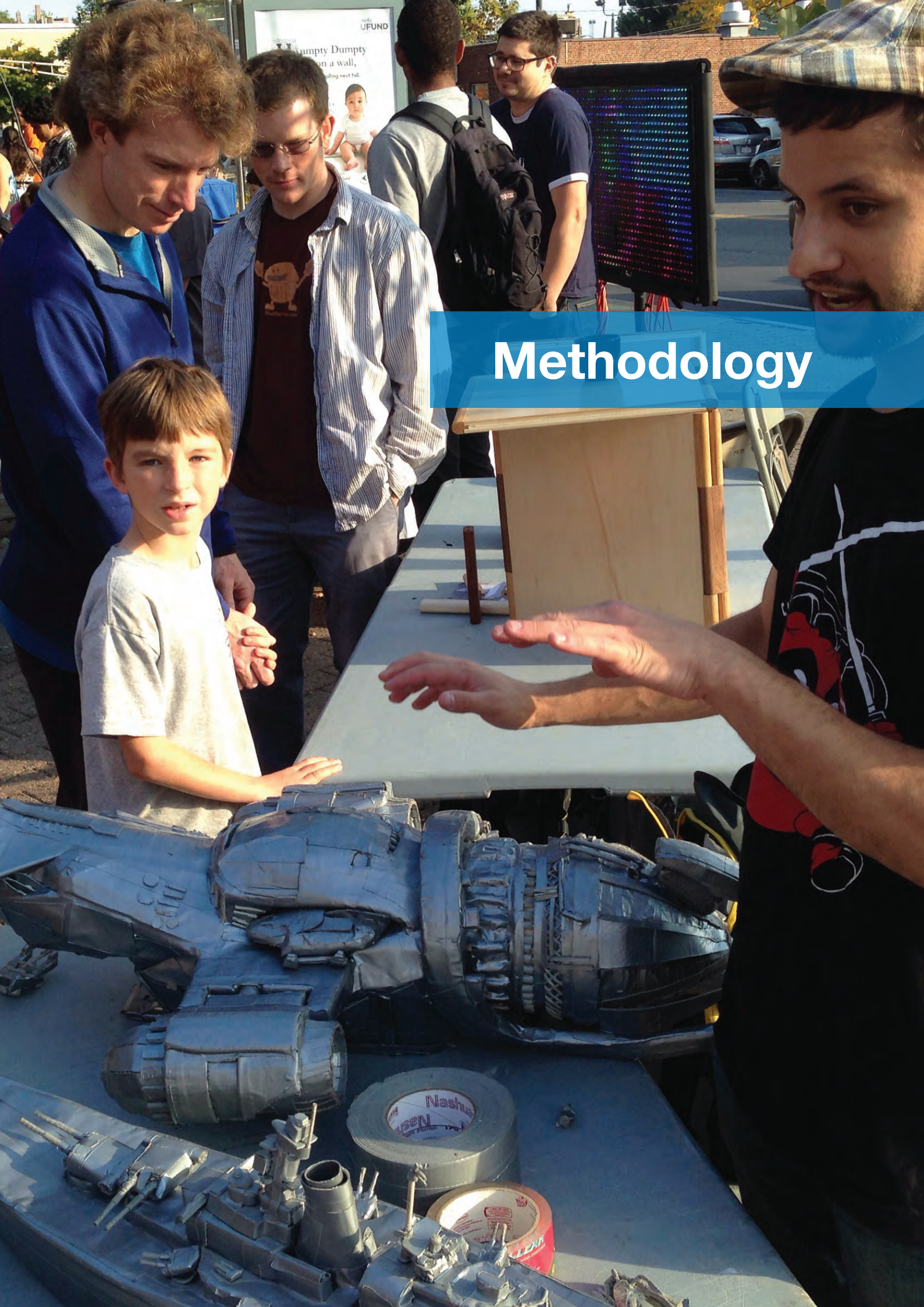
As a neighborhood on the cusp of major redevelopment, Union Square was uniquely suited to participate in [LOCUS' Attainable Housing and Social Equity Initiative \(AHSEI\)](#) pilot, a place-based method for developing and implementing effective community benefit programs as large-scale development occurs around incoming transit nodes. AHSEI aims to ensure that walkable communities are affordable to the full range of a community's residents and that long-time residents are able to live in and enjoy neighborhoods even as they become more walkable and attract more amenities.

Since November 2015, LOCUS has worked with the City of Somerville, Union Square strategy leaders (community leaders) and members of the general public to develop the [Somerville Union Square Strategic and Community Benefits Plan](#) – an actionable articulation of the economic and social equity benefits needed to help maintain the qualities and attributes of the Union Square community. During this process, the City also conducted a comprehensive review and update of [Union Square's Neighborhood Plan](#) to provide incentives for economic development, diverse and affordable housing, the artist and maker economy and other goals. Together, the [Union Square Neighborhood Plan](#) and the [Somerville Union Square Strategic and Community Benefits Plan](#) seek to find an equitable balance between promoting economic growth while maintaining social equity.

About this report

Measurement is a powerful tool that provides a deeper understanding of existing conditions and proposed changes. Communities who measure their economic and social equity performance are better equipped to manage gentrification and prevent displacement.

The social equity scan described in this report includes an evaluation of the current and future social equity conditions of Union Square, and creates a social equity score utilizing performance metrics – transit accessibility, non-car commuting accessibility, job density, location affordability and housing cost burden. The report findings will aid the City of Somerville and Union Square stakeholders in determining to what extent the [Union Square Neighborhood Plan](#) and the [Somerville Union Square Strategic and Community Benefits Plan](#), if implemented, will result in improved economic and social equity performance of Union Square.



Methodology

Methodology

The methodology employed in this report is based on quantitative research and data from the [WalkUP Wake-Up Call: Boston](#) report.

The [WalkUP Wake-Up Call: Boston](#) research team was composed of local and national partners who collaborated to produce the methodology, analysis and findings. The team included LOCUS, the Center for Real Estate and Urban Analysis at George Washington University, the Metropolitan Area Planning Council and the Dukakis Center for Urban and Regional Policy at Northeastern University.

WalkUP Wake-Up Call: Boston methodology

To identify and map walkable urban places (WalkUPs), the research team reviewed and compiled data from several sources to make preliminary identifications of major commercial concentrations. These commercial concentrations were initially separated into walkable and drivable by using Walk Score ([Walkscore.com](#)), a website that developed an algorithm to access the walkability of any location on a 1-100 scale. The scale is based primarily on the number of retail, restaurant, services and other frequent destinations within walking distance.

Using the average Walk Scores by census block, commercial concentrations with average Walk Scores over 70.5 were selected for further study as WalkUPs. Those commercial concentrations with Walk Scores below 70.5 were considered for analysis as Edge Cities¹, Emerging WalkUPs², or local-serving neighborhoods.

For each WalkUP candidate, boundaries were refined based on a review of aerial photographs, established or commonly held neighborhood boundaries or place-management districts and input from local residents and real estate professionals. In addition, boundaries were drawn with the recognition that a single walkable place tends not to exceed 600 acres, based upon experience and the limitations people are willing to walk, generally agreed to be between 1500 and 3000 feet.

After boundaries were established, average Walk Scores and intersection densities³ for each WalkUP candidate were calculated, and data on the commercial real estate inventory was aggregated. Average Walk Scores for each WalkUP represent the weighted average Walk Score of each census block within the WalkUP, weighted by the land area of each census block. The average intersection density is derived from the Environmental Protection Agency's (EPA) Smart Location Database, which provides estimates of the intersection density per square mile by census block group, excluding those intersections that are primarily for exclusive automobile use, such as interstate on and off ramps, etc.

1 Edge Cities or regionally significant drivable locations were identified as places that had a minimum of either 1.4 million square feet of office or 340,000 square feet of retail but did not meet walkability criteria for Established or Emerging WalkUPs.

2 For emerging WalkUPs, the minimum Walk Score criteria was reduced to 65, the intersection density per acre threshold reduced to 85 and the space requirements reduced to 90 percent of the established number.

3 Intersection density is a basic measure of the street network. Places with high intersection densities and therefore smaller block sizes, tend to be better environments for pedestrians.

To be considered an established WalkUP, each candidate had to meet the following criteria:

- **Walk Score:** Average value ≥ 70.5
- **Intersection density:** Average ≥ 100 per square mile
- **Office and retail space:**
 - **Office:** ≥ 1.4 million square feet, and/or
 - **Retail:** $\geq 340,000$ square feet

At its core, the methodology is a data mining exercise to identify very precise place geographies that are meaningful in the real estate market. The methodology for defining these WalkUPs and a regional economic and social equity analysis are described in further detail in the [WalkUP Wake-Up Call: Boston](#).

Figure 1: U.S. Metropolitan land use options



	REGIONALLY SIGNIFICANT	LOCAL SERVING
 WALKABLE URBAN	WALKUP (Walkable Urban Place) 1% <i>Metro Area Acreage</i>	NEIGHBORHOOD 3-7% <i>Metro Area Acreage</i>
 DRIVABLE SUB-URBAN	EDGE CITY 5-7% <i>Metro Area Acreage</i>	BEDROOM COMMUNITY 80-85% <i>Metro Area Acreage</i>

Figure 1 shows how two potential economic functions (regionally significant and local serving) and two land use forms (walkable urban versus driveable suburban) yield the four-cell matrix that categorizes 100 percent of metropolitan land.

WalkUPs in Metropolitan Boston

The [WalkUP Wake-Up Call: Boston](#) identified 57 Established WalkUPs in Metropolitan Boston in 2015. This equates to approximately one WalkUP per 88,000 people. Established WalkUPs range in size from 95 to 691 acres and account for one percent of the total land area in Metro Boston. **While the average acreage for a Boston metropolitan WalkUP is 337 acres, Union Square is 165.7 acres.**

Metropolitan Boston's 57 WalkUPs are concentrated inside Route 128 and span 33 towns and cities. For reference, the 57 Established WalkUPs and their respective social equity rankings are listed below:

#	WalkUP Name	Acres	#	WalkUP Name	Acres
1	Allston	567.1	31	Longwood Medical Area	198.5
2	Arlington	246.3	32	Lowell	689.5
3	Attleboro	206.3	33	Lower Allston	506.0
4	Back Bay	468.6	34	Lynn/Central Square	271.9
5	Beacon Hill	195.6	35	Malden Center	211.5
6	Brockton	247.7	36	Marlborough	253.4
7	Cambridgeport	421.6	37	Mission Hill	323.1
8	Central Cambridge	541.0	38	MIT/Kendall Square	225.3
9	Charleston	424.9	39	Newburyport	200.5
10	Chinatown	108.3	40	North Dorchester	396.1
11	Coolidge Corner	691.0	41	North End	157.2
12	Downtown Beverly	266.4	42	North New Bedford/Acushnet	288.3
13	Downtown BID	95.1	43	Northeastern	164.6
14	Downtown Fall River	489.4	44	Norwood	193.7
15	Downtown Gloucester	287.2	45	Plymouth	123.4
16	Downtown New Bedford	171.9	46	Porter Square/Davis Square	600.2
17	Downtown Peabody	214.8	47	Roxbury	335.9
18	Downtown Quincy	318.9	48	Seaport	420.2
19	Downtown Salem	308.4	49	South Boston	469.0
20	Downtown Worcester	518.2	50	South End	474.4
21	Dudley Square	321.9	51	Taunton BID	95.5
22	East Cambridge	275.7	52	Tufts	568.6
23	Fields Corner	275.1	53	Wakefield	137.5
24	Financial District (Boston)	149.0	54	Waltham	600.6
25	Fitchburg	290.4	55	Watertown	426.8
26	Framingham	256.7	56	West End	157.8
27	Harvard Square	676.6	57	Woburn	174.3
28	Haverhill	286.4			
29	Kenmore/Fenway	372.9			
30	Lawrence	828.4			

Social Equity Rankings:

	Copper		Gold
	Silver		Platinum



Social Equity Metrics

Social equity metrics

Metrics used to measure social equity

In studying the Boston region's real estate market, economic performance is not the only outcome of interest. Federal agencies, municipal governments, community-based organizations and real estate developers share a growing interest in ensuring that public policies and private investments are oriented so as to improve economic opportunity for the disadvantaged; reduce disparate burdens on low-income, minority and foreign-born residents; and minimize displacement from areas experiencing reinvestment.

To better understand the social equity dimensions of WalkUPs, the research team developed social equity rankings that characterize the extent to which low-income residents can benefit from housing and economic opportunities in those places—and the extent to which existing residents might be affected by escalating rents and sale prices. Our social equity rankings are based on three components: accessibility, opportunity and affordability. A WalkUP ranks high on accessibility and opportunity if it is easy to reach by a large share of the region's population, accessible by non-driving modes and provides opportunities for jobs and for good schools. A WalkUP ranks high on affordability if it is not severely cost-burdened by housing and transportation costs. The measures within accessibility, opportunity and affordability are weighted equally.

In examining social equity, we primarily looked at nationally available measures of accessibility, opportunity and affordability. The selected six measures include the following:

Accessibility (1/3 of final score)

- **Transit accessibility**

Proportion of the region's working-age population that can access the WalkUP by transit within 45 minutes, a measure created by the EPA and available in the Smart Location Database. This measure takes into account actual travel times by transit during the afternoon/evening peak hours, and includes walking, waiting, in-vehicle travel and transfer times. Accessibility by transit is an important measure of access to the WalkUP for residents of the region, especially in WalkUPs close to the Boston/Cambridge/Somerville area, where driving can be prohibitively expensive and inconvenient.

- **Anything But Car (ABC) commuting accessibility**

Proportion of the WalkUP's residents that commute by non-car modes (i.e. transit, biking, walking), a measure available in the American Community Survey. This measure reports actual commuting behavior since the presence of transit alone does not necessarily reflect its actual use. In general, if people can and do reach their jobs by non-car modes, the WalkUP is considered more accessible than one where transit is available but not well-utilized.

Opportunity (1/3 of final score)

- **Job density**

Calculated as the number of jobs per acre. This measure is included as measure of opportunity for employment in the WalkUP.

- **School reading proficiency**

Calculated using **Massachusetts Comprehensive Assessment System data** as the percent of test takers in the area's elementary and elementary/middle schools that score at least proficient in reading. This measure is included as a measure of educational opportunity in quality schools for resident families.

Affordability (1/3 of final score)

- **Location Affordability Index**

Housing and transportation costs as a percentage of area median income, a measure developed by the U.S. Department of Housing and Urban Development (HUD). Since housing and transportation costs are generally linked – especially if the household has to “drive till you qualify”, exchanging lower housing costs for higher transportation costs – this measure combines the overall expenses paid by the WalkUP's residents on these two living expenses.

- **Housing cost burden**

Proportion of households under 100% Area Median Income that are housing cost-burdened (30%+ of income spent on housing), a measure we calculated using data provided by HUD as part of the Comprehensive Housing Affordability Strategy dataset. This measure provides the level of cost burden that comes specifically from housing, and it is included both to provide an alternative source of housing costs and to reflect the reality that housing costs alone can frequently be crippling for residents whose income is less than the Area Median Income.

*A WalkUP ranks high on **accessibility** and **opportunity** if it is easy to reach by a large share of the region's population, accessible by non-driving modes, and provides opportunities for jobs and for good schools.*

*A WalkUP ranks high on **affordability** if it is not severely cost-burdened by housing and transportation costs.*

WalkUPs and social equity

On these measures, WalkUPs tend to be more accessible and have more work opportunities than the rest of the region. The cost of that opportunity seems to vary depending on the data source and methodology. While HUD's Location Affordability Index indicates that average housing and transportation costs are lower in WalkUPs than in driveable places, the proportion of households earning less than Area Median Income with housing cost burdens is clearly higher in WalkUPs than anywhere else. The ranking incorporates both measures and the result is that WalkUPs tend to have significantly more accessibility and opportunity than driveable places, but are less affordable. Walkable cities like Somerville tend to be both more affordable and offer slightly more opportunity than driveable places. However, the summary is hiding a lot of variation in social equity within each category.

The accessibility and opportunity measures are correlated with each other. Generally, WalkUPs that are accessible also have higher opportunity and those that are less accessible have lower levels of opportunity. Therefore, they are combined into one scale of accessibility/opportunity. The affordability measure is also correlated with accessibility and opportunity, but in opposite directions (places with high affordability tend to be inaccessible and vice versa), reflecting a different dimension of social equity. The measures within accessibility, opportunity and affordability are weighted equally.

Most of the measures used to generate this Social Equity Index are available nationwide in the United States, but the school quality measure is state-specific and may not be replicable.

WELCOME TO SOMERVILLE
HOME OF THE FIRST AMERICAN FLAG
RAISED ON PROSPECT HILL, JAN. 1, 1776

Union Square's Social Equity Scan



Union Square's social equity scan

Current conditions

Presently, Union Square's social equity index places it in the most progressive group of WalkUPs in the Boston metropolitan region, the Platinum group, including: Arlington; Charlestown; Chinatown; Mission Hill; MIT/Kendall Square; Newburyport; Northeastern; Roxbury; Tufts; and Watertown. The averages for these ten places, for each of the six key drivers are presented in Table 1, alongside Union Square.

Table 1: Baseline measure for six drivers of social equity			
Driver	Platinum WalkUPs	Union Square	Unit
Housing + transportation costs	41%	39%	As a percent of median income for Metropolitan Boston
Housing cost burden	43%	39%	Percent of lower-income households that spend over 30% of income on housing
Job density	41	12	Per acre
School quality	67%	71%	Percent of students with proficient or higher reading level
Transit accessibility	18%	15%	Share of regional population that can access the WalkUP by transit within 45 minutes
ABC (Anything But Car) commuting	49%	53%	Non-car commute mode share

WalkUPs like Union Square are ranked as Platinum on the social equity scale because they provide some combination of affordability, accessibility and good job and school opportunities. Those that are relatively unaffordable, not easily accessible, or do not provide good opportunities are ranked Copper. The rest are ranked either Silver or Gold, depending on their levels; however, a WalkUP will not rank as Gold or Platinum if it scores Copper in either of the two component measures. Please reference page 10 of this report for the social equity rankings of Metropolitan Boston's 57 Established WalkUPs.

It is important to note that the index is relative, so while these WalkUPs lead their regional peers in the social equity metrics included here, this does not mean that they lead all places in the region as a whole, or in absolute terms (for example, compared to places in other regions).

Future conditions

For the purpose of generating Union Square's social equity projections, the [Union Square Neighborhood Plan](#) is used as a basis to explore three potential future scenarios over the next ten years (target year 2026): business-as-usual (BAU), which assumes that Union Square will continue on its current development trajectory; a partial implementation scenario (partial), which models a moderate intensification of efforts to redevelop Union Square according to policies and strategies laid out in the [Union Square Neighborhood Plan](#); and full implementation (full), which assumes aggressive redevelopment according to the [Union Square Neighborhood Plan](#) and the implementation of recommendations from the [Somerville Union Square Strategic and Community Benefits Plan](#).

Each scenario consists of a complex set of assumptions involving possible future changes to transportation and land use in Somerville as envisioned in the [Union Square Neighborhood Plan](#) and elsewhere. The detailed assumptions and projection methodology are described fully in the technical appendix.

Findings

The projections described in this report are based on specific and strict assumptions about changes in population size, demographics and the economy that are by no means certain, as well as assumptions about the timing and ultimate inventory of the Union Square development buildout. Therefore, while this methodology is relatively easily replicable for other places, the projection methods and analysis described in the following section should be understood as the product of significant locally-specific constraints that are not data-driven.

Table 2 summarizes the projected values for each social equity driver under each potential future scenario - BAU, partial and full:

Table 2: Future estimates for six drivers of social equity							
	Year 2017	Year 2026					
Driver	Baseline	BAU		Partial		Full	
Housing + transportation costs	39%	44%	↑5%	39%	↔	35%	↓4%
Housing cost burden	39%	34%	↓5%	39%	↔	27%	↓12%
Job density	12	14	↑17%	17	↑42%	20	↑67%
School quality	71%	71%	↔	71%	↔	71%	↔
Transit accessibility	15%	17%	↑2%	32%	↑17%	32%	↑17%
		23%	↑8%	41%	↑26%	41%	↑26%
ABC commuting	53%	53%	↔	53%	↔	54%	↑1%
		61%	↑8%	61%	↑8%	62%	↑9%

Under both partial and full implementation scenarios, it is projected that the strategies outlined in the [Union Square Neighborhood Plan](#) and the [Somerville Union Square Strategic and Community Benefits Plan](#) will have a positive and material impact on the drivers of social equity. The one exception to this is the Location Affordability Index, labeled in Table 2 as “Housing + transportation costs”. The baseline conditions for this Index is calculated by HUD and the Center for Neighborhood Technology using a complex structural equation model that was not methodologically reproducible for this analysis. Therefore, the projected changes in this variable are not plan-or data-driven. Instead, the three scenarios simply model a shift by one standard deviation in this Index in each direction.

It is important to note that school quality is held constant across all scenarios, as there is little methodological basis to hypothesize or predict changes to this metric in the future.

Within each implementation scenario, a lower and upper bound for changes in the accessibility-related metrics (transit accessibility and ABC commuting) is estimated based on uncertainty about future infrastructure changes in Somerville, namely the extension of the Green Line.

The current social equity conditions in Somerville, relative to other WalkUPs in the Boston metropolitan area, are already excellent in the baseline and hold true under future projections. However, since this benchmark is relative, it does not capture the extent to which all WalkUPs in the Boston region are struggling with a housing affordability crisis.

While this index inherently compares Somerville to its peers, the future scenarios allow the community to benchmark itself against the current baseline in absolute terms. The composite index results are shown in Figure 2 below.

The projections suggest that implementing the [Union Square Neighborhood Plan](#) would move Somerville from the front of the pack to a class of its own in terms of social equity. Full implementation in particular would make a dramatic difference for affordability, primarily by reducing the number of cost-burdened households.

Figure 2: Scatter plot showing distribution of accessibility/opportunity vs. affordability of Metropolitan Boston's regionally significant WalkUPs

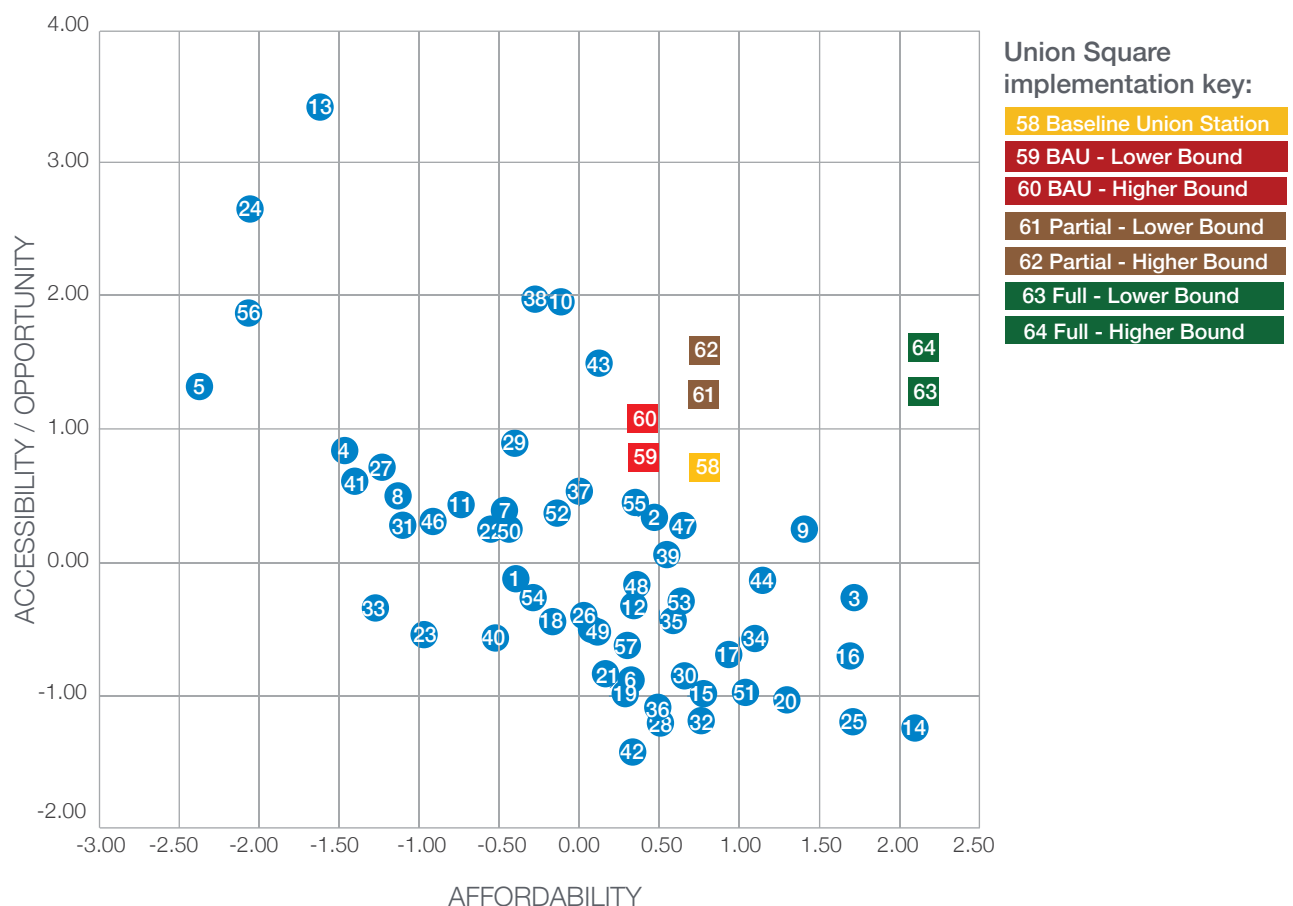


Figure 2 shows the trade-offs between affordability and accessibility/opportunity. WalkUPs in the inner core, like the Downtown and Financial District, are accessible but not affordable; in contrast, WalkUPs on the outer edges of the commuter rail system, like Worcester, New Bedford, and Fall River are affordable but difficult to access.



Summary of findings

- Presently, Union Square's Social Equity Index places it in the most progressive group of WalkUPs in the Boston metropolitan region, including Arlington; Charlestown; Chinatown; Mission Hill; MIT/Kendall Square; Newburyport; Northeastern; Roxbury; Tufts; and Watertown.
- Under both the partial and full implementation scenarios, it is projected that the strategies outlined in the Union Square Neighborhood Plan will have a positive and material impact on the drivers of social equity.
- The social equity projections suggest that implementing the Union Square Neighborhood Plan would help to move Somerville from the front of the pack to a class of its own in terms of social equity.
- Only full implementation would make a dramatic difference for affordability, primarily by reducing the number of cost-burdened households.



A photograph of a city street at dusk. On the right, a multi-story brick building with classical architectural details is visible. A sign on the building reads "SOMERVILLE THEATRE". Below it, a marquee displays the text "BIG SHORT JOY REVENANT HATEFUL EIGHT IN 70MM". To the left of the theatre, a red sign for "boston sports clubs" is visible. The street has cars and a "ONLY" road marking. The sky is filled with soft, orange and blue clouds. A blue semi-transparent box with white text is overlaid on the right side of the image.

Conclusion and next steps

Report conclusion

Based on the findings, full implementation of the [Union Square Neighborhood Plan](#), including local zoning and the [Somerville Union Square Strategic and Community Benefits Plan](#) represent an opportunity for Somerville to lead the region in equitable development.

Historically, community opposition known as “not in my backyard” (NIMBYism) has prevented local zoning reform or new development from occurring, resulting in greater lack of affordability in housing and in some instances commercial space. For Union Square and Somerville, it is imperative to (1) build unified community-wide support for local zoning changes outlined in the [Union Square Neighborhood Plan](#) and (2) become YIMBY (yes in my back yard) advocates for future development projects that align with the community’s goals.

Preventing and minimizing socially detrimental impacts by 2026 will be contingent upon these factors, including the successful implementation of the housing, transportation and economic development recommendations outlined in the [Somerville Union Square Strategic and Community Benefits Plan](#). It is our hope that the City will take these recommendations under consideration as they work to improve the economic and social equity performance of Union Square.

Next steps

The next step for Union Square is to establish a Neighborhood Council to steward community development and achieve community goals. The strategy leaders have made significant progress in crafting a proposal for an independent and democratic neighborhood council responsible for: (1) implementing the [Somerville Union Square Strategic and Community Benefits Plan](#), (2) creating a transparent and inclusive knowledge-sharing and decision making process and (3) addressing the issues raised through the redevelopment of Union Square. Ultimately that neighborhood council will serve as a leading advocate for shared prosperity and the democratization of development in Union Square. The group has held several neighborhood meetings educating the community about the proposal. The intent is to have a final proposal and approval by the City of Somerville, strategy leaders and members of the public by Fall 2017.

Following the release of the Social Equity Scan, LOCUS will reconvene the strategy leaders within three months to conduct a social equity scan follow up and to evaluate progress on the [Somerville Union Square Strategic and Community Benefits Plan](#). This meeting is designed to hold the strategy leaders and other stakeholder accountable to the [Union Square Neighborhood Plan](#) and the [Somerville Union Square Strategic and Community Benefits Plan](#).



Appendices

Technical appendix

Union Square social equity projections

Introduction

This appendix describes methods for making rough predictions on the state of Union Square's social equity situation in 2026, given different levels of implementation of the strategies and policies laid out in the [Union Square Neighborhood Plan](#). The projections are based on five pre-determined indicators: transit accessibility, non-car commuting accessibility, job density, location affordability, and housing cost burden.

For each of the five pre-determined indicators, this appendix provides a brief description of the indicator, the data sources used to construct the indicator, a set of assumptions about how the data underlying the indicators might change in the next ten years under different planning scenarios, and instructions on how to use 'future' data to reconstruct the indicators. Projections are for three different planning scenarios: **business-as-usual**, which assumes that Union Square will continue on its current development trajectory, a **partial implementation** scenario, which models a moderate intensification of efforts to redevelop Union Square according to policies and strategies laid out in the [Union Square Neighborhood Plan](#), and **full implementation**, which assumes aggressive redevelopment according to the [Union Square Neighborhood Plan](#).

This appendix is linked to an [Excel spreadsheet](#) which can be used to calculate the projected indicator values. The [spreadsheet](#) can be modified, should the user decide to alter any of the assumptions about the planning and development scenarios.

The appendix is organized as follows: first, 'global' background information and assumptions about Union Square's future that pertain to all five indicators. Then, detailed information, assumptions, and for four of the indicators, steps for reconstructing each indicator separately. The fifth indicator, location affordability, is not projected. Instead, the [spreadsheet](#) calculates the standard deviation of the Index for WalkUPs in Boston and uses that statistic to project marginal change in location affordability for each scenario.

Global background information

Background information and assumptions for all indicators:

- The study area is defined as per page 14 of the Union Square Neighborhood Revitalization Strategy Area (NRSA); sociodemographic data comes from the relevant census block groups, with weights applied based on the proportion of the study area's residential floor area that falls within each block group.
- Study area population will expand to fill available housing at 100 percent occupancy.
- The primary document for developing planning scenarios and relevant supporting assumptions is the [Union Square Neighborhood Plan](#) adopted in August 2016.

Assumptions about Union Square's future

Dimensions for each scenario require the following assumptions:

Population

- Regional population growth will follow national projections. [US Census](#) predicts eight percent growth in US population from 2016-2026.
- As there is already a shortage of acceptable, appropriately priced housing in Union Square, the neighborhood's population will grow at roughly the same rate as housing, and new housing will reach 100 percent occupancy shortly after it becomes available.

Region

- No changes in regional land use pattern, population, economic situation.

Zoning

- Zoning will be enforced as described in the [Union Square Neighborhood Plan](#).

Transportation

Business-as-usual (BAU)

- The MBTA Green Line will not be extended to Union Square. Instead, a new express bus along with the existing bus service will serve the area.

Partial implementation

- The Green Line Extension (GLX) will be in service by 2022.
- Streetscaping and pedestrian prioritization will occur as described in the plan along major streets (necessary infrastructure projects are complete, so this is feasible).

Full implementation

- GLX is operational by 2018.
- The MBTA Yellow Line is slated for extension. It will not be complete by 2026, but the town may still be able to capture revenue from increased land values, should the appropriate mechanisms be in place.
- Streetscaping and pedestrian prioritization will occur along all major streets.
- Protected bikeways will be installed on major streets where sufficient right of ways exist.
- The town will enact 20 miles per hour speed limits throughout the neighborhood and allow traffic calming on 'problem' streets.
- The town will establish parking maxima for transit oriented developments in 1/4 mile radius of the GLX of station area, and through zoning will permit shared parking elsewhere.

Land development and land use

BAU

- There will be minimal redevelopment of the plan's identified D-parcels (development parcels identified in the Union Square Revitalization Plan) and sporadic redevelopment

of scattered sites across the neighborhood.

Partial

- There will be moderate redevelopment of the easiest of the D-parcels (the low hanging fruit) in accordance with [Union Square Neighborhood Plan](#) and sporadic development of other sites.

Full

- There will be an aggressive push for redevelopment of all D-parcels in accordance with [Union Square Neighborhood Plan](#) and moderate redevelopment of scattered sites.
- The town will enact a community benefits payments as part of permitting.
- New development will provide an increased supply of retail space, and the town will encourage retail development 'off main street' and in second floor spaces in the plan area.
- Storefront widths of first floor uses will be limited to 10,000 square feet in floor area and will be lined by other establishments.

Housing

BAU and partial

- 20 percent of new development within 1/4 mile of Union Square station will be affordable.
- The scope of inclusionary zoning will be expanded to produce units priced for moderate-and middle-income households.
- Price requirements for new affordable units will be set to better match existing Somerville residents' needs.
- The town will allow payment-in-lieu from developers instead of requiring construction of affordable units.

Full

Same as BAU and partial, plus:

- The town will establish an anti-displacement program for qualifying renter households with children.
- The town will enact a property tax freeze mechanism for cost-burdened households.

Jobs

Full

- The town and/or developers will provide relocation assistance for existing businesses on the D-parcels as they get redeveloped.

Pre-determined indicators for projections

As mentioned above, the projections are based on five pre-determined indicators:

1. Transit accessibility
2. Non-car commuting accessibility
3. Job density
4. Location affordability
5. Housing cost burden

For each pre-determined indicator, the following is provided: a brief description of the indicator, the data sources used to construct the indicator, a set of assumptions about how the data underlying the indicators might change in the next ten years under different planning scenarios, and instructions on how to use ‘future’ data to reconstruct the indicators.

1. Transit Accessibility

Transit accessibility refers to the proportion of the region’s working-age population that can access the WalkUP by transit within 45 minutes.

Data sources

Data sources for baseline indicator construction:

- EPA Smart Location Database, variable D5b.

Relevant assumptions

Relevant assumptions needed for projected indicators reconstruction:

Regional population growth/changes

BAU, partial, and full

- No changes in regional sociodemographic makeup.

Transportation

BAU

- Introduction of express bus service; no other changes in transit service.

Partial

- MBTA Green Line is extended to new terminus in Union Square by 2022.

Full

- Extend the Green Line to Union Square by 2018. Yellow Line planned, but not implemented by 2026.

Realistically, whether the Green Line is extended by 2018 or 2022 has no bearing on the indicator’s value in 2026. Thus, in the [spreadsheet](#), there is no distinction between partial and full implementation scenarios. Rather, the user is able to modify the travel time savings (over current conditions) to Union Square from across the region expected given an extension of the Green Line at any point prior to 2026. This is also the case for the BAU scenario: the user is able to adjust the expected travel time savings upon introduction of the express bus (relative to current conditions). We do not provide an explicit calculation for the BAU scenario, as in the same way the indicator is indifferent to the date of introduction of a transit service, it is also indifferent to the type of transit provided. The indicator is sensitive only to travel times.

No land use assumptions: indicator depends on development patterns outside Union Square.

Actions to recalculate indicators

Actions needed to recalculate indicators using projected data:

EPA’s original method is not replicable within reasonable constraints. An alternative is to use peer communities to generate off-model estimates, which is the approach adopted here using

the following steps:

1. Use the Smart Location Database's online mapping tool to find the average Transit Accessibility Index value for all MBTA stations that met the following criteria: (1) served by the Green Line and not served by other T lines (N=30), (2) served by at least one MBTA bus line.
2. Use Google Maps to find estimated travel time via transit and driving from each station to a central location on the Green Line (the Orpheum Theatre) during mid-morning (between 10:00 and 10:30am) on a weekday.
3. Calculate three different potential explanatory variables: the difference between transit time and drive time, the transit:drive time ratio, and the transit "benefit" (inverse of the transit:drive ratio).
4. Regress station-area transit accessibility index value on each of the three potential explanatory variables.

The coefficients on the regression are provided in the [spreadsheet](#), along with how each model predicts change in accessibility given a change in transit travel time.

Projections

- Baseline value: 0.14667
- BAU, partial, full: see [spreadsheet](#).

2. Non-car commuting accessibility

Non-car commuting refers to the proportion of the WalkUP's residents that commute by non-car modes.

Data sources

Data source for baseline indicator construction:

- American Community Survey (ACS): weighted block group figures from ACS 2014 one-year estimate of Journey to Work for population 16 years+.

Relevant assumptions

Relevant assumptions needed for projected indicators reconstruction:

Population and sociodemographic shifts (including attitudes)

It is assumed that there are no changes in attitudes of the neighborhood's population, and that any sociodemographic-based changes in mode choice aren't influenced by attitudes, even though it's fair to suspect that the neighborhood will attract new residents who would prefer to commute by noncar modes. Thus, any projections on this indicator are likely to be conservative in this respect.

There are no data on which to base assumptions about sociodemographic shifts; therefore, we assume no change in the makeup of the population.

BAU, partial and full

- Population growth keeps pace with the increase in housing under the respective scenarios (see land use changes).

Transit system changes

Unfortunately, the literature is scant on the mode share impacts of changes in transit service type (there is copious research on the impacts of introducing new transit service to a previously unserved area, but not on adding a new type of service to an area that already has heavy transit coverage). This projection opts for the conservative side to assume no transit-service-based changes in commute mode share. The effect of the GLX would arguably be to increase transit mode share, but the size of that increase is impossible to predict.

BAU

- Bus-based shuttle introduced as alternative to GLX; no other changes in transit service except possible reduction in transit travel speeds/reliability due to increased congestion.

Partial

- GLX operational in 2022.

Full

- GLX operational in 2018; Yellow Line planned, but not built.

Land use changes

Assumptions on land use changes are based on buildout projections provided in the [Union Square Neighborhood Plan](#) (Nelson-Nygaard's projections) and the percent of buildout likely to be achieved by 2026 under each scenario. The plan also provides target buildout aspirations, and we include a means to calculate buildout based on these figures as well. Specifically, we use estimates of new dwelling units to project changes in residential density, that the literature supports as the most reliable correlate of commute mode share in the Boston region (Zhang, 2004). See the [spreadsheet](#) for Nelson-Nygaard's estimated buildout figures and how they are treated under each scenario.

BAU

- Minimal redevelopment of the D-parcels occurs (up to 10 percent of potential buildout) plus negligible development of scattered sites, with no attempts at intensification of land use. All new residential development has 100 percent occupancy.

Partial

- 30 percent of the D-parcel redevelopment (as envisioned in the [Union Square Neighborhood Plan](#)) has occurred by 2026 plus negligible development of scattered sites; new development has 100 percent occupancy for residential uses.

Full

- 50 percent of the D-parcel redevelopment (as envisioned in the [Union Square Neighborhood Plan](#)) has occurred by 2026; new development has 100 percent occupancy for residential uses. The lowest-hanging fruit of the scattered "underutilized parcels" (65 Bow St, 346 Somerville Ave, and 304-322 Somerville Ave) are developed in accordance with new zoning under [Union Square's Neighborhood Plan](#).

Bicycle/sidewalk facility changes

Streetscaping projects have been approved, but their potential impact is unclear. For the most part, the impacts on commuting behavior are likely to be marginal, but the grounding of McGrath is a notable exception. Its impacts are most certainly to be positive, but their

magnitude is virtually impossible to predict. Thus, the projections will assume this project does not take place, erring on the side of producing conservative estimates.

BAU

- No changes.

Partial and full

- Streetscaping and pedestrian prioritization along major streets.

Regional mode share trends

Boston-Cambridge metro area has a downward trend in car-commuting 2009-2012; slope -0.28. This trend could be due to cultural/attitudinal shifts, but also to changes in regional land use patterns. If the latter, then incorporating this trend into the calculations would be to double-count it, so the safe bet is to ignore the trend (and at worst, get a conservative estimate).

Actions to recalculate indicators

Actions needed to recalculate indicators using projected data:

The best built environment predictor of non-car commute mode share in the Boston area is density (household or job) (Ewing and Cervero, 2010; Zhang, 2004). Since the job density predictions are likely less accurate than the household density predictions, household density is used as the primary predictor of commute mode choice.

Elasticities for other environmental attributes are presented below, but their effects on the projections are not calculated.

Projections

- Baseline value: 52.69
- BAU, partial and full: see [spreadsheet](#).

Appendix Table 1: Elasticities for commute mode shares			
Dimension	Variable	Reported Elasticities	
		Walk/bike mode choice for work trips	Transit mode choice for work trips
Density	Population density	0.11 (Boston specific)	0.12
	Job density	0.03 (Boston specific)	0.09
Diversity	Land use mix (entropy)	n/s	n/s
Design	Street connectivity	n/s	n/s
	Percent 4-way	-0.06 (national)	0.29 (national)
Destination accessibility	Jobs within 1 mile	0.15 (national)	n/a
Distance to transit	Distance to nearest transit stop	0.15 (national)	0.29 (national)
Parking		n/a	n/a

3. Job density

Job density refers to the WalkUP's average number of jobs per acre.

Data sources

Data sources for baseline indicator construction:

- 2014 Longitudinal Employer-Household Dynamics (LODES) data for all census blocks in the study area (all but 3 census blocks fit entirely within the study area) says 2022 jobs; 165.74 acres.

Relevant assumptions

Relevant assumptions needed for projected indicators reconstruction:

Job growth

The academic literature is surprisingly sparse with respect to projecting employment growth under different planning/development scenarios. Thus, all of the projections on job density are based on predicted buildout and occupancy levels described below (under land use change), and estimates on jobs/sq ft provided in the [Union Square Neighborhood Plan](#).

Land use change

According to Nelson-Nygaard's projections, at 100 percent buildout, the D-parcels will produce 131,550 square feet of retail space, 624,900 square feet of office space, plus an untold number of service jobs supporting 533 new apartments and 175 new hotel rooms. The projections assume different levels of buildout and occupancy. These can be modified as appropriate in the [spreadsheet](#).

The [Union Square Neighborhood Plan](#) assumes the following with respect to jobs/square feet:

- Retail: 131,500 square feet at 1 job/500 square feet of retail or restaurant space. At 100 percent: $131,550/500 = 263$ retail jobs.
- Office: 624,900 square feet at 1 office job/200 square feet of office space; 1 lab job per 440 square feet of lab space; let's assume 50/50 split between office space and lab space. At 100 percent: $312,450/200 = 1562$ office jobs; $312,450/440 = 710$ lab jobs.
- Apartments: 533. Industry standard is 1 staff per 100 units minimum; we assume slightly more generous staffing of 1/80 units. At 100 percent: $533 \text{ new apartments}/80 = 7$ apartment service jobs.
- Hotel rooms: 175. Assume 0.5 employees/room, as per the [South Florida Regional Planning Council](#). At 100 percent: $175 \text{ hotel rooms}/2 = 88$ hotel staff jobs.
- Fabrication/manufacturing: The [Union Square Neighborhood Plan](#) calls for the creation of a new fabrication district at 200,620 square feet and 350 square feet per job.

BAU

- Minimal redevelopment of D-parcels (up to 10 percent) and negligible development of scattered sites, at 75 percent occupancy for non-residential land uses.

Partial

- Moderate redevelopment of D-parcels (~30 percent of full D-parcel redevelopment) and negligible redevelopment of scattered sites, at 75 percent occupancy for non-residential land uses.

Full

- Aggressive redevelopment of D-parcels (~50 percent of full D-parcel redevelopment) and minimal redevelopment of select scattered ‘underutilized’ parcels, at 75 percent occupancy for non-residential land uses.
- The town provides relocation assistance for existing (displaced) businesses currently located on D-parcels (the number of affected businesses can be adjusted in the [spreadsheet](#)). However, for the purposes of this calculation we assume these numbers are negligible and use a default value of zero.

Actions to recalculate indicators

Actions needed to recalculate indicators using projected data:

An extrapolation laid out in the [spreadsheet](#).

Projections

- Baseline value: 12.2
- Projections: see [spreadsheet](#).

4. Location affordability

Location affordability refers to housing and transportation cost as a percentage of area median income.

This indicator originally came from [HUD's Location Affordability Index](#). Unfortunately, the Location Affordability Index is constructed using structural equation models, which is beyond this project's scope. In the absence of a suitable workaround, we are not able to provide projections on location affordability. The baseline value of this indicator for Union Square is 39.45, based on an area-weighted sum of Census block group location affordability scores.

5. Housing cost burden

Housing cost burden refers to the proportion of households under 100 percent Area Median Income that are housing cost burdened (30 percent of income spent on housing).

Data sources

Data source for baseline indicator construction:

- This indicator was originally calculated using [HUD's Comprehensive Housing Affordability Strategy \(CHAS\) dataset](#), Table 8 of the tract-level dataset.

Relevant assumptions

Relevant assumptions needed for projected indicators reconstruction:

Sociodemographic shifts

BAU

- Necessarily it is assumed that there is no change in sociodemographics other than population growth (dependent on housing supply). The researchers were asked to hold income constant (adjusting for inflation). However, what matters for this indicator is not mean income, but the distribution of income, which isn't known. Data is known for the number of households in each census tract that make less than 100 percent of the area median household income and spend more than 30 percent of their income on housing, but for those households, their actual income (just that if falls below a certain threshold) is unknown. So unfortunately income cannot be held constant relative to the price

of housing. Instead, it is assumed that income keeps pace with the cost of housing. Unfortunately, this is known to be untrue, so it is best to consider the projections for this indicator to be a best case scenario in terms of social equity. In reality, the proportion of households that are cost-burdened in Union Square in 2026 is likely to be higher than the estimates provided in this analysis.

Housing costs

BAU

- Increase inclusionary zoning to 20 percent for new development within 1/4 mile. Expand scope of inclusionary zoning to produce units priced for moderate and middle income households.
- Determine how this policy is operationalized (how is moderate and middle income defined? Does it effectively raise or lower the cost of housing?) Without knowing precisely how this policy is meant to work, these calculations are based on the assumption that affordable housing regulations are 100 percent efficient with respect to cost burden, in that (a) if a previously cost-burdened household moves into a designated affordable unit, the household is no longer cost-burdened and (b) affordable units are only available to previously cost-burdened households.
- Allow payment-in-lieu instead of constructing affordable units (note this is likely to reduce supply of affordable housing in Union Square, especially in the short term).

Partial and full

- Same as BAU, plus:
- Set price requirements for new affordable units under inclusionary zoning to better match existing Somerville residents' needs.

Gentrification

This indicator requires making additional assumptions about displacement and/or influx of households due to gentrification. See below for some general, yet essential assumptions.

BAU and partial

- No cost-burdened households get displaced out of the neighborhood. The displacement of cost-burdened households out of the Union Square study area would artificially depress the value of the cost-burden indicator, making it appear (with respect to this indicator) that housing in Union Square is becoming more affordable over time, while it has likely become less so instead. Thus, the projections assumes that Union Square households that are cost-burdened in 2016 will not relocate to cheaper neighborhoods by 2026 (i.e., there will be no net departures of cost-burdened households over the next 10 years). This assumption, while likely not realistic, is still important in that displacement through gentrification is a product of social inequity, and therefore should be captured in the social equity indicators.
- No new households will opt into a cost-burdened situation. Any increases in the cost-burden indicator come from households previously in Union Square that have newly become cost-burdened, not from in-migration of cost-burdened households from elsewhere.

Full

- Same as BAU and partial, plus the following:
 - The town establishes an anti-displacement program for qualifying renter

households with children.

- The town enacts a property tax freeze mechanism for cost-burdened owner-occupied households.

Note that the implications of this policy (and in assuming its adoption) are very confusing:

Assume, on one hand, that the property tax freeze allows X percent of cost-burdened home-owning households to remain in place (100-X percent will leave for cheaper housing elsewhere, since they were already cost-burdened before the tax freeze). It would be ideal to know which owner-occupied households have no mortgages or are nearly done paying a mortgage off, because then it would be much easier to identify the households most likely to stay put under a property tax freeze. In the absence of this information we have to guess at the value of X.

On the other hand, the property tax freeze will allow some number Y homeowners to remain in their homes long enough to pay off their mortgages (thus allowing them to alleviate a large portion of their cost burden, and therefore “graduate” from cost-burdened status). It will also allow some number Z households to stay in the neighborhood and earn higher wages (assuming there are higher wages to be earned, again allowing them to graduate from cost-burdened status).

So, in sum, some cost-burdened households will depart the neighborhood despite the property tax freeze. Some will stay put because of the tax freeze, but will remain cost-burdened. And the freeze will allow still other households to escape cost-burden. The households that leave in spite of the freeze represent a false reduction in apparent cost-burden—we don’t get to take credit for their contribution to any reductions in cost-burdened households. We only get to count that latter two types of households—those that stay put and stay cost-burdened, and those that stay put and become not cost-burdened.

Actions to recalculate indicators

Actions needed to recalculate indicators using projected data:

Extrapolation using projected data is shown in the [spreadsheet](#).

Projections

- Baseline value: 16.8
- Projections: see [spreadsheet](#).

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