CITY OF CAMBRIDGE
Community Development Department

BRIAN P. MURPHY
Assistant City Manager for Community Development

MEMORANDUM

To: Richard Rossi, City Manager
From: Brian Murphy, Assistant City Manager for Community Development
Date: January 21, 2015
Re: Incentive Zoning Nexus Study

Attached please find the Incentive Zoning Nexus Study completed by a consultant team led by Karl F. Seidman. The study analyzes the impact of projected non-residential development on the need for new low, moderate, and middle income affordable housing in the coming years and makes several recommendations for changes in the Incentive Zoning Ordinance. The study recommends a new contribution rate of $10-$12 per square-foot of new development. The study also recommends a significant expansion of the ordinance's coverage by expanding the set of non-residential developments of 30,000 square feet or more which would be required to make housing contributions to address their impact on the need for affordable housing.

Currently the ordinance's provisions apply only to non-residential developments which receive certain special permits. Most non-residential development is not currently subject to the ordinance's provisions. The study recommends adding hotel, industrial, and private institutional uses to the use groups subject to the ordinance, and eliminating entirely the special permit trigger so that the ordinance's contribution provisions would be applicable to non-residential development of more than 30,000 square feet. The housing contribution would no longer be limited to cases where a developer chooses to seek a particular special permit for development beyond what is allowed as of right, but would be a requirement for all projects over 30,000 square feet which include applicable uses.

The recommendation for an increased contribution rate of $10-$12 per square foot is made recognizing the impact that more than doubling the rate could have on Cambridge's regional competitiveness. The recommended rate is greater than Boston's requirement ($8.34 / s.f. for housing plus $1.67 for jobs for a total of $10.01 / s.f.) and the recently updated Somerville requirement ($5.15 / s.f. for housing). While the study determined that the maximum calculated contribution rate was $24.30 per square foot based upon the impacts of new non-residential development, it noted that such a change could have a significant impact on Cambridge's competitiveness. If the housing contribution rate is too high, it could impact development decisions, resulting

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in less commercial development in Cambridge, less new funding for affordable housing, as well as other impacts. The study also acknowledged that other policy goals, such as sustainability requirements and other public benefits the City might obtain through the approval process for new commercial developments, should also be considered as they also impact costs of these developments.

The Incentive Zoning Ordinance was adopted in 1988 and generates funds from developers seeking certain special permits to increase the density of use of their property above what is otherwise permitted as of right who are asked to make a housing contribution in return for the issuance of the special permit. A nexus study documented the impacts of new development on housing needs which assisted in setting the original amount of the housing contribution. The results of the 1988 nexus study were updated in a 2002 study, which recommended an increase in the contribution rate; however, that recommendation was not adopted by the City Council. CDD commissioned this study last year to update the analysis of the impacts of new non-residential development on the need for affordable housing.

As you know, funds generated by the Ordinance are used by the Affordable Housing Trust to fund its affordable housing efforts. We will also submit the completed study to the Affordable Housing Trust for review and discussion at its next meeting, January 29th.

We think the recommended increase in the contribution rate along with making the housing contribution mandatory for an expanded set of large new non-residential developments and uses would be a significant step forward in addressing affordable housing needs. We look forward to discussing the study with the City Council and after that discussion will be prepared to draft a zoning petition to advance the study's recommendations.

KARL F. SEIDMAN
CONSULTING SERVICES

Cambridge Incentive Zoning Ordinance Nexus Study

Final Report

to

City of Cambridge
Community Development Department

Submitted by:

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January 2015

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Executive Summary

The City of Cambridge established an Incentive Zoning Ordinance in 1988 through which non-residential developers seeking special permits to increase the density or intensity of use of their development above what is otherwise permitted make a housing contribution in return for such permits. This report provides an updated nexus study to quantify the impact of future non-residential development on the demand for affordable low, moderate, and middle income housing in Cambridge and the housing contribution rate to mitigate these impacts. It also reviews the current Incentive Zoning Ordinance, several policy options and policies in other communities and recommends changes to the City's current housing contribution rate and the Incentive Zoning Ordinance.

Housing Demand. Based on projected new development of 4,595,000 square feet over the next ten years and the likely mix of tenant businesses, 14,152 new jobs are estimated to be generated in Cambridge by this development. Information on the occupations and earnings of these new employees was combined with data on the distribution of households by size and number of workers as well as survey results from 1,318 Cambridge employees on the share of employees who moved to or sought housing in Cambridge when they obtained a job in Cambridge to estimate the demand for new housing units by income level from projected new development and employment. This analysis projected the need for 693 new housing units to address this demand over the next ten years, including 108 low-income units, 231 moderate income units and 354 middle income units[1].

Development Costs and Needed Subsidy. A separate analysis of the development costs and needed subsidy for rental and homeownership units was conducted based on 246 ownership units and 446 rental units[2]. Development costs were estimated based on costs for recent comparable affordable housing projects built in Cambridge. For rental projects, the needed subsidy was calculated as the difference between total development costs and the amount of debt and equity that could be supported by the housing cash flow using affordable rents at 30% of household income and comparable operating costs. For ownership projects, the needed subsidy was calculated as the difference between total development costs and the affordable purchase price based on home mortgage payments, insurance and property taxes at 30% of household income and a 5% down payment. The results of this analysis are:

- Total development costs of $332.7 million; and
- Total needed subsidy of $202.1 million with $139 million needed for the low and moderate income units and $63.1 million for the middle income units.

[1] A low-income unit is a household with income at 50% or less of the Boston area median income, a moderate income unit is for a household at 80% or less, and a middle income unit is for a household at or below 120%.

[2] This mix is based on all of the low-income units developed as rental units, 70% of moderate income units built as rental and 30% ownership, and middle income units divided 50/50 between rental and ownership housing. Total units were reduced to 692 units to avoid inconsistent results from rounding of fractional results when the 693 units were divided by household size and tenure categories.

The housing contribution rate needed to provide the full $202.1 million in subsidy is $44.54 per square foot on new non-residential development. However, low and moderate income housing development leverages public subsidies from federal and state sources in addition to those provided by Cambridge. Since Cambridge has provided 33.9% of the public subsidy in recent projects, it is appropriate to use this share of the needed subsidy for low and moderate income units (middle income units do not qualify for these subsidies) to calculate the housing contribution rate. Thus, the maximum determined housing contribution rate is $24.30 per square foot, with $10.38 needed to build low and moderate income units and $13.92 needed for the middle income units.

Impact on Competitiveness. An important consideration for Cambridge in establishing the housing contribution rate is the rate's potential impact on attracting new development and tenants. This is particularly important since the maximum determined rate of $24.30 per square foot is over five times the current rate of $4.58, more than twice the combined housing and jobs linkage fee in Boston ($10.01) and over four times Somerville's $5.15 commercial linkage fee. If the maximum determined rate is fully passed on as increased tenant rents, it represents a 4.1% to 6.5% increase depending on the property type and location. It would almost double the current rent differential between West Cambridge and 128/MassPike for office space, bring Cambridge's average office rents closer to Boston's financial district and cement East Cambridge's current status as one of the region's highest priced office locations. For lab space, it would add to Cambridge's existing large premium over the suburbs but have less impact on Cambridge's competitive position versus Boston due to the limited supply and high cost of laboratory space in Boston. While this level of rent increase may not deter major pharmaceutical and IT companies from locating in Cambridge, there is more risk that small and early stage firms would be unwilling to pay increased Cambridge rents and would locate outside of the city. Moreover, Cambridge needs to be concerned about the impact of a fivefold increase in the housing contribution rate when combined with public realm improvements that are often required or negotiated for large projects and other fees and contributions required to further other public purposes.

Recommendations. In recognition of the impact that adoption of the maximum determined contribution rate could have on Cambridge's regional competiveness, we recommend that Cambridge increase the current housing contribution rate by adopting a contribution rate in the range of $10 to $12 per gross square foot. This rate will put Cambridge at a level comparable to Boston and lessen any combined impact with other requirements that Cambridge might make of large new developments which could further increase rents and impact Cambridge's competitiveness.

The following additional changes to the current Incentive Zoning Ordinance and continuations of existing provisions are recommended to improve its consistent application to large new development projects that generate significant demand for housing:

- Expand the definition of a covered zoning project to include seven more use categories;
- Remove the current special permit triggers and change the ordinance from an incentive based ordinance to require a mandatory housing contribution in any non-residential development

project over 30,000 gross square feet that meets the expanded set of uses;

- Continue to apply a uniform housing contribution rate to all uses;
- Continue the current process for contribution rate adjustments based on the CPI: and
- Eliminate the current 2,500 square foot exemption.

Introduction

The City of Cambridge established an Incentive Zoning Ordinance in 1988 through which developers seeking special permits to increase the density or intensity of use of their development above what is otherwise permitted make a housing contribution in return for such permits. A nexus study documented the impacts of new development on housing to help set the amount of contribution. A second nexus study was completed in 2002 although its recommendation for a revised housing contribution rate was not implemented. With considerable new development and new housing market conditions in Cambridge, the city has commissioned a new essential nexus and rough proportionality study to assess the housing impacts from new development, the economic basis for updating its housing contribution rate and to review and make recommendations on other changes to the Incentive Zoning Ordinance. Cambridge has experienced a boom in both private commercial development and institutional growth over the past decade. At the same time, housing development costs, rents and home prices have increased which is affecting housing affordability for low and moderate-income households with incomes below 80% of median and increasingly for middle income households with incomes from 80% to 120% of area median income. Since past nexus studies neither addressed the impact of private commercial development on these middle income households nor considered the impact of institutional development, a new nexus study was also needed to expand the scope of the analysis to address these additional impacts.

This report provides a nexus study to quantify the impact of future non-residential development on the demand for affordable low, moderate, and middle income housing in Cambridge and the supportable housing contribution rate to mitigate these impacts. It also reviews the current Incentive Zoning Ordinance, several policy options and policies in other communities and recommends changes to the City's current housing contribution rate and the Incentive Zoning Ordinance. The methodology for this study differs from the methods used in the prior nexus studies. Prior studies used a "price impact" method that estimated how increased housing demand from new development affected housing rents and the incidence of these rent increases on low and moderate income households in Cambridge. Housing contributions were then based on the size of this estimated rent increase. This study is based on a "direct housing demand" method that estimates the number of new housing units needed to meet increased housing demand among low, moderate and middle income households that results from new development. Housing contribution rates are based on the amount of subsidy needed to develop these new housing units. This approach is more commonly used in nexus studies around the country to determine housing impact and developer contributions. This methodology also reflects the city's use of housing contributions: housing contributions made to the Cambridge Affordable Housing Trust are used to fund new affordable housing development.

The report presents its analysis and recommendations in six sections. The first section presents a likely development scenario for Cambridge over the next decade, based on its development capacity, planned projects and economic and market conditions. The scale and type of future development has a direct relationship to the number and type of new jobs created by non-residential development in Cambridge, which drives new demand for low, moderate, and middle income housing. In the second section, the job composition from the ten-year development

scenario is converted into specific demand for affordable housing units based on the share of employees who will seek housing in Cambridge and the likely distribution of household income among these employees. Next, data on housing market conditions and development costs are applied to determine the housing contribution level needed to fund the additional affordable and middle income housing required to address the demand generated by new development projects. The fourth section reviews similar housing contribution policies in other communities to inform Cambridge's policies. A fifth section considers several policy options for changes to the Incentive Zoning Ordinance and assesses the impact of the maximum determined housing contribution rate on the city's competitive position in attracting new development and businesses. The final section presents recommendations for changes to the Cambridge's housing contribution rate and other incentive zoning policies.

Cambridge Development Potential and Future Development

Cambridge experienced considerable new development over the past decade, heavily fueled by institutional growth and expanded biotech and pharmaceutical industry investment. Additional non-residential development occurred as ground floor retail space in mixed-use projects, hotels and office space built, in part, to address growing demand among internet, software and other IT-related business. Table 1 summarizes non-residential development by use in Cambridge from 2005 through mid-2014 along with projects currently under construction and those permitted for future development.

Table 1. Gross Floor Area for Cambridge Non-Residential Development Completed from 2005 to 2014, In Construction and Permitted

Development Type	Completed 2005 to mid-2014	Percent of Completed	In Construction	Permitted	Percent of In Construction and Permitted
Retail	112,892	2.3%	44,360	104,555	2.6%
Office/R&D	2,284,075	46.5%	1,499,872	3,743,542	90.9%
Institutional	2,446,968	49.8%	220,034	0	3.8%
Hotel	57,759	1.2%	74,168	82,000	2.7%
Industrial	11,800	.2%	0	0	0%
Total	4,913,494	100.0%	1,838,434	3,930,097	100.0%

Source: City of Cambridge Community Development Department October 2014

In the past decade, over 96% of the city's new development was in two categories, institutional and office/R&D space, and almost evenly divided between the two uses at 2.28 million and 2.45 million square feet, respectively. With the exception of one industrial project, retail and hotel space accounted for the balance of new development. Based on data that separately tracks office and laboratory space from the real estate firm Jones Lang Salle (JLL) (see Table 2), the bulk of new office/R&D development was laboratory space. Based on JLL data, the supply of Cambridge office and laboratory space increased by 3 million square feet from 2005 to mid 2014 with almost 2.6 million square, or 83%, comprising lab space[3].

Cambridge is well positioned to attract continued robust new development over the next decade and has the necessary land and permitting to support this development. New development in the next decade, however, is likely to be concentrated in private office/R&D development with far less institutional development than in the prior decade. As Table 1 shows, for the 3.9 million square feet of new space that is permitted for development, 91% is private office and research and development space with only 4% institutional space. There is also modest growth in retail and hotel space as a share of new development among permitted projects. Beyond this permitted development, other projects are likely to be proposed and permitted in coming years.

[3] The JLL total is over 700,000 square feet higher than Cambridge's records. This discrepancy may be due to differences in when space is deemed completed (JLL reports 280,000 square feet of new office and lab space in 2014 but Cambridge has none) and repurposing of space for lab use that did not involve new development.

Table 2. Cambridge Non-Owner Occupied Office and Lab Space, 2005 to 2014

Year	Office Space Supply (Square Feet)	Laboratory Space (Supply)	Total
2005	9,916,122	6,236,276	16,152,398
2006	9,916,122	6,655,276	16,571,398
2007	9,844,122	7,249,572	17,093,694
2008	9,970,271	7,249,572	17,219,843
2009	9,970,271	7,588,010	17,558,281
2010	9,970,271	7,420,837	17,391,108
2011	10,158,045	7,176,364	17,334,409
2012	10,084,677	7,691,806	17,776,483
2013	10,282,397	8,591,248	18,873,645
2014 YTD	10,321,411	8,832,234	19,153,645
10 Year Change	405,289	2,595,958	3,001,247

Source: Jones Lange LaSalle

Cambridge has sufficient land and zoning to support several million square feet of further development. For example, development rights for 1.78 million square feet of new space exist for MIT under PUD-5, including 980,000 square of commercial space and 800,000 square feet of institutional/academic space[4]. Opportunities also exist at several large underutilized sites, such as the Volpe Center site in Kendall Square. Analysis of the potential non-residential development that is allowable under existing zoning by commercial district identified five districts where at least 1 million square feet of new development can be permitted. Collectively, zoning in these five areas provides for up to 13 million square feet of new development. Consequently, over the next decade Cambridge does not face site or regulatory constraints to adding non-residential development at an annual rate of 400,000 to 500,000 square feet, comparable to the average for the prior decade.

Market Demand and Expected Absorption

New employment and the resulting demand for housing will depend on the actual absorption of new real estate space by new and expanding employers and the city's success in attracting business growth within the region. Within the Boston metropolitan area, Cambridge is a highly desirable business location with strong market demand and premium rents, especially in Kendall Square and the surrounding East Cambridge area. Its proximity to MIT, Harvard University and area research hospitals and institutes has made it one of the top locations for research and development facilities for major pharmaceuticals companies and biotechnology firms, as evidenced by the presence of many leading firms including Amgen, Biogen/Idec, Genzyme, Novartis, Pfizer and others. Jones Lang LaSalle in their 2013/2014 Greater Boston Life Sciences Outlook report that in East Cambridge, "Class A space is in high demand and tenants are paying premium rents—up to $60 NNN for new lab space". West Cambridge also is cited in this report as a second emerging center for life sciences lab space with asking rents lower than East Cambridge but still averaging $44 per square foot. Cambridge's strong market position is

[4] MIT East Campus Design Study

demonstrated by recent trends among several biopharmaceutical companies to consolidate their research and development operations within Massachusetts, and especially Cambridge[5].

Furthermore, Cambridge is a valued office location for high technology and professional service firms. In recent years, Kendall Square has become a desirable location for large computer software and information technology firms, with Microsoft and Google having a significant presence. This is in addition to the city's historic role as an incubator of new IT and other technology enterprises. The recent K2/C2 plan reported that this trend has resulted in office space demand now exceeding that for lab space in the Kendall Square and East Cambridge market.

Table 3. Real Estate Absorption, Supply and Rents in Cambridge 2005 to 2014

Market Indicator	Cambridge
Average Annual Net Absorption, Office Space*	155,531
Average Annual Net Absorption, Lab Space*	221,480
Available Office Space 2014, 2nd Quarter	1,012,353
Available Lab Space 2014, 2nd Quarter	1,559,317
Average Asking Rent, Office Space, 2014, 2nd Quarter	$48.34
Average Asking Rent, Lab Space, 2014, 2nd Quarter	$51.28

Source: Jones Lang LaSalle Real Estate Market Data * 2005 to 2013

With strong market demand for lab and office space, substantial permitted space and the capacity to support further development, market absorption of space in the recent past provides a reasonable basis for projecting new development and employment growth over the next decade for the non-institutional portion of the Cambridge economy. Table 3 summarizes average absorption and other market indicators for office and laboratory space in Cambridge. Based on data from Jones Lang LaSalle, average net absorption of new commercial space in Cambridge in the past decade averaged 377,000 square feet, as follows:

- Net absorption of office space averaged 155,531 square feet from 2005 through 2013, with East Cambridge accounting for 85% of the absorption on average;
- For lab space, net absorption averaged 221,480 from 2005 through 2013 with 91% occurring in East Cambridge.
- For 2013 and the first half of 2014, absorption was quite high at over 1.9 million square feet, 70% of which was lab space and 30% office space.
- A large supply of 2.57 million square feet of available space existed in mid-2014 with 1 million square feet office and the balance lab space. However, the ratio of available space to total supply was below average for the past decade: available office space was 9.8% versus an average of 13.3%; lab space at 17.7% was just shy of the 10 year average of 17.9%.

[5] Robert Weisman, "Biopharmaceutical companies shifting labs, jobs to Mass., "*Boston Globe*, August 25, 2014

With the sizable inventory of available office and lab space, there is some risk that future development may slow until the market absorbs more of this space. However, this risk is mitigated by strong demand for new space among existing Cambridge firms (much of the 1.8 million in space under construction is pre-leased to expanding firms already in Cambridge) and the high pace at which space is being absorbed. Moreover, strong demand among large users has allowed the Cambridge market to operate with availability rates of over 15% and still attract new development.

Interviews with developers and real estate professionals confirmed the strong market demand for office and lab space in Cambridge. They report that proximity to universities and research institutes and the supply of a very talented and innovative workforce, many of whom want to live near where they work, both attracts firms to Cambridge and sustains their growth in the city. Developers noted many companies expand their space and activities once they are established in Cambridge because Cambridge proves its productivity and is attractive to employees. Interviewees reported that the market is driven by technology-based firms, which is currently centered on life sciences and information technology firms but could expand to encompass new and future technology investment sectors, such as energy. Despite the recent boom in life sciences and IT expansion in Cambridge, the development community expects this market demand to remain strong for the foreseeable future with Cambridge continuing to attract new firms and see growth among existing firms.

Some factors could slow future development below that experienced by Cambridge over the past decade. Cambridge does compete with other locations. The emerging innovation district in Boston, Assembly Square in Somerville and the suburbs adjacent to the city and along I-95 are all locations with the potential to attract development away from Cambridge, especially if continued increasing rents in Cambridge create pressures for firms to move to less costly locations. To date none of these locations have emerged as major competitors and the availability of lower cost space options in west Cambridge mitigates this risk. Moreover, Cambridge may still be able to attract and retain research and innovation intensive uses even if firms move some functions to lower cost locations. A second risk is that a recession and/or a highly overbuilt market can lead to a sustained decline or stalled growth in the development market. Real estate does occur in cycles and Cambridge has experienced both boom periods and years of slow growth. The potential for and impact of a sustained downturn is reflected in the figures used to project future development with include the steep recent recession, during which Cambridge had little new private office and lab development.

Some changes may occur in the mix of space in future commercial development. In the past decade demand has been particularly strong among biotech and pharmaceutical firms who need a mix of lab space and office space. More recently, demand has increased among IT firms who largely use office space. The growing demand for high tech office uses along with biotech/pharma office needs may shift the balance of new development over the next decade toward a greater proportion of office use. It is also likely that the share of retail and restaurant uses in new development will increase with city plans and policy that emphasizes active ground floor uses in new projects and developer interest in providing amenities to their tenants. A growing number of daytime workers and more residential development in the core office centers

will provide the market support for more retail and restaurant space. With the strong demand for restaurant, cafes and food businesses as amenities and the large retail presence in the Galleria mall, this new ground floor space is likely to be weighted toward restaurant, cafes, and food-related businesses.

Future Institutional Development Plans

Although Cambridge experienced almost 2.5 million square feet of new institutional development over the past decade driven by university expansion, the pace of institutional expansion over the next decade probably will be much less. A review of planned projects in the most recent Town/Gown report that local colleges and universities filed with the city revealed limited new construction plans in Cambridge with only two future projects detailed. A synopsis of development plans among Cambridge's four higher educational institutions from these reports include:

- Cambridge College did not report any new development plans;
- Harvard is planning a new 77,000 square foot academic building in Cambridge as part of the Kennedy School of Government campus with a potential construction start in 2015:
- Lesley University reported one new campus project, the Lunder Arts Center, which is currently in construction and will house the relocation of its College of Art and Design from Boston to Cambridge:
- MIT's plans are focused on renovation and improvement to its existing buildings, although it expects to undertake new private commercial lab/office/retail development over next ten years. The one major new institutional project is the new Nanomaterials (nMass) building that will demolish the current building 12 and replace it with a new 151,000 square building, half of which is new space[6].

Based on these university plans, far less institutional development will occur over the next ten years than in recent years. It is likely to be in the range of several hundred thousand square feet including the new Kennedy School building, MIT's nMass project and additional hospital and university projects that may emerge toward the end of the decade.

Based on its strong market position and the rate of absorption and new development over the past ten years, **Cambridge is projected to absorb and spur new development of 3.8 million square feet in office and laboratory space.** Retail and restaurant space is projected to add 375,000 square feet of new space. This includes one-half of the planned 300,000 square feet in the North Point development, 5% of the balance of new office and laboratory space and 2% of new residential development[7]. Retail space is expected to be largely absent from institutional space. Finally, Cambridge is expected to attract 2 additional hotel developments, supported by

[6] A May 2014 report also recommended that MIT build new on-campus housing for 500 to 600 graduate students along with another 400 beds to address flexible housing needs.

[7] New residential development is estimated at 6 million square feet over the next decade, consistent with recent trends. A lower percentage of retail space is used for residential projects since some of these projects have little or no retail space.

the increased business, education and research activity, and its continued role as a regional visitor destination. This is comparable to level of hotel development over the past decade.

The components of projected new development in Cambridge over the next decade include:

- 3.8 million square feet of office and research and development laboratory space;
- 300,000 square feet of new institutional development;
- 375,000 square feet of retail and restaurant space
- 120,000 square feet for two new hotel developments.

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Table 4. Summary of Expected Development, 10 Year Period

Type of Use	Projected Square Feet of Development
Office and R&D Lab Space	3,800,000
Institutional Space	300,000
Retail and Restaurant	375,000
Hotel	120,000
Total	4,595,000

Expected Tenant Businesses

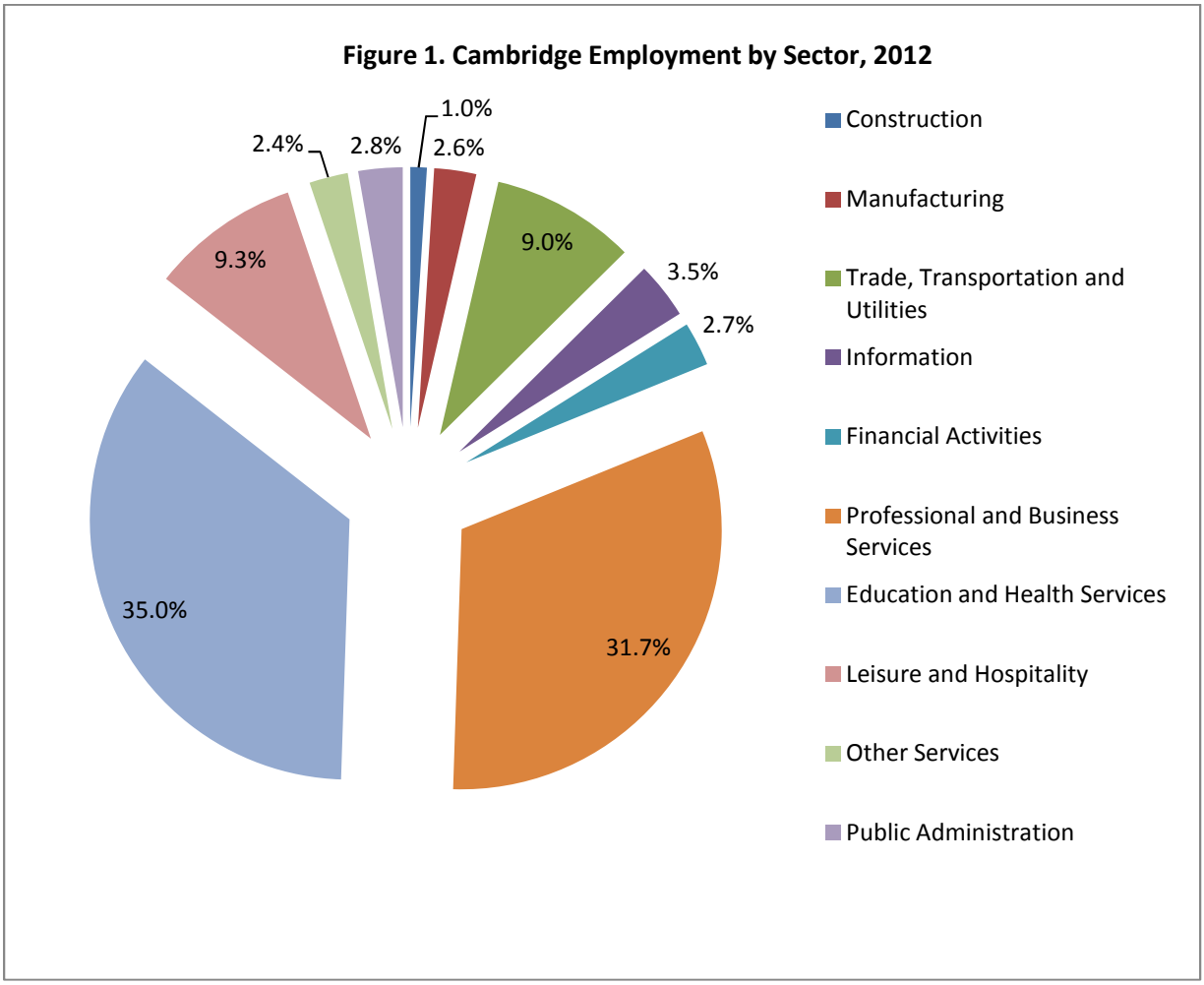
To determine the likely jobs and earnings from this new development, the industries likely to occupy the new space need to be projected. Given Cambridge's unique position as a research, life sciences and high technology center, new tenants are likely to reflect growth trends within Cambridge itself, rather than the diversified industry mix within the Boston region or the adjacent Metro North and Boston real estate markets.

Since housing contributions under the Incentive Zoning Ordinance are tied to **new development,** this analysis focus on the scale and type of new business and employment growth, which will differ from Cambridge's overall or net job growth. Cambridge has experienced decline in some parts of the economy, especially construction, manufacturing and information which offsets growth in other sectors to yield overall net employment change. Since the growing sectors largely require different facilities, have different workforce needs and provides the basis for new development, it is Cambridge's growth industries and resulting employment that will generate new housing demand and constitute the nexus for the housing contributions to address this demand.

Existing Employment Base

As shown in Figure 1, Cambridge employment in 2012 (the last full year for which city employment data is available) was concentrated in Health and Education Services and Professional and Business Services, which combined to provide two-thirds of the city's 108,330 jobs. The two next largest sectors, each with 9% of city employment, were Leisure and Hospitality (with hotels, restaurants and drinking establishments accounting for 90% of these jobs) and Trade, Transportation and Utilities (retailers are the biggest segment at 62% of jobs).

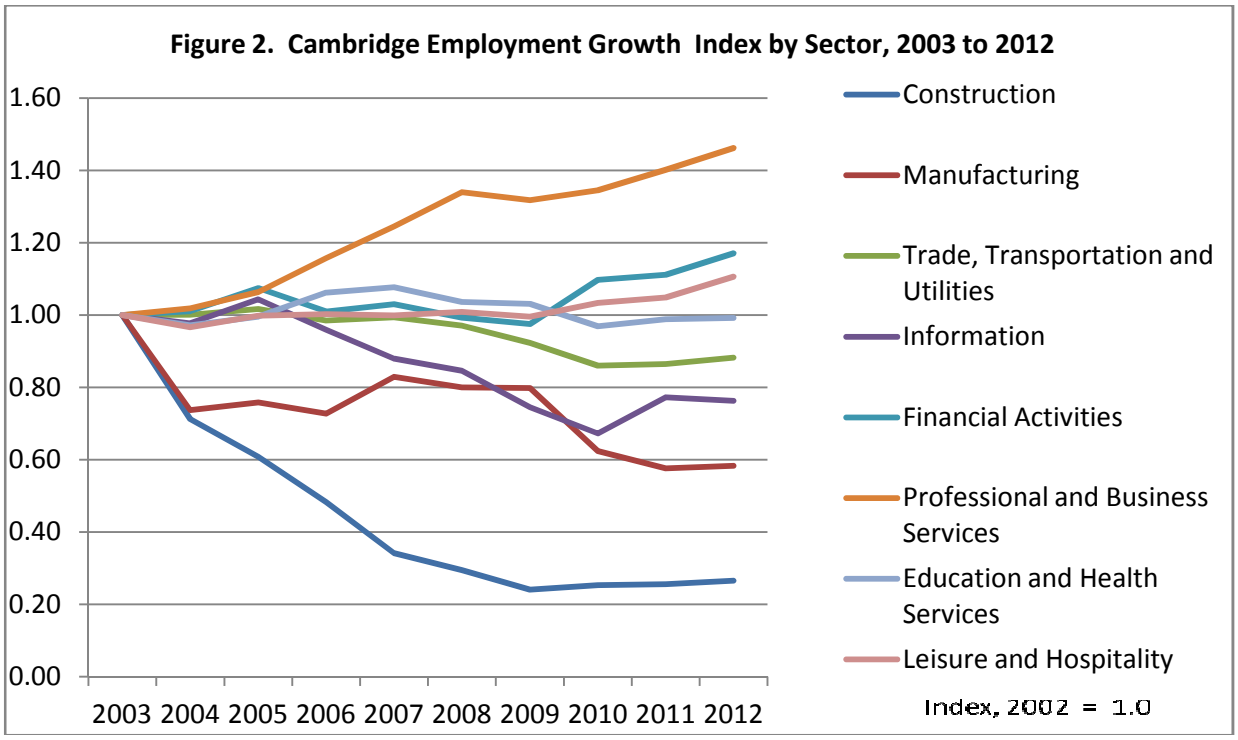
Not surprisingly, Colleges and Universities constituted the bulk of employment within Education and Health Services, with 27,275 jobs in 2012, or 63% of the entire sector. For Business and Professional Services, the largest sub-sector was Scientific Research and Development (which includes biotech and life sciences research) which employed 17,402 people in 2012, just over half of the sector's 34,296 jobs. Computer Systems Design and Related Services was the next largest component, with employment of 5,816.



Source: Massachusetts Department of Labor and Workforce Development ES-202 Data Series

Growth Industries

Cambridge's recent employment growth is a better indicator of the likely industry composition of new development than its overall employment base. An employment index that tracks growth by major sector from 2003 to 2012 is presented in Figure 2. Job growth occurred in three sectors: Professional and Business Services, Financial Activities and Leisure and Hospitality. Education and Health Services had fairly stable employment over this period, while jobs declined for the other four sectors, with the steepest decline for Construction.



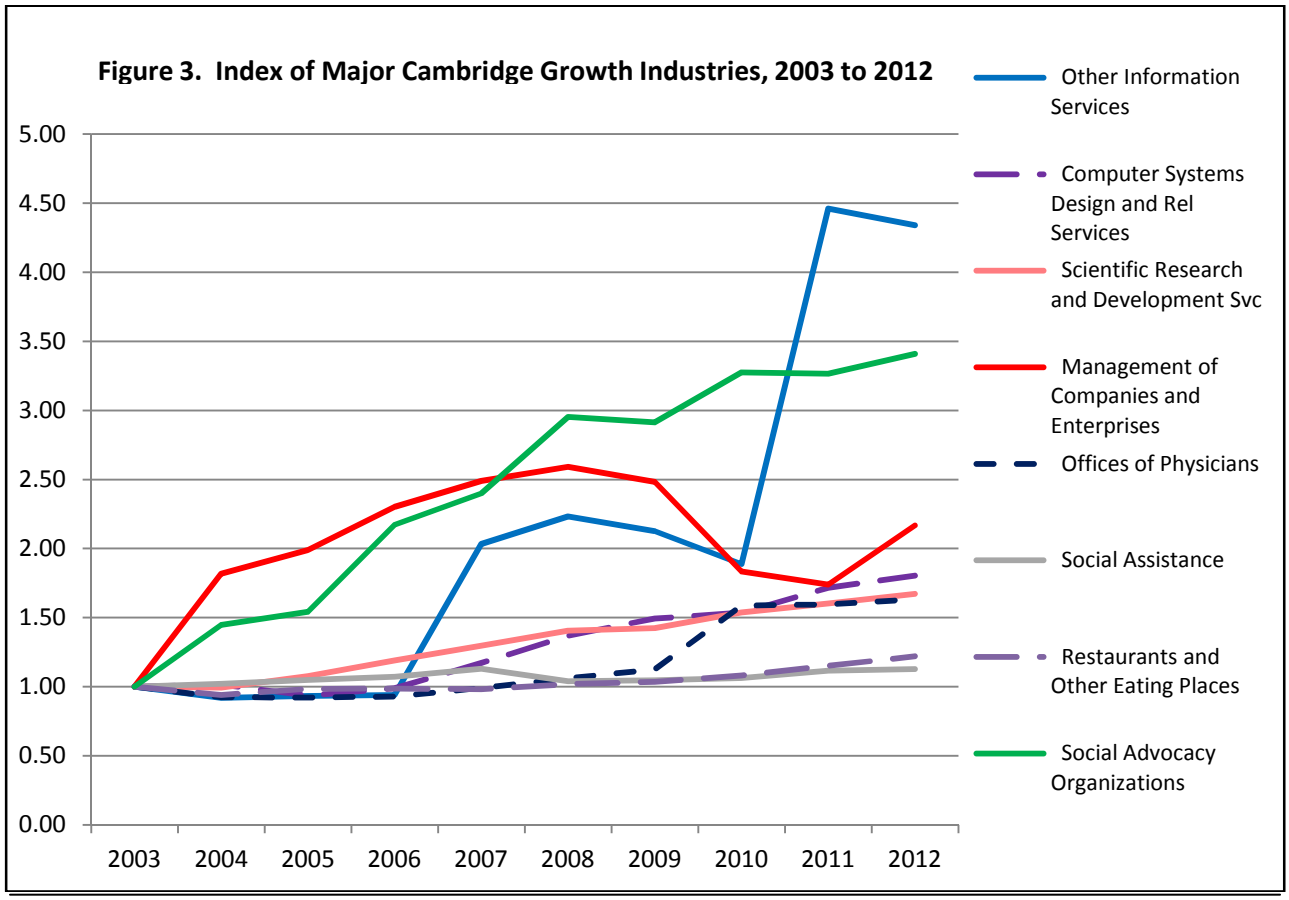
However, sector level data combines patterns across many component industries, which may have different trends. More detailed industry level data was examined to identify the industries with the largest job gains from 2003 to 2012. Table 5 presents absolute job growth from 2003 to 2012 for expanding Cambridge industries that added at least 250 jobs during this period. Eight industries meet this criterion and combined to add 13,652 jobs. Research and Development Services accounted for 51.2% of these new jobs, followed by Computer Systems Design and Related Services at 19%. These data confirm recent development patterns and what real estate developers reported: Cambridge's growth is driven by expanding research and development and IT-related businesses. Corporate Headquarters added 952 jobs and many of these are likely within the biotech and pharmaceutical industries. Physician's Offices and Restaurants also demonstrated considerable growth, adding 825 and 1,175 jobs, respectively.

Table 5. Job Growth from 2005 to 2012 for Cambridge Industries

Industry	Job Growth	Percent of Total
Other Information Services	501	3.7%
Computer Systems Design and Related Services	2,591	19.0%
Scientific Research and Development Services	6,991	51.2%
Management of Companies and Enterprises	952	7.0%
Offices of Physicians	825	6.0%
Restaurants	1,175	8.6%
Social Assistance	364	2.7%
Social Advocacy Organizations	253	1.9%
Total , 8 Industries	13,652	100%

Source: Massachusetts Department of Labor and Workforce Development ES-202 Data Series

Figure 3 shows percentage, rather than absolute growth, among Cambridge's eight growth industries using an employment index. Scientific Research and Development shows the steadiest most consistent growth while Other Information Services and Corporate Headquarters were more erratic, experiencing years of both sharp increases and declines over the ten-year period. Social Advocacy Organizations had the highest consistent growth rate with employment increasing more than threefold over the period. However, this result partly reflects the industry's low initial employment of 105 jobs in 2003.



A second factor in projecting future tenancy is developers' plans for proposed projects. The two major new permitted developments are Alexandria Real Estate's (ARE) 50 and 100 Binney Street project and North Point. ARE, which has many biotech, pharmaceutical and biomedical firms in its existing East Cambridge properties, plans to lease its latest project for biotech related lab and office space. HYM is looking to attract the type of tenants located in Kendall Square, including biotechnology, information technology and other technology-intensive firms to lab and office space at the North Point development. These plans are consistent with Cambridge market strengths and recent industry and employment growth trends. Additional development, on a smaller scale, is permitted for Discovery Park in west Cambridge. These new buildings, typical of this part of the Cambridge office market, are likely to have a more diverse mix of tenants that may include other information services, financial services, consulting firms and the growing social advocacy organizations.

Based on Cambridge's market position, growth trends and developer plans, the distribution of tenants for the 3.8 million square feet of new office and lab development over the next decade is expected to be:

- Scientific Research and Development (including biotechnology) 40%
- Computer Systems Design and Related Services 30%
- Other Information Services 10%
- Financial Services 2.5%
- Management of Companies and Enterprises 5%
- Management and Technical Consulting 5%
- Doctor's Offices and Ambulatory Health Services 5%
- Membership Organizations and Associations (including Social Advocacy) 2.5%

The first three industries are large and growing industries that are driving much of the demand for new space and willing to pay the higher rents associated with new development. Consequently, they are projected to account for 80% of new office and research and development space. The balance is divided among 5 industries, each of which has been growing modestly in Cambridge over the past decade.

Retail Tenants

The projections for new ground floor retail space are based on planned projects, employment trends and recent leasing activity in east Cambridge. A large share, or 65%, of new ground floor retail space is expected to be occupied by restaurants, consistent with the current leasing activity in Cambridge. North Point has plans for a new supermarket that will occupy 50,000 square feet. The remaining 85,000 square feet, is projected to be occupied by a mix of retail stores and services including two pharmacies (20,000 square feet), small grocery stores (10,000 square feet), specialty food, liquor and convenience stores (10,000), a day care center (10,000), miscellaneous retailers such as florists, gift or office supply stores (10,000), personal care services such as dry cleaners and hair salons (10,000), and bank branches (15,000).

Table 6 summarizes the overall projected development by use, tenant type and employment over the next ten years. These projections will be used to estimate occupations and wage levels for new employees working in the expected new buildings. Employment projections assume one new employee per 300 square feet of new office space and 350 square feet per employee for research and development space[8], based on current employment densities among Cambridge employers. Assumptions for the retail and service tenants are: one employee per 300 square feet for the pharmacy and grocery store; one employee per 500 square feet for the day care center; one employee per 400 square feet in other retail space; one employee per 250 square feet for the bank branches; and one employee per 225 square feet for restaurants[9]. Hotel employment is projected at one employee per 1,000 which assumes a mid-price full service hotel and is

[8] These figures reflect existing ratios among several large employers and input from Cambridge property owners.
[9] Derived from National Restaurant Association's 2013/2014 Restaurant Operations Report

consistent with existing patterns in Cambridge[10]. One employee per 500 square feet is used for institutional space, reflecting the presence of classroom and other community and shared spaces[11].

Table 6. Projected New Cambridge Development by Use and Tenant Type, 2015 to 2024

Use/Tenant Type	Projected Square Feet	Estimated New Employment
Office: scientific R&D	1,520,000	4,343
Office: doctors' offices and health services	190,000	633
Office: other information services	380,000	1,267
Office: computer systems design	1,140,000	3,800
Office: management & tech services	190,000	633
Office: financial services	95,000	317
Office: management of companies and enterprises	190,000	633
Office: membership organizations and associations	95,000	317
Institutional: colleges and universities	300,000	600
Supermarket/grocery stores	60,000	200
Retail: pharmacy	20,000	67
Retail: specialty food, liquor and convenience	10,000	25
Day Care Center	10,000	20
Retail: miscellaneous	10,000	25
Retail: personal care	10,000	25
Bank branches	15,000	60
Restaurants	240,000	1,067
Hotel	120,000	120
Total	4,595,000	14,152

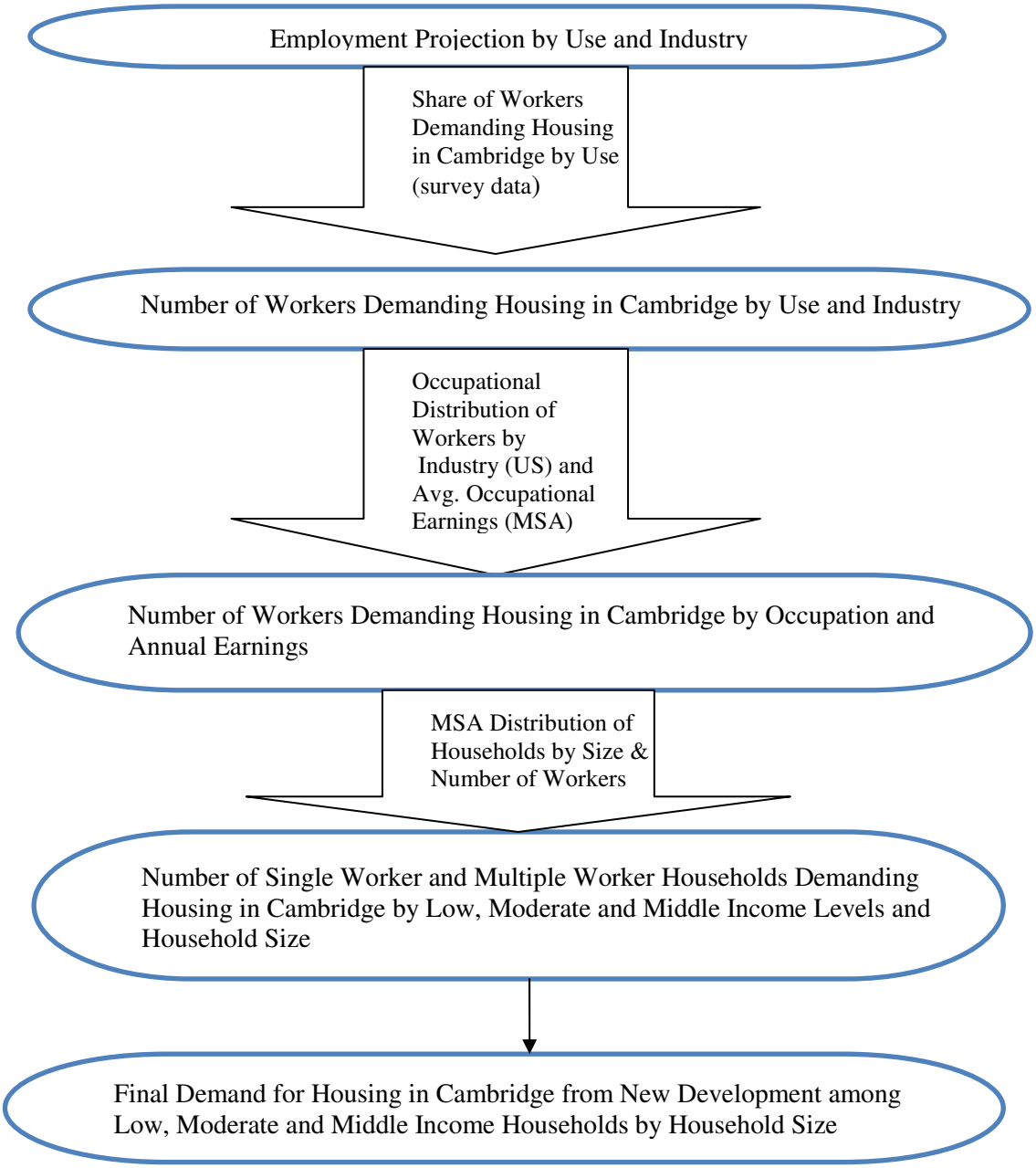
[10] Cambridge has almost 2.1 million square feet of hotel space and 2012 industry employment of 1,900.

[11] This ratio is consistent with MIT's employee density with approximately 13,000 employees in Cambridge and 6.8 million square feet of institutional and academic space.

Impact of Large Scale Development on Affordable Housing Demand

Using the 10-year development scenario and employment projections summarized in Table 6, this section forecasts the demand for affordable housing in Cambridge that will result from this development. Since this analysis utilizes several data sources and assumptions to prepare the forecast, a full explanation of the methodology used is provided along with the results. Figure 4 provides an overview of the analytical steps and data sources for the housing demand projections.

Figure 4. Methodology and Data Sources for Housing Demand Analysis



Since demand for affordable housing is tied to household income, the first step projects the distribution of new jobs by earnings. Using 2012 national data for each industry's occupational distribution, the number of new jobs in 22 occupational categories was calculated for each industry. Earnings were then estimated for these occupations for each of the 19 industries expected to occupy new development. These earnings were based on the average annual earnings for the respective occupation in May 2013 for the Boston metropolitan area. These calculations yielded the projected number of jobs at different annual earning levels by industry.

Since new employees will live in a variety of communities, it is necessary to determine the share that will demand housing in Cambridge. To estimate the percent of new employees who will demand housing within the city, employees in large office, laboratory institutional, hotel and retail buildings were surveyed in September and October 2014. This survey measured demand by asking employees whether, as a result of obtaining a job in Cambridge, they either moved to the city or sought housing in Cambridge but did not move due to housing costs. Based on the survey results[12], the percentage of new employees who are expected to demand housing in Cambridge is 11.3% for employees in research and development firms, 13.3% for office workers, 26.5% for employees at educational institutions and 12.3% for retail, restaurant and hotel employees. These percentages were multiplied by the gross number of new jobs in each industry to estimate the number of new workers who will demand housing in Cambridge. The occupational distributional for each industry was then applied to the number of workers for that industry who were expected to seek Cambridge housing to estimate their earnings distribution. To provide a picture of the resulting earning distribution, Table 7 summarizes this data by

Table 7. Distribution of Annual Earnings for Expected Jobs among New Employees Demanding Housing in Cambridge from New Development by Use and Earnings Level

Tenant Use/Industry	Gross New Jobs	Number Demanding Cambridge Housing	No. with Earnings below 50% AMI*	No. with Earnings below 50 to 80% AMI*	No. with Earning 80 to 120% AMI*	Total with Earnings at Below 120% AMI*	No. With Earning at 120% AMI or Above
Research and Development	4,343	491	2	83	60	145	346
Office—IT Related	5,067	674	0	139	60	199	475
Office-Other	2,533	336	11	149	22	182	154
Institutional	600	159	4	43	80	127	32
Retail and Personal Services	422	51	7	36	2	45	6
Restaurants	1,067	131	120	8	0	128	3
Hotel	120	15	5	8	1	14	1
Total	14,152	1,857	149	466	225	840	1017

*Income level for annual earnings from one employee

[12] 1,318 surveys response were received, 29% from research and development firms, 23% from office tenants, 34% from institutions, and 14% from employees at retailers, restaurants and hotels.

income category based on a single person household. These figures are not the same as the number of households that will demand housing in each category for two reasons: (1) many households will be larger and thus a higher income threshold will determine if they are low-, moderate- or middle income; and (2) households with two workers will have higher incomes that reflect the earnings of both workers.

The next step to project demand for affordable housing units among the 1,857 employees who are expected to seek housing in Cambridge requires considering their household type in terms of the number of wage-earners and the household size. Since the employees in Cambridge's new developments will be drawn from the greater Boston area, the most recent (2011 to 2013) American Community Survey data for the Boston Metropolitan Area[13] on the distribution of households by number of earners and household size were used to estimate the type of households for these employees. Workers in each occupation expected to demand housing in Cambridge were first divided into one-, two-, three- and four or more-person households based on the metro area distribution[14]. Then each household size group was divided into one-, two- and three worker households, using the American Community Survey metro are percentages (see Table 8).

Table 8. Household Size by Number of Wage-Earners, Boston-Cambridge Newton MA-NH Metro Area

Number or Workers	One Worker	Two Workers	Three Workers	Total
One Person Household	100.0%	0.0%	0.0%	100.0%
Two Person Household	36.6%	63.4%	0.0%	100.0%
Three Person Household	29.9%	47.6%	22.5%	100.0%
Four or More Person Household	28.2%	48.1%	23.8%	100.0%

Source: US Census 2011 to 2013 American Community Survey

For the single earner households, the average wage for the occupation was used to estimate their household income and determine if they fell below the low-income, moderate-income and middle-income thresholds for their respective household size. Among the single earner households who are expected to demand Cambridge housing, 108 are estimated to be low-income (less than 50% of area median income), 231 are projected to be moderate-income (between 50% and 80% or area median income) and 256 are estimated as middle income (80% to 120% of area median income) for a total demand of 595 affordable housing units. Projecting affordable housing demand among multiple-earner households requires estimating the earnings

[13] The formal name for this geographic area is the Boston-Cambridge-Newton-MA-NH Metropolitan Statistical Area

[14] From the 2011 to 2013 ACS, the ratios are: 28.4% one-person, 32.5% two-person 16.3% three person and 22.8% four or more.

from other wage earners. To simplify this analysis, it was assumed that the second worker's earnings equaled the average annual wage for all occupations in the Boston metro area, which was $62,340 in May 2013. This resulted in an additional 98 dual worker households from new development that will demand housing in Cambridge, all in the middle income category. No three worker households fall within the middle income range.

Across all household sizes and income groups, the total number of affordable and middle income housing units needed to meet the demand generated by new office and retail development is 693 units. Table 9 summarizes the total projected demand for new housing by household size and among low-income, moderate-income and middle-income households.

Table 9. New Affordable Housing Demand in Cambridge from New Large Developments* by Income Type and Household Size, 2015 to 2024

Income Group	One-Person Households	Two-Person Households	Three Person Households	Four Person Households	Total
Low Income	42	24	11	31	108
Moderate Income	136	56	21	18	231
Middle Income	82	96	63	113	354
Total	260	176	95	162	693

*Includes Hotel, Institutional, Office, R&D and Retail Developments,

Subsidy Required to Address Impact of Large Scale Development

This section builds upon the framework established in the earlier sections to project the total subsidy required to address the projected increased demand for affordable housing generated by large-scale developments in Cambridge. Housing affordability is a function of household income and the cost of available rental and for-sale housing units in a given real estate market. The City of Cambridge and the entire Metropolitan Boston region suffer from a well-known and demonstrated lack of sufficient affordable housing. This section reviews housing conditions in Cambridge and calculates subsidy needed to create new affordable housing that satisfies the demand generated by new workers in new commercial and institutional development by comparing the total development cost of new affordable housing units to the housing prices that can be supported by low, moderate, and middle-income households. Before calculating the projected subsidy required, current housing conditions in Cambridge are reviewed to provide background and context.

Housing Conditions in Cambridge[15]

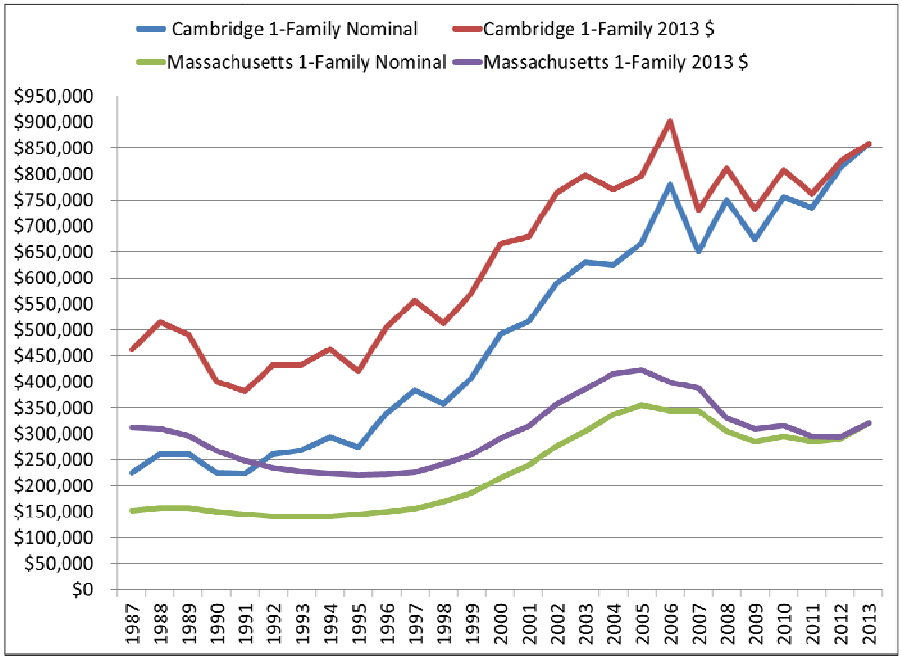
The City of Cambridge is experiencing a sustained and severe affordable housing shortage, because demand for affordable units is outstripping the supply of housing affordable to low and moderate income households, and increasingly middle income households.

Ownership Housing

There has been a sustained run up in housing prices for condos and single family homes in Cambridge, as shown by data in **Figure 5** and in **Figure 6**. The median price in 2013 of a single family home was over $850,000 and the median price of a condo exceeded $500,000.

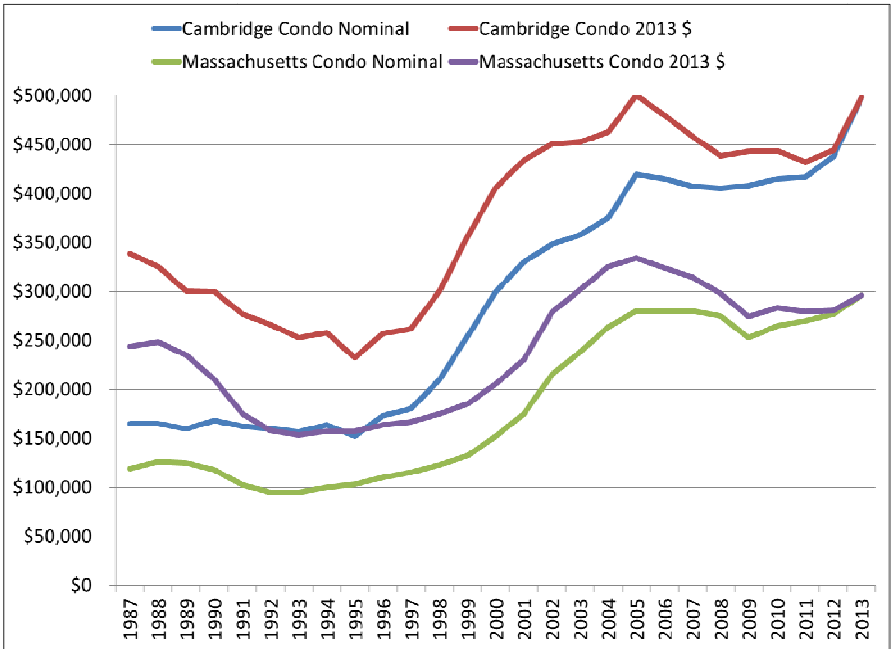
[15] Detailed statistical data on Cambridge's population, household, housing stock, and housing market conditions appear in **Appendix B**.

Figure 5
Trend in Median Sales Price of Single Family Units in Cambridge and in Massachusetts, in Nominal Value and 2013 Value of the Dollar



Source: Warren Group and ConsultEcon, Inc.

Figure 6
Trend in Median Sales Price of Condo Units in Cambridge and in Massachusetts, in Nominal Value and 2013 Value of the Dollar



Source: Warren Group and ConsultEcon, Inc.

Rental Housing

In addition to ownership housing prices that have far outpaced the growth in prices statewide, Cambridge and surrounding areas have had a relatively low rental vacancy rate in recent years. As reported by the U.S. Census Bureau in the 2000 and 2010 censuses, the rental vacancy rate in Cambridge increased from 2.8 percent in 2000 to 3.9 percent in 2010. Despite this increase, the rental vacancy rate is still low when compared to the rates across the Boston region and the Commonwealth of Massachusetts as a whole. In 2010 the rental vacancy rates were 5.9 percent in the Boston region and 6.5 percent in the Commonwealth. In Cambridge, the repeal of rent control in 1994 caused the displacement of many residents, as well as a significant loss of rental units, due to a boom in the conversion of rental units to condominiums. Cambridge continues to have low availability of affordable rental units. These trends continue to be a factor in the availability and cost of housing in Cambridge.[16]

Data from the Census Bureau also indicate that the median gross monthly rental payment among Cambridge renting households has increased 64.7 percent from $962 in 2000 to $1,585 in 2012.[17] Assuming 30 percent of income used for housing costs, the average rent in 2012 was affordable to households earning $63,400 or more annually. The cost of rental housing in Cambridge has increased faster than the general rate of inflation nationally, as indicated by the Consumer Price Index (CPI). Between 2000 and 2012, CPI increased from 172.2 to 229.6, a 33.3 percent increase, which would indicate that Cambridge households are devoting an increasing share of their financial resources to housing. Census data are supportive of this finding. Data in **Table 10** show the distribution of households by the percentage of income that was spent on rent in 1999 and 2012. In both years, the largest household cohort is those who pay 50 percent or more on rent. In 1999, 19 percent of households devoted more than 50 percent of their income to rent. In 2012, 23 percent of households did so.

[16] *Planning for Housing in Cambridge: Past, Present and Future.* City of Cambridge. February 7, 2013.
[17] This 2012 figure is based on the Census Bureau's American Community Survey 5-year (2008 to 2012) estimates and reflects average tenant rent payments not including any rental subsidies.

Table 10
Households by Percent of Income Spent on Rent, 1999 and 2012
City of Cambridge

	1999		2012	
Percent of Income	Renting Households	Percent of Total	Renting Households	Percent of Total
Less than 10 percent	1,734	6%	1,109	4%
10 to 14 percent	2,663	9%	2,359	8%
15 to 19 percent	3,933	14%	3,317	12%
20 to 24 percent	3,522	12%	3,847	13%
25 to 29 percent	3,520	12%	3,591	12%
30 to 34 percent	2,633	9%	2,585	9%
35 to 39 percent	1,741	6%	1,702	6%
40 to 49 percent	2,195	8%	2,195	8%
50 percent or more	5,542	19%	6,752	23%
Not computed	1,397	5%	1,361	5%
Total	**28,880**	**100%**	**28,818**	**100%**

Source: U.S. Census Bureau 2000; 2008-2012 American Community Survey; and ConsultEcon, Inc.

Total Residential Housing

According to the Census housing data, Cambridge had 44,725 housing units available in 2000. There was a net gain of 2,566 housing units between 2000 and 2010, with a 6 percent increase in available housing to 47,291 units. While the total number of housing units increased modestly, the number of vacant housing units increased over 50 percent, from 2,110 units to 3,259 units. The vacant units may have been vacant for sale or for rent at the time the survey was conducted. It is reasonable to suggest that conversions to condominiums, rising prices, and new units coming online contributed to the higher vacancy rate as the higher priced units are absorbed in the market.

As will be demonstrated later in this analysis, land and residential construction costs are too high in Cambridge for market demand for affordable housing alone to trigger the creation of affordable housing. In fact, the high cost of housing construction in Cambridge is a barrier to development of housing affordable even for families at 120 percent of the AMI. Cambridge's housing affordability gap, however, is most acute for low-income households at or below 80 percent of AMI.

The most recent report in an annual series of reports on the regional housing market, the *Greater Boston Housing Report Card 2013* reviewed the trends over the past decade that provide additional context for evaluation of Cambridge's housing market. The report identified two distinct stages within the regional housing market over the past decade. The first stage began in the late 1990's and lasted through 2005 reflected rapidly rising housing prices and relatively

stable rents. The second stage, which began in 2005 and ended in 2012, reflected declining sales and falling housing prices, (due in part to rising foreclosures and tightening credit), and escalating rents because demand exceeded the supply of available rental housing. During this second stage households that would have otherwise chosen homeownership were choosing rental housing, thereby contributing to increasing rents. In addition, it is important to note that declining ownership housing trend is relative. As indicated in Figure 1 and Figure 2, the declines in prices did not significantly improve affordability of housing for moderate and lower income households. Most recently, regional data has pointed to signs of recovery in the housing market (i.e. higher prices and more sales).

In addition, *Greater Boston Housing Report Card 2013* identified a new paradigm in demand for housing with lower demand for single family suburban homes and increased demand for condominiums and multi-family rental housing. This trend is attributed to fundamental changes in the regional economy, demographics and consumer behavior. Because the composition of housing stock in Cambridge matches this latter category, this trend in housing demand has the potential to exacerbate the affordability of housing in the City. Based on the factors discussed above, there is a clear need to mitigate the effect of new large-scale Cambridge commercial developments on creating additional demand for housing in Cambridge because they increase employment in the city.

As discussed in Section 3, there are projected to be 693 new units needed to address the impact of new developments on housing demand among low-, moderate-, and middle-income households. Given the market conditions and the costs to construct new housing, as discussed above, none of the needed affordable housing units will be supplied by either the current housing market or the new un-subsidized private development market. Therefore a housing contribution by the developments in Cambridge is warranted to support the construction of the new affordable housing demanded by workers of the new developments.

Methodology

Following is a summary of data and analyses used in calculating the projected total per square foot required subsidy from new non-residential development to support development of new affordable housing for workers. The subsidies would be for low, moderate and middle income households whose jobs would be located in Cambridge's new commercial buildings over the next 10 years.

The analyses establish that affordable rents and affordable sales prices do not currently support development of affordable housing, due to high development costs. Therefore, to stimulate affordable housing development, subsidies or other incentives must be provided. This analysis estimates the amount of such subsidies from the housing contribution from commercial development. The estimated <u>total</u> required subsidy is the difference between the total development costs of producing new affordable housing units and the capitalized value of affordable rent and unit sale proceeds. The required subsidy is presented as a per square foot cost for projected non-residential development.

The previous section projected demand for new housing among 693 low, moderate, and middle-income households ranging in size from one person to four or more persons. This section determines the projected subsidy required to construct housing that is affordable for those households, based on a modified demand estimate of 692 units.[18] The following methodology was used to calculate the subsidy required to produce sufficient housing to satisfy projected ten-year affordable housing demand generated by new development non-residential buildings.

- Estimate the number of low-income, moderate-income and middle income households moving to or seeking to live in Cambridge that would be generated by the new non-residential development. Specify demand by number of persons in the household, number of bedrooms, and by tenure (i.e. renter occupied units and owner occupied units).
- Estimate the total development costs of affordable units to satisfy the demand generated based on recent unit costs of new affordable housing developments completed since 2009 or currently under construction.
- Estimate the potential capitalized revenue due to annual rents and sales proceeds of affordable units segmented by middle income, moderate income and low income households.
- Calculate the difference between the total development costs and the capitalized revenue that is internally generated by renters and owners. This amount is the total subsidy required to produce the targeted new affordable units created by demand from new workers in new non-residential developments.
- Divide the total subsidy required by the total non-residential square feet subject to the housing contribution, based on current policy for exempt square feet. This amount is the subsidy projected to be required to produce the new affordable units created by demand from new workers in new non-residential developments.

The majority of state and federal programs of subsidy funding for affordable housing are targeted to low-income households. Federal and state tax credits prioritize creation of units for households below 50 percent AMI and 60 percent AMI. Therefore, because of the targeting of available subsidy sources of funding, it is likely that much of the new affordable housing created in Cambridge will be targeted to these income levels. As the following analysis shows, the amount of subsidy required to create housing for low-income households is substantial. Yet moderate-income and middle-income households are also increasingly finding housing to be unaffordable in Cambridge's housing market. Focusing on low, moderate, and middle-income households will expand access to a broader range of sources of subsidy, enhancing development feasibility.

The following key assumptions were made to calculate the housing subsidy required.

[18] Due to the division of the 693 units among multiple categories of household size, rental units and ownership units, fractional units can result. Rounding is used to insure the analysis occurs for whole numbers of units, rather than partial housing units. Due to differences in rounding results when 693 units were used, the total number of units demanded was reduced by one to maintain consistency and clarity of analysis focused on whole numbers of rental and ownership units. The total number of units is one unit lower than the housing unit demand presented in Section 3.

Unit Distribution for New Affordable Housing

The distribution of households by number of persons and income levels was derived in Section 3. The households range in size from one to four or more persons. All one-person households are assumed to be one-bedroom units. Two-person households are allocated as 20 percent to one-bedroom units and 80 to two-bedroom units. Three-person households are allocated 80 to two-bedroom units and 20 percent to three-bedroom units. Four or more person households are allocated to three bedroom units. Data in **Table 11** show the estimated distribution of housing units by size and income levels (low-moderate-middle).

Table 11
Distribution of New Affordable Housing Demand in Cambridge
by Number of Bedrooms due to Projected Non-Residential Development

	Households by Size				
	One Person	Two Person	Three Person	Four Person	Total
Total New Housing Units Needed Based on New Non-Residential Construction					**692**
Distribution of Units [1/]					
Low Income	42	24	11	31	108
Moderate Income	136	56	21	18	231
Middle Income	82	96	63	112	353
Total	**260**	**176**	**95**	**161**	**692**
Distribution of Units by Number of Bedrooms [2/]					
One Bedroom	100%	20%	0%	0%	43%
Two Bedrooms	0%	80%	80%	0%	31%
Three Bedrooms	0%	0%	20%	100%	26%
	100%	100%	100%	100%	100%
Units by Number of Bedrooms					
Low Income					
One Bedroom	42	5	0	0	47
Two Bedrooms	0	19	9	0	28
Three Bedrooms	0	0	2	31	33
Moderate Income					
One Bedroom	136	11	0	0	147
Two Bedrooms	0	45	17	0	62
Three Bedrooms	0	0	4	18	22
Middle Income					
One Bedroom	82	19	0	0	101
Two Bedrooms	0	77	50	0	127
Three Bedrooms	0	0	13	112	125
Units by Size, Number of Bedrooms					
One Bedroom	260	35	0	0	295
Two Bedrooms	0	141	76	0	217
Three Bedrooms	0	0	19	161	180
Total Units	**260**	**176**	**95**	**161**	**692**

1/ See Section 3. Rounding affects totals and the total number of units demanded is reduced by one in this table to maintain consistency and clarity of analysis focused on whole numbers of rental and ownership units. The total number of units is one unit lower than the housing unit demand presented in Section 3.

2/ Source: City of Cambridge.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Mix of Rental and Ownership Units

New affordable housing has primarily been supplied through rental housing, due to the available subsidy from federal sources. This analysis assumes that the affordable housing to be supplied will be a mix of rental and ownership units. The subsidy required estimated in this analysis assumes that:

- 50 percent of units for middle-income households will be ownership units; and the remaining 50 percent will be rental.
- 30 percent of units for moderate-income households will be ownership units; and the remaining 70 percent will be rental.
- All of the units for low-income households will be rental units.

Data in **Table 12** show the distribution of rental and home ownership housing units by size and income level.

Table 12
New Affordable Housing Demand in Cambridge
by Renter and Owner Occupied Units

	Households by Size				
	One Person	Two Person	Three Person	Four Person	Total
Distribution of Units					
Low Income	42	24	11	31	108
Moderate Income	136	56	21	18	231
Middle Income	82	96	63	112	353
Total Units	**260**	**176**	**95**	**161**	**692**
Percent of Households Occupying Ownership Housing [1/]					
Low Income	0%	0%	0%	0%	
Moderate Income	30%	30%	30%	30%	
Middle Income	50%	50%	50%	50%	
Number of Ownership Units					
Low Income	0	0	0	0	0
Moderate Income	41	17	6	5	69
Middle Income	41	48	32	56	177
Total	**82**	**65**	**38**	**61**	**246**
Percent of Households Occupying Rental Housing [1/]					
Low Income	100%	100%	100%	100%	
Moderate Income	70%	70%	70%	70%	
Middle Income	50%	50%	50%	50%	
Number of Rental Units					
Low Income	42	24	11	31	108
Moderate Income	95	39	15	13	162
Middle Income	41	48	31	56	176
Total	**178**	**111**	**57**	**100**	**446**
Units by Tenure (rounded)					
Ownership	82	65	38	61	246
Rental	178	111	57	100	446
Total	**260**	**176**	**95**	**161**	**692**
Rental Units by Number of Bedrooms					
One Bedroom	178	22	0	0	200
Two Bedrooms	0	89	46	0	135
Three Bedrooms	0	0	11	100	111
Total Rental	**178**	**111**	**57**	**100**	**446**
Ownership Units by Number of Bedrooms					
One Bedroom	82	13	0	0	95
Two Bedrooms	0	52	30	0	82
Three Bedrooms	0	0	8	61	69
Total Ownership	**82**	**65**	**38**	**61**	**246**
Total Housing	**260**	**176**	**95**	**161**	**692**

1/ Source: City of Cambridge.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Historic Unit Costs

The unit costs used to calculate the Total Development Cost are based on an inventory of five Cambridge affordable housing projects with a total of 133 new affordable units completed or under construction between 2009 and 2014. They had an average cost of $481,000 per unit, adjusted for inflation. Data in **Table 13** show the aggregate and unit costs for the affordable housing projects in Cambridge completed or under construction between 2009 and 2014.

Table 13
Aggregate and Unit Costs of Affordable Housing Projects in Cambridge
2009 to 2014 City of Cambridge

Affordable Units Produced in Cambridge, 2009 through 2015	**133**	
Cost Categories, Inflation Adjusted	**Amount**	**Percent to Total**
Hard Costs	$36,438,979	57.0%
Soft Costs	15,704,463	24.6%
Acquisition/Land Costs	11,800,158	18.5%
Total Development Cost	**$63,943,599**	**100.0%**
Average Unit Total Development Cost (rounded)	***$481,000***	

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Calculation of Needed Subsidy

The following presents the analysis of estimated total development costs, supportable financing, and needed subsidy for affordable housing units that must be created in order to satisfy the new demand generated by workers in new commercial developments in Cambridge over the next 10 years. The analysis only presents selected tables that summarize the calculation of the needed subsidy. Additional tables in **Appendix C** detail all assumptions and intermediate calculations that underlie required subsidy calculation.

Development Project Costs

The average costs of new developments constructed since 2009 or currently under construction are used as the basis for calculating the costs of new affordable housing in Cambridge over the next ten years. It is likely, however, that housing development costs will vary considerably according to the particulars of individual projects and may change over time.

Rental Housing

Data in **Table 14** summarize TDC of developing 446 affordable rental units in Cambridge. The TDC is assumed to be $481,000 per unit.

Table 14
Calculation of Total Development Costs of Affordable Rental Housing Units in Cambridge

Project Assumptions		
Number of Units	446	
Average Unit Size GSF	1,269	
Total Project GSF	566,000	
Cost Assumptions [1/]		
Land/Acquisition per Unit Costs	$88,723	
Construction per Unit Costs	$273,977	
Soft Costs, including Design, Permitting, Overhead, Profit, and Contingency, as a Percent of Construction Cost	43.1%	
Development Costs	**Amount**	**Percent to Total**
Land/Acquisition	$39,570,000	18.5%
Construction	$122,194,000	57.0%
Soft Costs, including Design, Permitting, Overhead, Developer's Fee, and Contingency	$52,663,000	24.6%
Total Development Costs (TDC)	**$214,427,000**	**100.0%**
TDC per Unit (rounded to nearest $100)	***$481,000***	
TDC per GSF (rounded to nearest $1)	***$379***	

1/ Cost assumptions are based on weighted average cost metrics from five affordable housing development projects in the City Cambridge constructed or under construction between 2009 and 2014. Estimates are rounded.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Ownership Housing

Data in **Table 15** summarize TDC of developing 246 affordable ownership units in Cambridge. Like rental housing units, the TDC is assumed to be $481,000 per ownership unit.

Table 15
Calculation of Total Development Costs
of Affordable Ownership Housing Units in Cambridge

Project Assumptions	
Number of Units	246
Average Unit Size GSF	1,301
Total Project GSF	320,000
Cost Assumptions [1/]	
Land/Acquisition per Unit Costs	$88,723
Construction per Unit Costs	$273,977
Soft Costs, including Design, Permitting, Overhead, Profit, and Contingency, as a Percent of Construction Cost	43.1%

Development Costs	**Amount**	**Percent to Total**
Land/Acquisition	$21,826,000	18.5%
Construction	$67,398,000	57.0%
Soft Costs, including Design, Permitting, Overhead, Developer's Fee, and Contingency	$29,047,000	24.6%
Total Development Costs (TDC)	**$118,271,000**	**100.0%**
TDC per Unit (rounded to nearest $100)	***$481,000***	
TDC per GSF (rounded to nearest $1)	***$370***	

1/ Cost assumptions are based on weighted average cost metrics from five affordable housing development projects in the City Cambridge constructed or under construction between 2009 and 2014. Estimates are rounded.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Rental Housing Development Project Revenue

An important step in calculating the subsidy required to create new affordable housing units is to define the rental housing development project's revenue that will be used to support the development and operations of new affordable housing. This analysis assumes that the new rental housing will solely be supported by rental income from tenant households and ownership housing will be supported by the sales of affordable units. Affordable rents and sales prices are derived based on household income. In prior sections of this report, annual occupational wages were the input for establishing the demand for affordable housing by low, moderate and middle-income levels of households of new workers in new commercial development in Cambridge. The weighted average gross income for each income level[19], as shown by the data in **Table 16**, is the basis for calculating affordable rents and sales prices that in turn support the development of affordable housing.

Table 16
Weighted Average Income by Income Group and Household Size, Households of Workers in Projected Non-Residential Development

	Households by Number of Persons			
	One Person	Two Person	Three Person	Four Person
Distribution of Weighted Average Income				
Low Income	$26,756	$28,729	$29,933	$34,098
Moderate Income	$44,236	$46,736	$47,115	$58,859
Middle Income	$72,174	$82,935	$89,113	$98,628

Source: Bureau of Labor Statistics, Karl F. Seidman Consulting Services; and, ConsultEcon, Inc.

The needed subsidy for new affordable rental housing is calculated first, followed by the calculation of the needed subsidy for affordable ownership housing.

Affordable Rent Levels

The affordable rents for rental units are based on the estimated annual income of workers in the new commercial developments in Cambridge. Construction of the 446 rental units of affordable housing projected in this analysis are supported by rental revenue from tenants with subsidies used to fill the gap between rental revenue and the cost of developing the housing. In general, the federal department of Housing and Urban Development (HUD) is a source of many subsidies for affordable housing. HUD defines housing costs as affordable to a household when the total

[19] This average is based on the average annual earnings for the occupations projected for low, moderate and middle-income household as discussed in section two on the Impact of New Development on Affordable Housing Demand.

cost of shelter consumes no more than 30 percent of gross (total) income. For this analysis, households are assumed to pay 30 percent of household income in rent. Data in **Table 17** detail the assumed income levels of households to derive the total gross rental revenue for the 446 units, based on the distribution of households by size and income. Total annual gross rental revenue for the units is estimated at $7.8 million.

Table 17
Annual Rental Revenue by Household Income and Size of Household

Household Size	Annual Income [1/]	Applicable Monthly Rent [2/]	Number of Households	Total Annual Rent
Low Income Households				
1 Person	$26,756	$669	42	$337,126
2 Persons	$28,729	$718	24	$206,849
3 Persons	$29,933	$748	11	$98,779
4 Persons	$34,098	$852	31	$317,111
Moderate Income				
1 Person	$44,236	$1,106	95	$1,260,726
2 Persons	$46,736	$1,168	39	$546,811
3 Persons	$47,115	$1,178	15	$212,018
4 Persons	$58,859	$1,471	13	$229,550
Middle Income Households				
1 Person	$72,174	$1,804	41	$887,740
2 Persons	$82,935	$2,073	48	$1,194,264
3 Persons	$89,113	$2,228	31	$828,751
4 Persons	$98,628	$2,466	56	$1,656,950
Total Households / Housing Units			**446**	
Total Annual Rent				**$7,776,675**
Total Annual Rent (Rounded)				***$7,777,000***

Aggregate Annual Rent by Income Level	Number of Units	Total Annual Rent (Rounded)	Percent of Total Rent	Average Monthly Rent
Low Income	108	$960,000	12.3%	$741
Moderate Income	162	$2,249,000	28.9%	$1,157
Middle Income	176	$4,568,000	58.7%	$2,163
Total	**446**	**$7,777,000**	**100.0%**	**$1,453**

1/ Weighted average annual earnings based on anticipated mix of occupantions and wages in new non-residential development in Cambridge.

2/ Assumed at 30% of monthly income.

Note: Rounding may affect totals.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

To calculate the rental revenue available to support the total development costs described above, the gross rents must be adjusted to reflect lost revenue due to periodic vacancies and the operating costs of maintaining and managing housing. As shown by data in **Table 18**, vacancy is assumed at 3 percent of gross rental revenue. Operating costs typically include such items as building management, janitorial services, trash removal, building maintenance, landscaping, and marketing and other administrative costs. For this analysis, the full cost of utilities is also included. Based on comparable projects in Cambridge and the region and interviews with Cambridge developers, total operating costs were calculated as $8,500 per unit or $3.8 million total. Net rental income after deducting vacancy and operating costs is estimated at $3.8 million.

Table 18
Summary of Required Affordable Housing Subsidy Rental Units

			By Household Type		
		All Units	Low Income	Moderate Income	Middle Income
Potential Development Costs					
Number of Units		446	108	162	176
Percent to Total		*75.8%*	*24.2%*	*36.3%*	*39.5%*
TDC per Unit		$481,000	$481,000	$481,000	$481,000
TDC per GSF		$379	$379	$379	$379
Total Gross Square Footage (GSF)		566,000	137,058	205,587	223,354
Total Development Costs (TDC)		**$214,427,000**	**$51,924,027**	**$77,886,040**	**$84,616,933**
Net Rental Income	**Unit Factor**	**Amount**	**Amount**	**Amount**	**Amount**
Gross Annual Rent [1/]		$7,777,000	$960,000	$2,249,000	$4,568,000
Less Vacancies [2/]	3% of Gross Rent	($233,310)	($28,800)	($67,470)	($137,040)
Less Total Operating Costs [2/]	$8,500 per Unit	($3,791,000)	($918,000)	($1,377,000)	($1,496,000)
Net Operating Income (NOI)		**$3,752,690**	**$13,200**	**$804,530**	**$2,934,960**
Derivation of Permanent Mortgage / Supportable Debt Calculation		**Amount**	**Amount**	**Amount**	**Amount**
Net Operating Income (NOI)		$3,752,690	$13,200	$804,530	$2,934,960
Debt Coverage Ratio [3/]		1.1	1.1	1.1	1.1
Available for Debt Service		$3,411,500	$12,000	$731,400	$2,668,100
Mortgage Constant [3/]		6.435%	6.435%	6.435%	6.435%
Permanent Mortgage / Supportable Debt		**$53,019,000**	**$186,000**	**$11,367,000**	**$41,465,000**
Supportable Equity Calculation		**Amount**	**Amount**	**Amount**	**Amount**
Required Return on Equity [3/]		8.0%	8.0%	8.0%	8.0%
Revenue Available for Return to Equity		$375,269	$1,320	$80,453	$293,496
Supportable Equity Investment		**$4,691,000**	**$17,000**	**$1,006,000**	**$3,669,000**
Subsidy Required Calculation		**Amount**	**Amount**	**Amount**	**Amount**
Total Development Costs		$214,427,000	$51,924,027	$77,886,040	$84,616,933
Less Permanent Mortgage / Supportable Debt		($53,019,000)	($186,000)	($11,367,000)	($41,465,000)
Less Supportable Equity		($4,691,000)	($17,000)	($1,006,000)	($3,669,000)
Subsidy Required (TDC-Mortgage-Equity)		**$156,717,000**	**$51,721,027**	**$65,513,040**	**$39,482,933**
Subsidy Required as a Percent of TDC		*73.1%*	*99.6%*	*84.1%*	*46.7%*

1/ See Table C-8.

2/ Source: ConsultEcon, based on interviews with housing developers, and City of Cambridge staff input.

3/ Source: ConsultEcon calculation of mortgage constant based on interest rates from the Massachusetts Housing Partnership.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Rental Affordability Gap and Needed Subsidy

The next step is to find the gap in project finance between the permanent mortgage and developer equity that the net rental income can support and the total development costs of the 446 rental units. In general, the amount of loan that lenders will approve is based on the income stream from the project. In this case, the annual net income from rents is $3.8 million. However, lenders prefer to build into their mortgage calculations a cushion between projected net income from rents and the annual debt service needed to pay down the loan. The debt coverage ratio (ratio of net income to allowable debt) reduces the effective amount of net income that can be used to support a mortgage. This analysis assumes a debt coverage ratio of 1.1, based on permanent financing programs offered by the Massachusetts Housing Partnership. After adjusting the net income by the debt coverage ratio, the project has $3.4 in annual net income with which to pay the debt service on a permanent mortgage.

The total allowable permanent loan is calculated by dividing the net income by the mortgage constant, based on a 6.435 percent mortgage constant, (assuming the available current Massachusetts Housing Partnership financing rate amortized over a 30 year period). The permanent loan that could be supported by the resident households is $53 million. The annual revenue not required for the mortgage is then available to support equity investment. Based on a required return of 8.0 percent, this revenue would support $4.7 million in equity investment. Given the total development costs of $214.4 million, the subsidy required to create 446 new affordable rental housing units is $156.7 million, approximately 73 percent of the total development cost (TDC).

Ownership Housing Development Project Revenue

The average sales price of affordable units sold in Cambridge is the basis for estimating the sales proceeds available to support the creation of 246 affordable ownership units in Cambridge. Of the total, 69 units are for moderate income households and 177 units are for middle income households, as shown by data in **Table 19**.

Table 19
Ownership Units by Number of Persons and Number of Bedrooms for Moderate and Middle Income Households

	Households by Size				
	One Person	Two Person	Three Person	Four Person	Total
Number of Ownership Units (rounded) [1/]					
Low Income	0	0	0	0	0
Moderate Income	41	17	6	5	69
Middle Income	41	48	32	56	177
Total	**82**	**65**	**38**	**61**	**246**
Distribution of Units by Number of Bedrooms [1/]					
One Bedroom	100%	20%	0%	0%	43%
Two Bedrooms	0%	80%	80%	0%	31%
Three Bedrooms	0%	0%	20%	100%	26%
Total	**100%**	**100%**	**100%**	**100%**	**100%**
Distribution of Moderate Income Ownership Units					
One Bedroom	41	3	0	0	44
Two Bedrooms	0	14	5	0	19
Three Bedrooms	0	0	1	5	6
Total	**41**	**17**	**6**	**5**	**69**
Distribution of Middle Income Ownership Units					
One Bedroom	41	10	0	0	51
Two Bedrooms	0	38	26	0	64
Three Bedrooms	0	0	6	56	62
Total	**41**	**48**	**32**	**56**	**177**
Total Ownership Units by Number of Bedrooms					
One Bedroom	82	13	0	0	95
Two Bedrooms	0	52	31	0	83
Three Bedrooms	0	0	7	61	68
Total Ownership	**82**	**65**	**38**	**61**	**246**

1/ See Table C-1.

Note: Rounding may affect totals.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

As shown by analysis in **Table 20**, the "affordable" sales price is derived based on 30 percent of gross income spent on housing and estimates of housing costs, the same as rental housing. Housing costs for ownership units include mortgage payments based on 5% down payment on the home, real estate taxes and condo fees. (Private Mortgage Insurance is not included in this analysis as it is waived for low-income and moderate-income households through a housing lending program offered by the Massachusetts Housing Partnership. For middle-income

households of over $75,000, it is assumed that they pay PMI which raises their annual housing costs slightly.

Based this analysis of average earnings and housing costs, the average estimated sale price of moderate income units is:

- $160,000 for a one bedroom unit
- $168,000 for a two bedroom unit
- $205,000 for a three bedroom unit

Based the data and analysis of average earnings and housing costs, the average estimated sale price of middle income units is:

- $297,000 for a one bedroom unit
- $342,000 for a two bedroom unit
- $392,000 for a three bedroom unit

It is assumed that low-income units are all rental units, so estimates of sales prices based on low-income earnings was not prepared.

Table 20
Aggregate Affordable Ownership Unit Sales by Household Income and Size of Unit

Household Size	Annual Income [1/]	Monthly Housing Costs [2/]	Number of Households	Supportable Sales Price [3/]	Total Sales
Moderate Income					
One bedroom	$44,831	$1,121	44	$161,359	$7,099,786
Two bedroom	$45,356	$1,134	19	$161,886	$3,075,841
Three bedroom	$58,472	$1,462	6	$212,063	$1,272,378
Middle Income Households					
One bedroom	$73,634	$1,841	51	$294,270	$15,007,792
Two bedroom	$85,406	$2,135	64	$342,208	$21,901,314
Three bedroom	$98,282	$2,457	62	$394,999	$24,489,954
Total Households / Housing Units			**246**		
Total Sales					**$72,847,065**
Total Sales (Rounded)					***$72,847,000***

Aggregate Sales by Income Level	Number of Units	Total Sales	Percent of Total	Average Sales Price
Moderate Income	69	$11,448,000	15.7%	$165,913
Middle Income	177	$61,399,000	84.3%	$346,887
Total	**246**	**$72,847,000**	**100.0%**	**$296,126**

1/ See Table C-13.

2/ Assumed at 30% of monthly income.

3/ See sales price analysis in Table C-15.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Ownership Housing Needed Subsidy

The affordability gap in project financing of ownership units is the difference between the TDC and the proceeds from the sale of the estimated required 246 ownership units. Based on the mix of units and the assumed sales prices, the total estimated sales proceeds are $72.8 million. Assuming TDC of $118.3 million, the estimated financing gap for 246 affordable home ownership units is $45.4 million, approximately 38% of the TDC. Data in **Table 21** summarize the subsidy needed for ownership units.

Table 21
Summary of Subsidy Required for Affordable Ownership Housing

				By Household Type	
			All Units	Moderate Income	Middle Income
Potential Development Costs					
Number of Units			246	69	177
Percent to Total				*28.0%*	*72.0%*
TDC per Unit			$481,000	$481,000	$481,000
TDC per GSF			$370	$370	$370
Total Gross Square Footage (GSF)			320,000	89,756	230,244
Total Development Costs (TDC)			**$118,271,000**	**$33,173,573**	**$85,097,427**
Aggregate Unit Sales Proceeds	**Units**	**Average Price [1/]**	**Sales Proceeds**	**Sales Proceeds**	**Sales Proceeds**
Moderate Income	69	$165,913	$11,448,000	$11,448,000	$0
Middle Income	177	$346,887	$61,399,000	$0	$61,399,000
Total Sales Proceeds	**246**	**$296,126**	**$72,847,000**	**$11,448,000**	**$61,399,000**
Subsidy Required Calculation			**Amount**	**Amount**	**Amount**
Total Development Costs			$118,271,000	$33,173,573	$85,097,427
Less Sales Proceeds			($72,847,000)	($11,448,000)	($61,399,000)
Subsidy Required (TDC-Sales Proceeds)			**$45,424,000**	**$21,725,573**	**$23,698,427**
Subsidy Required as a Percent of TDC			*38.4%*	*65.5%*	*27.8%*

1/ See Tables C-12 and C-13 for derivation of average sales price.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Subsidy Needed to Satisfy Ten-Year Affordable Housing Demand

The total development costs for rental and ownership units in Cambridge that satisfy the demand for new affordable housing due to workers in new non-residential developments who will be seeking housing in Cambridge is $332.7 million. The total subsidy needed for the rental and ownership units is $202.1 million, approximately 61 percent of the TDC. The total subsidy is then divided by the total estimated commercial development building area that is non-exempt from the housing contribution. Of the total 4.595 million square feet of commercial space, an estimated 4.538 million square feet is not exempt, almost 99 percent of the projected total, based on current policy and an average project size of 200,000 square feet. Therefore, the total subsidy required is estimated at $44.54 per square foot of non-residential development, as shown by data in **Table 22**.

Table 22
Unadjusted Calculation of Subsidy Required for new Affordable Rental and Ownership Units per Square Foot of Projected Non-Residential Development

	All Units	Low Income	Moderate Income	Middle Income
Total Development Cost [1/]	$332,698,000	$51,924,027	$111,059,614	$169,714,360
Total Subsidy Required [1/]	$202,141,000	$51,721,027	$87,238,614	$63,181,360
Percent TDC that is Subsidy	60.8%	99.6%	78.6%	37.2%
Derivation of Commercial Square Footage Subject to Housing Contribution				
Total Commercial Square Footage [2/]	4,595,000	4,595,000	4,595,000	4,595,000
Square Footage Exempt from Housing Contribution under Current Policy [3/]	57,000	57,000	57,000	57,000
Commercial Square Footage Subject to Housing Contribution	4,538,000	4,538,000	4,538,000	4,538,000
Subsidy Required per Square Foot of New Commercial Development [4/]	**$44.54**	**$11.40**	**$19.22**	**$13.92**

1/ See Table C-9 and Table C-15 for detail on breakdown by rental and ownership units.

2/ See Section 2 of report.

3/ Per the City of Cambridge Incentive Zoning Ordinance, the first 2,500 SF of non-residential building area is exempt from the housing contribution. It is assumed that non-residential projects in the future average approximately 200,000 GSF, for a total of 24 projects. Across all projects, 60,000 SF would be exempt from the housing contribution, per the current ordinance.

4/ Total Subsidy Required divided by the total Commercial SF Subject to Housing Contribution.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Modified Subsidy Required Based on Other Subsidy Sources

This analysis calculates the full cost of subsidizing the housing demand generated by workers of households in projected large-scale developments in the City of Cambridge. Cambridge has relatively high affordable housing development costs, given the scarcity of vacant land, and high acquisition and construction costs. The purpose of affordable housing is to limit the rental or mortgage payments of low-income households; there is a limited income stream with which to finance development financing. Therefore, the City and developers are challenged to find additional sources of subsidy to fill the gap between the rents and sales proceeds that low, moderate and middle-income families can afford and the development financing that would be incurred by affordable housing developers. Since most affordable housing developers layer multiple subsidies to support the construction of new housing units, the housing contribution will work in conjunction with other subsidy sources to fill the $202.1 million needed subsidy.

The housing contribution due to new commercial development is contributed to the Cambridge Affordable Housing Trust (CAHT). Because there are other sources of subsidy available for development of new affordable housing in Cambridge, the housing contribution to the CAHT does not have to provide all the funds needed to subsidize affordable housing. On average, CAHT funds have represented 33.9% of the total subsidies used in recent affordable housing projects in Cambridge, as shown by data in **Table 23**. In other words, for each dollar in CAHT funds contributed, there was an additional $1.95 from other subsidies that contributed to the development of affordable housing in Cambridge. It should be noted that these funds are available only to projects targeting low-income and moderate-income households.

Table 23
Sources of Funds for Recent Affordable Housing Projects in Cambridge
(Nominal Dollars)

	All Projects [1/]	
Source of Funds	**Amount**	**Percent to Total**
Debt/Sales	$11,831,798	19.1%
Equity	19,906,490	32.2%
Cambridge Affordable Housing Trust (CAHT)	16,954,069	27.4%
Other City Source (CDBG, HOME, etc.) [2/]	2,873,966	4.6%
Department of Housing and Community Development, Commonwealth of Massachusetts	8,850,000	14.3%
Other miscellaneous	1,477,460	2.4%
Total Sources of Funds	**$61,893,783**	**100.0%**
Source of Funds		
Debt/Sales	$11,831,798	19.1%
Cambridge Affordable Housing Trust (CAHT)	16,954,069	27.4%
Other Sources of Subsidy Funds	33,107,916	53.5%
Total Sources of Funds	**$61,893,783**	**100.0%**
Total Subsidy Funds (CAHT + Other Sources of Subsidy Funds)	**$50,061,985**	
CAHT Percent of Total Subsidy Funds [3/]	***33.9%***	
CAHT "Leverage" Ratio, CAHT to Other Subsidies [4/]	***1.95***	

1/ Source: City of Cambridge. Based on five new construction affordable housing development projects completed or under construction in Cambridge between 2009 and 2014.

2/ CDBG = Community Development Block Grant. HOME funds are another federal program that supports housing.

3/ CAHT contribution divided by the Total Subsidy Funds.

4/ The leverage ratio is equal to the Other Sources of Subsidy Funds divided by CAHT contribution.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Cambridge's future supply of affordable housing subsidies is likely to reflect the diversity of the programs utilized by projects in the past. The primary non-City funding sources available for new affordable housing development in Cambridge in the future will likely be Low-Income Housing Tax Credits, Federal HOME and CDBG Funds, Massachusetts Housing Stabilization Funds, and Massachusetts Affordable Housing Trust Funds. Since state sources are often awarded competitively, Cambridge is not guaranteed funding from all of these programs. Moreover, projects do not typically receive funding from all of these sources. Nonetheless, it is reasonable to assume that future affordable housing projects will require multiple sources of subsidy including the housing contribution to the CAHT due to new commercial development. Because these funds apply only to housing targeted to low and moderate income households, applying the historic ratio of CAHT subsidy (33.9%) to the total subsidy needed ($30.62) for low-income and moderate-income housing projects in Cambridge, a modified subsidy required of new commercial development is $10.38 per square foot of non-residential development. Adding the total subsidy needed for middle income housing of $13.92 per square foot of non-residential development yields a total modified subsidy of $24.30.

Review of Other Housing Contribution Programs and Nexus Studies

Cities across the country have implemented housing contribution programs associated with commercial development under various labels for more than three decades. Many California communities have enacted such programs, and they are also found in other states, such as Washington, Colorado, Florida, and New Jersey. Locally, Boston, Somerville and Barnstable County have implemented such programs. This section reviews selected housing contribution policies and nexus studies to identify best practices. The key focus of the review is upon selected issues identified by and relevant to the City of Cambridge as it considers an update to its Incentive Zoning ordinance.

Housing Contribution Programs and Policy Administration

Many housing contribution programs associated with commercial development operate in a similar manner. Commercial, mixed-use, or other types of developments over a certain number of square feet are subject to a fee assessed per square foot of new developed space over the threshold size for the development. Though the essence of the policy may be the same, programs differ in a variety of ways. Some programs require the fee on all commercial development, others permit developers to develop an as-of-right density and apply the housing contribution only if developers seek extra density. Some governing bodies restrict the application of the fee to the use type, such as office space or retail space, whereas others impose the fee on all nonresidential development in their jurisdiction. Some policy programs allow developers to either directly build housing or make payments to an affordable housing trust over a set period of time. In some cases, the fee is divided into installments and paid at certain intervals over a period of several years, most frequently related to the issuance of the certificate of occupancy or building permit.

Governments adjust the fee on a regular basis, most often relating to the Consumer Price Index (CPI) or a construction cost index, such as the Engineering News Record Construction Cost Index. In the ordinances dictating the policies, fees should be adjusted annually, though in practice they may not be, or may be adjusted without taking into account local market conditions and operational considerations. It should be noted that adjustments based on these indices do not take into account changes in land values, which impact the costs of developing affordable housing. Major revisions to the fee structure are undertaken less frequently, requiring approval of the local legislative body and often a new nexus study. Many communities have maintained the original fee structures from when the fees were first enacted, adjusting only based on the index, largely due to the cost and complexity of re-evaluating and passing new linkage legislation. The following section reviews housing contribution programs in Massachusetts, including Boston, Somerville, and Cape Cod, as well as other communities around the United States.

City of Somerville

The City of Somerville's fees, referred to as Project Mitigation Contributions, were first implemented in 1991. Article 15 of the Zoning Ordinance states that the policy's purpose is to increase the supply of available and affordable housing to low-income and moderate-income people, to ensure that such housing is affordable over the long-term, and to mitigate the impact of large-scale development on the supply and cost of housing in the City of Somerville. This section of the ordinance applies to applications seeking special permits, special permits with site plan review, or site plan approval for projects of new construction or substantial rehabilitation of 30,000 gross square feet or more to be occupied by any uses or combination of uses except for residential, protected religious uses, buildings owned by the City of Somerville, and artist studio spaces. The current contribution, adopted by the Board of Aldermen in November of 2013, is $5.15 per square foot over 30,000 gross square feet.

Before the new ordinance was approved in late 2013, the Project Mitigation Contribution policy had last been evaluated with a nexus study conducted in 2004, and subsequently updated, doubling the fee to $3.91 per square foot over 30,000 gross square feet. In 2013, a new nexus study was conducted to evaluate the 2004 policy. Fast-paced development in Somerville had made it necessary to reevaluate the contribution amounts as they were first implemented in 1991 and updated in 2004. The changes recommended in the 2013 nexus study were considered to be supportive of the long-term vision for the city's redevelopment as laid out in the "SomerVision" plan, which projects the addition of 30,000 new jobs and 6,000 housing units, 1,200 of which would be affordable housing units, by the year 2020[20].

The recommendation was to increase the contribution from $3.91 to $5.15 per square foot over 30,000 gross square feet. (The study also recommended a job-creation contribution of $1.40 per square foot; however, this policy was not adopted.) The 2013 ordinance states that the contribution is subject to recalculation every three years, as recommended by the Planning Board to the Board of Aldermen based on a consideration of the current impact of new commercial development on the cost and supply of housing in the City.

The amount of the Project Mitigation Contribution is calculated by multiplying the $5.15 per square foot amount by the total number of square feet in the project over the initial exempt 30,000 gross square feet. In the event that a project is phased, the amount is calculated based on the combined square footage of the phases. The contribution is paid in five equal installments to the Somerville Housing Trust Fund. The first of the five installments is to be paid upon the issuance of a certificate of occupancy, and the remaining four are due and payable annually on the anniversary of the first payment.

City of Boston

Under Article 80 of the Boston Zoning Code, any development project over 100,000 square feet of gross floor area that involves a Development Impact Use is required to pay a Housing Exaction and Jobs Contribution Exaction, referred to as housing and jobs contributions. The current housing contribution is $8.34 per square foot and the jobs contribution is $1.67 per

[20] City of Somerville news, http://somervillema.gov

square foot over 100,000 square feet. Development Impact Uses are linked to specific uses under the city's zoning code, and generally include office, retail, services, hotel, motel, institutional, and educational uses.

Contributions are paid into a Neighborhood Housing Trust and Neighborhood Jobs Trust, respectively, and then allocated by Trustees to help fund the creation of affordable housing and job training programs throughout the City of Boston. Housing contributions are paid in seven equal annual installments for all projects. For most projects the first payment is due either at the issuance of a Certificate of Occupancy date or 24 months after the issuance of the project building permit, whichever comes first. For special downtown projects, the first payment is due upon the issuance of the building permit, and the remaining six payments are payable on the anniversary of the first payment. Jobs contributions are paid in two equal installments with the first due upon issuance of the building permit and the second payment due one year later. An alternative to paying the housing contribution is to create housing units for occupancy exclusively by low-income and moderate-income residents of the city, those whose total annual income is not more than 80 percent of the median income for the Boston area. These units should be developed at a cost at least equivalent to the amount of the housing contribution. This option is not frequently chosen.

The amount of housing contributions may be increased at three-year intervals based on changes in the consumer price index (CPI). No inflation adjustments were made until January 2002, when special legislation provided for an increase to reflect inflation between 1987 and October 1999. The next adjustment for inflation occurred in 2006 to cover the change from 2003 to 2006, setting the contribution at $7.87 for housing. The most recent adjustment took place in November of 2013, raising the amount 9.3 percent to the current levels of $8.34 for housing. There is no variation in Boston's housing contribution for either project size or project use. Boston has been a desirable city for development in the 25 years after the housing contribution fees were established, with considerable new development and rising commercial rents occurring during this period. BRA staff interviewed as part of the study reported that housing contributions have not served as a disincentive to development in Boston.

Barnstable County

The Cape Cod Commission is a regional planning agency that acts as the regulatory authority for all development projects in Barnstable County, which comprises all of Cape Cod. In 2005, the Commission carried out a nexus study to investigate the impact of regional development on low-income and moderate-income residents. The results of the study were incorporated as an affordable housing contribution policy into the 2009 Regional Policy Plan, which has since been amended under a number of county ordinances.

The policy is triggered by all new commercial developments and expansions to existing developments over 10,000 square feet. These developments are called "Developments of Regional Impact" or "DRIs," which are regionally significant development projects that, due to their size, location, or character, impact more than one community. The 2009 plan puts forth a process for the appropriate review of these projects and includes appropriate affordable housing

and other mitigation fees. The affordable housing fee varies depending on the type of development. These categories were determined based on the number of lower-than-average-income jobs each industry or use creates. The fee also depends on whether the development is located in an area that is determined to be an "economic center." Data in **Table 24** summarize the current affordable housing contribution rates. Fees are adjusted on an annual basis based on the Consumer Price Index.

Table 24. Affordable Housing Contribution for DRIs
March 2014 – February 2015

Type of Development	Mitigation in Economic Centers	Mitigation not in Economic Centers
Office	$3.95 Per Square Foot	$7.90 Per Square Foot
Health/Medical	$5.23 Per Square Foot	$10.43 Per Square Foot
Retail	$5.37 Per Square Foot	$10.75 Per Square Foot
Restaurant/Food Service	$7.67 Per Square Foot	$15.34 Per Square Foot
Warehouse/Distribution	$1.27 Per Square Foot	$2.52 Per Square Foot
Other	$2.55 Per Square Foot x (# of jobs with lower-than-average wages / total square footage / 1,000)	$5.11 Per Square Foot x (# of jobs with lower-than-average wages / total square footage / 1,000)

Source: Cape Cod Commission.

Fees accrued under this policy are collected upon the issuance of a certificate of occupancy, though this date is flexible, depending on the project. The fees are collected by the Cape Cod Commission, which, as an organization, holds the funds until the town manager of the town where the development took place requests them for affordable housing projects. Instead of paying the fee, developers can also mitigate the effects on affordable housing by developing 10 percent of the housing units determined necessary to support the lower-than-average-income jobs that are projected to be created by the new development; for example, if a development is projected to create 20 new jobs, then the developer could build 2 low-income housing units instead of paying the mitigation fee.

Since the 2009 policy was implemented, there have been approximately 4 redevelopment projects and one new development projects that have triggered the review process. The one new development project, which ultimately was not built, would have contributed $600,000 from affordable housing fees for construction costs of $20 million.

Contribution Fee Variables

As was previously discussed, there are a number of factors that contribute to variations in housing contribution policies. The following are some important variables to consider in the evaluation of a revised Incentive Zoning Ordinance policy in the City of Cambridge.

Size Threshold

Communities vary in the size threshold that triggers the application of contribution fees and the square footage of the development that the contributions come from. In Boston, the housing contribution applies to developments over 100,000 square feet, while in Somerville, it applies to developments over 30,000 square feet. Though some communities have policies that depend heavily on development size, there are also some, in California for instance, that are less restrictive. Based on a 2010 survey of California fees[21], a majority of communities had no minimum size threshold for the application of commercial housing contribution fees. Three communities that did have size thresholds ranged from 7,500 square feet to 25,000 square feet.

Development Use and Exemptions

Most communities in the Boston area have a single contribution amount for all commercial development. Cape Cod, along with many communities in California, varies the amount depending on the type of commercial development. The 2010 survey of 27 California communities found that 33 percent had one fee level, typically for general office and industrial uses. Approximately 19 percent had 2 or 3 fees for different types of development, 26 percent had 4 or 5 fees, and 33 percent had 6 to 10 different fees. The types of development are often determined by a community's land use, zoning categories, or identified by policy leaders.

There is no discernible consistency among communities about which development types warrant higher fees. In some communities, office use has the highest fee, while in others hotel or retail uses were highest. The key economic determinants of fees by development types are the density of employment (i.e. the number of jobs per square foot of development) and the occupational distribution and wage levels for different uses. California nexus studies reviewed most often identified the maximum level of fee warranted for different types of development. Ultimately, policy makers have leeway up to the fee maximum to set fees based on policy goals, local market conditions, and other in-place policies that impact different types of development.

Similarly to development use factors, communities vary the types of non-residential developments that may be exempt from fees. In the case of Somerville, for instance, contributions are made by all developments seeking special approval, except that contributions do not apply to religious organizations, municipal buildings, and artist studio spaces. Boston, on the other hand, applies it housing contributions policy all developments over 100,000 square feet, regardless of the use at hand. Like variations based on development use, exempting a certain development use is related to the community's economic development priorities at the time the fee structure is created.

For Cambridge, the current Incentive Zoning Ordinance applies to developers seeking special permits to increase the density or intensity of use of the development above what is otherwise permitted as of right. There is no variation based on development use, but the increased development of biomedical and technological commercial spaces and simultaneous decrease of regular office space development could indicate tailoring the Incentive Zoning Ordinance to a

[21] *Jobs Housing Nexus Study,* Prepared for the City of San Diego, Prepared by Keyser Marston Associates, Inc., October 2010.

certain development type. For size, the first 2,500 of the minimum 30,000 square feet are exempt from the provisions of the Incentive Zoning Ordinance.

Timing and Administration of Contributions

The timing and administration of contributions vary somewhat independently of other variables in housing contribution policies. The payment date is generally related to the date of the issuance of a certificate of occupancy; frequently that date is considered the due date for the contribution amount. Others are related to the Building Permit date. In some situations, the administrative body adopts a two-date system, where the contribution is due at the sooner of two dates: the issuance of the certificate of occupancy, or twelve or twenty-four months following the issuance of a building permit. Boston is among those cities, collecting the contribution either when the Certificate of Occupancy is issued, or twenty-four months after the issuance of the building permit.

Additional variations in administration are related to the number of installments of payments over a specific number of years. Though some areas collect the contribution in a lump sum at the time of issuance of the Certificate of Occupancy, some collect a particular amount each year, on the anniversary of that date. The number of years depends on the community. In the case of Somerville, the contribution is paid over five years. In Boston, the contribution is paid over seven years for downtown projects and twelve years for neighborhood projects.

Linkage fees for affordable housing are most frequently collected by an affordable housing trust that is established in the city. Affordable housing trusts develop very low and low-income housing options for the community with these funds. In some cases the developers also have the option to develop housing units instead of paying the fee into the housing trust, as is the case in Cambridge, though this option is not frequently selected.

Established Contributions and Payment Levels and Frequency of Contribution Amount Adjustments

Housing contribution policies are highly dependent on the market and should be adjusted with some frequency to appropriately mitigate the impact that commercial development has on the availability of affordable housing in a community. Though many communities establish a frequency of adjustment in their zoning ordinance, this adjustment is not always carried out. The City of Somerville, for instance, states that the housing contribution is subject to recalculation every three years based on recommendations to the Board of Aldermen by the Planning Board; however, in the event the Planning Board does not make this recommendation, the contribution could carry on unrevised for longer periods of time.

The process for adjusting the contribution amount is usually related to the change in the Consumer Price Index (CPI), the Housing Component of CPI, or on a construction cost index. Adjusting based on CPI is fairly easy to do, as the change can be easily calculated. However, it must be included in the legislation and carried out, if it is to be effective. Some communities in

California do not include adjustment schedules in their legislation and, therefore, have not adjusted their contribution amount since the program was first established.

Review of Current Ordinance and Policy Options

This section reviews the impact of the current Incentive Zoning Ordinance, considers several policy options for changing the application of the housing contribution and assesses the impact of the new maximum determined housing contribution rate on Cambridge's competitiveness for attracting businesses and development.

Current Ordinance

Cambridge's current policy was established in 1988 with the adoption of the Incentive Zoning Ordinance. The Incentive Zoning Ordinance is triggered only when commercial developers of more than 30,000 square feet of gross floor area want something more than their as-of-right development and thus seek special permits to increase the density or intensity of use, the project size, obtain changes in dimension requirements or parking requirements. The housing contribution is calculated at $4.58 per gross square foot of the project authorized by the special permit granted, less a 2,500 square foot exemption. The contribution does not vary by type or by size of development. As an alternative to the monetary contribution, developers may pursuant to the Housing Creation Option, "create or cause to be created affordable units for occupancy exclusively by eligible households, or may donate land to be used exclusively for the development of affordable units"; however, this option has not been selected in the past decade. Housing contributions are made to the Cambridge Affordable Housing Trust (CAHT). From 2004 to 2013, Cambridge collected $1,787,754 in housing contributions under the Incentive Zoning Ordinance.

The Incentive Zoning ordinance allows the Cambridge Affordable Housing Trust to make annual adjustments, which have occurred regularly, though not annually, according to the CPI housing index. The last adjustment was made in February 2014. Cambridge City Council approval is required to adjust the base calculation beyond any adjustment made according to the CPI. The housing contribution is collected as a lump sum payment, prior to the issuance of the certificate of occupancy. There are no reported problems with the administration or collection of the contribution.

Limitations to the Current Ordinance

Several factors have resulted in the Incentive Zoning Ordinance not applying to the majority of the development in Cambridge. First, the City is seeing many commercial projects that do not trigger the Incentive Zoning Ordinance, either because they are developed as-of-right, are exempted from the Incentive Zoning Ordinance, or did not require one of the special permit provisions that trigger application of the ordinance. Second, Cambridge also has added new special permit provisions whose use does not trigger the Incentive Zoning Ordinance. Third, growth has occurred in development uses that are not subject to the Ordinance, including institutional uses and hotels.

Table 25. Commercial, Laboratory and Retail Developments at Least 30,000 Square Feet in Gross Floor Area, 2004 to 2013

Year	Address	Office/Lab/ Retail SF	Housing Contributions
2004	Arrow Street, #0	48,224	$127,310
2004	Mass. Avenue, #254 (Novartis)	484,072	$224,481
2004	West Kendall St., #675 (Vertex/CRP)	245,226	$0
2005	Cambridge Center, #12R (Biogen)	132,270	$0
2005	Discovery Park, #100 (Smithsonian)	158,007	$0
2006	Cambridge Center, #7 (Broad)	194,096	$0
2006	Hampshire Street, #1 (Draper)	157,700	$0
2006	Massachusetts Ave., #250 (Budget)	65,319	$0
2007	Binney St., #301 (Lyme)	268,779	$0
2007	Oxford Street, #15 (LISE Building)	118,600	$0
2009	Alewife Brook Pkwy., #220 (Hotel Tria)	57,759	$0
2010	East Kendall St., #650 (office/CRP)	217,398	$932,657
2011	Discovery Park , #200/300 (Forrester)	235,000	$0
2013	Binney St., #225 (Alexandria/Biogen HQ)	302,660	$0
2013	Cambridge Center, #3-5 (Google Bridge)	42,000	$0
2013	Cambridge Center, #17 (Biogen)	186,000	$0
2013	Main St., #610 Phase 1 (Pfizer/MITIMCO)	230,000	$0
2013	Second St, #150 (Skanska)	108,800	$471,463
2013	250 Kendall St (Watermark[22] 2)	9,290	31,843
	Total	3.261,200	$1,787,754

Source: City of Cambridge Community Development Department

The limited applicability of the Incentive Zoning Ordinance over the last decade is demonstrated in Table 25 which lists all completed non-institutional office, laboratory and retail projects in the prior decade and associated housing contributions. Five of 19 completed projects made housing contributions, accounting for 26% of projects and 27% of developed square feet. Of the 14 projects that did not contribute, four were part of Cambridge Center in which the zoning allowed these developments as-of-right, one was a hotel in which the contribution did not apply by use, and nine did not require applicable special permit that would trigger the Incentive Zoning Ordinance. The ten projects other than Cambridge Center comprised 1.839 million square feet of development.

Another 2.44 million square feet of institutional uses were built over this period—none of which was subject to the ordinance by use.

[22] This housing contribution was required because this building was part of a larger multi-phase planned unit development project

Policy Options

There are four policy changes to the current Incentive Zoning Ordinance that are important to consider and that are discussed in this section:

- Changing the development uses to which the ordinance and housing contributions apply;
- Altering regulatory conditions or types of permits that trigger payment of housing contributions;
- Administration of the housing creation option,
- Varying the housing contribution rate by type of use; and
- Changing or removing the 2,500 square foot exemption.

Development Use. Four uses are currently subject to the Incentive Zoning Ordinance:

1. Noncommercial research facilities;
2. Office and laboratory uses;
3. Retail businesses and consumer service establishments; and
4. Open air or drive in retail & service establishments.

These uses cover a large share of the non-residential development in Cambridge, but they omit several uses that similarly generate demand for additional affordable and middle income housing. These other uses include: employment intensive institutional uses (education and health care facilities); hotels and motels; industrial uses; and radio and television studios. If built, these uses will have similar employment impacts and thus generate increased demand for new housing as the office, laboratory, research, retail and consumer service uses now subject to housing contributions. To make the Incentive Zoning Ordinance more comprehensive and consistent, it is appropriate to expand the current definition of an incentive zoning project to include the following uses, as defined in the current Cambridge Zoning Ordinance Article 4:

- 431i — Transient accommodations: 2. hotel or motel
- 432f— Radio and television studio
- 433b—Institutional Use: Educational purposes; 1 to 6 (dormitories not included) that are that are private non-government
- 433d— Institutional Use: Health care facilities that are that are private non-government
- 433e— Institutional Use: Social service facilities that are private non-government
- 437—Light Industry, Wholesale business or storage
- 438— Heavy Industry

Triggering Regulatory Processes or Permits. Under the current Incentive Zoning Ordinance, the application of the ordinance and associated housing contribution is only triggered when a developer seeks to increase the density or intensity of use, project size, changes in dimension requirements or changes in parking requirements through a special permit under one or more of 16 provisions. Projects that would otherwise trigger a housing contribution due to their size and use but are allowed by right or that only seek special permits or zoning approvals other than one

of the 16 incentive zoning-designated special permits do not make a housing contribution. This policy has had the effect of creating an inconsistency for large projects that also have affordable and middle income housing demand impacts. To ensure comparable treatment of projects with similar scale impacts and help ensure sufficient resources are available to address the increased need for affordable and middle income housing generated by these projects, Cambridge should consider amending the Incentive Zoning Ordinance to apply across the board to all projects over the designated size threshold, without regard to whether or not there is an application for a special permit, s through one of the following options:

- Maintain the existing 30,000 square foot project threshold and apply the housing contribution to any project over this threshold with the defined incentive project uses; or
- Raise the project size threshold to 50,000 square feet and apply the housing contribution to any project over this threshold with the defined incentive project uses. This would provide consistency between Cambridge's existing large project threshold and the trigger for the Incentive Zoning Ordinance.

In practice, few projects are likely to fall between the 30,000 and 50,000 gross square feet. Since 2005, almost all new commercial development projects have been either over 50,000 gross square feet or below 30,000. In this period, there were only three completed projects with commercial space between 30,000 and 50,000 square feet: two were primarily residential with 3,000 and 7,000 commercial square and the third was 3-5 Cambridge Center. Among projects currently permitted or under construction, two are within this size category; both are mixed use buildings with modest commercial space (2,500 and 4,000 square feet).

While another option would be to lower or eliminate the 30,000 square foot project threshold, any such revision must be carefully crafted to reflect findings of the current study on the impact of non-residential development on housing affordability[23].

Housing Creation Option. As previously stated, the current Incentive Zoning Ordinance includes a "housing creation" option that allows developers to build new housing units in lieu of making housing contributions. The level of new housing units required under this option is not specified but rather is left to the discretion of the special permit granting authority acting on the recommendation of the Cambridge Affordable Housing Trust. An alternative to the current procedure would be to set a schedule of housing units to be created per square feet of qualifying non-residential Gross Floor Area. Table 26 provides one example of a possible schedule with the a ratio of gross square feet per each unit for low-income, moderate and middle income housing to be built under the housing creation option based on the housing demand impacts calculated in this study. Consistent with the financial contribution analysis, both a gross subsidy equivalent ratio and one that reflects a 33.9% Cambridge subsidy share is presented in this schedule. Under this scenario, all three ratios would be satisfied by a development. For example, a 260,000 square foot project could create two low-income units, four moderate income units and 20 middle income units, if Cambridge adopted a $24.30 financial housing contribution rate. As this

[23] There may also be legal issues beyond the scope of this report that need to be considered in eliminating the 30,000 square foot threshold.

is only one possible schedule, the city in conjunction with the Cambridge Affordable Housing Trust may want to explore other options for a fixed housing creation schedule and how they may affect the potential for use of this option before making any final policy decisions.

Table 26. Housing Creation Schedule for Low, Moderate and Middle Income Units

Household Type	Square Feet of Total Projected Development	New Units Needed to Meet Demand	Gross Square Feet of Development Per Unit to Be Created*	GSF Adjusted per 33% Cambridge Contribution*
Low-Income Units	4,595,000	108	42,500	128,000
Moderate Income Units	4,595,000	231	19,900	60,300
Middle Income Units	4,595,000	354	13,000	13,000

*Rounded to 100 square feet

Variation of Housing Impact by Use. Three factors shape how different uses impact the demand for affordable and middle income housing in Cambridge:

1. The density of employees in the occupied space;
2. The percentage of employees expected to seek housing in Cambridge; and
3. The share of employees with earnings at the low, moderate and middle income levels.

The following table summarizes how these factors vary across six use categories.

Table 27. Factors Affecting Impact on Housing Demand by Use

Use	Employees per 1,000 SF (a)	Percent of Employees Demanding Housing in Cambridge (b)	Weighted Percent of Jobs with Salaries at Low, Moderate and Middle Incomes** (c)	Composite Impact Measure (a*b*c)
R & D	2.86	11.3%	19.3%	.062
Office*	3.33	13.3%	32.0%	.142
Institutional+	2.00	26.5%	33.3%	.177
Restaurant	4.44	12.3%	95.8%	.524
Hotel	1.00	12.3%	71.5%	.088
Retail/Personal Services *	2.88	12.3%	66.2%	.215

Source: Karl F. Seidman Consulting Services

* Average for projected industries in this use category ;+Colleges and Universities only; **Weight = % below 50% of median income + .67 times percent between 50% and 80% of median income + .25 times percent between 80% and 120% of median income.

The greatest variations occur in employment density and employee earning; the percentage of workers demanding housing in Cambridge based on the employee survey is 11% to 13% for all uses except institutions. For employment density, restaurants are highest at 4.44 workers per 1,000 square feet, or more than four times that of hotels with only 1 worker per 1,000. The

weighted share of employees with earnings below middle income levels is also quite variable: R&D use is the lowest at 19.8%, which is one-fifth the percent for restaurants (95.8%).

When all three factors are combined into a composite impact measure: hotels and R&D have the lowest impact on the need for affordable housing; office and institutional are the second lowest with twice the impact; retail and personal services are next at close to 3.5 times the impact of R & D and 2.5 times hotels; and restaurants have by far the greatest impact –over eight times that of the lowest R&D impact.

There is considerable precedent in varying affordable housing contributions by type of use. It is fairly common in California. A 2010 survey of 27 California communities found that two-thirds varied their contribution amounts by use with half of these having 6 or more use categories and amounts. In Massachusetts, Boston, Cambridge and Somerville all use a uniform contribution amount but Barnstable County varies its amount by use and location in or outside an "economic center". There are six separate uses and associated contribution amounts with fees ranging from $1.27 per square foot for warehouse use within an economic center to $15.34 per square foot for restaurants/food service outside an economic center.

Based on impact alone, there is a case for varying the housing contribution by use. Cambridge could establish a tiered four step fee schedule with different contribution rates for research and development, office, retail/personal services, and restaurants. If the definition of incentive projects is expanded as proposed above, additional rates would be added for institutional, hotel and industrial uses.

However, Cambridge may choose to stick with a single contribution level for administrative simplicity and competitive factors. From an administrative perspective, the occupancy use of a project may be difficult to determine for some projects and use may change over time for a building. The first problem is most likely to occur for office and research and development uses since many of the life science facilities combine office and lab space and these can be interspersed in the same floor or laboratory. There would be an incentive for developers to classify mixed space as research and development space or to under-estimate office space if differential contribution rates were applied. Additional administrative complexities might result from the need to allocate common areas and shared uses (e.g., reception areas, conference rooms, etc.) among different uses. Furthermore, developers and building owners might seek a refund of housing contributions if the allocation of uses changed upon final occupancy. These problems can be addressed by having the contribution rate based on the predominant use in the building. However, this would limit achieving the goal of relating the contribution rate to differential impacts.

Another issue is that building uses often change over time: ground floor space may first be rented to a retail store and later converted to a restaurant. Similarly, a building might first have an office tenant and later be converted to institutional or R&D use. Cambridge could address this issue by basing the housing contribution rate on the initial use but this could create inequitable results between buildings with stable uses and those for which uses change more often. This problem seems greatest for buildings with a larger share of ground floor commercial space which may change more frequently between retail, restaurant and office uses.

Exemption. Under the current ordinance, the first 2,500 square feet of space in a development that has triggered the housing contribution is not counted for purposes of determining how much contribution will be made by the development. This provision does not serve to exempt small projects from housing contributions since the 30,000 square foot threshold itself achieves this purpose, but it does help mixed-use projects that are primarily residential but include a small amount of retail or commercial space. These projects make no contributions if their retail and commercial space falls below 2,500 square feet and have a greatly reduced contribution amount when their commercial space is between 3,000 to 7,000 square feet. However, this provision does slightly reduce housing contribution revenue at the established rate and adds a slight complexity to the policy and its administration.

Impact on Cambridge's Competitiveness

An important consideration for Cambridge in establishing the housing contribution rate is the rate's potential impact on attracting new development and tenants. This is a particularly important concern given that maximum determined rate of $24.30[24] per square foot would be over five times the current rate of $4.58. If adopted, this rate would be more than twice the combined housing and jobs contributions amount in Boston ($10.01) and over four times Somerville's $5.15 amount. An increase in the housing contribution rate increases development costs, which developers must offset through either paying less for land (or an existing building in the case of renovation projects), reducing their return on investment, or collecting higher rents from tenants. The last option, raising rents, may affect Cambridge's competiveness in attracting businesses to new development projects. Although the Cambridge market is highly competitive and a unique location given its proximity to MIT, Harvard, and a large concentration of research activities and innovative firms, it does compete with other locations and a large rent differential will enhance the attraction of other locations. Interviews with developers and brokers indicated that Cambridge's competing locations vary for different types of firms and include the Longwood Medical area, downtown Boston and the Seaport district, and nearby suburban communities.

Tables 28 and 29 compare Class A office and laboratory rents, respectively, for Cambridge, the East and West Cambridge submarkets, competing areas in Boston, and suburban locations such as Lexington, Waltham and Watertown, with sizeable biotech or IT companies. A developers' capacity to pass on the housing contribution to office and other non-residential tenants and still remain economically competitive in attracting tenants depends on rent differentials between Cambridge and competing locations. Cambridge office and lab rents are already well above suburban locations, especially East Cambridge with rents 70% to 80% above suburban alternatives. West Cambridge lab rents are over 50% higher than competing locations in Watertown and Lexington but office rents are only 7% above those in the suburban 128/Mass Pike market area. The maximum determined housing rate, based on the city covering 33.9% of the housing subsidy needed to address housing demand impacts, is $24.30 per square foot of new

[24] Without the 2,500 square foot exemption, the maximum determined rate is $24.00. This analysis uses a contribution rate consistent with the current ordinance that includes the exemption.

development—a $19.72 increase over the current rate. If a developer passed on this increase in full to tenants, it would increase rents by $2.29 per square foot for a ten-year lease[25]. This represents a 4.1% to 6.5% increase in rents depending on the property type and location. It would almost double the current rent differential between West Cambridge and 128/MassPike for office space, bring Cambridge's average office rents closer to Boston's financial district (the difference would drop from $5.80 to $3.51) and increase East Cambridge's current status as one of the region's highest priced office locations. For lab space, it would add to Cambridge's existing large premium over the suburbs but have less impact on Cambridge's competitive position versus Boston due to the limited supply and high cost of laboratory space in Boston.

Table 28. 2014 First Quarter Class A Office Rents in Cambridge, Boston and Suburbs

Community	Average Asking Rent Per Square Foot
Boston—Total	$53.22
Boston—Seaport District	$54.19
Boston—Financial District	$52.72
Suburbs-128/MassPike	$32.73
Cambridge	$48.39
East Cambridge	$55.40
West Cambridge	$35.02

Source: Jones Lang LaSalle Office Statistics, Boston Q1, 2014

Table 29. 2013-2014 Laboratory Rents in Cambridge, Boston and Suburbs

East Cambridge	$51.10
West Cambridge	$44.13
Watertown	$27.67
Lexington	$27.55
Boston-Longwood	$80-$90*

Source: Jones Lang LaSalle Greater Boston Life Sciences Outlook, 2013-2014
*Reflects one lease by Dana Farber at Longwood Center

While this level of rent increase may not deter major pharmaceutical and IT companies from locating in Cambridge, there is more risk that small and early stage firms in biotechnology, IT and other innovative sectors will be unwilling to pay increased Cambridge rents and would locate outside of the city. As a result, Cambridge's character and its role as a hub for innovative small firms would decline. This concern was raised in interviews with real estate developers and cited in the recent K2/C2 report.

Interviews with developers indicate that Cambridge's current housing contribution is not a deterrent to development and most recognized the importance of having this policy to help

[25] This calculation is based on the current 2,500 square foot exemption, 85% net leasable space and a building size of 200,000 gross square feet.

increase the supply of affordable housing. However, developers are concerned about the number and overall cost of development fees and requirements in Cambridge, which can include infrastructure and public realm improvements along with housing contributions and housing units under the Inclusionary Zoning Ordinance. Developers anticipate that these costs may increase further with current proposals for net zero energy use requirements and discussions of private assessments or fees for improvements to Kendall Square. Since multiple additional development costs that are unique to Cambridge will impact investor and developer returns, they could ultimately make Cambridge less attractive for new development. For example, if the increased housing contribution has to be fully financed by developer (or investor) equity and cannot be passed on in tenant rents, it would reduce the investment return by approximately 100 basis points[26]. By itself, this may not deter investment, but if combined with other increased costs and more competition for tenants that constrain rent increases, returns might decline enough that developers would find projects in Boston, suburban locations and other regions more profitable and shift investment activity to these other locations.

[26] This estimate is based on a 200,000 square foot building with total development costs of $80 million and a 20% equity investment. If the project earns an 8% return on a $16 million equity investment, adding the $3.45 million additional housing contribution to the equity investment reduces the return to 6.70%. With an initial 6% return, the housing contribution drops return on equity to 5.02%.

Recommended Housing Contribution Rate and Incentive Zoning Policies

The City of Cambridge established an Incentive Zoning Ordinance in 1988 that requires developers to make a housing contribution to mitigate the impact of new office, research and development, and retail space on housing demand. Since the last study to update this ordinance was completed in 2002, Cambridge commissioned a new study to address the boom new development over the past decade, changed housing market conditions and a desire to expand the policy to address middle income as well as low and moderate income households. This report provides a updated nexus study to quantify the impact of future non-residential development on the demand for affordable low, moderate, and middle income housing in Cambridge and the recommended housing contribution rate to mitigate these impacts.

The analysis detailed in this report supports an increase in Cambridge's housing contribution rate under the Incentive Zoning Ordinance. The degree to which the contribution rate is increased is a matter of balancing public policy goals and considering both the need to address increased affordable housing demand the potential impacts of an increased rate on the city's future development New demand for affordable and middle income housing from projected new development of 4,595,000 square feet over the next 10 years is projected to total 693 units. All of these units require some level of subsidy to be affordable to low-income, moderate income and middle income households. The total required subsidy to build these units is $202.1 million. However, since federal and state resources contribute to meeting this subsidy for low and moderate income units, Cambridge's expected share from the housing contributions is $109.2 million. When applied to the 4.595 million square feet of projected new development, this translates into a maximum determined housing contribution rate of up to $24.30 per square gross square foot under the current policy with a 2,500 square foot exemption and up to $24.00 without the exemption.

In recognition of the impact that adoption of the maximum determined contribution rate could have on Cambridge's regional competiveness, we recommend that Cambridge increase the current contribution rate by adopting a contribution rate in the range of $10 to $12 per gross square foot to lessen the potential for adverse impacts on the city's commercial rents and competitiveness for attracting business and continued investment. This contribution rate would maintain Cambridge at a level comparable to Boston and lessen any combined impact with other requirements that Cambridge might make of large new developments which could increase rents and impact Cambridge's competiveness.

We also recommend the following additional changes to the current Incentive Zoning Ordinance and continuations of existing provisions are recommended to improve its consistent application to large new development projects that generate significant demand for housing:

- Expand the definition of an incentive zoning project to include the seven additional use categories listed on page 51 (transient hotel and motel accommodations, radio and television studios, non-government institutional use for education, health care and social services, light industry/wholesale, and heavy industry);
- Remove the current special permit triggers and make the Incentive Zoning Ordinance

applicable to any non-residential development project over 30,000 gross square feet that meets the expanded set of uses;

- Continue to apply a single housing contribution rate to all uses;
- Continue the current process for rate adjustments based on the CPI: and
- Eliminate the current 2,500 square foot exemption.

In terms of the Housing Creation Option, we recommend that further analysis be undertaken before establishing a specific defined schedule to replace the current discretionary process for administering this provision of the Incentive Housing Ordinance.

Appendix A: Summary Data from Employee Survey

A brief survey was distributed to employers in Cambridge to determine the extent to which employees in large office and institutional buildings demand housing in Cambridge either by having moved to Cambridge as result of their job in Cambridge or sought housing or plan to seek housing due to their job. Surveys were distributed in person and via email to major employers and to tenants in commercial building with over 30,000 square of space. A total of 1,318 employees completed surveys were received with the distribution of responses by type of business as follows:

Type of Business	Number of Responses	Percent of Responses
R and D	389	29.5%
Office	301	22.8%
Institutions	449	34.1%
Retail/Restaurant/Hotel	179	13.0%
Total	1,318	100.0%

Key survey results include:

- 16.3% of respondents live in Cambridge (215 people) whereas 83.7 percent of respondents reported living elsewhere (1,103 people)
- 58% percent of respondents own their residence and 41.7 percent rent.
- 328 people, (24.9 percent of respondents) moved to their current residence as a result of obtaining a job in Cambridge. 114 of these people (34.8 percent of the respondents who moved) reported moving to Cambridge due to the job they attained in Cambridge.
- 228 people or 17 percent of respondents sought housing in Cambridge because of the job they attained in Cambridge but did not move to Cambridge. Of these, 133 cited the high cost or lack of affordable housing as a reason for why they did not move to Cambridge and 32 people cited relative costs as a factor.
    - Other reasons cited for not moving to Cambridge included:
        - Too crowded/density
        - Safety and security concerns
        - School quality
        - Family/spousal reasons
        - Quality or age of housing stock
        - Space constraints/lack of desired green space
        - Lack of supply of available rental housing
        - Parking (hard to find garages or street parking)
        - Daycare too expensive in Cambridge
        - Perception that Cambridge is not "family friendly"
- 174 people not currently living in Cambridge indicated that they plan to move to Cambridge over the next five years, of which 50 people plan to rent housing, 44 plan to purchase housing, and 10 plan to either rent or purchase (69 respondents indicated that they plan to move to Cambridge but did not specify or are unsure if they would purchase

or rent; primarily depending on prices).

Conclusion: After checking for double-counting of people across categories, 92 people or 7 percent of surveyed employees in office, industrial, institutional and retail buildings moved to Cambridge as a result of getting a job and another 133 sought housing in Cambridge but did not move due to its high cost, for a total of 17.1% of survey respondents. This represents the expected demand for new housing due to employment at large non-residential buildings. This estimated demand for housing in Cambridge varied considerably by type of business, with the highest percentage among educational institutions (26.5%) and the lowest among research and development firms (11.3%). The combined group of retailers, restaurants and hotels and office tenants fell in between at 12.3% and 13.3%, respectively. Given the variation in housing demand, these industry-specific percentages are the most appropriate to use in forecasting affordable and middle income housing demand from non-residential development.

Appendix B. Data Tables on Housing Conditions Tables

Table B-1
Population and Household Trends, 2000 and 2010

	Cambridge		Average Annual Change, 2000-2010	Boston MSA [1/]	Massachusetts		Average Annual Change, 2000-2010
	2000	2010		2010	2000	2010	
Population	101,355	105,162	0.4%	4,552,402	6,349,097	6,547,629	0.3%
Households	42,615	44,032	0.3%	1,760,584	2,443,580	2,547,075	0.4%
Average Household Size	2.03	2	-0.1%	2.5	2.51	2.48	-0.1%
Household type							
Families	41.3%	39.6%	-0.4%	62.6%	67.4%	63.0%	-0.7%
Non-Families	58.7%	60.4%	0.3%	37.4%	32.6%	37.0%	1.4%
Tenure							
Owner	32.3%	34.6%	0.7%	61.5%	59.3%	62.3%	0.5%
Renter	67.7%	65.4%	-0.3%	38.5%	40.7%	37.7%	-0.7%

1/ 2000 data is not available for the Boston MSA due to a change in its geographic definition between 2000 and 2010.

Source: U.S. Census, 2000; U.S. Census, 2010; and ConsultEcon, Inc.

Table B-2
Age Distribution of Population, 2000 and 2010

Age	2000 Number	2000 Percent	2010 Number	2010 Percent	Average Annual Change, 2000-2010
Cambridge					
Under 20	18,829	18.6%	17,307	16.5%	-0.8%
20-24	16,090	15.9%	16,576	15.8%	0.3%
25-44	39,144	38.6%	42,709	40.6%	0.9%
45-64	18,010	17.8%	18,582	17.7%	0.3%
65 and over	9,282	9.2%	9,988	9.5%	0.8%
Total	**101,355**	**100.0%**	**105,162**	**100.0%**	**0.4%**
Median Age	***30.4***		***30.2***		
Boston MSA [1/]					
Under 20			1,119,890	24.6%	
20-24			336,178	7.4%	
25-44			1,248,417	27.4%	
45-64			1,251,874	27.5%	
65 and over			596,043	13.1%	
Total			**4,552,402**	**100.0%**	
Median Age			***38.5***		
Massachusetts					
Under 20	1,675,113	26.4%	1,621,143	24.8%	-0.3%
20-24	404,279	6.4%	475,668	7.3%	1.8%
25-44	1,989,783	31.3%	1,732,290	26.5%	-1.3%
45-64	1,419,760	22.4%	1,815,804	27.7%	2.8%
65 and over	860,162	13.5%	902,724	13.8%	0.5%
Total	**6,349,097**	**100.0%**	**6,547,629**	**100.0%**	**0.3%**
Median Age	***36.5***		***39.1***		

1/ 2000 data is not available for the Boston MSA due to a change in its geographic definition between 2000 and 2010.

Source: U.S. Census, 2000; U.S. Census, 2010; and ConsultEcon, Inc.

Table B-3
Household Income Distribution, in 2012 inflation adjusted dollars

	Cambridge		Boston MSA		Massachusetts		Ratio of Cambridge
	Households	% of Total	Households	% of Total	Households	% of Total	to MA
Less than $10,000	3,488	7.7%	104,966	6.0%	159,535	6.3%	1.22
$10,000 to $14,999	2,482	5.5%	80,868	4.6%	132,198	5.2%	1.05
$15,000 to $24,999	3,384	7.5%	131,865	7.5%	213,618	8.5%	0.89
$25,000 to $34,999	2,949	6.5%	124,657	7.1%	195,047	7.7%	0.85
$35,000 to $49,999	4,336	9.6%	179,589	10.3%	277,254	11.0%	0.88
$50,000 to $74,999	6,710	14.9%	276,199	15.8%	412,921	16.3%	0.91
$75,000 to $99,999	5,419	12.0%	229,090	13.1%	329,572	13.0%	0.92
$100,000 to $149,999	7,329	16.3%	311,362	17.8%	422,194	16.7%	0.97
$150,000 to $199,999	3,439	7.6%	150,153	8.6%	190,175	7.5%	1.01
$200,000 or more	5,551	12.3%	162,420	9.3%	193,180	7.6%	1.61
Total Households	**45,087**	**100.0%**	**1,751,169**	**100.0%**	**2,525,694**	**100.0%**	**1.00**
Median Household Income	***$72,225***		***$72,769***		***$66,658***		
Mean Household Income	***$109,212***		***$97,964***		***$89,965***		

Source: U.S. Census Bureau, 2008-2012 American Community Survey; and ConsultEcon, Inc.

Table B-4
Employed Residents by Occupation and Industry, 2008-2012 Estimates

	Cambridge		Boston MSA		Massachusetts	
	Employed Residents	% of Total	Employed Residents	% of Total	Employed Residents	% of Total
Occupation						
Management, business, science, and arts occupations	41,323	69.4%	1,085,701	45.9%	1,427,312	43.2%
Service occupations	6,070	10.2%	381,979	16.2%	562,727	17.0%
Sales and office occupations	9,405	15.8%	557,056	23.6%	785,567	23.8%
Natural resources, construction, and maintenance occupations	948	1.6%	153,895	6.5%	234,051	7.1%
Production, transportation, and material moving occupations	1,806	3.0%	184,837	7.8%	293,333	8.9%
Total (Employed Civilian Population 16 Years and Older)	**59,552**	**100.0%**	**2,363,468**	**100.0%**	**3,302,990**	**100.0%**
Industry						
Agriculture, forestry, fishing and hunting, and mining	55	0.1%	7,132	0.3%	12,941	0.4%
Construction	645	1.1%	123,544	5.2%	182,294	5.6%
Manufacturing	3,487	5.9%	211,339	8.9%	314,245	9.6%
Wholesale trade	558	0.9%	56,968	2.4%	81,702	2.5%
Retail trade	3,627	6.1%	248,651	10.5%	361,663	11.1%
Transportation and warehousing, and utilities	793	1.3%	84,957	3.6%	122,703	3.8%
Information	1,991	3.3%	61,109	2.6%	79,208	2.4%
Finance and insurance, and real estate and rental and leasing	3,703	6.2%	200,403	8.5%	258,406	7.9%
Professional, scientific, and management, and administrative and waste management services	12,218	20.5%	339,523	14.4%	425,375	13.0%
Educational services, and health care and social assistance	24,294	40.8%	634,730	26.9%	906,215	27.7%
Arts, entertainment, and recreation, and accommodation and food services	3,927	6.6%	194,129	8.2%	272,828	8.3%
Other services, except public administration	2,281	3.8%	105,751	4.5%	149,513	4.6%
Public administration	1,973	3.3%	95,232	4.0%	135,897	4.2%
Total (Employed civilian Population 16 Years and Older)	**59,552**	**100.0%**	**2,363,468**	**100.0%**	**3,271,535**	**100.0%**
Population 16 years and Older	**93,440**		**3,701,609**		**5,320,423**	
Percent of Population 16 Years and Older Employed	***63.7%***		***63.8%***		***61.5%***	

Source: U.S. Census Bureau, 2008-2012 American Community Survey; and ConsultEcon, Inc.

Table B-5
Travel Time to Work, 2008-2012 Estimates

	Cambridge		Boston MSA		Massachusetts	
Travel Time to Work	Employed Residents	% of Total	Employed Residents	% of Total	Employed Residents	% of Total
Less than 5 minutes	1,356	2.5%	54,610	2.5%	85,729	2.8%
5 to 9 minutes	4,478	8.2%	182,916	8.3%	286,494	9.3%
10 to 14 minutes	7,477	13.8%	260,396	11.8%	407,026	13.1%
15 to 19 minutes	8,354	15.4%	273,118	12.3%	416,265	13.4%
20 to 24 minutes	7,762	14.3%	289,939	13.1%	414,651	13.4%
25 to 29 minutes	3,900	7.2%	129,802	5.9%	179,744	5.8%
30 to 34 minutes	9,390	17.3%	340,896	15.4%	440,337	14.2%
35 to 39 minutes	1,646	3.0%	76,398	3.5%	99,896	3.2%
40 to 44 minutes	2,893	5.3%	115,710	5.2%	145,531	4.7%
45 to 59 minutes	4,440	8.2%	239,716	10.8%	298,270	9.6%
60 to 89 minutes	1,986	3.7%	191,622	8.7%	241,599	7.8%
90 or more minutes	655	1.2%	56,635	2.6%	79,890	2.6%
Total	**54,337**	**100.0%**	**2,211,758**	**100.0%**	**3,095,432**	**100.0%**
Percent Commuting 30 Minutes or More	***38.7%***		***46.2%***		***42.2%***	

Source: U.S. Census Bureau, 2008-2012 American Community Survey; and ConsultEcon, Inc.

Table B-6
Age of Housing Stock, 2008-2012 Estimates

	Cambridge		Boston MSA		Massachusetts	
Year Built	Number of Units	% of Total	Number of Units	% of Total	Number of Units	% of Total
Built 2010 or later	56	0.1%	3,444	0.2%	4,326	0.2%
Built 2000 to 2009	3,908	8.1%	143,028	7.6%	194,907	7.0%
Built 1990 to 1999	2,354	4.9%	132,488	7.0%	205,609	7.3%
Built 1980 to 1989	3,367	7.0%	198,951	10.6%	302,725	10.8%
Built 1970 to 1979	4,291	8.9%	210,459	11.2%	330,310	11.8%
Built 1960 to 1969	2,791	5.8%	198,030	10.5%	291,931	10.4%
Built 1950 to 1959	2,509	5.2%	210,544	11.2%	324,028	11.6%
Built 1940 to 1949	2,445	5.1%	107,418	5.7%	168,890	6.0%
Built 1939 or earlier	26,557	55.0%	676,125	36.0%	981,480	35.0%
Total	**48,278**	**100.0%**	**1,880,487**	**100.0%**	**2,804,206**	**100.0%**

Source: U.S. Census Bureau, 2008-2012 American Community Survey; and ConsultEcon, Inc.

Table B-7
Occupied Housing Units by Unit Type and Tenure, 2008-2012 Estimates

	Cambridge		Boston MSA		Massachusetts	
Unit Type	Number of Units	% of Total	Number of Units	% of Total	Number of Units	% of Total
Owner-Occupied						
1, detached	3,733	22.9%	805,019	73.8%	1,238,280	77.6%
1, attached	2,136	13.1%	66,972	6.1%	86,947	5.4%
2	3,022	18.6%	76,792	7.0%	103,197	6.5%
3 or 4	3,057	18.8%	42,993	3.9%	57,966	3.6%
5 to 9	1,073	6.6%	20,512	1.9%	24,985	1.6%
10 to 19	728	4.5%	16,578	1.5%	19,377	1.2%
20 to 49	1,064	6.5%	20,397	1.9%	22,133	1.4%
50 or more	1,456	8.9%	23,521	2.2%	25,536	
Mobile home	0	0.0%	18,051	1.7%	17,380	1.1%
Boat, RV, van, etc.	0	0.0%	152	0.0%	158	0.0%
Total Owner-Occupied Units	**16,269**	**100.0%**	**1,090,987**	**100.0%**	**1,595,959**	**100.0%**
Renter-Occupied						
1, detached	610	2.1%	56,115	8.5%	94,521	10.2%
1, attached	902	3.1%	33,079	5.0%	44,853	4.8%
2	3,388	11.8%	109,754	16.6%	156,394	16.8%
3 or 4	5,930	20.6%	140,402	21.3%	209,888	22.6%
5 to 9	4,147	14.4%	82,512	12.5%	122,772	13.2%
10 to 19	2,671	9.3%	66,400	10.1%	88,485	9.5%
20 to 49	3,693	12.8%	69,263	10.5%	83,031	8.9%
50 or more	7,477	25.9%	99,946	15.1%	126,648	
Mobile home	0	0.0%	2,596	0.4%	2,902	0.3%
Boat, RV, van, etc.	0	0.0%	115	0.0%	241	0.0%
Total Renter Occupied Units	**28,818**	**100.0%**	**660,182**	**100.0%**	**929,735**	**100.0%**
Total Occupied Units	**45,087**		**1,751,169**		**2,525,694**	

Source: U.S. Census Bureau, 2008-2012 American Community Survey; and ConsultEcon, Inc.

Table B-8
Housing Unit Occupancy and Vacancy Rates, 2000-2010

	Cambridge				Boston MSA [1/]		Massachusetts			
	2000		2010		2010		2000		2010	
Tenure	Number of Units	% of Total	Number of Units	% of Total	Number of Units	% of Total	Number of Units	% of Total	Number of Units	% of Total
Owner-Occupied Housing Units	13,760	30.8%	15,235	32.2%	1,082,688	57.5%	1,508,248	57.5%	1,587,158	56.5%
Renter-Occupied Housing Units	28,855	64.5%	28,797	60.9%	677,896	36.0%	935,332	35.7%	959,917	34.2%
Vacant Housing Units	2,110	4.7%	3,259	6.9%	122,622	6.5%	178,409	6.8%	261,179	9.3%
Total	**44,725**	**100.0%**	**47,291**	**100.0%**	**1,883,206**	**100.0%**	**2,621,989**	**100.0%**	**2,808,254**	**100.0%**
Homeowner Vacancy Rate [2/]	***2.0%***		***3.3%***		***1.5%***		***0.7%***		***1.5%***	
Rental Vacancy Rate [3/]	***2.8%***		***3.9%***		***5.9%***		***3.5%***		***6.5%***	

1/ 2000 data is not available for the Boston MSA due to a change in its geographic definition between 2000 and 2010.
2/ The homeowner vacancy rate is the proportion of the homeowner inventory that is vacant "for sale." It is computed by dividing the total number of vacant units "for sale only" by the sum of owner-occupied units, vacant units that are "for sale only," and vacant units that have been sold but not yet occupied; and then multiplying by 100.
3/ The rental vacancy rate is the proportion of the rental inventory that is vacant "for rent." It is computed by dividing the total number of vacant units "for rent" by the sum of the renter-occupied units, vacant units that are "for rent," and vacant units that have been rented but not yet occupied; and then multiplying by 100.
Source: U.S. Census, 2000; U.S. Census, 2010; and ConsultEcon, Inc.

Table B-9
Household Size by Household Tenure, 2000-2010

	Cambridge				Boston MSA [1/]		Massachusetts			
	2000		2010		2010		2000		2010	
	Number of Units	% of Total	Number of Units	% of Total	Number of Units	% of Total	Number of Units	% of Total	Number of Units	% of Total
Owner occupied										
1 person	5,600	36.8%	3,164	29.7%	228,864	20.9%	297,972	19.8%	343,656	21.4%
2 persons	5,535	36.3%	3,824	35.9%	369,791	33.7%	509,562	33.8%	556,151	34.6%
3 persons	2,120	13.9%	1,831	17.2%	185,786	17.0%	269,732	17.9%	270,555	16.8%
4 persons	1,357	8.9%	1,303	12.2%	195,578	17.8%	264,278	17.5%	278,507	17.3%
5 persons	441	2.9%	367	3.4%	81,922	7.5%	117,995	7.8%	112,652	7.0%
6 persons	114	0.7%	50	0.5%	23,556	2.1%	33,408	2.2%	32,307	2.0%
7 or more persons	68	0.4%	107	1.0%	10,199	0.9%	15,301	1.0%	14,646	0.9%
Total Owner Occupied	**15,235**	**100.0%**	**10,646**	**100.0%**	**1,095,696**	**100.0%**	**1,508,248**	**100.0%**	**1,608,474**	**100.0%**
Renter occupied										
1 person	12,333	42.8%	7,206	33.9%	268,734	42.0%	386,506	41.3%	383,392	42.4%
2 persons	9,776	33.9%	7,049	33.1%	182,469	28.5%	264,702	28.3%	251,592	27.8%
3 persons	3,915	13.6%	4,082	19.2%	94,398	14.8%	130,606	14.0%	133,277	14.7%
4 persons	1,825	6.3%	2,064	9.7%	59,981	9.4%	88,766	9.5%	85,560	9.5%
5 persons	628	2.2%	566	2.7%	22,447	3.5%	41,064	4.4%	33,347	3.7%
6 persons	209	0.7%	242	1.1%	7,632	1.2%	14,994	1.6%	11,170	1.2%
7 or more persons	111	0.4%	63	0.3%	3,818	0.6%	8,694	0.9%	5,740	0.6%
Total Renter Occupied	**28,797**	**100.0%**	**21,272**	**100.0%**	**639,479**	**100.0%**	**935,332**	**100.0%**	**904,078**	**100.0%**
Total Occupied Units	**44,032**		**31,918**		**1,735,175**		**2,443,580**		**2,512,552**	

1/ 2000 data is not available for the Boston MSA due to a change in its geographic definition between 2000 and 2010.
Source: U.S. Census, 2000; U.S. Census Bureau; and ConsultEcon, Inc.

Table B-10
Contract Rent, 2008-2012 Estimates

	Cambridge		Boston MSA		Massachusetts		Ratio of	Ratio of
Contract Rent	Renting Households	% of Total	Renting Households	% of Total	Renting Households	% of Total	Cambridge to Boston MSA	Cambridge to MA
Less than $250	1,587	5.5%	48,073	7.3%	72,508	7.8%	0.76	0.71
$250 to $499	1,768	6.1%	57,206	8.7%	99,083	10.7%	0.71	0.58
$500 to $749	1,731	6.0%	67,730	10.3%	155,903	16.8%	0.59	0.36
$750 to $999	1,797	6.2%	116,832	17.7%	177,858	19.1%	0.35	0.33
$1,000 to $1,249	3,049	10.6%	123,095	18.6%	146,071	15.7%	0.57	0.67
$1,250 to $1,499	4,120	14.3%	94,343	14.3%	103,684	11.2%	1.00	1.28
$1,500 to $1,999	8,164	28.3%	85,729	13.0%	92,412	9.9%	2.18	2.85
$2,000 or more	5,905	20.5%	46,514	7.0%	49,257	5.3%	2.91	3.87
No Cash Rent	697	2.4%	20,660	3.1%	32,959	3.5%	0.77	0.68
Total	**28,818**	**100.0%**	**660,182**	**100.0%**	**929,735**	**100.0%**	**1.00**	**1.00**
Median Contract Rent	***$1,501***		***$1,061***		***$918***			

Source: U.S. Census Bureau, 2008-2012 American Community Survey; and ConsultEcon, Inc.

Table B-11
Gross Rent Payments, 2008-2012 Estimates

	Cambridge		Boston MSA		Massachusetts		Ratio of	Ratio of
Gross Rent Payments	Renting Households	% of Total	Renting Households	% of Total	Renting Households	% of Total	Cambridge to Boston MSA	Cambridge to MA
Less than $250	1,063	3.7%	34,800	5.3%	51,139	5.5%	0.70	0.67
$250 to $499	1,911	6.6%	56,819	8.6%	92,533	10.0%	0.77	0.67
$500 to $749	1,474	5.1%	48,484	7.3%	104,654	11.3%	0.70	0.45
$750 to $999	1,759	6.1%	91,738	13.9%	163,679	17.6%	0.44	0.35
$1,000 to $1,249	2,617	9.1%	119,660	18.1%	161,719	17.4%	0.50	0.52
$1,250 to $1,499	3,749	13.0%	102,073	15.5%	120,308	12.9%	0.84	1.01
$1,500 to $1,999	8,756	30.4%	120,956	18.3%	133,255	14.3%	1.66	2.12
$2,000 or more	6,792	23.6%	64,992	9.8%	69,489	7.5%	2.39	3.15
No Cash Rent	697	2.4%	20,660	3.1%	32,959	3.5%	0.77	0.68
Total	**28,818**	**100.0%**	**660,182**	**100.0%**	**929,735**	**100.0%**	**1.00**	**1.00**
Median Gross Rent	***$1,585***		***$1,184***		***$1,056***			
$1,250 or More per Month		***67.0%***		***43.6%***		***34.7%***		
$1,500 or More per Month		***54.0%***		***28.2%***		***21.8%***		

Source: U.S. Census Bureau, 2008-2012 American Community Survey; and ConsultEcon, Inc.

Table B-12
Gross Rent as a Percentage of Household Income in Past 12 Months
(Renter-Occupied Units Only)

	Cambridge		Boston MSA		Massachusetts	
Percent of Income	Renting Households	% of Total	Renting Households	% of Total	Renting Households	% of Total
Less than 10 percent	1,109	3.8%	22,928	3.5%	32,821	3.5%
10 to 14 percent	2,359	8.2%	50,076	7.6%	71,345	7.7%
15 to 19 percent	3,317	11.5%	77,771	11.8%	107,608	11.6%
20 to 24 percent	3,847	13.3%	80,698	12.2%	110,576	11.9%
25 to 29 percent	3,591	12.5%	82,332	12.5%	115,229	12.4%
30 to 34 percent	2,585	9.0%	60,937	9.2%	86,870	9.3%
35 to 39 percent	1,702	5.9%	40,084	6.1%	56,166	6.0%
40 to 49 percent	2,195	7.6%	50,734	7.7%	71,667	7.7%
50 percent or more	6,752	23.4%	160,363	24.3%	227,126	24.4%
Not computed	1,361	4.7%	34,259	5.2%	50,327	5.4%
Total	**28,818**	**100.0%**	**660,182**	**100.0%**	**929,735**	**100.0%**

Source: U.S. Census Bureau, 2008-2012 American Community Survey; and ConsultEcon, Inc.

Appendix C: Housing Subsidy Calculation Tables

Table C-1
Distribution of New Affordable Housing Demand in Cambridge by Number of Bedrooms due to Projected Non-Residential Development

	Households by Size				
	One Person	Two Person	Three Person	Four Person	Total
Total New Housing Units Needed Based on New Non-Residential Construction					**692**
Distribution of Units [1/]					
Low Income	42	24	11	31	108
Moderate Income	136	56	21	18	231
Middle Income	82	96	63	112	353
Total	**260**	**176**	**95**	**161**	**692**
Distribution of Units by Number of Bedrooms [2/]					
One Bedroom	100%	20%	0%	0%	43%
Two Bedrooms	0%	80%	80%	0%	31%
Three Bedrooms	0%	0%	20%	100%	26%
	100%	100%	100%	100%	100%
Units by Number of Bedrooms					
Low Income					
One Bedroom	42	5	0	0	47
Two Bedrooms	0	19	9	0	28
Three Bedrooms	0	0	2	31	33
Moderate Income					
One Bedroom	136	11	0	0	147
Two Bedrooms	0	45	17	0	62
Three Bedrooms	0	0	4	18	22
Middle Income					
One Bedroom	82	19	0	0	101
Two Bedrooms	0	77	50	0	127
Three Bedrooms	0	0	13	112	125
Units by Size, Number of Bedrooms					
One Bedroom	260	35	0	0	295
Two Bedrooms	0	141	76	0	217
Three Bedrooms	0	0	19	161	180
Total Units	**260**	**176**	**95**	**161**	**692**

1/ See Section 3. Rounding affects totals and the total number of units demanded is reduced by one in this table to maintain consistency and clarity of analysis focused on whole numbers of rental and ownership units. The total number of units is one unit lower than the housing unit demand presented in Section 3.

2/ Source: City of Cambridge.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-2
New Affordable Housing Demand in Cambridge by Renter and Owner Occupied Units

	Households by Size				
	One Person	Two Person	Three Person	Four Person	Total
Distribution of Units					
Low Income	42	24	11	31	108
Moderate Income	136	56	21	18	231
Middle Income	82	96	63	112	353
Total Units	**260**	**176**	**95**	**161**	**692**
Percent of Households Occupying Ownership Housing [1/]					
Low Income	0%	0%	0%	0%	
Moderate Income	30%	30%	30%	30%	
Middle Income	50%	50%	50%	50%	
Number of Ownership Units					
Low Income	0	0	0	0	0
Moderate Income	41	17	6	5	69
Middle Income	41	48	32	56	177
Total	**82**	**65**	**38**	**61**	**246**
Percent of Households Occupying Rental Housing [1/]					
Low Income	100%	100%	100%	100%	
Moderate Income	70%	70%	70%	70%	
Middle Income	50%	50%	50%	50%	
Number of Rental Units					
Low Income	42	24	11	31	108
Moderate Income	95	39	15	13	162
Middle Income	41	48	31	56	176
Total	**178**	**111**	**57**	**100**	**446**
Units by Tenure (rounded)					
Ownership	82	65	38	61	246
Rental	178	111	57	100	446
Total	**260**	**176**	**95**	**161**	**692**
Rental Units by Number of Bedrooms					
One Bedroom	178	22	0	0	200
Two Bedrooms	0	89	46	0	135
Three Bedrooms	0	0	11	100	111
Total Rental	**178**	**111**	**57**	**100**	**446**
Ownership Units by Number of Bedrooms					
One Bedroom	82	13	0	0	95
Two Bedrooms	0	52	30	0	82
Three Bedrooms	0	0	8	61	69
Total Ownership	**82**	**65**	**38**	**61**	**246**
Total Housing	**260**	**176**	**95**	**161**	**692**

1/ Source: City of Cambridge.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-3
Ownership Units by Number of Persons and Number of Bedrooms for Middle and Moderate Income Households

	Households by Size				
	One Person	Two Person	Three Person	Four Person	Total
Number of Ownership Units (rounded) [1/]					
Low Income	0	0	0	0	0
Moderate Income	41	17	6	5	69
Middle Income	41	48	32	56	177
Total	**82**	**65**	**38**	**61**	**246**
Distribution of Units by Number of Bedrooms [1/]					
One Bedroom	100%	20%	0%	0%	43%
Two Bedrooms	0%	80%	80%	0%	31%
Three Bedrooms	0%	0%	20%	100%	26%
Total	**100%**	**100%**	**100%**	**100%**	**100%**
Distribution of Moderate Income Ownership Units					
One Bedroom	41	3	0	0	44
Two Bedrooms	0	14	5	0	19
Three Bedrooms	0	0	1	5	6
Total	**41**	**17**	**6**	**5**	**69**
Distribution of Middle Income Ownership Units					
One Bedroom	41	10	0	0	51
Two Bedrooms	0	38	26	0	64
Three Bedrooms	0	0	6	56	62
Total	**41**	**48**	**32**	**56**	**177**
Total Ownership Units by Number of Bedrooms					
One Bedroom	82	13	0	0	95
Two Bedrooms	0	52	31	0	83
Three Bedrooms	0	0	7	61	68
Total Ownership	**82**	**65**	**38**	**61**	**246**

1/ See Table C-1.

Note: Rounding may affect totals.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-4
Aggregate and Unit Costs of Affordable Housing Projects in Cambridge
2009 to 2014 City of Cambridge

Affordable Units Produced in Cambridge, 2009 through 2015	**133**	
Cost Categories, Inflation Adjusted	**Amount**	**Percent to Total**
Hard Costs	$36,438,979	57.0%
Soft Costs	15,704,463	24.6%
Acquisition/Land Costs	11,800,158	18.5%
Total Development Cost	**$63,943,599**	**100.0%**
Average Unit Total Development Cost (rounded)	***$481,000***	

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-5
Weighted Average Income by Income Group and Household Size, Households of Workers in Projected Non-Residential Development

	Households by Number of Persons			
	One Person	Two Person	Three Person	Four Person
Distribution of Weighted Average Income				
Low Income	$26,756	$28,729	$29,933	$34,098
Moderate Income	$44,236	$46,736	$47,115	$58,859
Middle Income	$72,174	$82,935	$89,113	$98,628

Source: Bureau of Labor Statistics, Karl F. Seidman Consulting Services; and, ConsultEcon, Inc.

Table C-6
Illustrative Distribution of Affordable Rental Housing Units by Number of Bedrooms and Building Area

	Number of Units	Average Unit Size [1/]	Total Living Area
One Bedroom	200	700	140,000
Two Bedroom	135	950	128,250
Three Bedroom	111	1,150	127,650
Total Units	**446**	**888**	**395,900**
Net Square Feet as a Percent of Gross Square Feet [1/]			70.0%
Total Gross Square Feet (GSF) (Rounded)			**566,000**
Average Unit Size per GSF [1/]			***1,269***

1/ Average unit size and net square feet as a percent of gross square feet are assumed based on inventory of affordable housing projects in Cambridge and surrounding communities. Cambridge affordable housing projects completed or under construction between 2009 and 2014 had an average gross unit size of 1,333 square feet.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-7
Calculation of Total Development Costs of Affordable Rental Housing Units in Cambridge

Project Assumptions		
Number of Units	446	
Average Unit Size GSF	1,269	
Total Project GSF	566,000	
Cost Assumptions [1/]		
Land/Acquisition per Unit Costs	$88,723	
Construction per Unit Costs	$273,977	
Soft Costs, including Design, Permitting, Overhead, Profit, and Contingency, as a Percent of Construction Cost	43.1%	
Development Costs	**Amount**	**Percent to Total**
Land/Acquisition	$39,570,000	18.5%
Construction	$122,194,000	57.0%
Soft Costs, including Design, Permitting, Overhead, Developer's Fee, and Contingency	$52,663,000	24.6%
Total Development Costs (TDC)	**$214,427,000**	**100.0%**
TDC per Unit (rounded to nearest $100)	***$481,000***	
TDC per GSF (rounded to nearest $1)	***$379***	

1/ Cost assumptions are based on weighted average cost metrics from five affordable housing development projects in the City Cambridge constructed or under construction between 2009 and 2014. Estimates are rounded.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-8
Annual Rental Income by Household Income and Size of Household s

Household Size	Annual Income [1/]	Applicable Monthly Rent [2/]	Number of Households	Total Annual Rent
Low Income Households				
1 Person	$26,756	$669	42	$337,126
2 Persons	$28,729	$718	24	$206,849
3 Persons	$29,933	$748	11	$98,779
4 Persons	$34,098	$852	31	$317,111
Moderate Income				
1 Person	$44,236	$1,106	95	$1,260,726
2 Persons	$46,736	$1,168	39	$546,811
3 Persons	$47,115	$1,178	15	$212,018
4 Persons	$58,859	$1,471	13	$229,550
Middle Income Households				
1 Person	$72,174	$1,804	41	$887,740
2 Persons	$82,935	$2,073	48	$1,194,264
3 Persons	$89,113	$2,228	31	$828,751
4 Persons	$98,628	$2,466	56	$1,656,950
Total Households / Housing Units			**446**	
Total Annual Rent				**$7,776,675**
Total Annual Rent (Rounded)				***$7,777,000***

Aggregate Annual Rent by Income Level	Number of Units	Total Annual Rent (Rounded)	Percent of Total Rent	Average Monthly Rent
Low Income	108	$960,000	12.3%	$741
Moderate Income	162	$2,249,000	28.9%	$1,157
Middle Income	176	$4,568,000	58.7%	$2,163
Total	**446**	**$7,777,000**	**100.0%**	**$1,453**

1/ Weighted average annual earnings based on anticipated mix of occupantions and wages in new non-residential development in Cambridge.

2/ Assumed at 30% of monthly income.

Note: Rounding may affect totals.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-9
Summary of Required Affordable Housing Subsidy Rental Units

			By Household Type		
		All Units	Low Income	Moderate Income	Middle Income
Potential Development Costs					
Number of Units		446	108	162	176
Percent to Total		*75.8%*	*24.2%*	*36.3%*	*39.5%*
TDC per Unit		$481,000	$481,000	$481,000	$481,000
TDC per GSF		$379	$379	$379	$379
Total Gross Square Footage (GSF)		566,000	137,058	205,587	223,354
Total Development Costs (TDC)		**$214,427,000**	**$51,924,027**	**$77,886,040**	**$84,616,933**
Net Rental Income	**Unit Factor**	**Amount**	**Amount**	**Amount**	**Amount**
Gross Annual Rent [1/]		$7,777,000	$960,000	$2,249,000	$4,568,000
Less Vacancies [2/]	3% of Gross Rent	($233,310)	($28,800)	($67,470)	($137,040)
Less Total Operating Costs [2/]	$8,500 per Unit	($3,791,000)	($918,000)	($1,377,000)	($1,496,000)
Net Operating Income (NOI)		**$3,752,690**	**$13,200**	**$804,530**	**$2,934,960**
Derivation of Permanent Mortgage / Supportable Debt Calculation		**Amount**	**Amount**	**Amount**	**Amount**
Net Operating Income (NOI)		$3,752,690	$13,200	$804,530	$2,934,960
Debt Coverage Ratio [3/]		1.1	1.1	1.1	1.1
Available for Debt Service		$3,411,500	$12,000	$731,400	$2,668,100
Mortgage Constant [3/]		6.435%	6.435%	6.435%	6.435%
Permanent Mortgage / Supportable Debt		**$53,019,000**	**$186,000**	**$11,367,000**	**$41,465,000**
Supportable Equity Calculation		**Amount**	**Amount**	**Amount**	**Amount**
Required Return on Equity [3/]		8.0%	8.0%	8.0%	8.0%
Revenue Available for Return to Equity		$375,269	$1,320	$80,453	$293,496
Supportable Equity Investment		**$4,691,000**	**$17,000**	**$1,006,000**	**$3,669,000**
Subsidy Required Calculation		**Amount**	**Amount**	**Amount**	**Amount**
Total Development Costs		$214,427,000	$51,924,027	$77,886,040	$84,616,933
Less Permanent Mortgage / Supportable Debt		($53,019,000)	($186,000)	($11,367,000)	($41,465,000)
Less Supportable Equity		($4,691,000)	($17,000)	($1,006,000)	($3,669,000)
Subsidy Required (TDC-Mortgage-Equity)		**$156,717,000**	**$51,721,027**	**$65,513,040**	**$39,482,933**
Subsidy Required as a Percent of TDC		*73.1%*	*99.6%*	*84.1%*	*46.7%*

1/ See Table C-8.

2/ Source: ConsultEcon, based on interviews with housing developers, and City of Cambridge staff input.

3/ Source: ConsultEcon calculation of mortgage constant based on interest rates from the Massachusetts Housing Partnership.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-10
Calculation of Subsidy Required for New Affordable Rental Units per Square Foot of Projected Non-Residential Development

	All Units	Low Income	Moderate Income	Middle Income
Total Development Cost [1/]	$214,427,000	$51,924,027	$77,886,040	$84,616,933
Total Subsidy Required [2/]	$156,717,000	$51,721,027	$65,513,040	$39,482,933
Percent TDC that is Subsidy	73.1%	99.6%	84.1%	46.7%
Derivation of Commercial Square Footage Subject to Housing Contribution				
Total Commercial Square Footage [3/]	4,595,000	4,595,000	4,595,000	4,595,000
Square Footage Exempt from Housing Contribution under Current Policy [4/]	57,000	57,000	57,000	57,000
Commercial Square Footage Subject to Housing Contribution	4,538,000	4,538,000	4,538,000	4,538,000 `
Subsidy Required per Square Foot of New Commercial Development [5/]	**$34.53**	**$11.40**	**$14.44**	**$8.70**

1/ See Table C-7.

2/ See Table C-9.

3/ See Section 2 of report.

4/ Per the City of Cambridge Incentive Zoning Ordinance, the first 2,500 SF of non-residential building area is exempt from the housing contribution. It is assumed that non-residential projects in the future average approximately 200,000 GSF, for a total of 24 projects. Across all projects, 60,000 SF would be exempt from the housing contribution, per the current ordinance.

5/ Total Subsidy Required divided by the total Commercial SF Subject to Housing Contribution.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-11
Affordable Ownership Housing Units by Number of Bedrooms and Building Area

	Number of Units	Average Unit Size [1/]	Total Living Area
One Bedroom	95	700	66,500
Two Bedroom	82	950	77,900
Three Bedroom	69	1,150	79,350
Total Units	**246**	**910**	**223,750**
Net Square Feet as a Percent of Gross Square Feet [1/]			70.0%
Total Gross Square Feet (GSF) (Rounded)			**320,000**
Average Unit Size per GSF [1/]			***1,301***

1/ Average unit size and net square feet as a percent of gross square feet are assumed based on inventory of affordable housing projects in Cambridge and surrounding communities. Cambridge affordable housing projects completed or under construction between 2009 and 2014 had an average gross unit size of 1,333 square feet.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-12
Calculation of Total Development Costs of Affordable Ownership Housing Units in Cambridge

Project Assumptions		
Number of Units	246	
Average Unit Size GSF	1,301	
Total Project GSF	320,000	
Cost Assumptions [1/]		
Land/Acquisition per Unit Costs	$88,723	
Construction per Unit Costs	$273,977	
Soft Costs, including Design, Permitting, Overhead, Profit, and Contingency, as a Percent of Construction Cost	43.1%	
Development Costs	**Amount**	**Percent to Total**
Land/Acquisition	$21,826,000	18.5%
Construction	$67,398,000	57.0%
Soft Costs, including Design, Permitting, Overhead, Developer's Fee, and Contingency	$29,047,000	24.6%
Total Development Costs (TDC)	**$118,271,000**	**100.0%**
TDC per Unit (rounded to nearest $100)	***$481,000***	
TDC per GSF (rounded to nearest $1)	***$370***	

1/ Cost assumptions are based on weighted average cost metrics from five affordable housing development projects in the City Cambridge constructed or under construction between 2009 and 2014. Estimates are rounded.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-13
Conversion of Ownership Unit Household Income by Persons to Household Income by Bedrooms

Household Size	Annual Income [1/]	Number of Households [2/]	Aggregate Income
Calculation of Aggregate Income			
Moderate Income Households			
1 Person	$44,236	41	$1,813,676
2 Persons	$46,736	17	$794,512
3 Persons	$47,115	6	$282,690
4 Persons	$58,859	5	$294,295
Total	**$46,162**	**69**	**$3,185,173**
Middle Income Households			
1 Person	$72,174	41	$2,959,134
2 Persons	$82,935	48	$3,980,880
3 Persons	$89,113	32	$2,851,616
4 Persons	$98,628	56	$5,523,168
Total	**$86,524**	**177**	**$15,314,798**

	Units by Number of Bedrooms			
	One bedroom	Two bedroom	Three bedroom	All Units
Distribution of Units by Number of Bedrooms [3/]				
1 Person	100%	0%	0%	100%
2 Persons	20%	80%	0%	100%
3 Persons	0%	80%	20%	100%
4 Persons	0%	0%	100%	100%
Distribution of Moderate Income Aggregate Income by Unit Size				
1 Person	$1,813,676	$0	$0	$1,813,676
2 Persons	$158,902	$635,610	$0	$794,512
3 Persons	$0	$226,152	$56,538	$282,690
4 Persons	$0	$0	$294,295	$294,295
Total	**$1,972,578**	**$861,762**	**$350,833**	**$3,185,173**
Total Units by Size [4/]	**44**	**19**	**6**	**69**
Avg. Income per Unit by Size	***$44,831***	***$45,356***	***$58,472***	***$46,162***
Distribution of Middle Income Aggregate Income by Number of Bedrooms				
1 Person	$2,959,134	$0	$0	$2,959,134
2 Persons	$796,176	$3,184,704	$0	$3,980,880
3 Persons	$0	$2,281,293	$570,323	$2,851,616
4 Persons	$0	$0	$5,523,168	$5,523,168
Total	**$3,755,310**	**$5,465,997**	**$6,093,491**	**$15,314,798**
Total Units by Size [4/]	**51**	**64**	**62**	**177**
Avg. Income per Unit by Size	***$73,634***	***$85,406***	***$98,282***	***$86,524***

1/ Source: Karl F. Seidman Consulting Services. Weighted average annual household income based on anticipated mix of occupations and average occupational wages for based on projected commercial development in Cambridge.

2/ See Table C-2.

3/ Source: City of Cambridge. See Table C-1.

4/ See Table C-3.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-14
Aggregate Affordable Ownership Unit Sales by Household Income and Size of Unit

Household Size	Annual Income [1/]	Monthly Housing Costs [2/]	Number of Households	Supportable Sales Price [3/]	Total Sales
Moderate Income					
One bedroom	$44,831	$1,121	44	$161,359	$7,099,786
Two bedroom	$45,356	$1,134	19	$161,886	$3,075,841
Three bedroom	$58,472	$1,462	6	$212,063	$1,272,378
Middle Income Households					
One bedroom	$73,634	$1,841	51	$294,270	$15,007,792
Two bedroom	$85,406	$2,135	64	$342,208	$21,901,314
Three bedroom	$98,282	$2,457	62	$394,999	$24,489,954
Total Households / Housing Units			**246**		
Total Sales					**$72,847,065**
Total Sales (Rounded)					***$72,847,000***

Aggregate Sales by Income Level	Number of Units	Total Sales	Percent of Total	Average Sales Price
Moderate Income	69	$11,448,000	15.7%	$165,913
Middle Income	177	$61,399,000	84.3%	$346,887
Total	**246**	**$72,847,000**	**100.0%**	**$296,126**

1/ See Table C-13.

2/ Assumed at 30% of monthly income.

3/ See sales price analysis in Table C-15.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-15
Sales Price Analysis by Unit Size / Number of Bedrooms based on Estimated Monthly Housing Costs Set at 30% of Household Income

Assumptions		
Mortgage	5%	Assumed Downpayment
	95%	Percent of Price covered by Mortgage
	4.25%	Mortgage interest rate
		Private Mortgage Insurance [2/]
Assessed Values for Affordable Housing Units in Cambridge	$150,000	One Bedroom
	$165,000	Two Bedrooms
	$180,000	Three Bedrooms
Real Estate Taxes	$7.82	per 1,000 of assessed values.
Condo Fees, as a Percent of Sales Price	1.50%	Middle Income unit
	2.00%	Moderate Income unit

	Unit Size / Number of Bedrooms		
	One Bedroom	**Two Bedroom**	**Three Bedroom**
Low Income Households	Not applicable because Low Income housing units are assumed to be all rental units.		
Moderate Income Households			
Sales Price	$161,359	$161,886	$212,063
Downpayment	$8,068	$8,094	$10,603
Monthly Payment Calculation			
First Mortgage Payment	$754	$757	$991
Real Estate Taxes	$98	$108	$117
Condo Fees	$269	$270	$353
Total Monthly Payment [1/]	**$1,121**	**$1,134**	**$1,462**
Monthly Payment Target	$1,121	$1,134	$1,462
Middle Income Household			
Sales Price	$294,270	$342,208	$394,999
Downpayment	$14,713.52	$17,110	$19,750
Monthly Payment Calculation			
First Mortgage Payment	$1,375	$1,599	$1,846
Real Estate Taxes	$98	$108	$117
Condo Fees	$368	$428	$494
Total Monthly Payment [1/]	**$1,841**	**$2,135**	**$2,457**
Monthly Payment Target	$1,841	$2,135	$2,457

1/ Assumed at 30% of monthly income. See Table C-14.

2/ Moderate and middle income households earning less than $75,000 annually are assumed to utilize the One Mortgage Program (http://www.mhp.net/homeownership/homebuyer/one_mortgage.php) that waives paying Private Mortgage Insurance (PMI) through participating lenders, many of which are located in Cambridge. Middle income households earning more than $75,000 are assumed to pay required PMI through capitalized PMI thus increasing the loan amount, downpayment, or through monthly PMI payments.

Source: Massachusetts Housing Partnership; City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-16
Summary of Subsidy Required for Affordable Housing Ownership Units

				By Household Type	
			All Units	Moderate Income	Middle Income
Potential Development Costs					
Number of Units			246	69	177
Percent to Total				*28.0%*	*72.0%*
TDC per Unit			$481,000	$481,000	$481,000
TDC per GSF			$370	$370	$370
Total Gross Square Footage (GSF)			320,000	89,756	230,244
Total Development Costs (TDC)			**$118,271,000**	**$33,173,573**	**$85,097,427**
Aggregate Unit Sales Proceeds	**Units**	**Average Price [1/]**	**Sales Proceeds**	**Sales Proceeds**	**Sales Proceeds**
Moderate Income	69	$165,913	$11,448,000	$11,448,000	$0
Middle Income	177	$346,887	$61,399,000	$0	$61,399,000
Total Sales Proceeds	**246**	**$296,126**	**$72,847,000**	**$11,448,000**	**$61,399,000**
Subsidy Required Calculation			**Amount**	**Amount**	**Amount**
Total Development Costs			$118,271,000	$33,173,573	$85,097,427
Less Sales Proceeds			($72,847,000)	($11,448,000)	($61,399,000)
Subsidy Required (TDC-Sales Proceeds)			**$45,424,000**	**$21,725,573**	**$23,698,427**
Subsidy Required as a Percent of TDC			*38.4%*	*65.5%*	*27.8%*

1/ See Tables C-12 and C-13 for derivation of average sales price.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-17
Calculation of Subsidy Required for New Affordable Ownership Units per Square Foot of Projected Non-Residential Development

	All Units	Moderate Income	Middle Income
Total Development Cost [1/]	$118,271,000	$33,173,573	$85,097,427
Total Subsidy Required [2/]	$45,424,000	$21,725,573	$23,698,427
Percent TDC that is Subsidy	38.4%	65.5%	27.8%
Derivation of Commercial Square Footage Subject to Housing Contribution			
Total Commercial Square Footage [3/]	4,595,000	4,595,000	4,595,000
Square Footage Exempt from Housing Contribution under Current Policy [4/]	57,000	57,000	57,000
Commercial Square Footage Subject to Housing Contribution	4,538,000	4,538,000	4,538,000
Subsidy Required per Square Foot of New Commercial Development [5/]	**$10.01**	**$4.79**	**$5.22**

1/ See Table C-11.

2/ See Table C-14.

3/ See Section 2 of report.

4/ Per the City of Cambridge Incentive Zoning Ordinance, the first 2,500 SF of non-residential building area is exempt from the housing contribution. It is assumed that non-residential projects in the future average approximately 200,000 GSF, for a total of 24 projects. Across all projects, 60,000 SF would be exempt from the housing contribution, per the current ordinance.

5/ Total Subsidy Required divided by the total Commercial SF Subject to Housing Contribution.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-18
Calculation of Subsidy Required for New Affordable Rental and Ownership Units per Square Foot of Projected Non-Residential Development

	All Units	Low Income	Moderate Income	Middle Income
Total Development Cost [1/]	$332,698,000	$51,924,027	$111,059,614	$169,714,360
Total Subsidy Required [1/]	$202,141,000	$51,721,027	$87,238,614	$63,181,360
Percent TDC that is Subsidy	60.8%	99.6%	78.6%	37.2%
Derivation of Commercial Square Footage Subject to Housing Contribution				
Total Commercial Square Footage [2/]	4,595,000	4,595,000	4,595,000	4,595,000
Square Footage Exempt from Housing Contribution under Current Policy [3/]	57,000	57,000	57,000	57,000
Commercial Square Footage Subject to Housing Contribution	4,538,000	4,538,000	4,538,000	4,538,000
Subsidy Required per Square Foot of New Commercial Development [4/]	**$44.54**	**$11.40**	**$19.22**	**$13.92**

1/ See Table C-9 and Table C-15 for detail on breakdown by rental and ownership units.

2/ See Section 2 of report.

3/ Per the City of Cambridge Incentive Zoning Ordinance, the first 2,500 SF of non-residential building area is exempt from the housing contribution. It is assumed that non-residential projects in the future average approximately 200,000 GSF, for a total of 24 projects. Across all projects, 60,000 SF would be exempt from the housing contribution, per the current ordinance.

4/ Total Subsidy Required divided by the total Commercial SF Subject to Housing Contribution.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.

Table C-19
Sources of Funds for Recent Affordable Housing Projects in Cambridge
(Nominal Dollars)

	All Projects [1/]	
Source of Funds	**Amount**	**Percent to Total**
Debt/Sales	$11,831,798	19.1%
Equity	19,906,490	32.2%
Cambridge Affordable Housing Trust (CAHT)	16,954,069	27.4%
Other City Source (CDBG, HOME, etc.) [2/]	2,873,966	4.6%
Department of Housing and Community Development, Commonwealth of Massachusetts	8,850,000	14.3%
Other miscellaneous	1,477,460	2.4%
Total Sources of Funds	**$61,893,783**	**100.0%**
Source of Funds		
Debt/Sales	$11,831,798	19.1%
Cambridge Affordable Housing Trust (CAHT)	16,954,069	27.4%
Other Sources of Subsidy Funds	33,107,916	53.5%
Total Sources of Funds	**$61,893,783**	**100.0%**
Total Subsidy Funds (CAHT + Other Sources of Subsidy Funds)	**$50,061,985**	
CAHT Percent of Total Subsidy Funds [3/]	***33.9%***	
CAHT "Leverage" Ratio, CAHT to Other Subsidies [4/]	***1.95***	

1/ Source: City of Cambridge. Based on five new construction affordable housing development projects completed or under construction in Cambridge between 2009 and 2014.

2/ CDBG = Community Development Block Grant. HOME funds are another federal program that supports housing.

3/ CAHT contribution divided by the Total Subsidy Funds.

4/ The leverage ratio is equal to the Other Sources of Subsidy Funds divided by CAHT contribution.

Source: City of Cambridge; Karl F. Seidman Consulting Services; and ConsultEcon, Inc.