

# Google's Expansion and The Potential Impact on Boulder's Housing Market

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## Abstract

*Google has officially announced plans to expand their workforce in the city of Boulder. By the first quarter of 2017 Google wants to increase their employee count in Boulder from the current 300, to potentially 1500.<sup>1</sup> Boulder is an interesting city due to the fact that it is a college town that has forbidden growth of the city upwards (strict limitations on building height) and outwards. Given Boulder's limitations for space, the influx of high income employees could potentially create a strain on the city's housing market. The goal of this study was to answer the question of what could possibly happen if all 1200 of the incoming employees chose to either buy or rent property in the city of Boulder.*

## I. INTRODUCTION

To understand Google's origin and growth within Boulder it is important to take a quick look into their history. They originally set up their 300 person operation in 2006 once they acquired the 3-Dimensional rendering software company Sketchup headquartered in Boulder. Despite selling Sketchup in 2012, Google's office remained. They conducted a small expansion in the city when they built across the street from their current office at 26th and Pearl. This brings us to the current day in which they are planning on building a 4.29 acre lot at 30th and Pearl<sup>2</sup>. When discussing their decision to expand and build a campus on this specific location, they claimed to have explored other areas of Colorado however they decided that Boulder fit their needs best because of its "business climate and infrastructure to support the needs of Google's Operations"<sup>3</sup>. Despite the company's large campus size, none of the buildings will exceed 55 feet. The campus itself could be fairly unobtrusive due to the fact that the lot they bought hosts mostly empty

buildings, however they will still be forcing out some local businesses. The most important aspect of this expansion though is the increase in population in a city that has a 3.6 percent vacancy rate among rental units<sup>4</sup> and an average of 3.11 percent vacant houses<sup>5</sup>. Given these low figures for vacancy, my study took me in the direction of examining specifically the potential displacement that the influx of employees could cause.

## II. DATASETS

For my datasets I pulled a large amount of Geographic Information Systems (GIS) data from the Boulder County Assessor's Website. This data came in the form of very large comma separated value sheets (usually half a gigabyte). The goal behind pulling these figures was to get all the property values in the City of Boulder. I found the property values, however there were quite a few adjustments that needed to be made, these changes are largely discussed in the Methods section. Overall I pulled the material which gave me all the property values

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<sup>1</sup>This according to the Denver Post

<sup>2</sup>Denver Post

<sup>3</sup>Source BizWest quote from Scott Green Google's Boulder site director

<sup>4</sup>page 21 Boulder Market Housing Analysis

<sup>5</sup><http://zipatlas.com/us/co/boulder/zip-code-comparison/percentage-vacant-housing-units.htm>

in Boulder County, and once I had this data I parsed it down to cut out all the surrounding towns (Superior, Longmont, Lafayette, etc.). In addition to Boulder County's information I pulled GIS information from Zillow's API to get another idea of potential housing values in the City of Boulder. Once I had all the information on housing prices, I needed to find the range of job positions and salaries for the incoming Google employees.<sup>6</sup> The property values and potential salaries of the incoming employees being settled, I needed to dictate the split of potential renters versus buyers, as well as general disposable income towards housing. BBC Research and Consulting published their analysis in their 2013 report *Boulder Market Housing Analysis* in which they explained that Boulder has a half and half split between renters and buyers. This proportion is high of course because of the University of Colorado student population, so I have run my analysis with differing proportions of the incoming employees as renters or buyers. BBC's report also postulated the figure of 30 percent of a person's income should be spent on housing if their residence is still to be considered affordable.<sup>7</sup>

### III. METHODS

Regarding methods used in this study, I mostly employed simple functions to handle the employee's incomes versus randomly selected houses in Boulder. To start with the housing prices I took all of the assessed values of the homes according to the city of Boulder. However I soon learned that in the overwhelming majority of cities within the United States, the publicly assessed value of a home is significantly lower than the market value.<sup>8</sup> In the footnote I included, the website explains how the assessed and market values can differ so greatly. The main point to take away is that the

city or county assessor is determining housing values with tax ramifications in mind, as opposed to the market value of a home being a more straightforward prediction for what a home could sell for if it were to be put on the market. To reconcile the difference between these two values I pulled data from the Zillow API which gave me the median prices from all zip codes in Boulder. Zillow separated these costs into top tier and middle tier homes which is appropriate for this study because the incoming employees can be considered the upper end of the middle tier as well as the top tier. I took all the medians of all zip codes provided then took the median of these median values to get a grand total of 376,600. I subtracted the total median of all assessed properties in the city of Boulder(19,892) from the Zillow median, to get a value of 356,708. This new median was added on to all values from the Boulder Assessor's table to get the new price of a home

$$ZillowMedian - AssessorMedian = MedianAddOn$$

$$376600 - 19892 = 356708$$

**Table 1:** Median Values Taken from Zillow

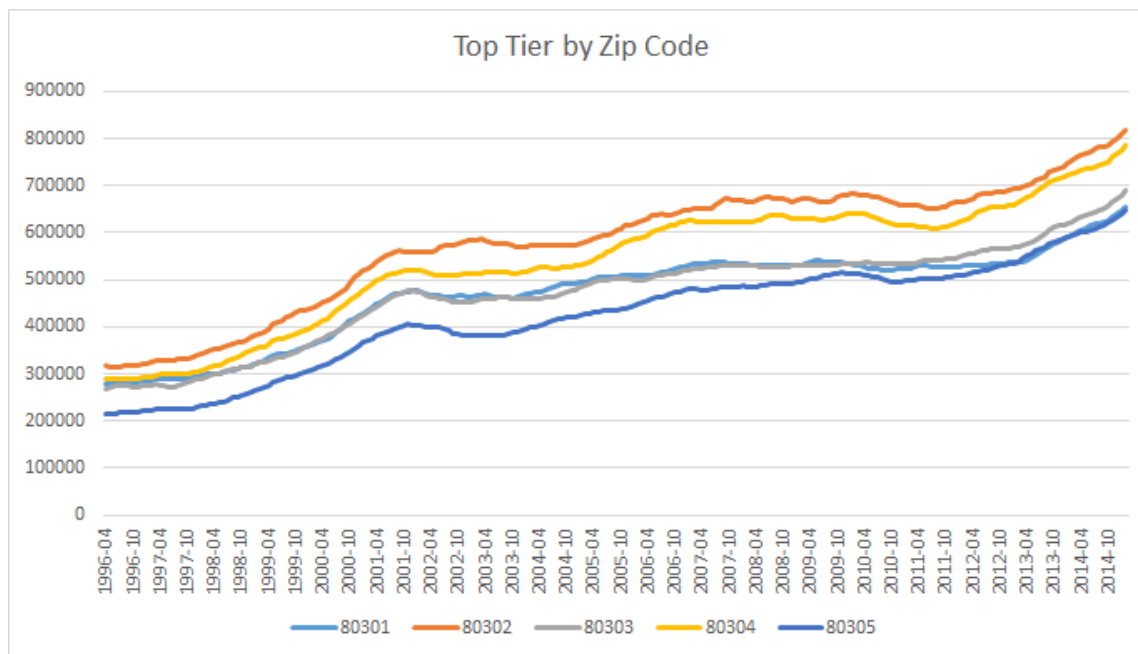
Break Down of Medians		
Tier	Zip Code	Median
Top	80301	506100
Top	80302	603700
Top	80303	500000
Top	80304	569700
Top	80305	435200
Middle	80301	313900
Middle	80302	315200
Middle	80303	304400
Middle	80304	296300
Middle	80305	318000

Once I had the prices of the homes I had to decide on the best way to determine whether

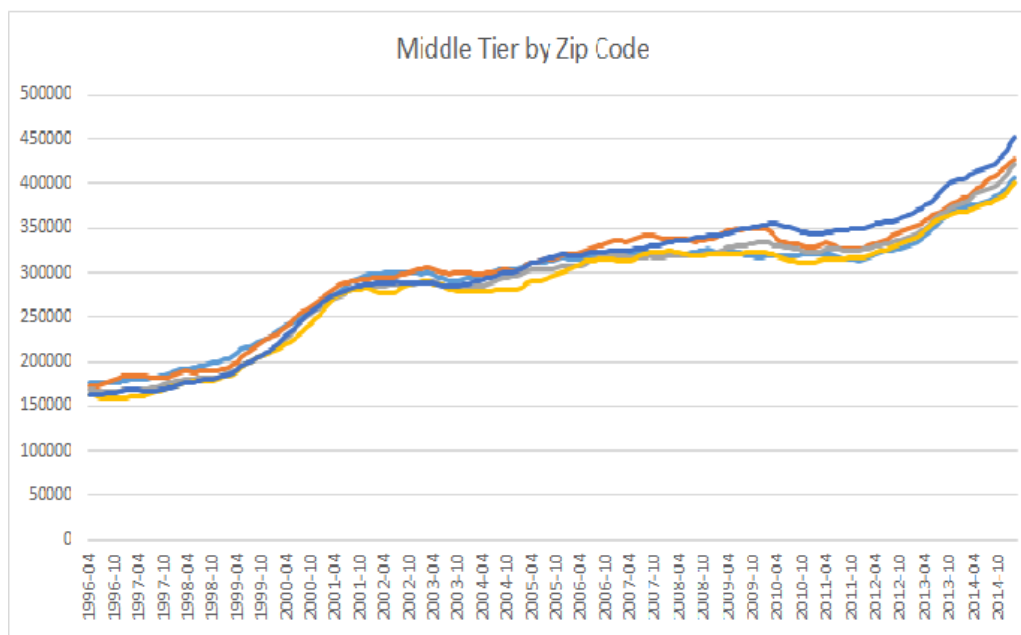
<sup>6</sup>Taken from payscale.com

<sup>7</sup>page 24 of *Boulder Market Housing Analysis*

<sup>8</sup><http://www.home-plans-advisor.com/assessed-value-vs-market-value.html>



**Figure 1:** *Top Tier Property Values by Zip Code provided by Zillow*



**Figure 2:** *Middle Tier Property Values by Zip Code provided by Zillow*

these incoming employees would buy or rent the homes based on its price and their income. To handle the employees I wrote a program that would generate a worker with a randomly generated job position and a salary based on that position. I created 1200 employees total, as the workforce is supposed to grow from 300 to 1500. I ran the program as a single test of 1200 employees, then I ran it ten times over generating 12000 employees to get a more solid average. Under one test analysis, I dictated half of the employees to be renters and half buyers. I also ran an analysis in which 60 percent were buyers and 40 renters. Within the differing renter buyer proportion analyses, I changed two other variables. In order for a house to be affordable for the home owner employees, they were allowed to spend 5 times their annual income in one scenario, and 4 times their annual income in another. For the rental portion of the workers I varied what is called the "price to rent ratio" as dictated by

$$\text{pricetorent} = \text{housingprice} / (\text{monthlyrent} * 12)$$

<sup>9</sup>. I decided to set the price to rent ratio to a high value of 10, because given BBC's figures of a 3.6 percent rental vacancy rate within the city and .2 percent vacancy rate within the university submarket, it is safe to say that Boulder is a renter's market <sup>10</sup>. This value actually generated rental rates much lower than I would have expected but I will discuss this further in the results section. For the second run of tests I set the price-to-rent ratio to a lower 15 which would be more of an advantage to the renters and as I will argue later, more accurate to what I would expect of the results.

To revisit the proportion of employees I set to buying versus renting, I felt that a half and half split was a very high proportion of renters considering the rental market is largely students which is why I also wanted to run a 60 to 40 percent split. Even 40 percent seems to be on the higher end of renters versus buyers however I feel that both of these higher figures are justifiable due to the fact that a large

portion of employees will not have bought a house yet and will need to stay in some form of temporary housing until they are settled.

Lastly I wanted to discuss the methodology behind deciding to include all zip codes of Boulder in factoring the study. Originally I was on the fence as to whether I should exclude the 80302 zip code because it contains the predominantly student population in the area known as "The Hill". This area is not always considered the most welcoming to residents older than the traditional undergraduate age and is largely avoided by newcomers outside of that age range. While 80302 has "The Hill" it also has large portions of Folsom street and Pearl Street which are higher income, quieter, and desirable places to live. Pearl Street especially is a hub of commerce with companies like Galvanize Boulder, GNIP, SolidFire, and even Google itself. So to exclude 80302 I felt would be unjustifiable.

#### IV. RESULTS

The results for this study were mostly uniform with one major twist. I ran the program that generated my employees once and pulled the buying/renting rate vs the failure rate. To get an even average of the values I ran the program ten times for a larger sample size. Overall the difference in averages from running the program once to running it ten times over were minimal. Under the constraints of the housing prices being 5 times their annual income and the price to rent index being set to 15, the Google employees were overwhelmingly able to both purchase the house or rent the property they were paired up with. After multiple runs the overall average of successful purchases if the buyers were willing to spend 5 times their annual income was

$$(98.5 + 98.6 + 98.6 + 98.5) / 4 = 98.55$$

. The averages of employee's renting when the price to rent ratio was 15 was.

$$(98.5 + 98.4 + 99.3 + 98.3) / 4 = 98.6$$

<sup>9</sup>taken from <http://www.investopedia.com/terms/p/price-to-rent-ratio.asp>

<sup>10</sup>rates taken from pages 18-19

A 98.55 purchase rate seem suspiciously high however I felt the median method I was using was dependable so I could not find any reason to discredit the high average. Regarding the 98.6 rental rate, this result was about what I was expecting. High income employees should be able to rent in a competitive market with maybe the exception of the lowest income employee making 88,634 trying to rent out the most expensive houses. When the price to rent ratio is set at 15 the median rental rate is 1,767. Setting the price to rent ratio equal to 10 was an interesting result in that it drove down the rental pass rates more than any other metric I varied. The median rent for the price to rent ratio set at 10 was 2,650. It surprised me that this median rent could drive the average rent down to

$$(83 + 82.4 + 62.1 + 60.6) / 4 = 72.05$$

. Granted 2,650 dollars needed to be 30 percent of one's monthly income meaning

$$2650 = .3 * x$$

which leads to a monthly income of 8,833, and an annual income of 105,996. The median income of the provided employees is 135,591 meaning we should get an acceptance rate of roughly 72 percent. This is a telling result because the median annual income for the residents of Boulder was 54,539 as of 2012 <sup>11</sup>. According to BBC's analysis, the median rent as of 2012 was 1,080 <sup>12</sup> which is of course much closer to the price to rent ratio of 15. So once we get an injection of 1200 employees whose median value is well over double the recent median value of Boulder's residents we could potentially see prices increase to get closer to an acceptance rate of 72 percent, hence a monthly rental rate with a median closer to 2,650.

The map on the following page is a coarse visualisation of the incoming workers with the factors of; a half and half split, housing price equal to 5 times their gross income, and 15 price to rent ratio. The yellow dots represent

purchases or rent being taken and the red is the rejection. I could not fully contain all of the points being made on the graph however While the rejected dots may seem too sparse, I believe them to be more accurate than they first appear. The dots are largely being crowded out. Clustering is not the most appropriate approach to get a cleaner view of the individually rejected properties because the purchased properties flooding the graph adds to the effect of what their potential for change could look like. Overall, this research lends itself to the simplistic conclusion that these high earning employees whose median salary is significantly higher than the rest of the currently residing population, could potentially cause massive displacement in the saturated housing market. Roughly if the 98 percent figure is taken, then we have  $(1200 * .98 = 1176)$ , 1176 people who would either be priced out or selling their homes come 2017. More specifically the rental market could see as much as  $(600 * .98 = 588)$ , 588 people being displaced. The rental market may be more of an indicator of "pricing out" or displacement in that renters are forced into competing with one another for housing as opposed to home owners who have the option to sell or not sell. This does however discount the factor of affordability of a city no longer being an option for home owners with slightly lower incomes once high income residents flood a community.

**Table 2:** Averages for Home Buyers

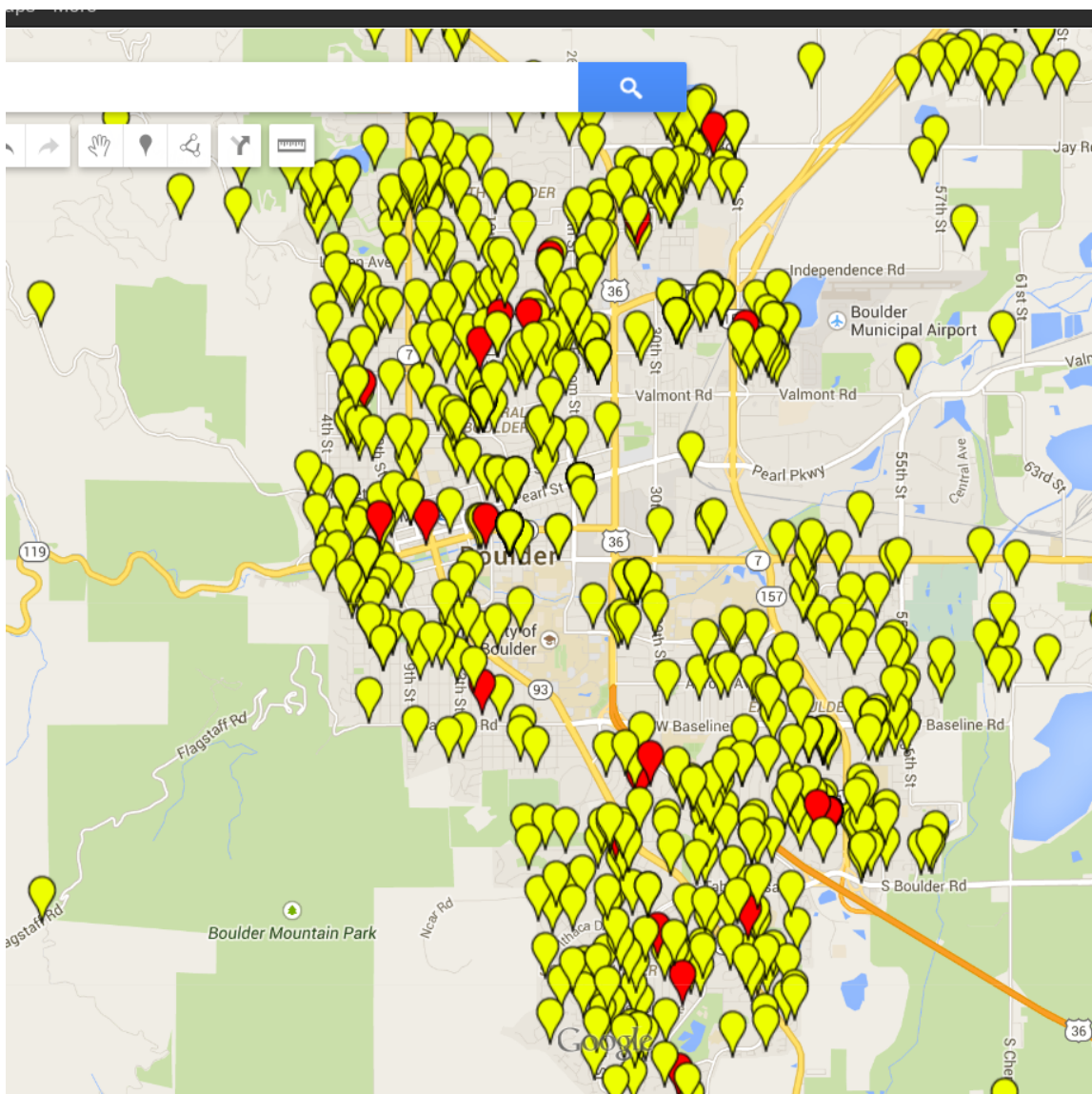
Price of House	Buyers	Houses Bought	Avg Purchase Rate
5*Gross Income	600	591	98.5
5*Gross Income	6000	5913	98.6
5*Gross Income	720	710	98.6
5*Gross Income	7200	7089	98.5
4*Gross Income	600	584	97.3
4*Gross Income	6000	5861	97.8
4*Gross Income	720	705	98
4*Gross Income	7200	7052	98

<sup>11</sup>page 6 Boulder Housing Market Analysis

<sup>12</sup>pg 22

**Table 3: Averages for Renters**

Price to Rent Ratio	Renters	Houses Rented	Avg Rental Rate
10	600	498	83
10	6000	4948	82.4
10	480	298	62.1
10	4800	2908	60.6
15	600	591	98.5
15	6000	5903	98.4
15	480	477	99.3
15	4800	4718	98.3



## V. DISCUSSION

### I. Datasets

Reflecting on my datasets there could have been a more unified structure for the values of the homes. Pulling data from the Boulder Assessor's office distracted from the spatial component of the study because, while the data included mailing addresses it was not categorized by zip code as far as I could tell. Plus there was so much time spent on parsing out extraneous information; getting rid of surrounding areas, cutting out the mobile homes, and finally patching together massive data sets, that it was difficult to keep the progress of the study consistent. Instead of randomly selecting homes to compare against the employee, it may be better to introduce a controlled bias into the study that could see if they take to some areas more so than others. A great direction for this study to be taken in is to focus on the zip codes instead of individual properties, their market values instead of assessed values, and to use the displacement information to try to predict the future of rental and housing prices in Boulder.

### II. Methods and Results

Earlier in the Dataset section I mentioned focusing on zip codes as opposed to individual properties, I would like to revisit this point as I believe it to be indicative of the main challenge regarding this study. There was so much data present in this project that the old maxim "Can't see the forest for the trees" was very appropriate. Clustering could be a great solution to this challenge because instead of focusing on individual homes scattered across the city we could examine specific areas to determine a pattern. Clustering could provide the focus needed to determine future trends regarding specific areas within the city. My method was to pull random values from the housing csv however

if future researchers could find an algorithm that in some way can determine preference we could get a much more specific mapping of displacement and how that would affect the less popular areas due to spilling over. In determining future behavior I feel the increase in median income is a good place to start but it would be interesting to see what other formulas could be more effective or which could be valuable additions. Spatially, after covering the city, moving to Boulder County as a whole to take into account the rise or decline in rent and prices of homes in the surrounding areas such as Lousiville, Longmont, Superior, etcetera could be a relevant next step. Doing similar studies on these outlying areas would be interesting, because a rise in prices could be much more telling in that they have more room for expansion so arguably less of a need to raise the cost of living. Comparing and contrasting these areas with one another and seeing if the population spikes in any one of them in particular would make for an engrossing discovery into what possible areas of commerce could be up and coming. While the main focus of this particular study was to examine what effects the new Google employees could have on the housing market in the city itself, it would be even better to see how these 1200 employees could affect an entire county!

## REFERENCES

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