Supply and Demand of Apartment Complexes in San Marcos, Texas Final Report

BOBCAT COMMUNITY CONSULTANTS

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Abstract

This project analyzed the need for the City of San Marcos to continue building large apartment complexes aimed at college-aged students (18-24) attending Texas State University. Over the last few years, San Marcos has experienced a jump in the number of large rent-by-the bed apartment complexes changing the previous rental market and gentrifying neighborhoods. Although San Marcos historically had a higher percentage of renters than homeowners, residents and university staff alike are concerned about the character of their city, previously balanced as a retirement and working class community.
For the needs of the City of San Marcos and it's student population alike, the Bobcat Community Consultants (BBC) has conducted research on the density of apartment complexes and a timeline of how the number of apartments have increased since the year 2000, and a quick projection to the future with the complexes currently approved by the city and under construction. It is our hope that with this project, the city of San Marcos planning department and community leaders can make an informed decision about the development of further apartment complexes.

1. Introduction

1.1 Background

To make a holistic and inclusive community, the City of San Marcos constantly engages with the general public to create a vision for future development. The city has been home to Texas State University since the turn of the 20th century in 1899. Over 120 years later the community has maintained a unique identity of being a place for youth and retirement age residents. The continous growth of San Marcos has allowed for the construction of many different apartment complexes over the years, but has it come to a point where there are too many apartment complexes in San Marcos?

The implementation of a geographic information system (GIS) would provide the City of San Marcos and local law enforcement agencies with a needs assessment for new rent-by-bed apartment complexes. Because of the possible abundance of student housing could negatively affect the community in the sense of traffic issues, infrastructure and gentrification. One of the main objectives is to provide city officials with updated data from apartment complexes throughout the city. The city currently has a Multifamily Status Report last updated in June 2019 with a list total of 50 apartments. Bobcat Community Consultants (BCC) will update the list to the true value of 104 apartments, consisting of rent-by-bed and traditional apartments. With this information BCC will determine the need for new rent-by-bed complexes in San Marcos, Texas.

1.2 Problem Statement

The objective of the study is to identify the supply and demand of student oriented apartments versus the population age group 18-24 in San Marcos Texas. With the help of Geographic Information Systems (GIS) analytical tools such as the Calculate Field tool and the division tool we hope to achieve this goal. This study will help the City of San Marcos determine the need for further development of student oriented apartment complexes.

1.3 Reference to Literature

This study was a good fit for GIS technology because it gives an excellent representation of the spatial data and how it evolved over time. The maps help layout some of scenes for Rent-by-the-bed apartments showing the trend for them appearing after the year 2005. Similar studies have been performed in Real Estate markets (Clapp & Rodríguez. 1998).

2. Data

2.1 Master Data List

Most of our data was secondary-level and obtained from valid sources. We, Bobcat Community Consultants, conducted a market survey to collect information about apartments in San Marcos, Texas is our only primary-level data. The master data list in figure 1 shows the data used for this project.

Entity	Attributes	Spatial Object	Status	Source
San Marcos Apartment Market Survey	Name, Status, Location, Units, Bedrooms, Traditional or Individual Lease, ACT Allies, Management Team, Longitude, Latitude, Shape Area	Points	Available	Bobcat Community Consultants
Multi Family Project Status Report -June 2019	Project Name, Status, Location, Units, Bedrooms, Construction Value, Developer	Table	Available	City of San Marcos
Population Data	Census Block group ID, Population Value	Polygons	Available	SimplyAnalytics
Centerline	Name, Roadtype, FullStreet, Number of Lanes	Lines	Available	City of San Marcos
San Marcos City Limit	City Limit, Shape Area	Polygons	Available	City of San Marcos
Condensed People Per Bedroom	Name, Units, Beds	Table	Available	Texas State Attorneys for Students
Building Footprint	Name, Units	Polygons	Available	City of San Marcos

Figure 1. Master Data List

2.2 About the Data

The San Marcos Apartment Market Survey was evenly collected by every team member. The market survey started off as an excel sheet with a compiled list of 104 apartment complex names and locations. The complex names and locations were collected through a simple google search – Apartments in San Marcos, Texas. After, we joined the Multi Family Project Status Report – June 2019 to our market survey based on like-attributes (Name) to help fill out attributes such as number of units, status, and bedrooms. Once these attributes were attained, we called each complex to collect the rest of the attributes i.e. status, number of beds, units, traditional or individual lease, and if they allowed double occupancy. The Attorneys for Students Office provided several documents containing information on management teams, ACT Allies, and number of units and bedrooms. We used these documents to complete our market survey and most importantly, to cross-reference our number of units and bedrooms for each complex. With these documents we were able to verify the credibility of our market survey. The management teams, ACT Allies, and double occupancy fields were not used for our analysis but were requested by our clients for future analysis. We used the locations of the apartments to geocode using a google drive tool called "Geocode by Awesome Table". Once we had a latitude and longitude field for all the complexes, we created point data to use for our analysis. This point shapefile was one of the most important data acquired in order to complete our supply and demand analysis, with the bedrooms acting as the "supply". Only a total of 76 out of the 104 apartments were used for analysis because only 76 had attributes for the status field. This point data has the GCS WGS 1984 geographic coordinate system.

Multi Family Project Status Report - June 2019 was downloaded from the City of San Marcos GIS Portal as an excel file. Though the list only contains a fraction of the apartments we used for analysis, the report was used to fill in attributes for our market survey. Once in ArcGIS Pro the table was joined to our market survey based on Name and was used to fill in attributes for number of units and bedrooms. This report does not have a coordinate system as it was solely used to join like attributes. Without this data it would have taken longer to collect our primary-level data.

The census block group data was downloaded from Simply Analytics for the state of Texas and only from ages 18-24. This data was obtained so we could use the population data per census block group to act as the "demand" for our analysis. Since the hypothesis of our analysis is to demonstrate that there is an excess of rent-by-bed apartments than there are students to occupy them, we decided that ages 18-24 would more accurately represent the

demographic that are renting the apartments. This data was also vital to complete our analysis.

The building footprint data was downloaded from the City of San Marcos GIS Portal and was used for the visual representation of apartment growth maps. The original dataset contained polygons of what seemed like all the businesses in San Marcos but was filtered to only show the apartments using the fields CATEGORY and SUBCAT. It has a projected coordinate system of NAD 1983 StatePlane Texas South Central FIPS 4204 Feet and had GCS NAD 1983 as the geographic coordinate system, which was projected to GCS WGS 1984.

The Centerline and San Marcos City Limit shapefiles were both downloaded from the City of San Marcos GIS Portal. The San Marcos City Limit was used to clip the census block group data to the region and as the scope of our project. The centerline shapefile has all the roads in San Marcos but after selecting by attributes we only used major highways – I35, Highway 80, Highway 21, and Highway 123. This shapefile was used for visual aid purposes and not for analysis. Both the city limit and centerline have a projected coordinate system of NAD 1983 StatePlane Texas South Central FIPS 4204 Feet.

3. Methods

3.1 Flowchart

Our analysis was mainly completed using the calculate field in the attribute table in ArcGIS Pro, Version 2.3.0. The flowchart diagram in Figure 2 shows a general process we followed to conduct our analysis.

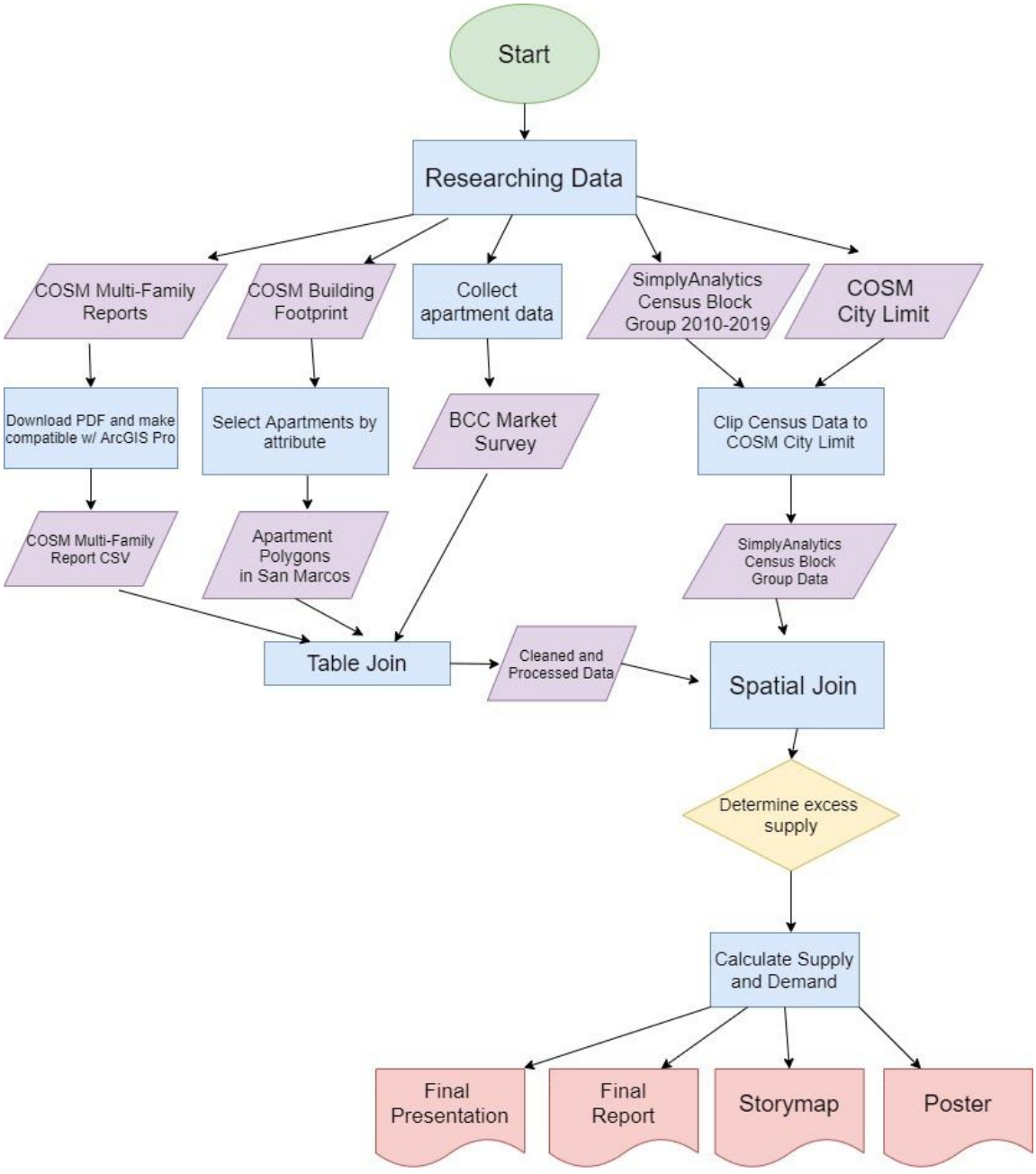

Figure 2. Flowchart

3.2 Methods Used

Once the market survey table was formatted, it was imported into ArcGISPro and displayed as XY data to ensure that the points were compatible to be joined with census data. The supply and demand analysis starts by creating new shapefiles for every year of the analysis. Seeing that we created an analysis for each year from 2010-2019 it was best to create shapefiles using the select by attributes tool. The market survey has an attribute field called Status, this field contains when each complex was completed by. We used this attribute field to select the apartments built through 2010, 2011, etc.

After our shapefiles were categorized by year, we used the corresponding year of census block group data to create a spatial join. The census block group was used as our target group and the year shapefile was used as our join group. Before running the tool, we had to make sure that the Merge Rule was set to "SUM" for the field num_beds. This ensured that all the bedrooms were added per census block group. Without the merge rule we would have received a population number per apartment complex and would have misrepresented our results. In the new spatial join table, we created a new field called "density". We used the "Calculate Field" tool to divide the number of bedrooms by the population.The join_count field was used for the statistical representation of the results. A join count with a density greater than 1 was divided by the total amount of join counts. For example, if there were a total of 109 join counts and only 39 join counts with a density greater than 1 then we divided 39 by 109. This produced the final analysis for supply and demand

The visual representation of apartment growth in San Marcos was created like the supply and demand analysis. We created visual representation for the years 2000, 2005, 2010, 2015, 2019, and a projected representation for the year 2021. Instead of using point data for this analysis, we used polygons. We joined the market survey to building footprints polygon shapefile based off of like-attributes, in this case we used the field "Name". Once the join was complete, we separated each year using the select by attributes tool. We categorized the type of apartments by Rent-By-Bed, Traditional, or Under Construction. After the apartments were separated by year we used the Table to Excel tool, which just used the attribute table of the building footprints shapefile and converted it into an excel table. Once in excel, we added all the shape_area fields for the apartments and divided by the number of shape_area for the city limit. This gave us a percentage of the land being used for apartments in San Marcos. We used this data to create pie charts so that the public would better understand how much of San Marcos land was being used for apartment complexes.

4. Results and Discussion

4.1 Importance of the project

The objective of this project was to give an accurate representation of the development of apartment complexes in San Marcos,Texas and compare the potential number of occupants to the number of bedrooms available. This project was focused on collecting data from apartment complexes that serve the student population that attends Texas State University. The results of this study is for community leaders and city officials alike to determine the need for further development of apartment complexes. This college town historically had more renters than homeowners, although concerns raised by University faculty and local residents over the character of their city instilled the City of San Marcos planning department to do research on apartment complexes. Since the city of San Marcos has a small amount of time to do research on this issue, they asked Bobcat Community Consultants (BCC) to conduct this project. After weeks of collecting data and working with the Attorney for Students office at Texas State, BCC has completed an analysis on the apartment complexes in San Marcos, and made a short timeline of the apartment available from 2000- 2019 (Present). BCC also made a projection of Apartment complexes to be built between now through 2021, based off the complexes currently under construction and already approved by the city to begin building. For the main part of our Analysis made a comparison of Rent-by-bed and Traditional lease complexes vs. the student age population in the Census blocks from 2010-2019.

4.2 Results

BCC collected apartment data for over 100 different apartment complexes in San Marcos. We were able to collect complete data for 66.6% of all apartment complexes in San Marcos. This means that we have the completion status, number of beds, units, traditional or individual lease, and if they allow double occupancy for a majority of our apartments. There are only 9 (8.8%) apartments that we were unable to gather information due to either their lack of information or our consultants were unable to get contact, so we left them unclassified.

We found it best to display the supply and demand analysis as density maps. Because we divided the number of bedrooms to the population per census block to obtain our density, a density of one is a perfect supply to demand ratio, while a demand greater than one represents excess supply of bedrooms and an insufficient number of occupants. In the year 2010, 20 out of the 55 apartments analyzed had a density of over one, meaning that 36.4% complexes had an excess of supply. In the year 2011, 24 out of 59 (40.7%) had an excess of supply.

- In the year 2012, 24 out of the 63 (38.1%) complexes.
- In the year 2013, 32 out of the 63 (50.8%) complexes.
- In the year 2014, 30 out of the 65 (46.2%) complexes.
- In the year 2015, 31 out of the 71 (43.7%) complexes.

- In the year 2016, 36 out of the 72 (50%) complexes.
- In the year 2017, 36 out of the 74 (48.6%) complexes.
- In the year 2019, 39 out of the 76 (51.3%) complexes.

We didn't include the year 2018 in our analysis seeing that we didn't have any attributes for apartments built in 2018. With that said, it is clear that there is an overabundance of apartment bedrooms.

4.3 Data quality issues

The study area of this project is strictly in the boundaries of the San Marcos City limits to gauge the needs of the city and determine if there is any further need for apartments in proximity to Texas State University students. A quality issue to our analysis is that we weren't able to use all the apartment complexes in our market survey. Although a majority of apartments had a bedroom count they weren't used for analysis since they didn't have an attribute for the status field. Because a complex didn't have a year that it was built in, it couldn't be categorized and was omitted from the analysis. In addition to that issue is our bedroom and unit count in our market survey. Although it was cross-referenced with documents provided by the Attorneys for Students Office, not all the counts were exact and were off by 1-2 units and/or bedrooms. Our analysis only accounts for the vast majority of rent-by-bedroom occupants, aged 18-24, and doesn't account for any outliers.

4.4 Limitations and improving the results

To collect data for the entire city of San Marcos was a challenge, in order to get the number of potential occupants we had to rely on the numbers of the census data for college-aged students(18-24). Since the city of San Marcos is not a major metroplex, population breakdowns are in larger areas. Not to mention a few university students living in San Marcos probably reported living with their parents out of town. Another limitation is that we are only assessing the bedrooms available in apartment complexes not in single family homes, so this does not capture the entire rental market. Other limitations that we encountered was the city of San Marcos did not have a full record of apartment complex developments. Bobcat Consultants had to identify and collect data on the apartment complexes currently operating in San Marcos. This was challenging because of the amount of complexes, BCC had to rely on phone calls and data reported on the internet in order to get unit and bedroom counts.

If our group had a smaller area of study, we would have physically visited the complexes and done more research on the individual complexes' number of renters. More limitations arose once Texas State University switched to remote classes because of COVID-19. This became a problem for some of our consultants because of the lack of required hardware to run specific GIS software. Bobcat Community Consultants were able to overcome these obstacles by assisting each other in certain tasks other consultants

were not able to complete. Other limitations in software should be also noted. In the progress report BCC mentioned using Areal Interpolation as part of the analysis and for our final analysis we didn't use the tool. BCC didn't include it in the final analysis because of the lack of accuracy the interpolation produced. No team member had previously worked with areal interpolation in a project and was suggested to use by our G.I.S. analyst Analie's mentor - Dr. Dede-Bamfo. Had we had ample time to become well acquainted with the interpolation our results would have been more accurate.

5. Conclusions

Using GIS analytical tools such as the calculate field tool, the division tool, and spatial join we are able to display the expansion of apartment growth in San Marcos, Texas. In conclusion, Bobcat Community Consultants (BCC) has compiled research on these Apartment complexes located in San Marcos in order for community leaders to make an informed decision about developing further complexes.

BCC is proud of their results and is excited to present the findings that there are in fact more bedrooms available than students to fill them. According to our analysis in 2019 a little over 50 percent of apartment complexes are located in a zone where the supply of bedrooms is greater than the number of potential occupants or student age population (18-24). To give context of the growth of these apartment complexes, BCC has made a series of maps showing the geographic locations of the complexes that are completed as well as under construction. BCC has provided maps showing the growth of apartments in San Marcos, Texas from 2000 to 2019 while also providing a projection of apartment growth for 2021. Through this research we were able to provide valuable data regarding a majority of apartment complexes in San Marcos. With this collected data BCC is able to provide temporal maps with projections showing that more apartment complexes are expected to be built and completed.

Considering that in 2019 San Marcos had over 50% of apartment complexes that had too many bedrooms for the amount of people living there , the City of San Marcos should continue to monitor the number of apartment complexes they permit to build for the future. Some considerations for future development of this research is being able to build a finalized and complete database for unclassified and future apartment complexes.

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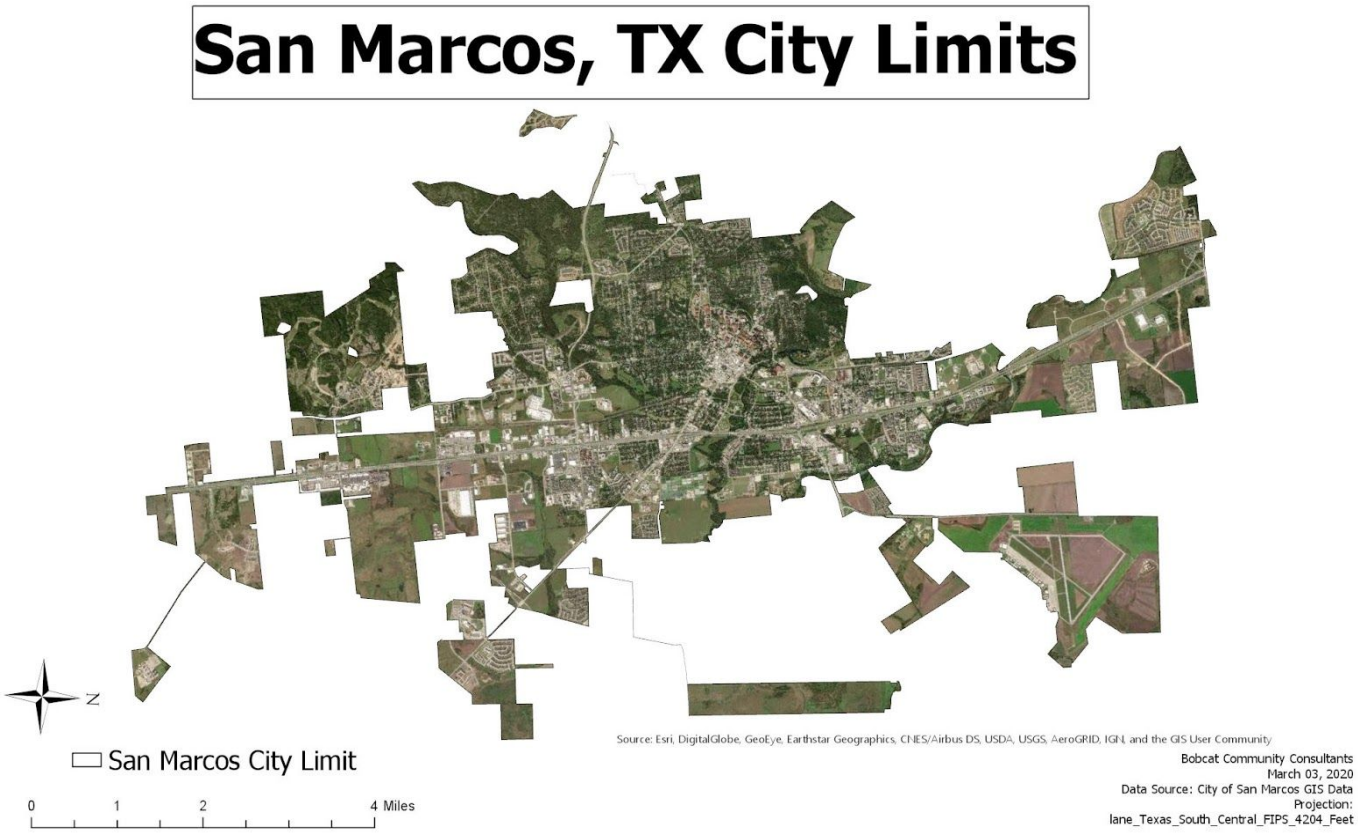
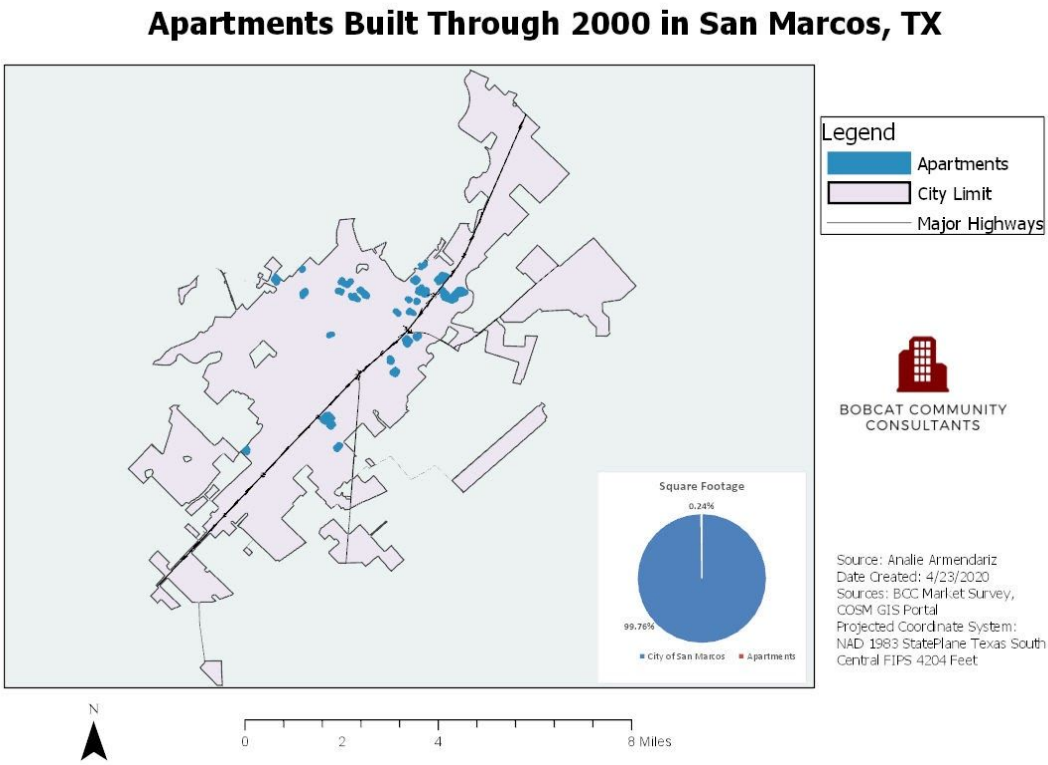
6. Appendix

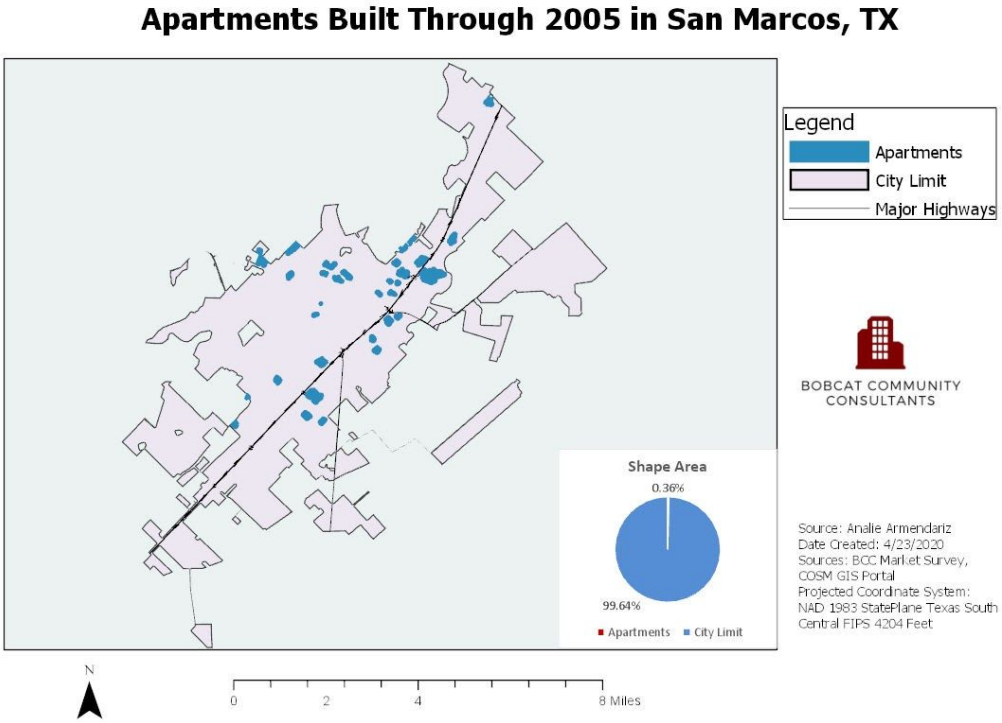
7.1 Figure A - Scope Map



7.2 Figure B Apartment growth visualization 2000



7.3 Figure C - Apartment growth visualization 2005



7.4 Figure D- Data Interpretation Charts

Data Interpretation Charts

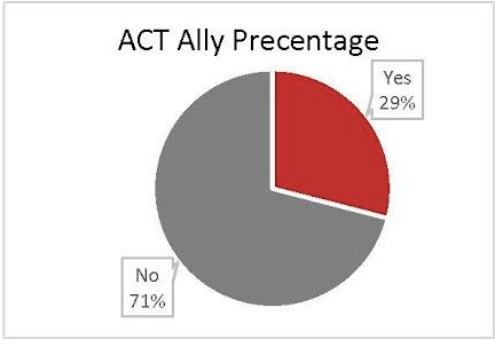
Apartment Complex Supply and Demand

Total of 76 Apt. Complexes in Analysis	
In a Zone Supply > Demand	39
In a Zone Supply < Demand	37
In a zone Supply>Demand	Precentage
Yes	51%
No	49%

This analysis was made to determine the amount of bedrooms vs. the student age population (18-24) in each census block in San Marcos. These census blocks were made into zones, where the number of bedrooms available where counted. According to the results 51 percent of apartment complexes in the city are located in a zone where their are more bedrooms than potential occupants.

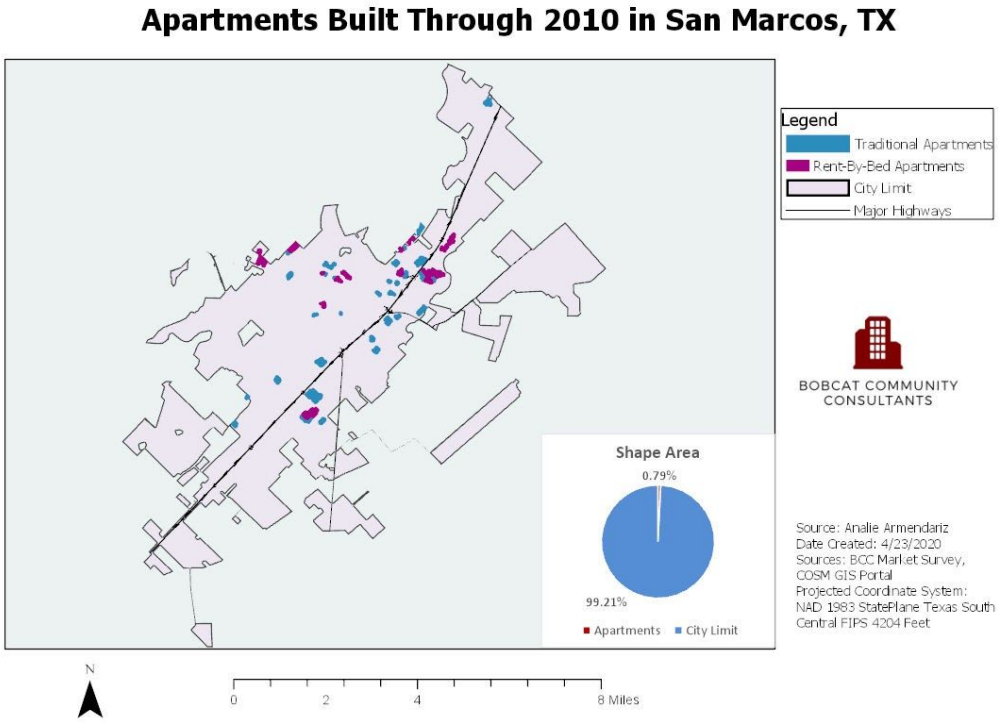
Market Survey Data

According to the Market Survey completed there are more traditional lease apartment complexes than Rent-by-the-bed(Individual) complexes.

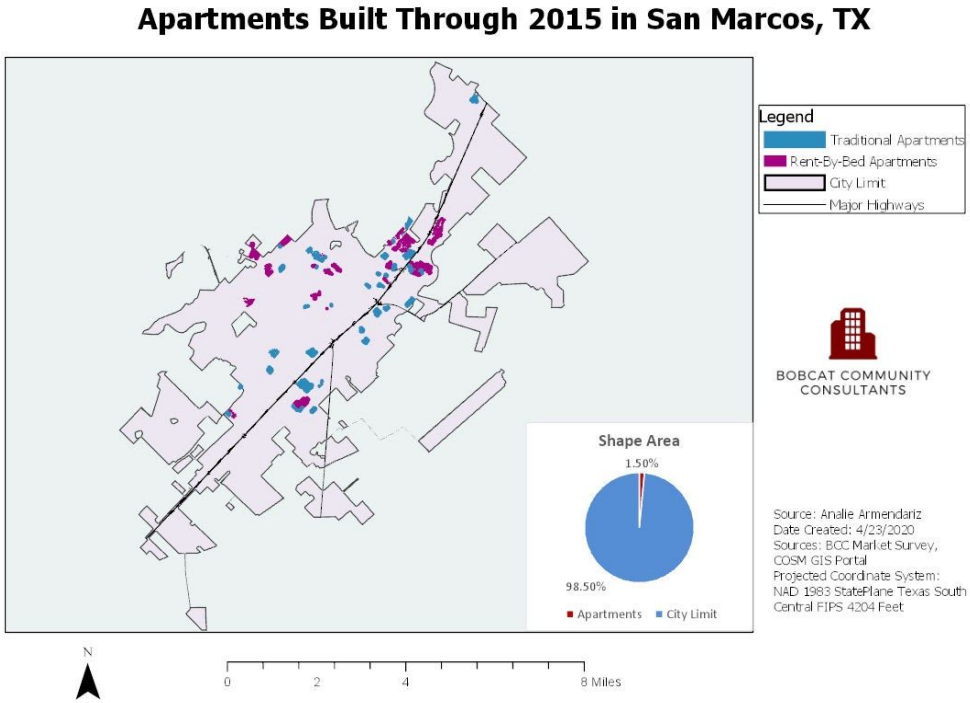


According to the Market Survey completed nearly 30 percent of apartment complexes are ACT Allies. While 70 percent are not.

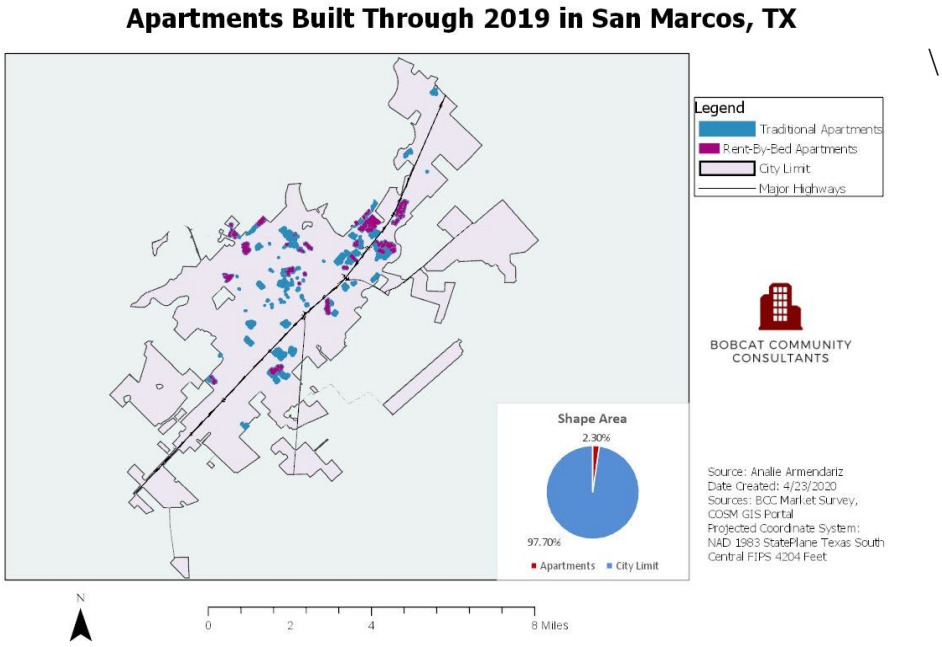
7.5 Figure E- Apartment growth visualization 2010



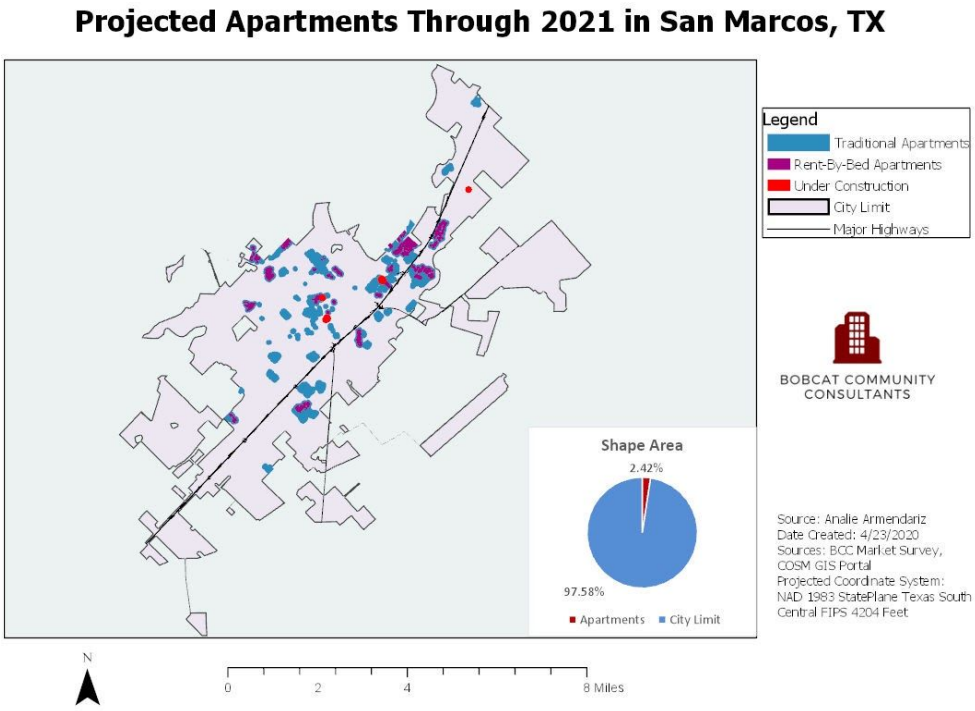
7.6 Figure F- Apartment growth visualization 2015



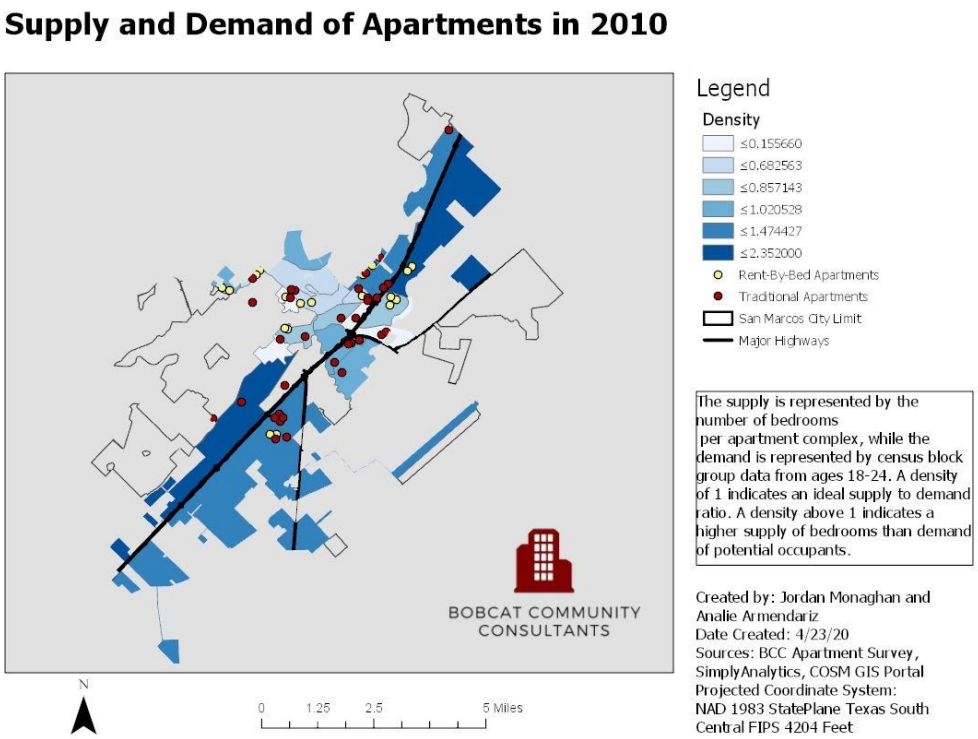
7.7 Figure G- Apartment growth visualization 2019



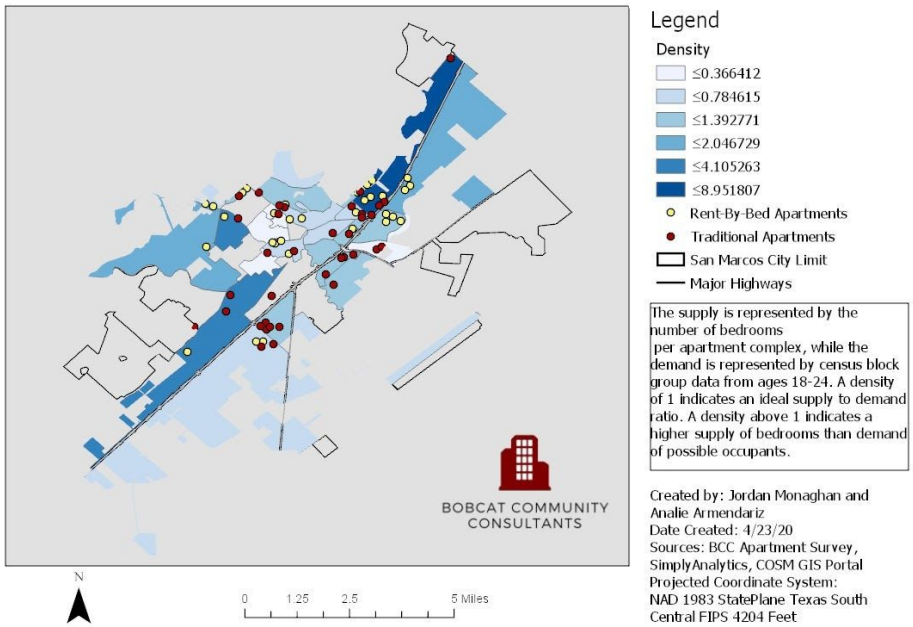
7.8 Figure H- Apartment growth projection 2021



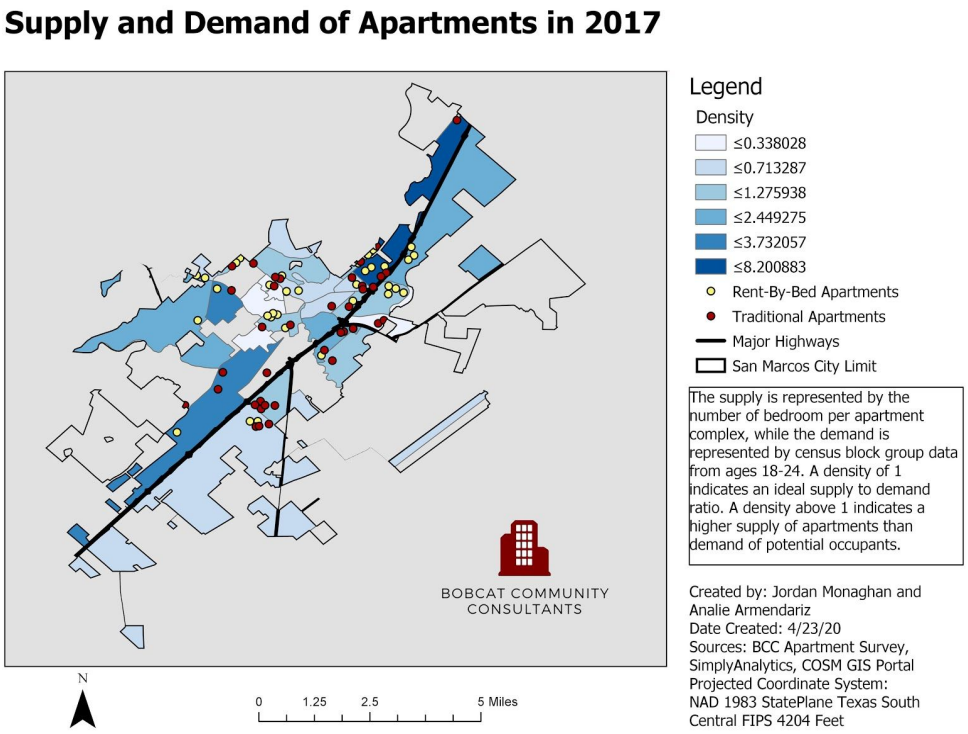
7.9 Figure I- Supply and Demand Analysis 2010



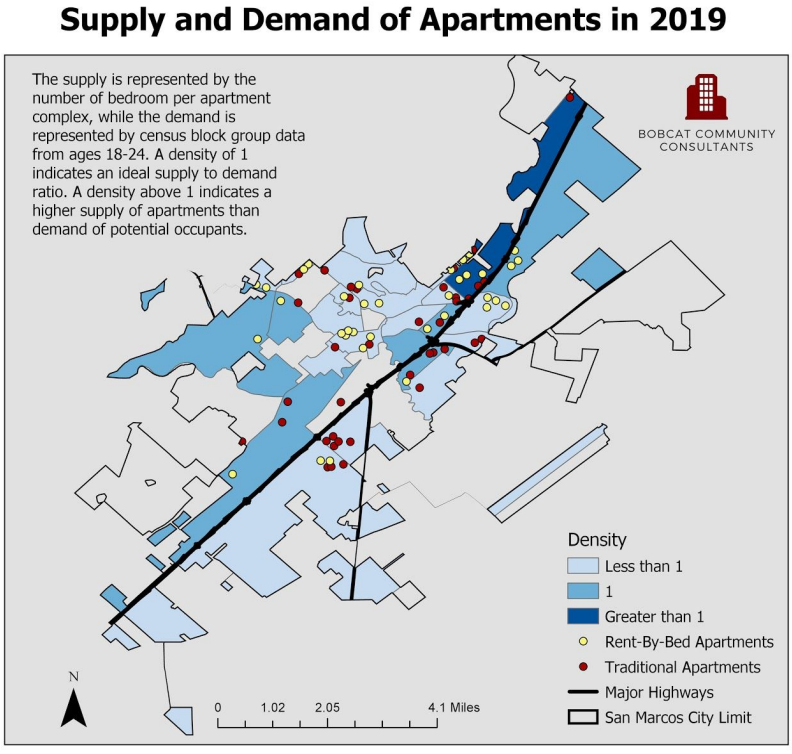
7.10 Figure J- Supply and Demand Analysis 2015



7.11 Figure K- Supply and Demand Analysis 2017



7.12 Figure L- Supply and Demand Analysis 2019



7. Appendix I - Group Members Contribution

Figure M - Analie Armendariz

The backbone of our data analysis and methodology of this group. Analie has taken the lead on creating the market survey and computing our collected data and has contributed the most amount of time to working on the GIS analysis portion of this project.

- Computed apartment complex locations and shapefiles.
- Completed the analysis for each year in the project.
- Coordinated the data and methodology portion of the project.
- Created the visual representation of apartment growth and supply and demand maps.

Figure N - Jordan Monaghan

The main researcher in this group. Jordan took the lead on collecting data from the city of San Marcos and has contributed the most amount of time to working on the Literature review and coordinating with Analie Armendariz on the GIS analysis portion of this project.

- Computed census data
- Coordinated with Analie Armendariz to make the final maps and results for the visualization of our analysis.
- Converted 2019 Arcmap Pro to AGOL map and dashboard.

Figure O- Kyle Shorter

The backbone of our statistical analysis of this group. Kyle has taken the lead on computing our collected data and has contributed the most amount of time to working on the GIS portion of this project.

- Collected and computed apartment data
- Directed market survey for data collection
- Calculated statistics over apartment data

Figure P -Robert Starke

As a data collector and analyst, Robert has contributed to the collection of the apartment data as well as some GIS analysis of the collected data. Robert also created an Esri story map to present our maps in a more concise and organized way.

- Collected and computed apartment data
- Collected census data
- Created Esri Story map

Figure Q -Maximilian Stuart

The group manager and public speaker. Max has spent most of his time keeping track of the groups progress and coming up with goals as well as assigning tasks. Max was also the main delegate for the clients and drafted many of the group's presentation slides.

- Created proposal, progress, and final presentations
- Presented for the progress and final presentation
- Maintained communication with clients via email and scheduled meetings.
- Made poster design