Transit Expansion Recommendation

Atlanta Light-Rail Bond Investment

Defining the Problem

- Expansion funds for light-rail system cannot reach all city neighborhoods.
- Funds must be prioritized to maximize the return on investment in the form of future system ridership.

Data Sets Used for Analysis

- Pulled information from multiple data sources.
- Organized into 2 different data sets
- Removed outliers from the Light Rail System data for better correlation analysis.

	North American Light Rail Systems	Atlanta NPU District
Name	df_rs	df_atl
Columns	System Name, City, Annual Ridership, Daily Ridership, AVG Daily Boarding's Per Mile, Pop Density, Job Density	NPU District, Total Population, 2000 Population, Pop Change, Population Density, Jobs, Residential Permits, Commercial Building Permits, Total Permits
Rows	28	24
Design Intent	Correlation Modeling	Recommendation Modeling

Top-Ten Most Successful Light Rail Systems

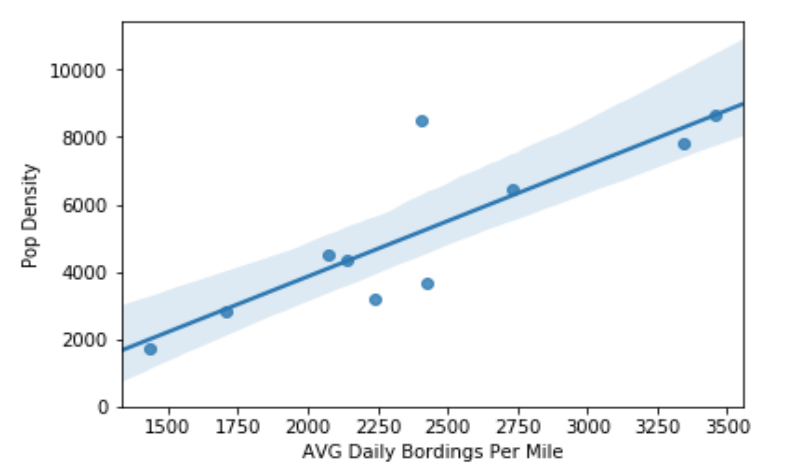
	System Name	City	Annual Ridership	Daily Ridership	AVG Daily Bordings Per Mile	Pop Density	Job Density
2	Link	Seattle	24155900	74400	3456	8642	35112
3	METRO Light Rail	Minneapolis	23811200	71900	3344	7820	17631
6	Buffalo Metro Rail	Buffalo	4560600	16900	2734	6436	4710
7	METRORail	Houston	18808000	61100	2427	3660	12556
8	Metro Rail	Los Angeles	67921600	219900	2403	8483	17386
9	Valley Metro Rail	Phoenix	16269000	48900	2240	3207	6984
10	San Diego Trolley	San Diego	37215800	112100	2140	4325	7937
11	MAX Light Rail	Portland	39173700	119700	2070	4504	12978
12	Lynx	Charlotte	5228500	16900	1708	2827	8092
13	TRAX	Salt Lake City	18823500	63000	1435	1709	5389

- Success is defined as the system with the highest average daily boarding's per system mile.

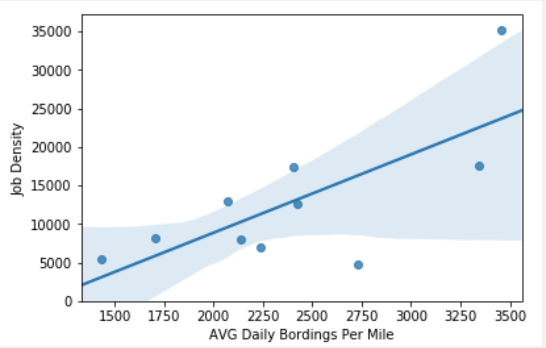
Correlation

- AVG Daily Boarding's Per Mile are most closely related with population density and job density.
- Population Density had a stronger correlation and Peason Correlation Coefficient than Job Density.
- Therefore, Population Density was selected as the metric for success.

	Annual Ridership	Daily Ridership	AVG Daily Bordings Per Mile	Pop Density	Job Density
Annual Ridership	1.000000	0.998189	0.039953	0.438033	0.308191
Daily Ridership	0.998189	1.000000	0.025802	0.436752	0.297633
AVG Daily Bordings Per Mile	0.039953	0.025802	1.000000	0.846095	0.721692
Pop Density	0.438033	0.436752	0.846095	1.000000	0.721716
Job Density	0.308191	0.297633	0.721692	0.721716	1.000000



Population Density to AVG Daily Bordings Per Mile



Establish Minimum Population Density

- Population Density was selected as the metric for success.
- Mean Average Density of the most successful light rail systems is:

5161 ppl per square mile

	Annual Ridership	Daily Ridership	AVG Daily Bordings Per Mile	Pop Density	Job Density
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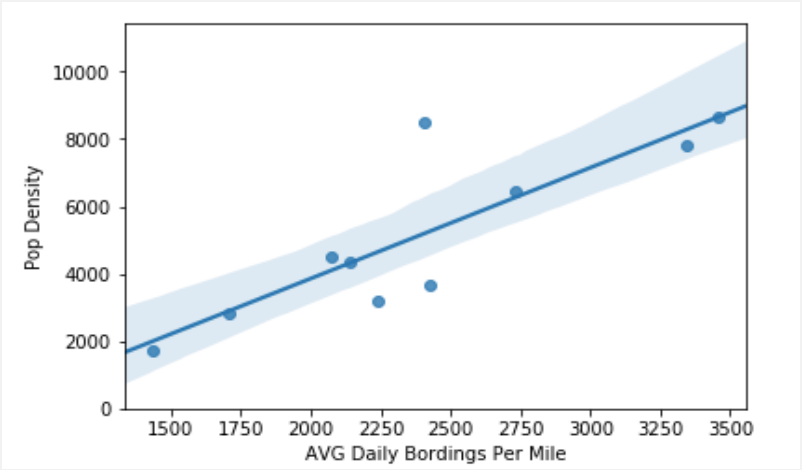
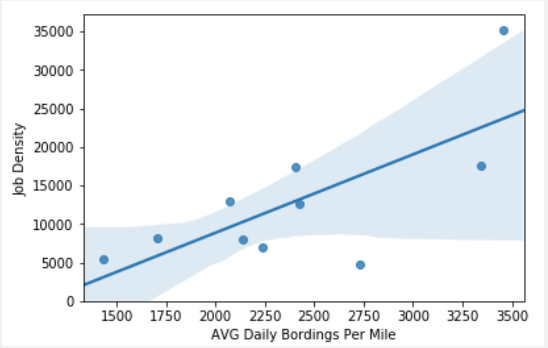


Population Density to AVG Daily Bordings Per Mile



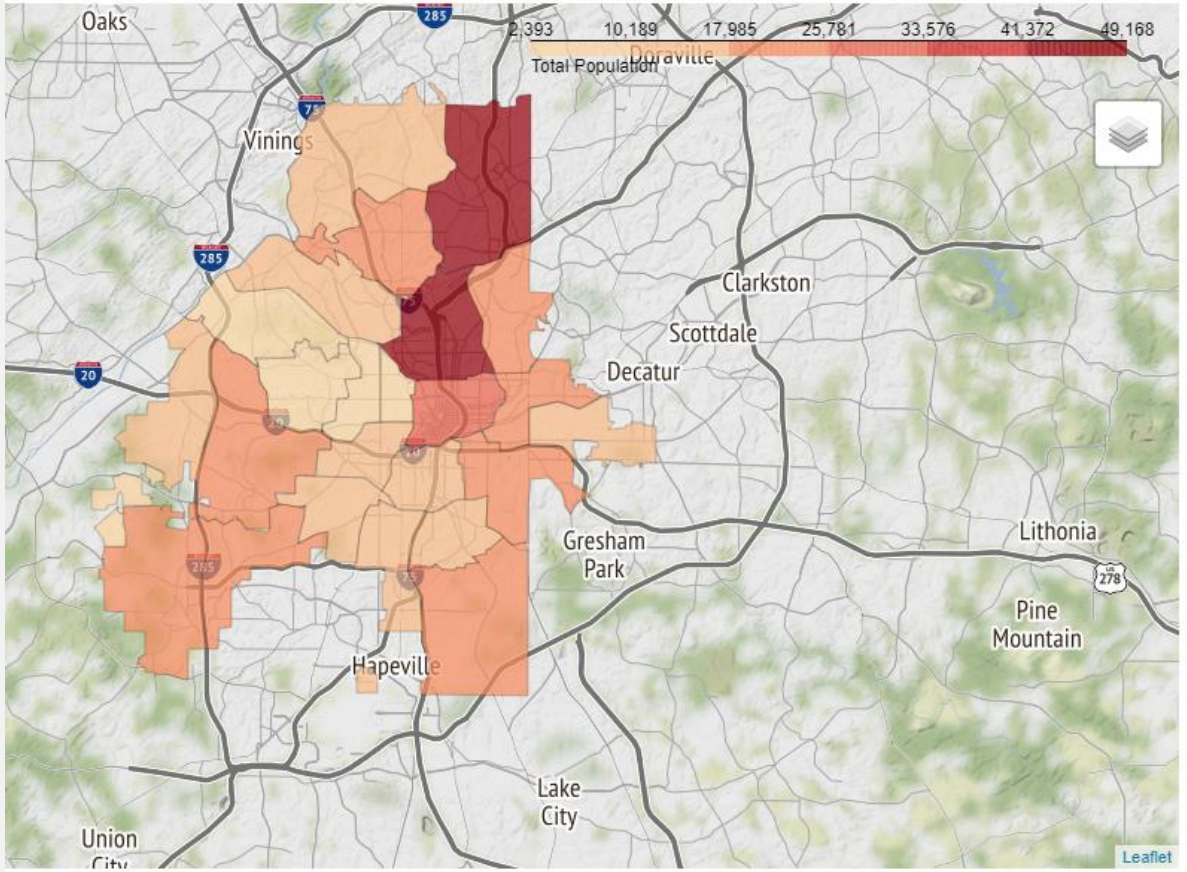
Atlanta NPU Data

- There are 24 different Neighborhood Planning Districts.
- The top-ten most densely populated districts contain the closest population density to the mean average.

	NPU	District	TOTAL POPULATION	2000 Pop	Pop Change	Sq Miles	POP SQ MILE	JOBS	Residential Permits	Commercial Building Permits	Single-Family	Total
12	M	NPU M	30647	21343	43.6	3.78	8108	131381	46	6	19	71
4	E	NPU E	45375	34502	31.5	5.91	7678	99242	12	7	22	41
19	T	NPU T	17260	20095	-14.1	2.74	6299	4965	2	2	0	4
21	W	NPU W	21502	20197	7.0	3.52	6108	6790	3	2	52	57
13	N	NPU N	19039	14730	29.3	3.44	5535	6426	41	3	6	50
11	L	NPU L	6970	7314	-4.7	1.32	5280	1883	0	0	7	7
20	V	NPU V	15542	15840	-1.9	3.17	4903	3790	1	0	38	39
1	B	NPU B	48709	38562	26.3	10.18	4785	91833	44	4	72	120
5	F	NPU F	25661	21378	20.0	6.00	4277	11200	21	3	55	79
10	K	NPU K	9973	11923	-16.4	2.39	4173	2478	0	0	7	7

Atlanta NPU Data Analysis

- Reviewed the data set to visualize the following characteristics:
  - Total Population
  - Population Density
  - Population Growth
  - Residential Building Permits
- This helps identify current densely populated neighborhoods as well as neighborhoods trending toward greater density.



2.1: Map of Atlanta NPU Total Population

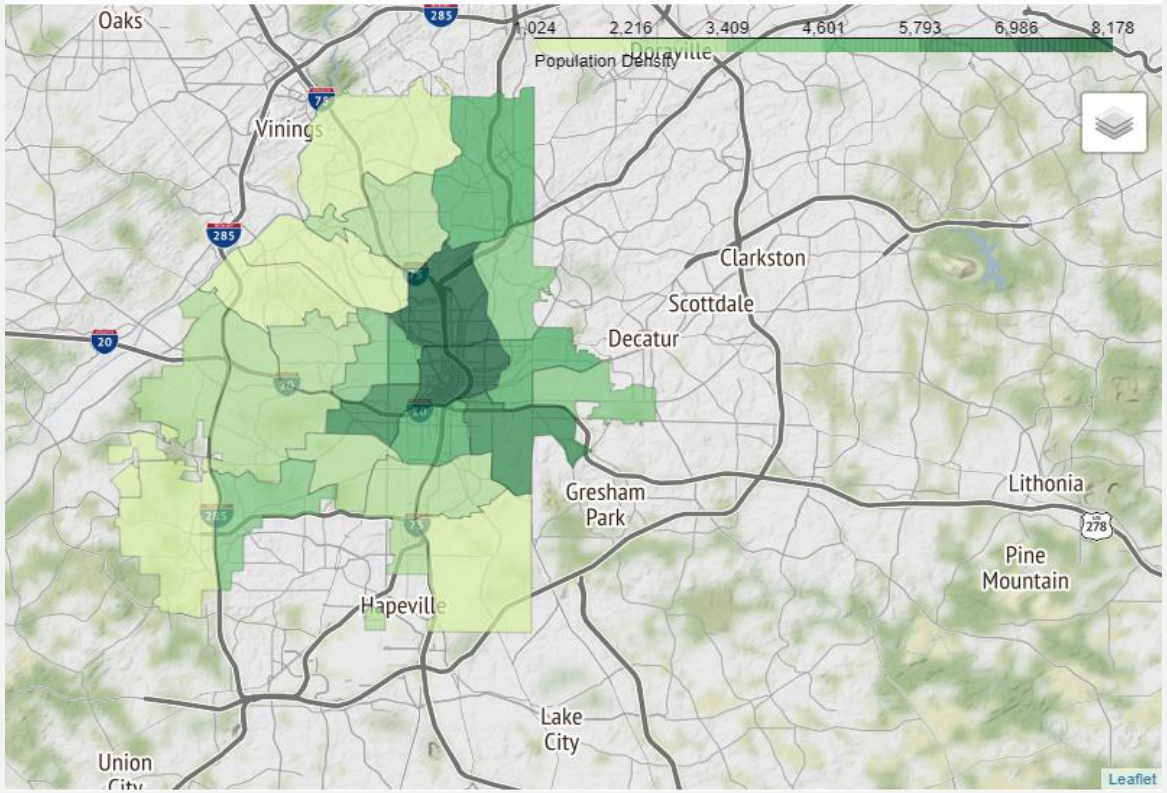
Atlanta NPU Data Analysis

- Reviewed the data set to visualize the following characteristics:

  Population Density

- This helps identify current densely populated neighborhoods.

- This includes **NPU B, E, M, N**, and **W**



2.2: Map of Atlanta NPU Population Density

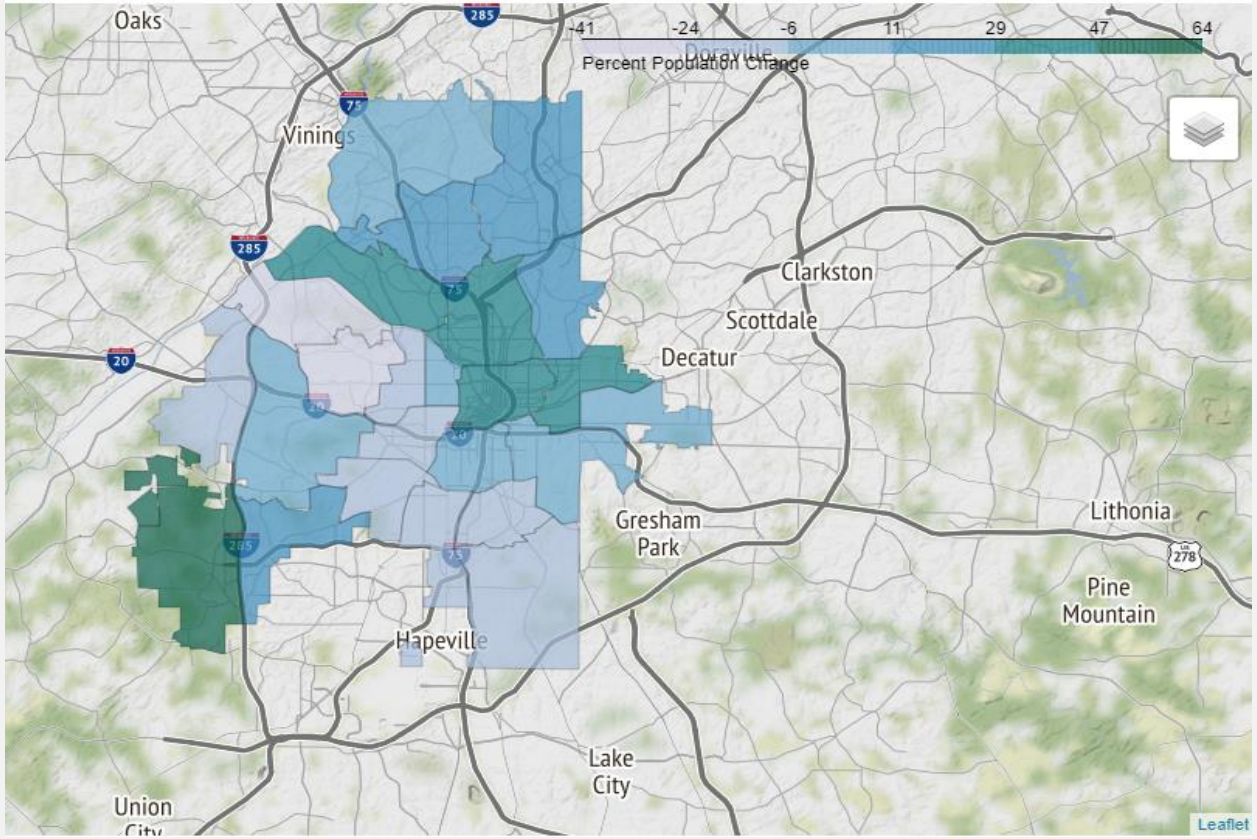
Atlanta NPU Data Analysis

- Reviewed the data set to visualize the following characteristics:

  Population Change

- This helps identify neighborhoods which are continuing to densify.

- This includes **NPU B, D, E, M,** and P.



2.3: Map of Atlanta NPU Population Change

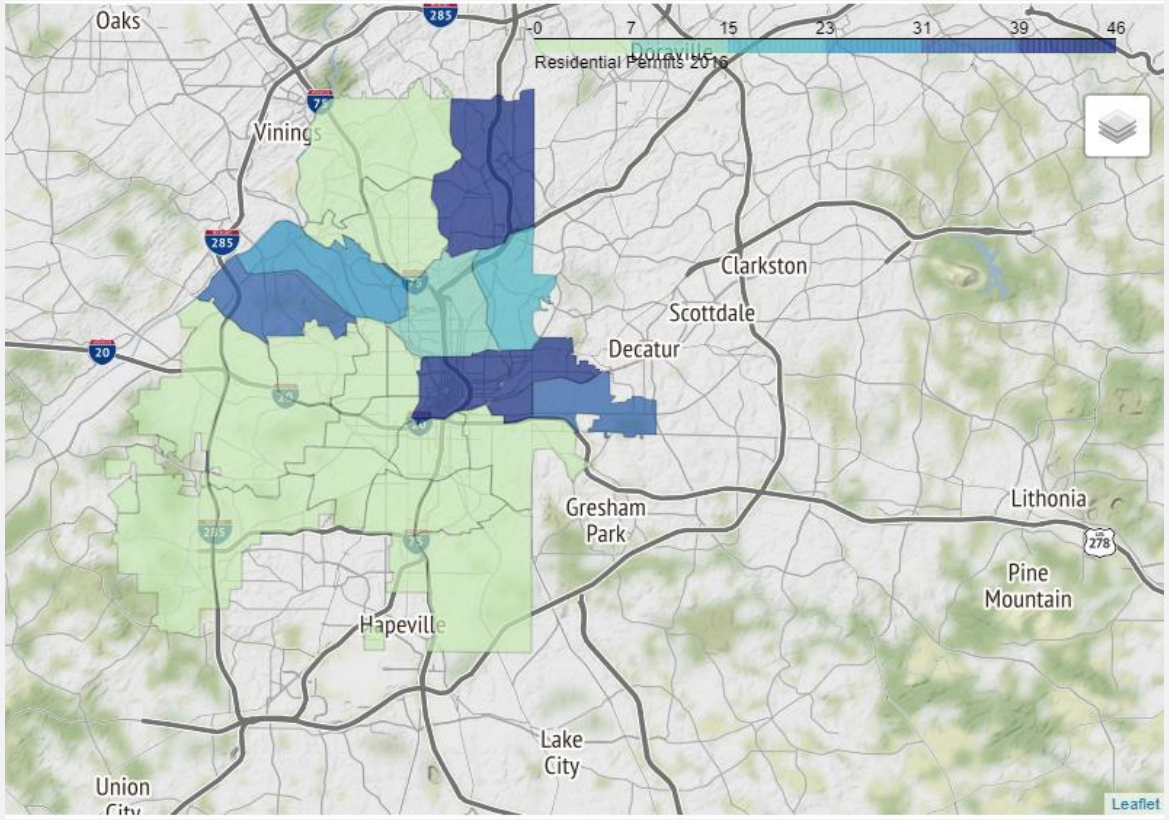
Atlanta NPU Data Analysis

- Reviewed the data set to visualize the following characteristics:

  Population Change

- This helps identify neighborhoods which are continuing to densify.

- This includes **NPU B, D, G, E, M, N, O,** and **F.**



2.3: Map of Atlanta NPU Residential Building Permit Issuance 2016

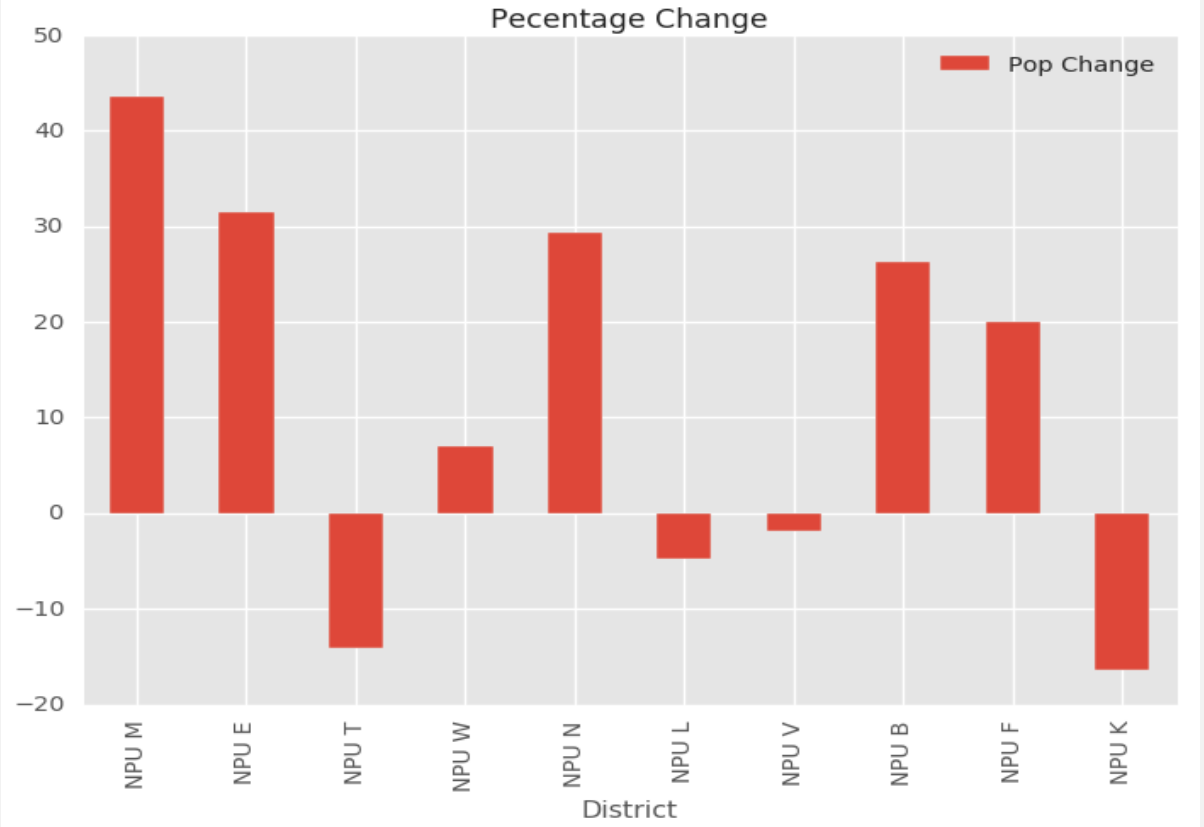
Atlanta NPU Data Analysis: Top Ten Densely Populated

- Reviewed the data set to visualize the following characteristics:

  Population Change of Top Ten

- This helps identify which densely populated neighborhoods are still growing.

- This includes **NPU E, M, W, N, B,** and **F.**



Top Ten Densely Populated NPU Population Changes 2010 to 2016.

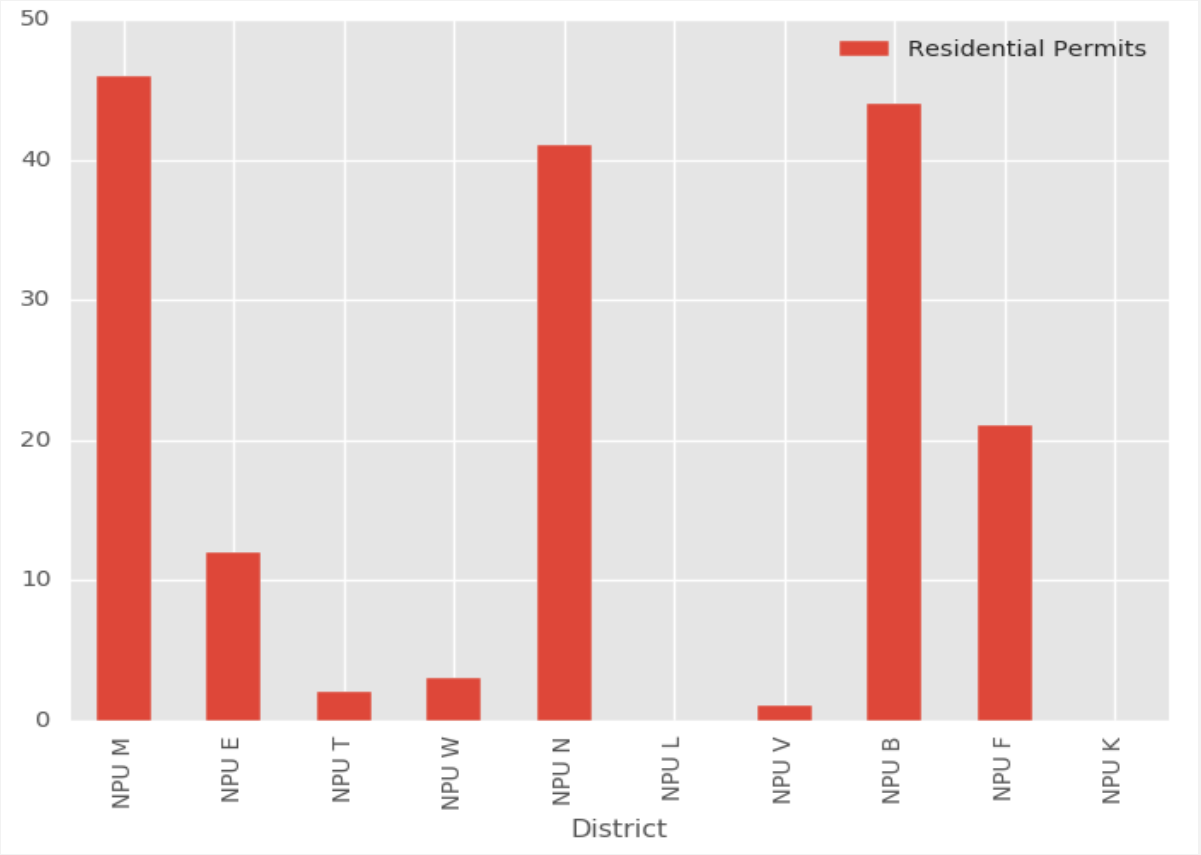
Atlanta NPU Data Analysis: Top Ten Densely Populated

- Reviewed the data set to visualize the following characteristics:

  Future Residence Building

- This helps identify which densely populated neighborhoods are still growing.

- This includes **NPU M, E, T, W, N, B,** and **F.**



Top Ten Densely Populated NPU Residential Building Permit Issuance in 2016

Recommendation

- All districts are broken into four different categories:

  Populated & Growing

  Populated & Not Growing

  Growing & Not Populated

  Not Populated & Not Growing

- This helps identify which neighborhoods should receive the most funding for transit expansion. .
- It is recommended that money be funneled to districts that exhibit both characteristics or one of the two characteristics.
- Doing so will ensure that the system is both efficiently placed to be used give current demographics as well as effective given demographic trends.

	Populated	Not Populated
Growing	**NPU M, E, W, B, F**	**NPU G, D, N, O**
Not Growing	**NPU T, L, V, K**	NPU A, C, H, I, J, P, R, S, X, Y, Z