Mobility Hubs Identification

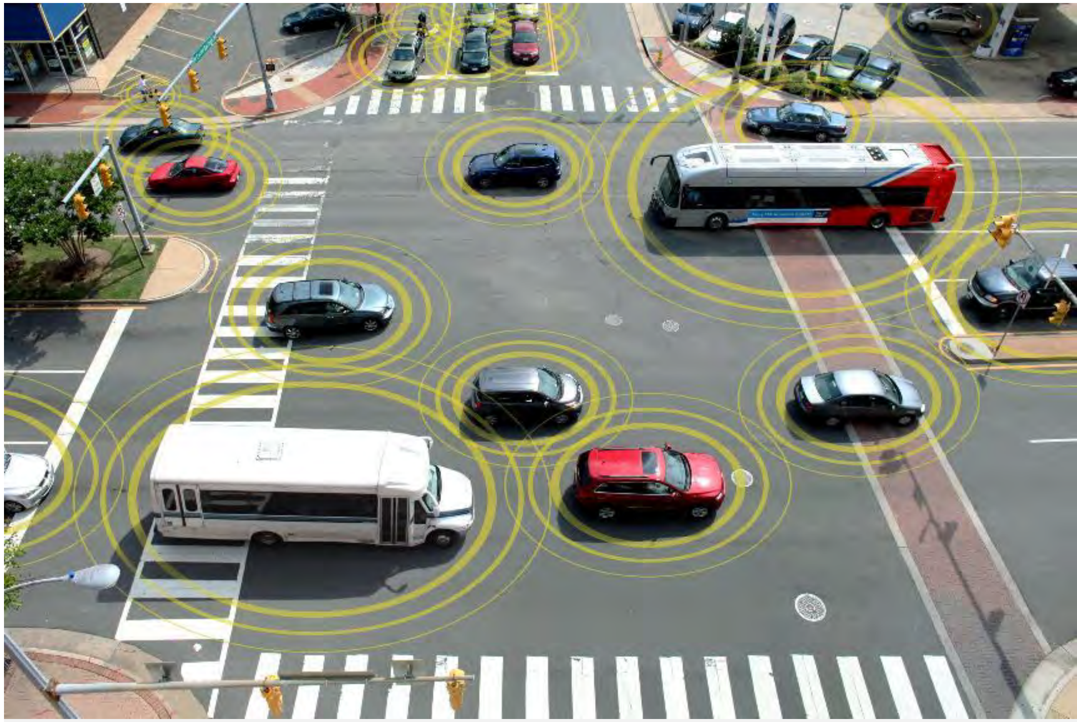
Arcadis Mobility Toolkit Pilot for City of Gainesville

Introduction

The City of Gainesville, known as the primary campus for the University of Florida, has a population of 130,000, but strives to provide public transportation coverage and quality typically associated with larger urban areas. In 2019, the City of Gainesville is updating its 5-year Transit Development Plan, reviewing parking management, exploring dockless mobility options, launching an Autonomous Vehicle (AV) pilot and has kicked off several innovative research projects in partnership with the Florida Department of Transportation (FDOT) and the University of Florida (UF).

As innovation in the mobility sector has increased the number of modes available, so too have cities' needs to harmonize these new options with existing transit. Our team, comprised of Arcadis, Sam Schwartz, HR&A and CityFi, developed a New Mobility Toolkit to help cities understand and harness new mobility innovation. our team partnered with the City of Gainesville to identify possible mobility hubs and types of modes to best serve them. The mobility hubs were identified based on five primary layers: demographics, current infrastructure, accessibility, economics, and mobility behaviors.

This project is part of a three-month pilot in collaboration with Transportation for America and serves to support and help inform the City of Gainesville Mobility Plan.

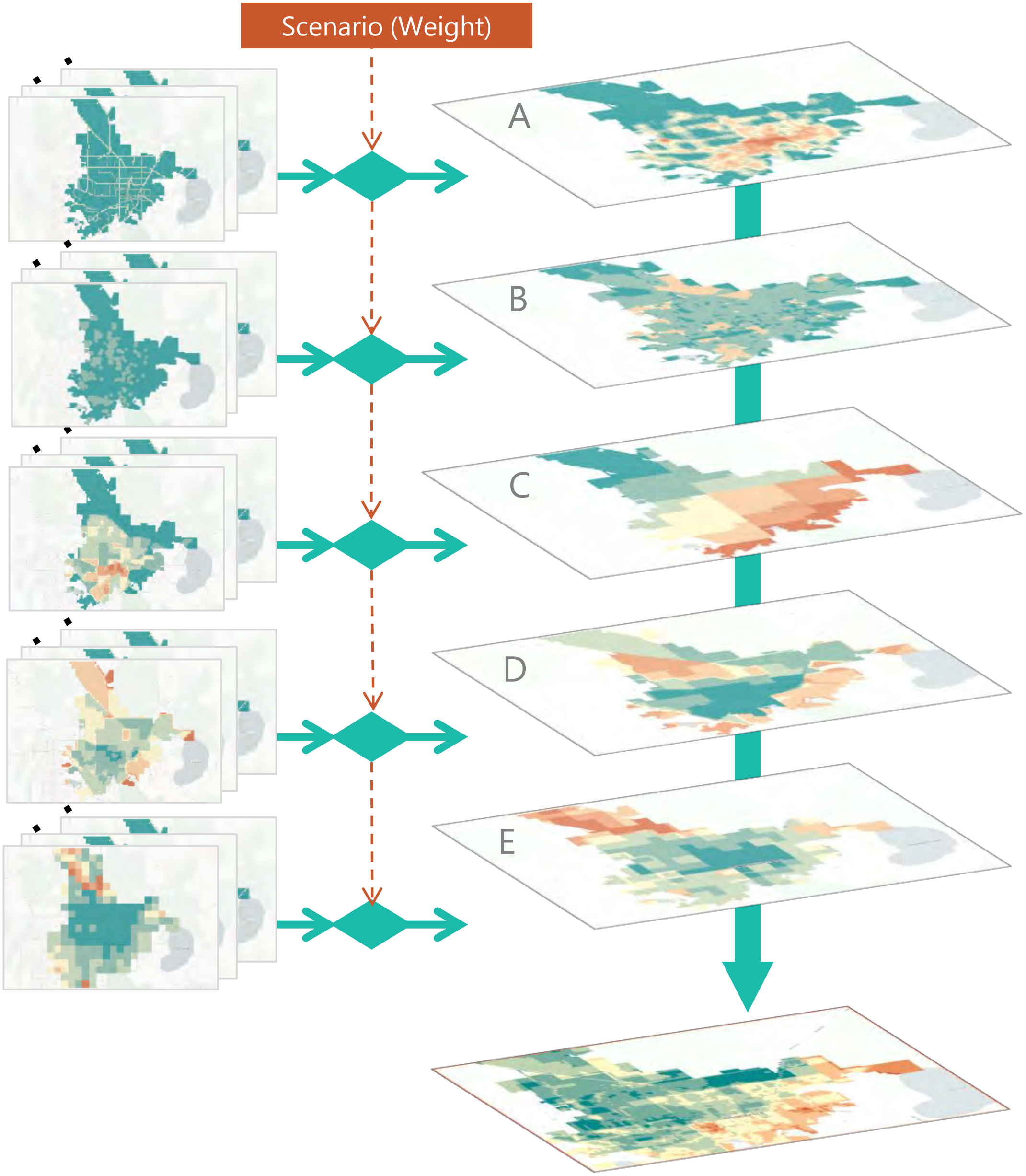


Courtesy of University of Florida Transportation Institute

About Transportation for America

Transportation for America

Transportation for America is an alliance of elected, business and civic leaders from communities across the country, united to ensure that states and the federal government step up to invest in smart, homegrown, locally-driven transportation solutions.



Methodology

1. Mobility Hubs

Mobility hubs locations were identified by combining 27 different layers. Layers were grouped into five different layer groups: **(A) Physical; (B) Economics; (C) Demographic; (D) Access; (E) Behavior**

Data from each aggregated layer was weighted based on the chosen scenario. Scenarios were provided to illustrate the different outcomes that result from a different city planning focus areas. Five scenarios used **(1) Equal consideration of all inputs; (2) Complements to current infrastructure; (3) Improving commuting; (4) Leveraging existing infrastructure; and (5) Improving equity.** The hotspots resulting in each scenario then become the candidates for mobility hubs.

2. Modes for Mobility Hubs

We identified optimal modes for each of the scenario's mobility by assessing population density in combination with the site's distance from the nearest hub or high-connectivity transit stop.

A. Physical	B. Economic	C. Demographic	D. Access	E. Behavior
1. Streets 2. Bus Lines 3. Bike Lane 4. Bike Share Stations 5. Bus Stops 6. Parking Lots 7. Other Transportation Facilities 8. Public Attractions 9. Shopping Centers 10. Hospitals 11. Schools 12. Underutilized Land	1. Employment density 2. City planned development	1. Population density 2. Household income 3. Education level 4. Percentage of non-English-speaking household 5. Race	1. Accessibility to job centers by transit 2. Accessibility to recreational areas by transit 3. Average commute time 4. Average commute time if using public transit	1. Congestion friction 2. Average travel time by driving 3. Average travel time by public transit 4. Value experience (function of cost and time)

Table 1. All individual layers used for each layer group

For the purpose of this project, the city was divided into 10,083 450ft x 450 ft. tiles. All layers considered as a product of this project are listed under their corresponding layer group in Table 1. For each layer, tiles were given a score ranging from 0 to 6 based on the layer's mobility hub suitability, with 0 representing least fit and 6 representing best fit. The score was then aggregated by layer group and multiplied by the relevant scenario weight to get the final score for each tile.

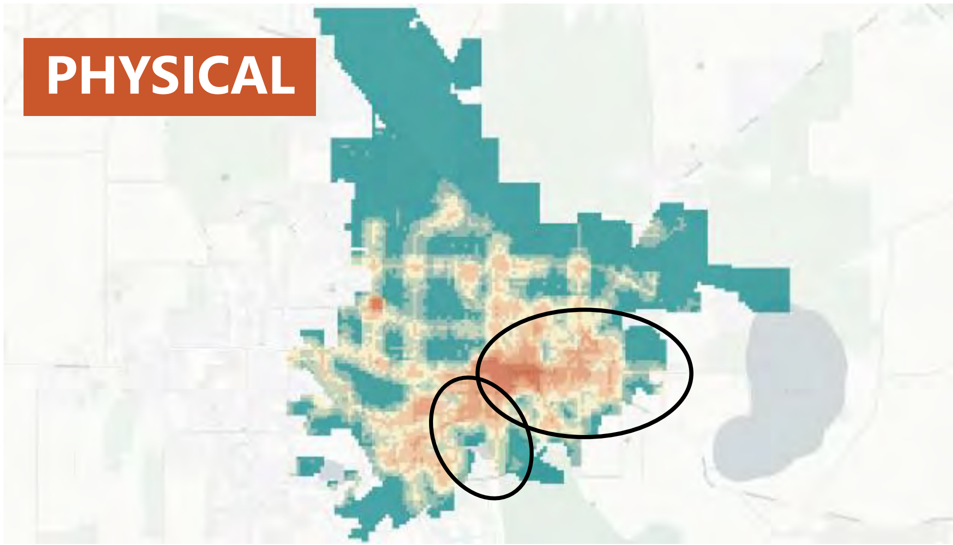
Table 2 was used to decide suitable modes for each identified mobility hub. The modes considered were light individual transportation (bikes, scooters, etc.), shuttle service, and bus or bus rapid transit.

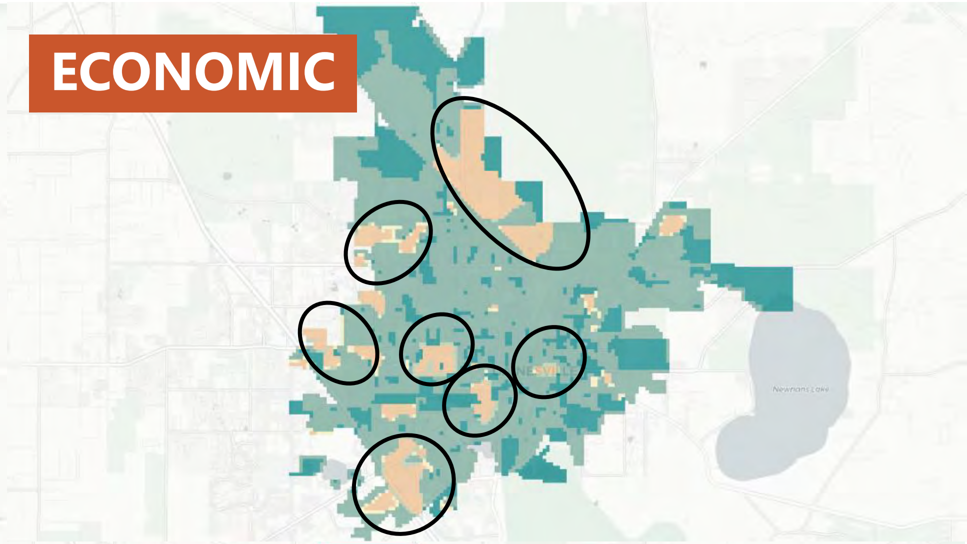
Population Density	1 – 2 miles	2 – 3 miles	3+ miles
0 – 3,000			
3,000 – 20,000	 		
20,000+			

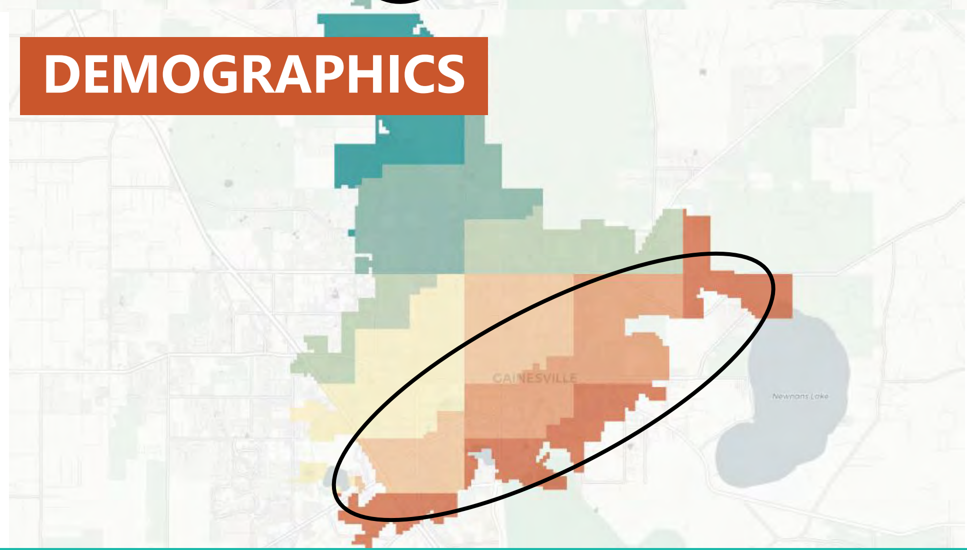
 Light individual transportation  Shuttle  Bus/bus rapid transit

Table 2. Criteria of best modes for mobility hub candidates

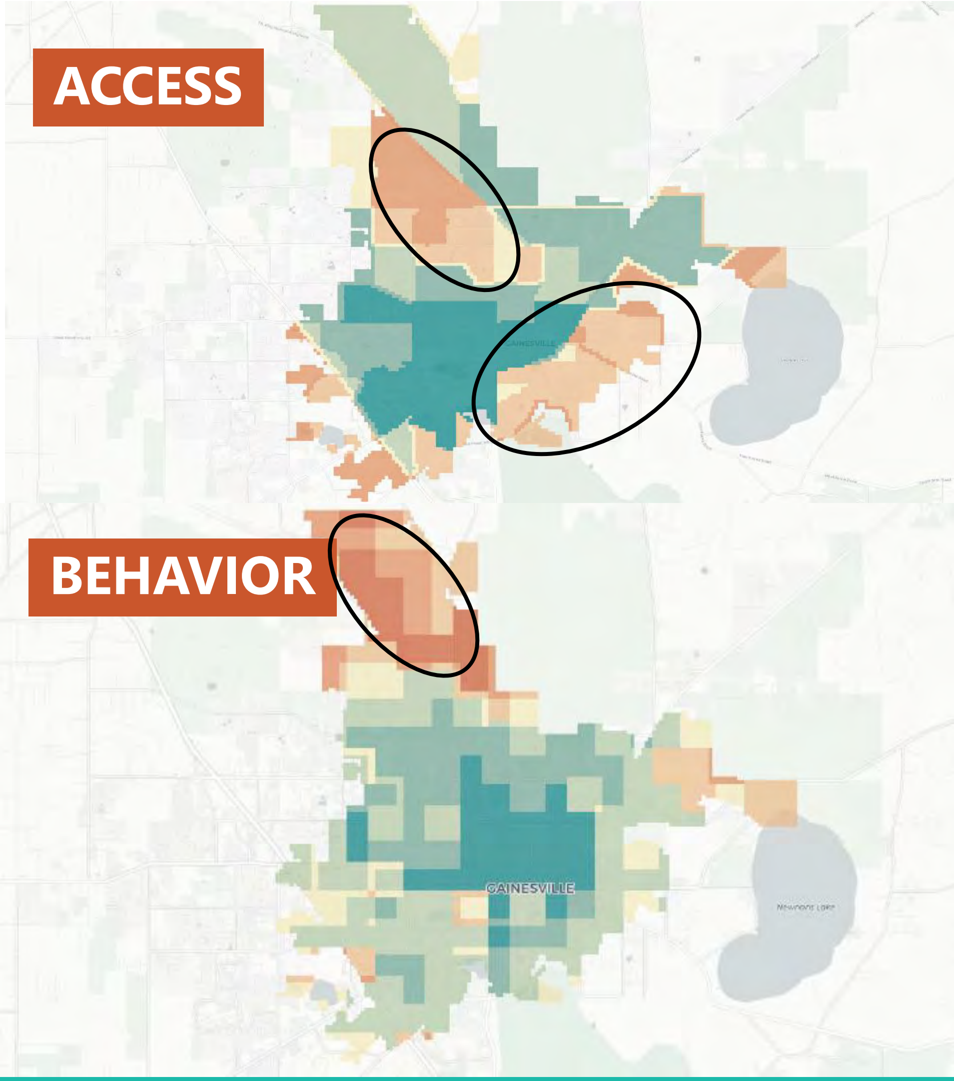
Results





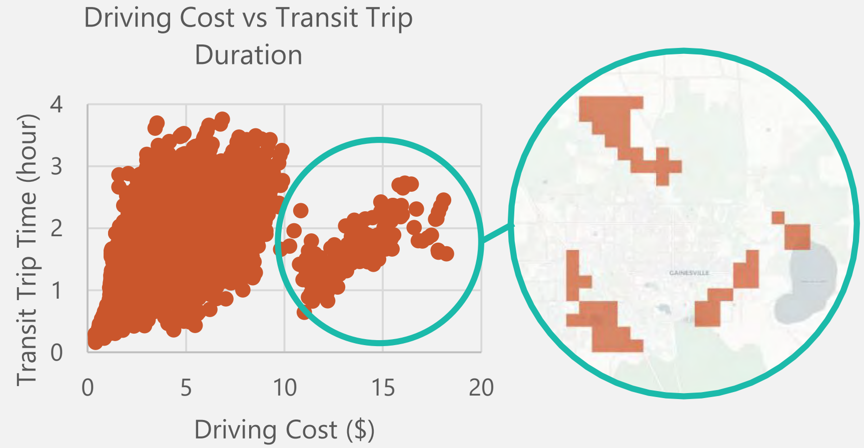


The objective of using five different layers is to accommodate and attribute different aspects of the city. The physical layer group emphasize the current infrastructure so that the aggregated layer shows more concentration in the city center. The economic layer group concentration was calculated using Local Spatial Autocorrelation so that areas with high job concentration were emphasized. The demographic layer group highlighted vulnerable populations. The access layer group showed areas that are not currently well connected using public transit. Finally, the behavior layer group emphasized disadvantaged areas for transit based on value and time.



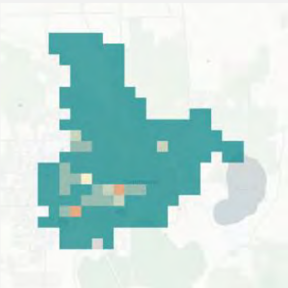
Value Experience

Value experience is a special layer developed within the behavior group. As a function of cost and time, value experience tries to determine the relative value of travel by public transit from or to a given area, compared to traveling by other modes like driving or rideshare. Driving is used in this project as a comparison with the cost of driving $0.592/mile, according to AAA study on the cost of car ownership.



A trip by transit for an origin-destination pair is considered valuable provided that: (1) Total trip duration is less than 90 minutes; (2) Trip duration is less than an hour more than travel by car; (3) Trip duration is no more than three times longer than driving; (4) Trip cost is less than travel by car.

More than 40,000 Origin-Destination pairs were assessed and only 219 pairs provided a better value experience.



Orange areas are the origins for trips where transit has comparable value in (time, $)

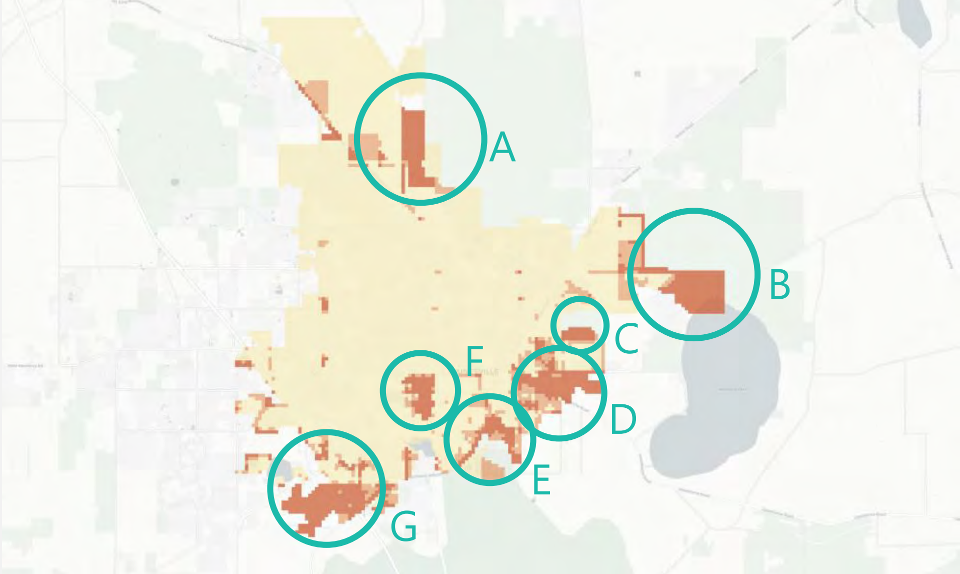
Scenario Planning

As results show, each layer group emphasizes different potential sites for mobility hubs. As such, scenario planning is necessary to account for city priorities, needs and focus. There are five scenarios used in this project: 1) Equal consideration of all inputs; (2) Complements to current infrastructure; (3) Improving commuting; (4) Leveraging existing infrastructure; and (5) Improving equity.

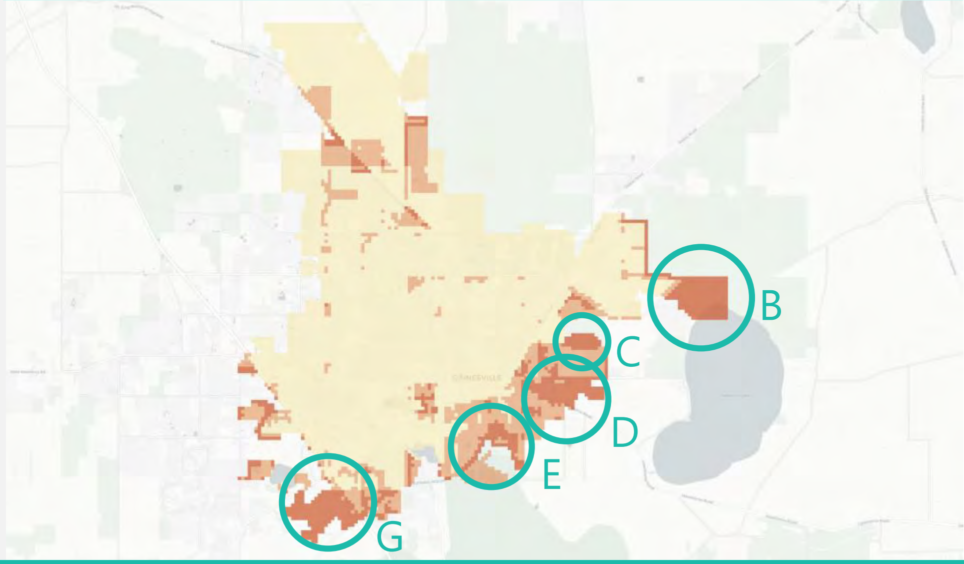
For each scenario, hot spots were defined as tiles with higher aggregated values relative to their surroundings. These clusters were marked as mobility hub candidates. Locations identified as hot spots across scenarios are noted as especially strong candidates.

Equal Consideration	Same weight for all layer groups
Complement Infrastructure	Accessibility is the focus
	More weight on Access layers
Improve Commuting	More weight on Economic layers
Leverage Infrastructure	More weight on Physical layers
Equity	Focus on disadvantaged population
	More weight on Demographics layers

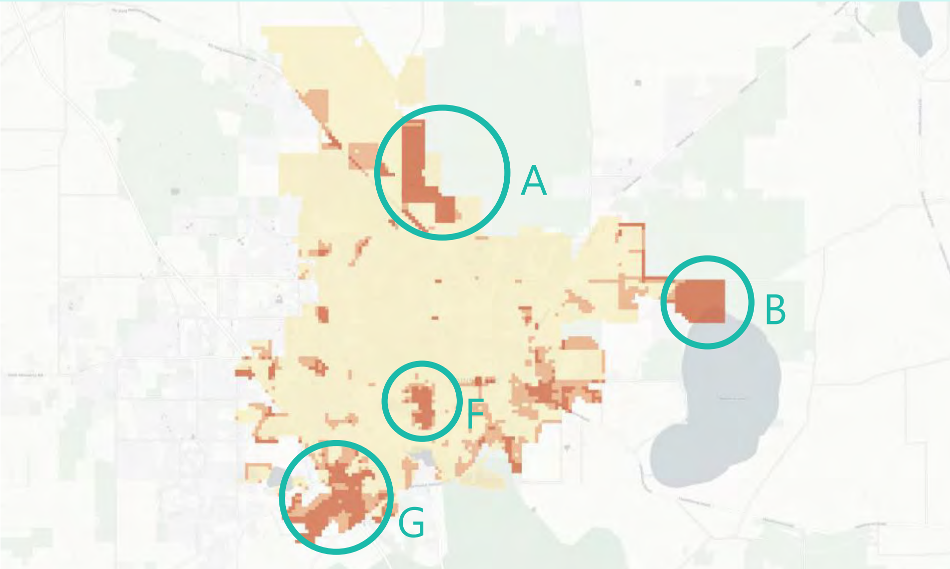
1. Equal Consideration



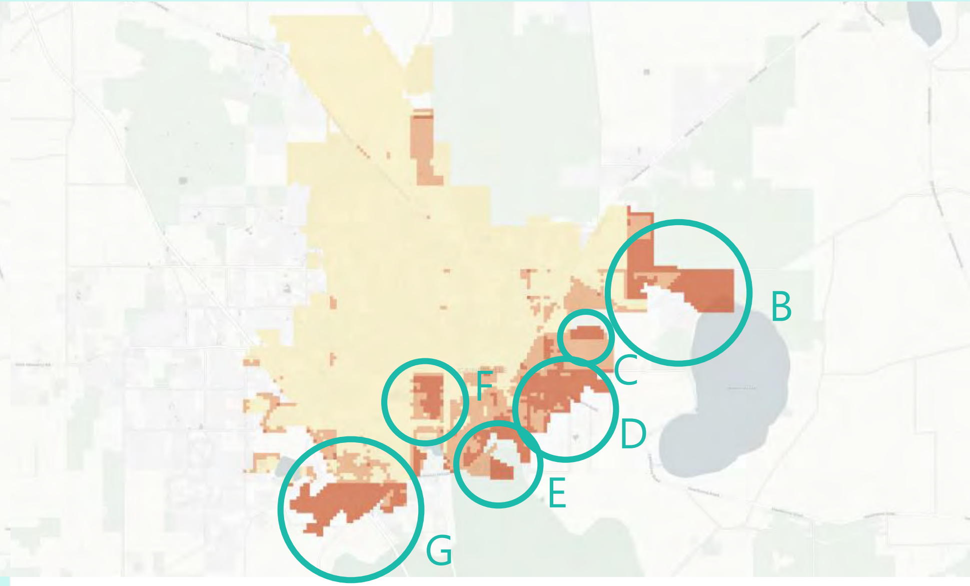
2. Complement Infrastructure



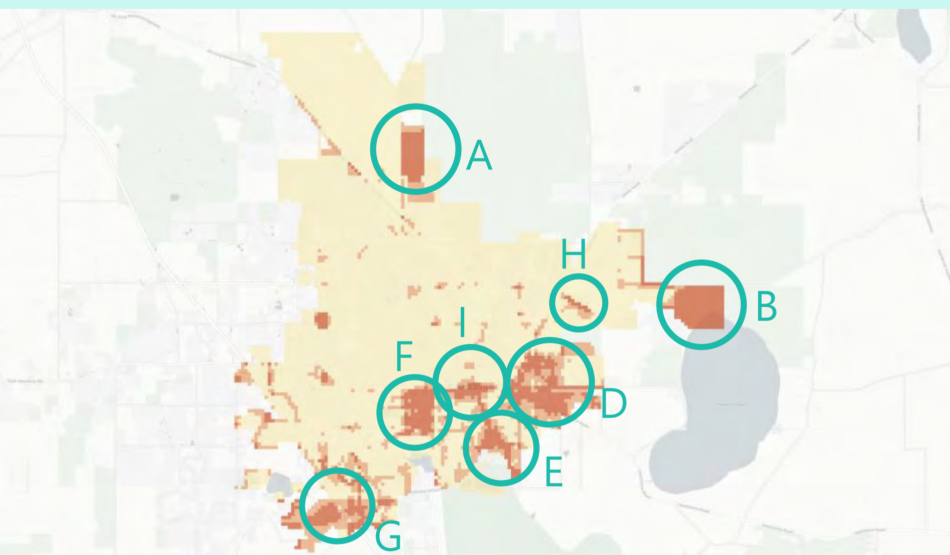
3. Improve Commuting



5. Improve Equity



4. Leverage Infrastructure



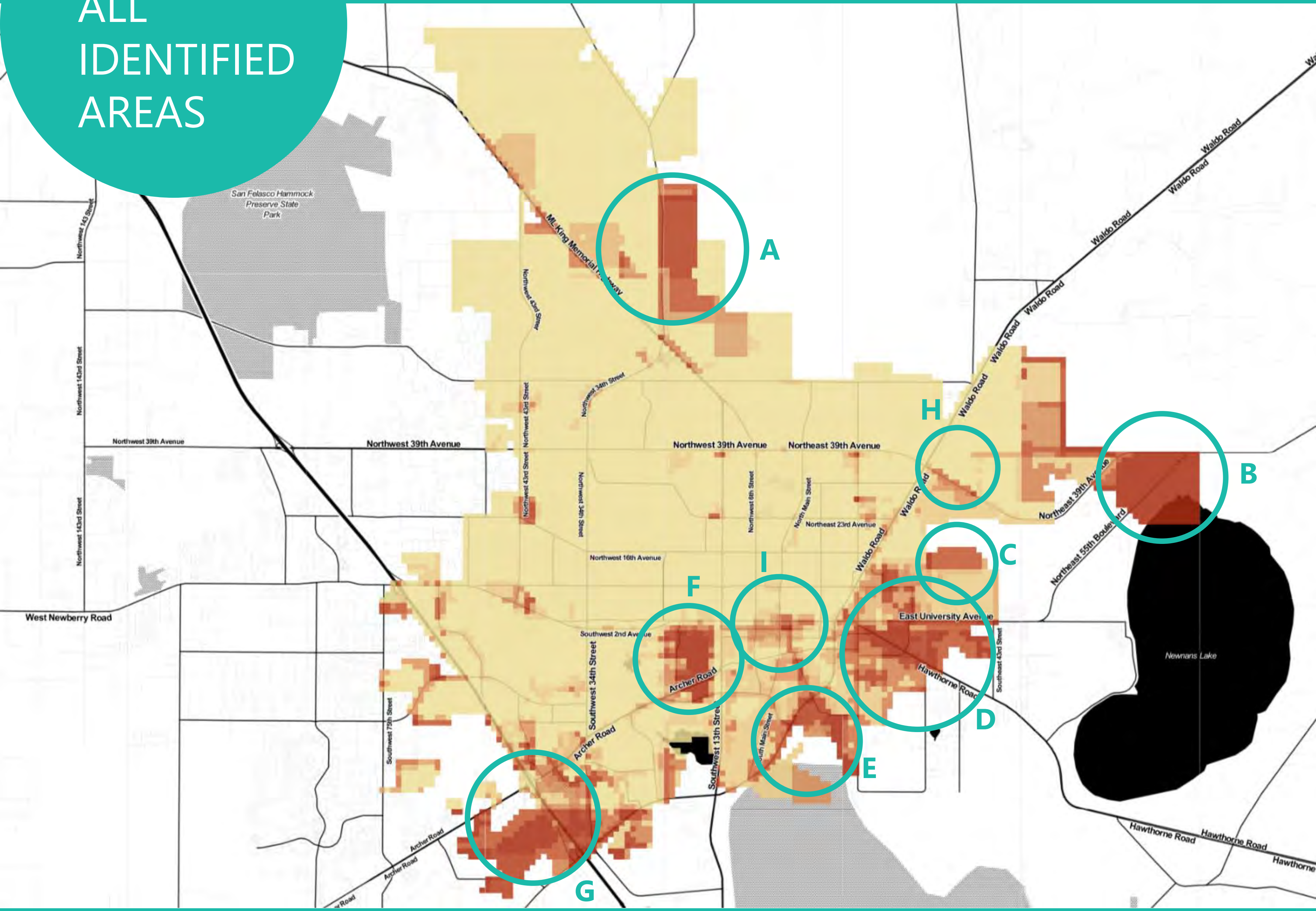
Total Appearance

A	B	C	D	E	F	G	H	I
3	5	3	4	4	4	5	1	1

There are nine unique mobility hub sites identified as candidates across scenarios. Candidates B and G are the most popular hotspots and appear in all five scenarios. Candidates D, E, and F appear in four scenarios. A and C appear three times and both H and I only appear once.

Details for each candidate were then assessed in context, in order to identify the most suitable modes to serve them.

ALL IDENTIFIED AREAS

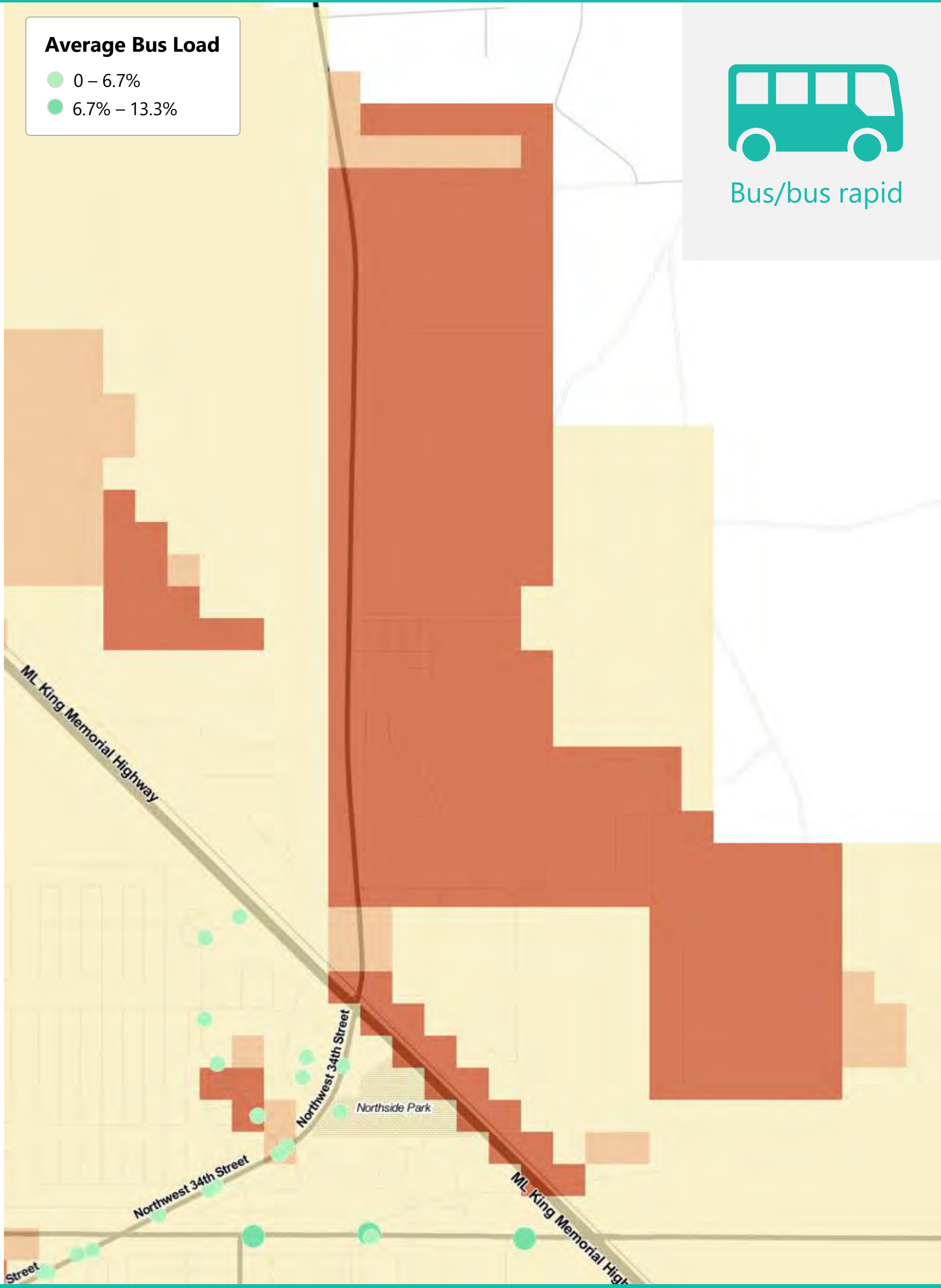


Candidate A

Layer	Median Score
Physical Layer	6
Economic Layer	6
Demographic Layer	1
Access Layer	1
Behavior Layer	6

Profile	Value
Potential traffic: workers and residents	1,600
Population/Traffic Density	3,000/sqmi
Distance to nearest existing hub (Rosa Parks Downtown Station)	6 miles

Candidate A is located in an industrial area where traffic is usually generated by employees of local businesses. Worker traffic is the cause of recurrent traffic on the intersection of NW 13th St and NW 34th Blvd. Based on the neighborhood profile, bus or bus rapid transit with a stop alongside NW 22nd St is the best solution. Traffic could also be alleviated by the addition of a bus lane alongside the congested segment (NW 13th St between NW 22nd St and NW 53rd Ave)



Bus/bus rapid

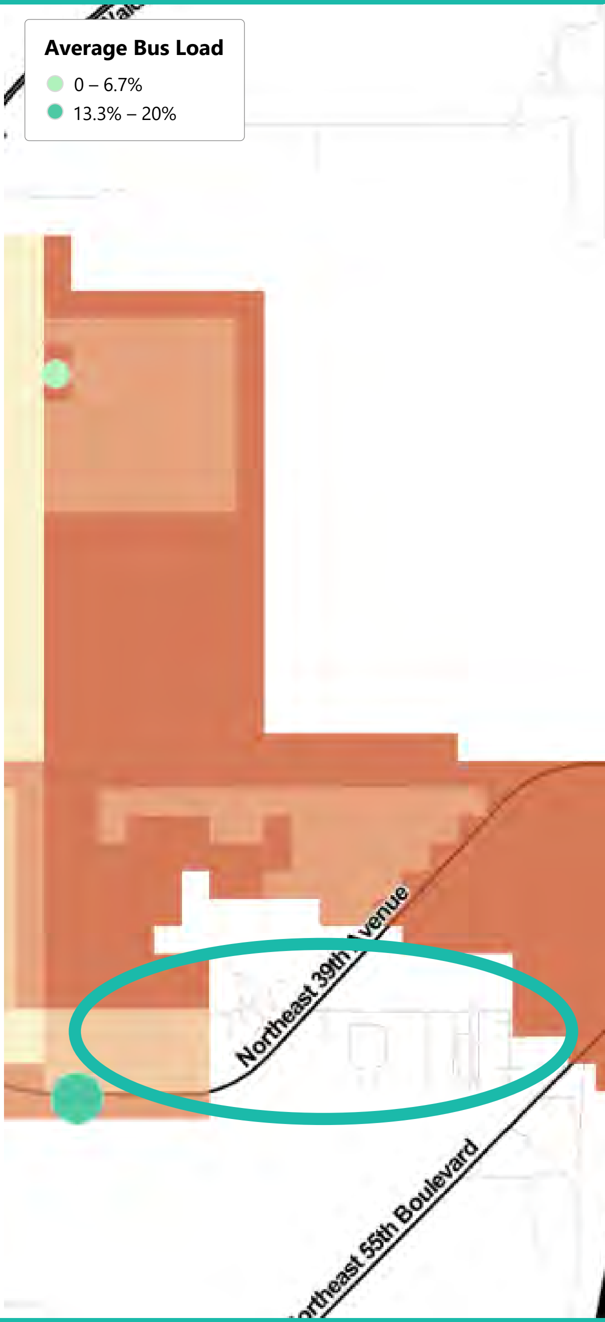
Candidate B

Layer	Average Score
Physical Layer	0
Economic Layer	0
Demographic Layer	6
Access Layer	5
Behavior Layer	5

Profile	Value
Potential traffic: residents	2,900
Population Density	4,000/sqmi
Distance to nearest existing hub (Rosa Parks Downtown Station)	6 miles

Candidate B is located in the easternmost area of the city. The stop at FDOT Operations Center can be utilized as a first-mile last-mile hub for the Lamplighter and the Copeland neighborhood area by providing light individual transportation such as dockless bike share. Bus rapid transit to and from the FDOT stop to Rosa Parks Downtown Station would be another recommended mode.

However, if it is not feasible, considering Copeland is out of Gainesville City area, we recommend to drop this candidate.



Light individual transportation combined with bus rapid, or drop

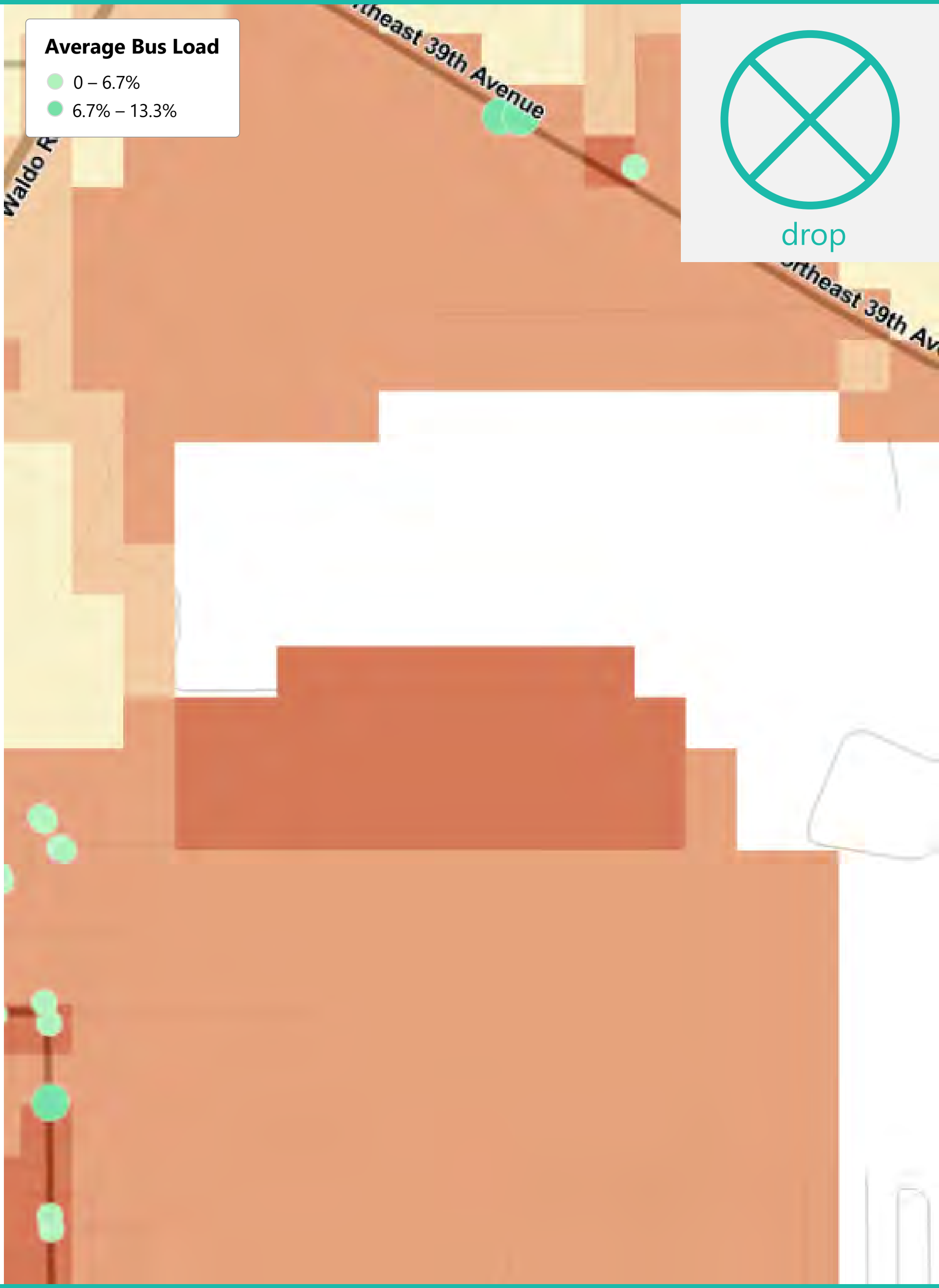
Candidate C

Layer	Median Score
Physical Layer	0
Economic Layer	1
Demographic Layer	5
Access Layer	5
Behavior Layer	6

Profile	Value
Potential traffic: workers, residents	0
Population Density	0
Distance to nearest existing hub (Rosa Parks Downtown Station)	3 miles

Candidate C is located in a green area. Despite having a score of 6 in the demographic layer group, the area achieved this score as a result of census data aggregation at the block level. The area is not in reality a high-potential mobility-hub site, as it does not have traffic demand or generation.

Therefore, it is safe to assume that this candidate can be dropped from consideration.

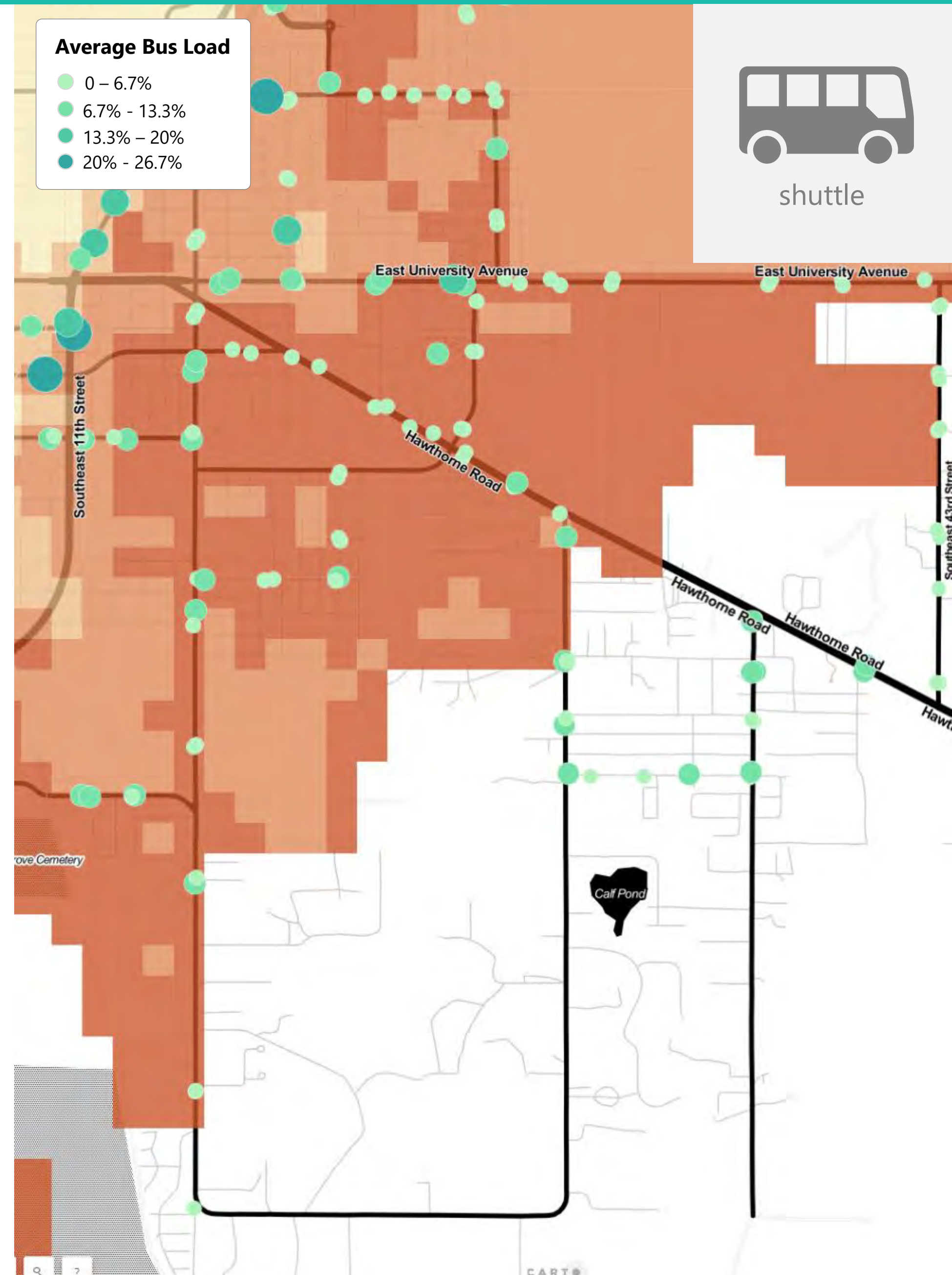


Candidate D

Layer	Median Score
Physical Layer	2
Economic Layer	4
Demographic Layer	6
Access Layer	4
Behavior Layer	4

Profile	Value
Potential traffic: residents	2,200
Population Density	10,000/sqmi
Distance to nearest existing hub (Rosa Parks Downtown Station)	2 miles

Candidate D is located in a highly populated area in close proximity to Rosa Parks Downtown Station. Frequent shuttles that go to Rosa Parks Downtown Station will be the best mode for this area.

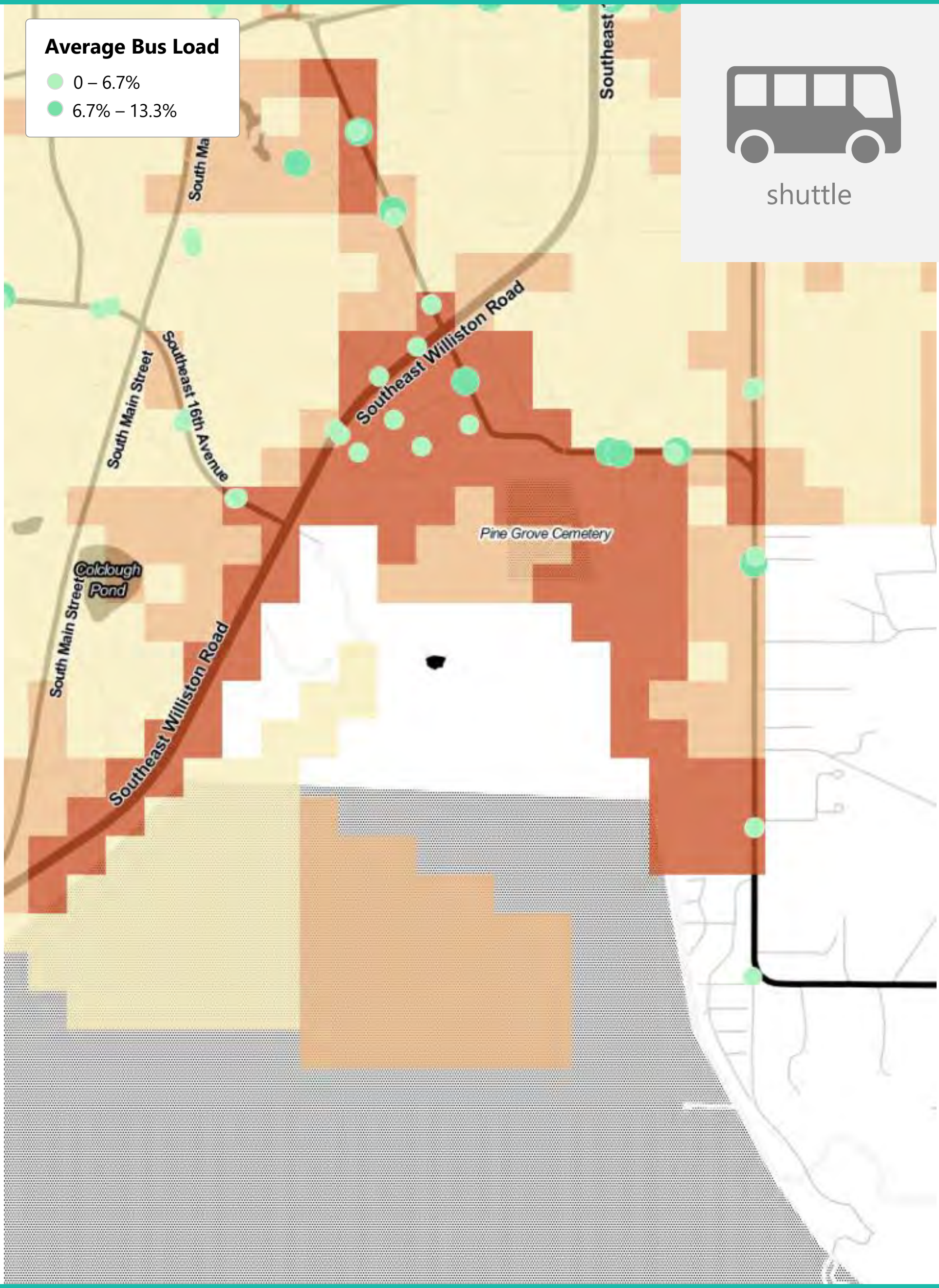


Candidate E

Layer	Median Score
Physical Layer	0
Economic Layer	1
Demographic Layer	6
Access Layer	5
Behavior Layer	4

Profile	Value
Potential traffic: residents	1,900
Population Density	11,000/sqmi
Distance to nearest existing hub (Rosa Parks Downtown Station)	2 miles

Candidate E is also located in a densely populated area. Since it is close to Rosa Parks Downtown Station, a shuttle with stops alongside S Main Street or SE Willston Road (south of Southeast 16th Avenue) is the best modal option for this area.



shuttle

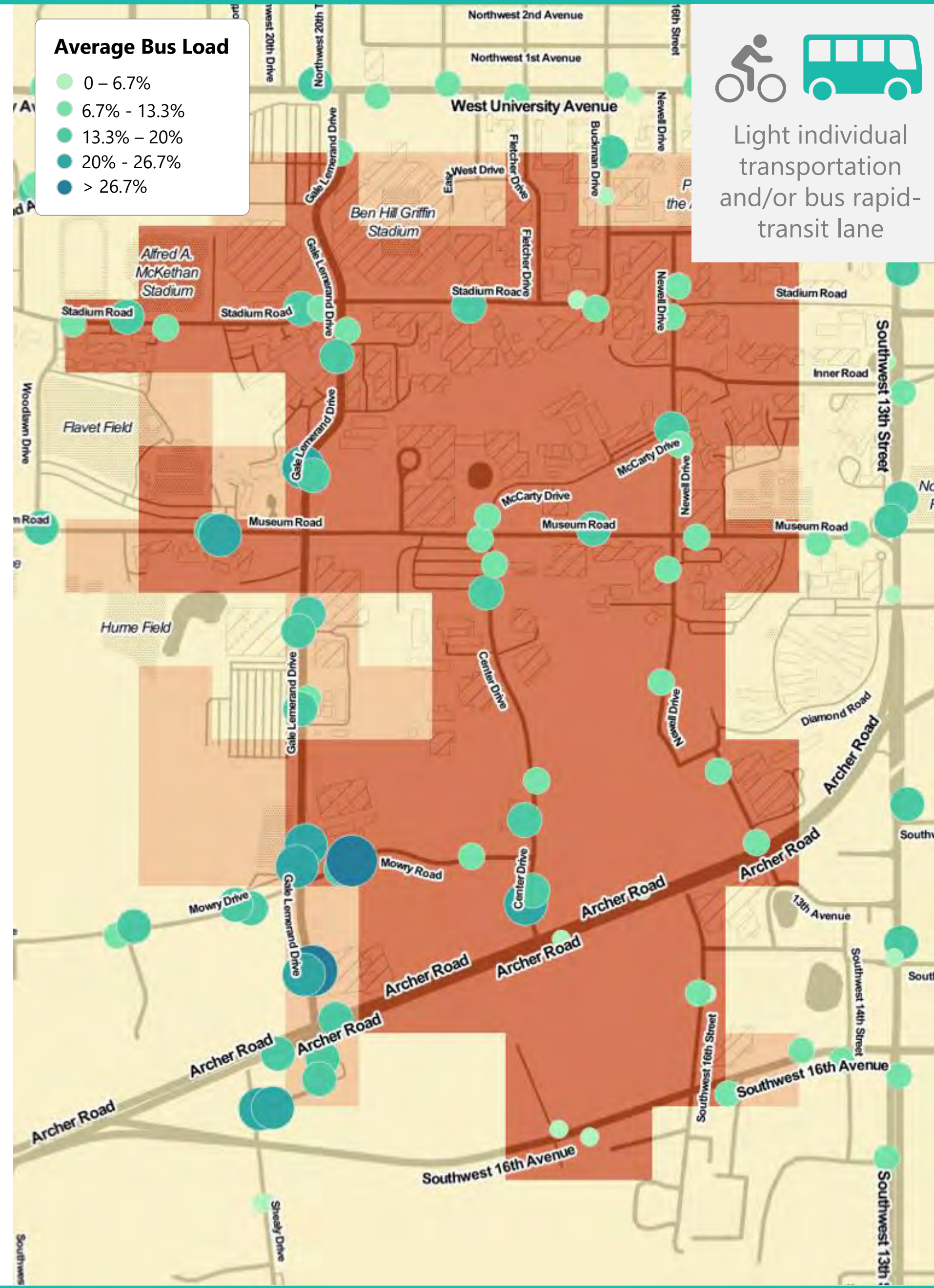
Candidate F

Layer	Median Score
Physical Layer	3
Economic Layer	4
Demographic Layer	5
Access Layer	0
Behavior Layer	4

Profile	Value
Potential traffic: students, workers	20,000
Population/Traffic Density	80,000/sqmi
Distance to nearest existing hub (Reitz Union/Beaty Towers)	< 1 mile

Candidate F is located in the University of Florida complex. Despite having high density, we recommend light individual transportation like electric scooters or bikeshare, as the ideal modal options for this area, since most of the potential users are students. A several-months long pilot could be conducted to observe the modal feasibility.

As high traffic is common in this area, another option is to introduce a bus rapid-transit lane alongside Archer Road and SW 13th St between SW 16th Ave and NW 8th Ave.

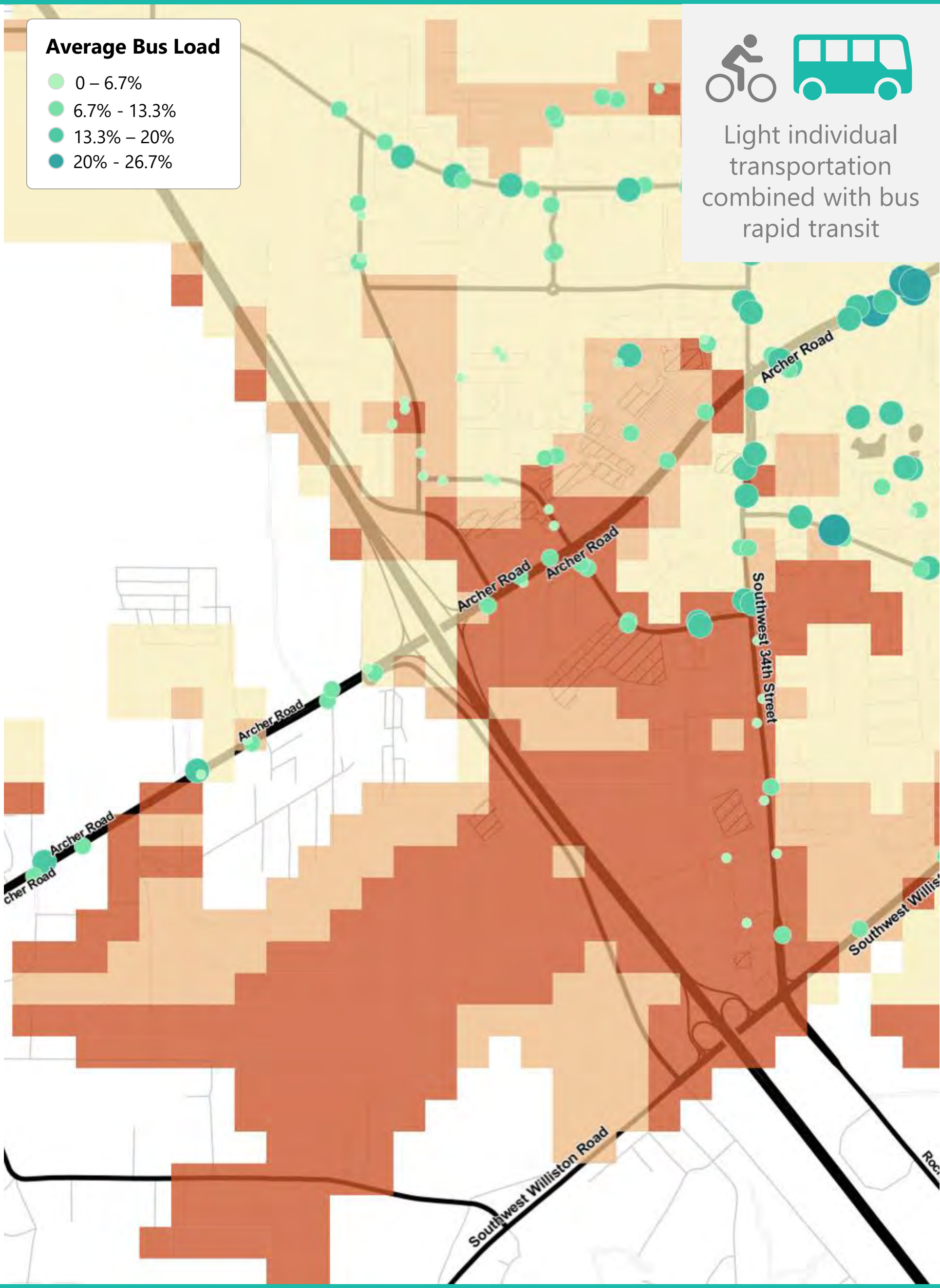


Candidate G

Layer	Median Score
Physical Layer	1
Economic Layer	4
Demographic Layer	6
Access Layer	5
Behavior Layer	5

Profile	Value
Potential traffic: workers, residents	8,000
Population/Traffic Density	9,000/sqmi
Distance to nearest existing hub (Butler Plaza)	< 1 mile
Distance to Downtown Station	5 miles

Candidate G is a mix industrial-commercial area. Most of the buses passing through this area go to either Butler Plaza or Reitz Union and therefore, many students/ young professionals may live in this area. Light individual transportation might be introduced in the residential area part of the candidate. To alleviate the traffic and make a better public transportation network, bus rapid-transit via SW Archer Rd to Downtown Station is also recommended.

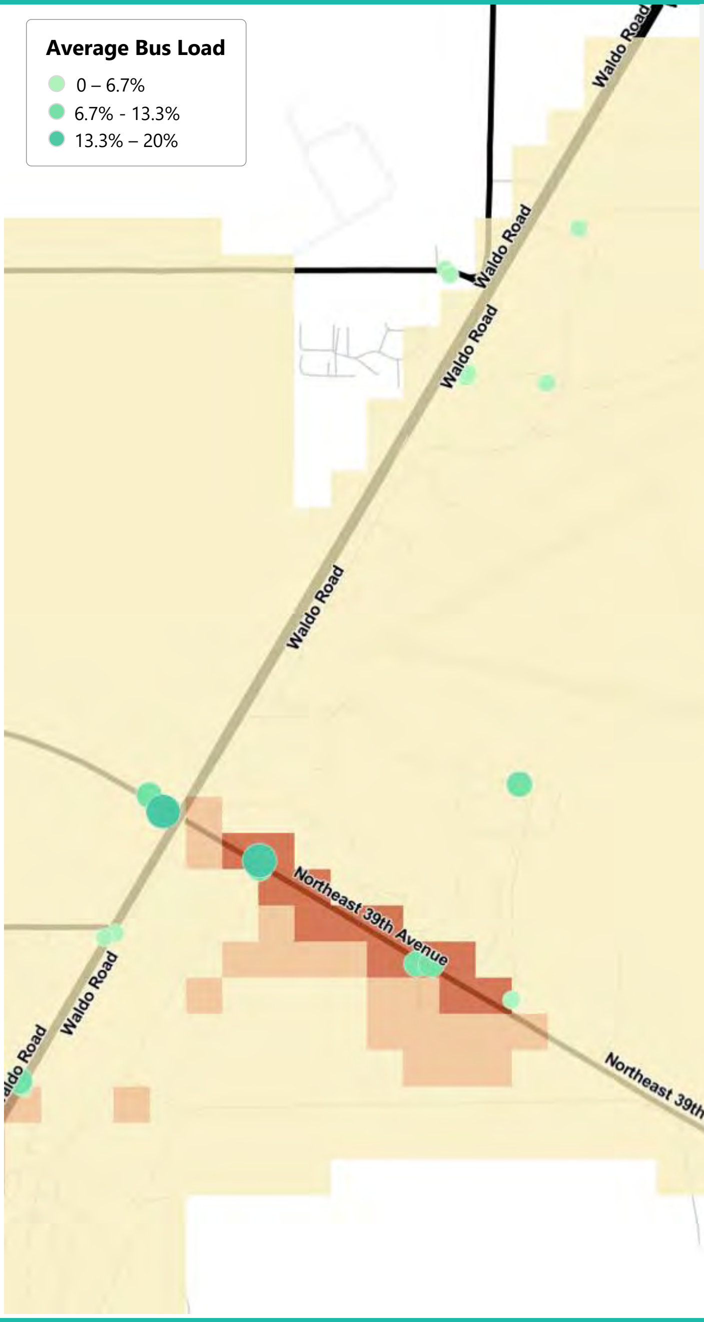


Candidate H

Layer	Median Score
Physical Layer	2
Economic Layer	1
Demographic Layer	5
Access Layer	3
Behavior Layer	5

Profile	Value
Potential traffic: workers, residents, airline passengers	5,000
Population/Traffic Density	7,000/sqmi
Distance to nearest existing hub	4 miles

Candidate H located on NE 39th Ave before the airport entrance. To alleviate the potential congestion, bus rapid transit lane in a specific peak hours can be implemented.



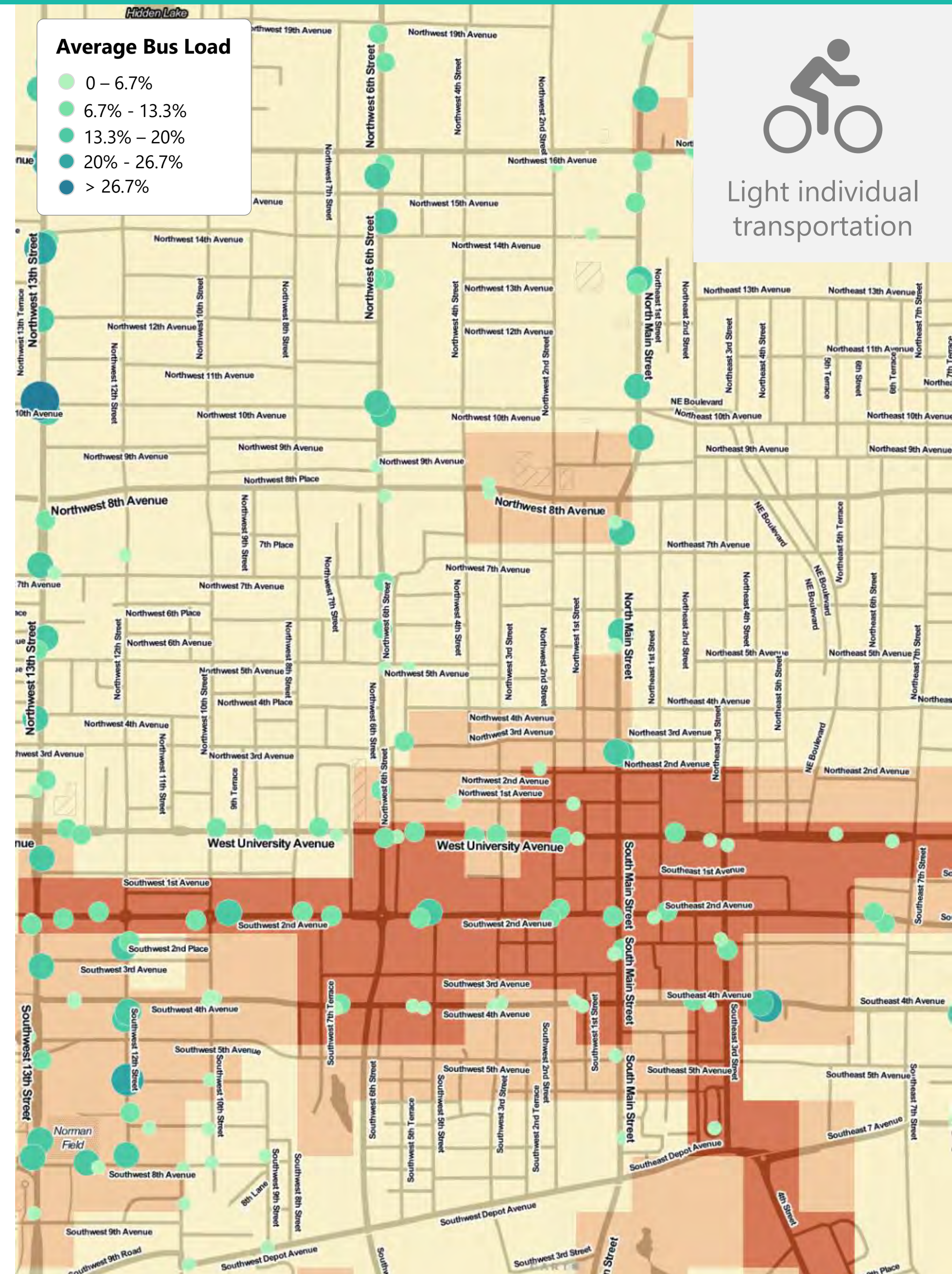
Bus/bus rapid

Candidate I

Layer	Median Score
Physical Layer	5
Economic Layer	3
Demographic Layer	5
Access Layer	0
Behavior Layer	0

Profile	Value
Potential traffic: workers, visitors, residents	4,100
Population/Traffic Density	36,000/sqmi
Distance to nearest existing hub	0.5 miles

Candidate I is located in the city center and therefore scores high in the physical and demographic layer groups. It is also already well connected to transit. Therefore, light individual transportation would be the best mode to support this area. A pilot of light individual transportation such as scooter or dockless bike is recommended in this area to test the feasibility of the modes.



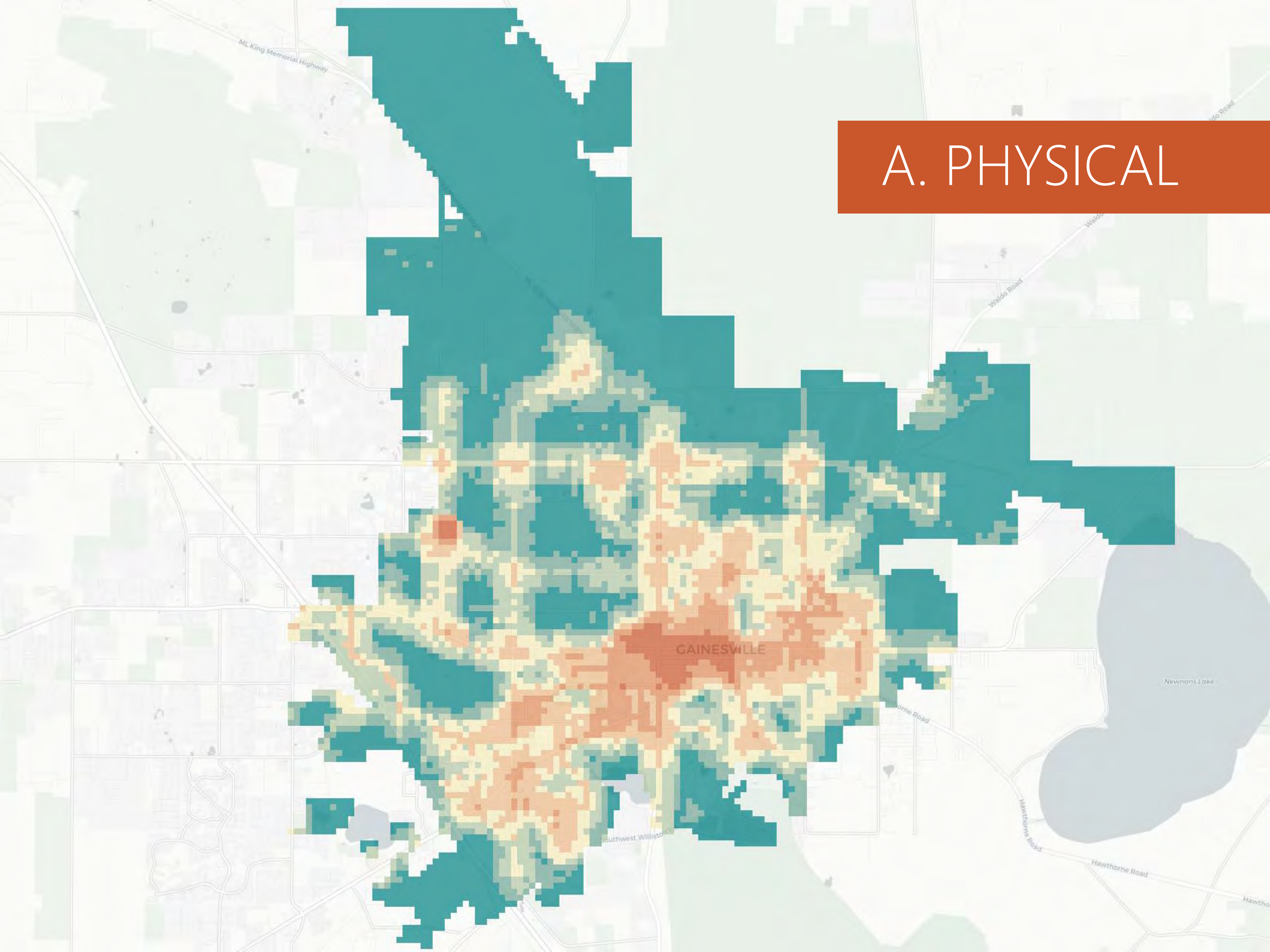
Conclusion

To identify mobility hubs, 27 layers were grouped into five different layer groups. Due to the specific focus of the layer groups, each inherently tended to highlight different areas of the city. However, this made overlapping hot spots all the more noteworthy. Scenario planning was accounted for through weighted aggregation, relative to desired outcomes and focus.

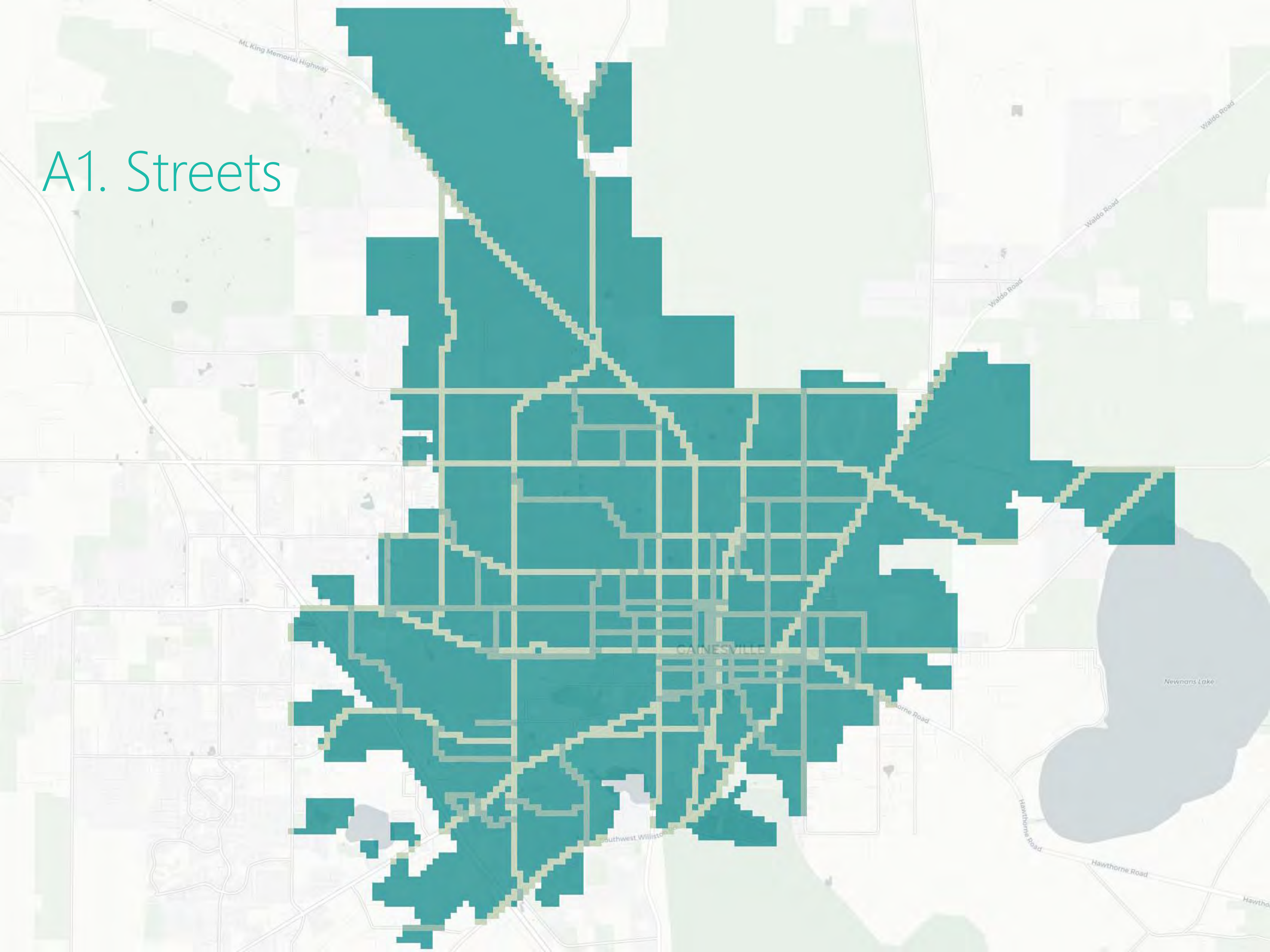
Nine different mobility hub candidates were identified, with two dropped from consideration in the process. Seven viable candidates remained, and we recommended ideal modes for each of them.

Mobility hubs with transportation modes identified and bus lane recommendations could be pursued through pilot project. Projects in partnership with the Florida Department of Transportation, University of Florida, Santa Fe Community College, and Alachua County could realize a significant shift toward a more coordinated transportation system that provides better access to mobility options for all.

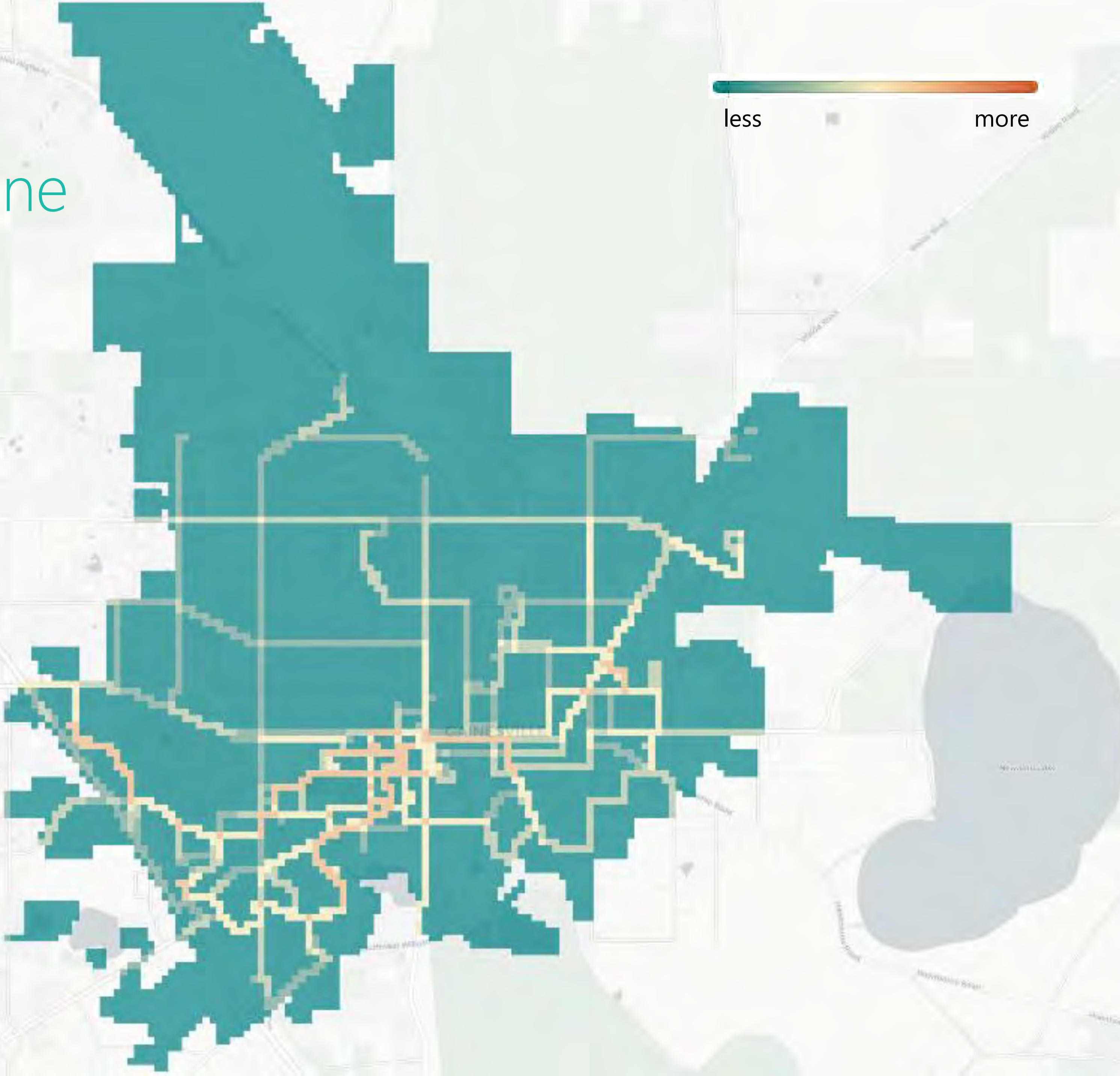
Appendices


A. PHYSICAL
ML King Memorial Highway
Waldo Road
GAINESVILLE
Newnans Lake
Hawthorne Road

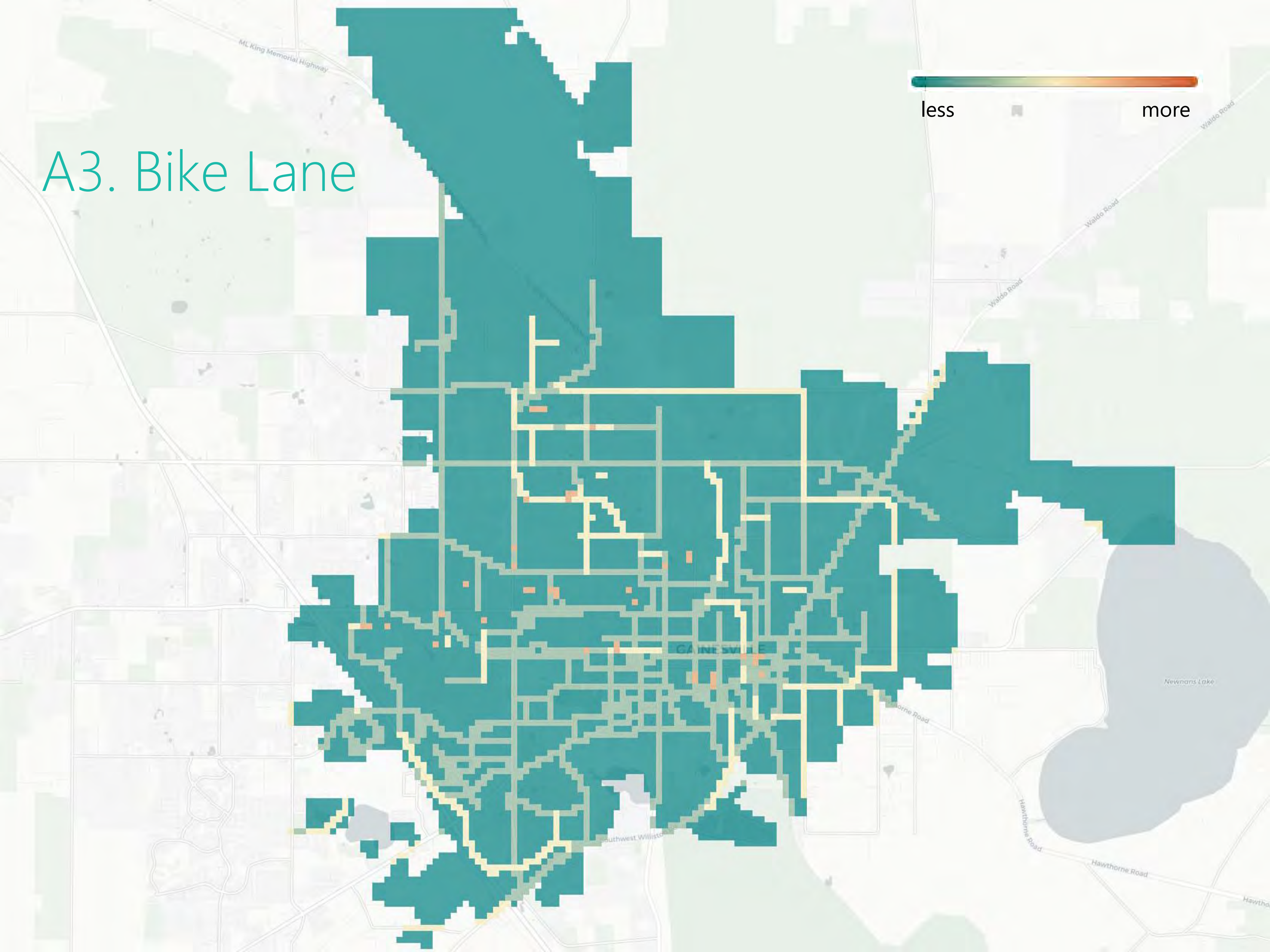
A1. Streets


ML King Memorial Highway
Waldo Road
Waldo Road
Waldo Road
GAINESVILLE
Newnans Lake
Hawthorne Road
Hawthorne Road
Hawthorne Road
Southwest Williston

A2. Bus Lane

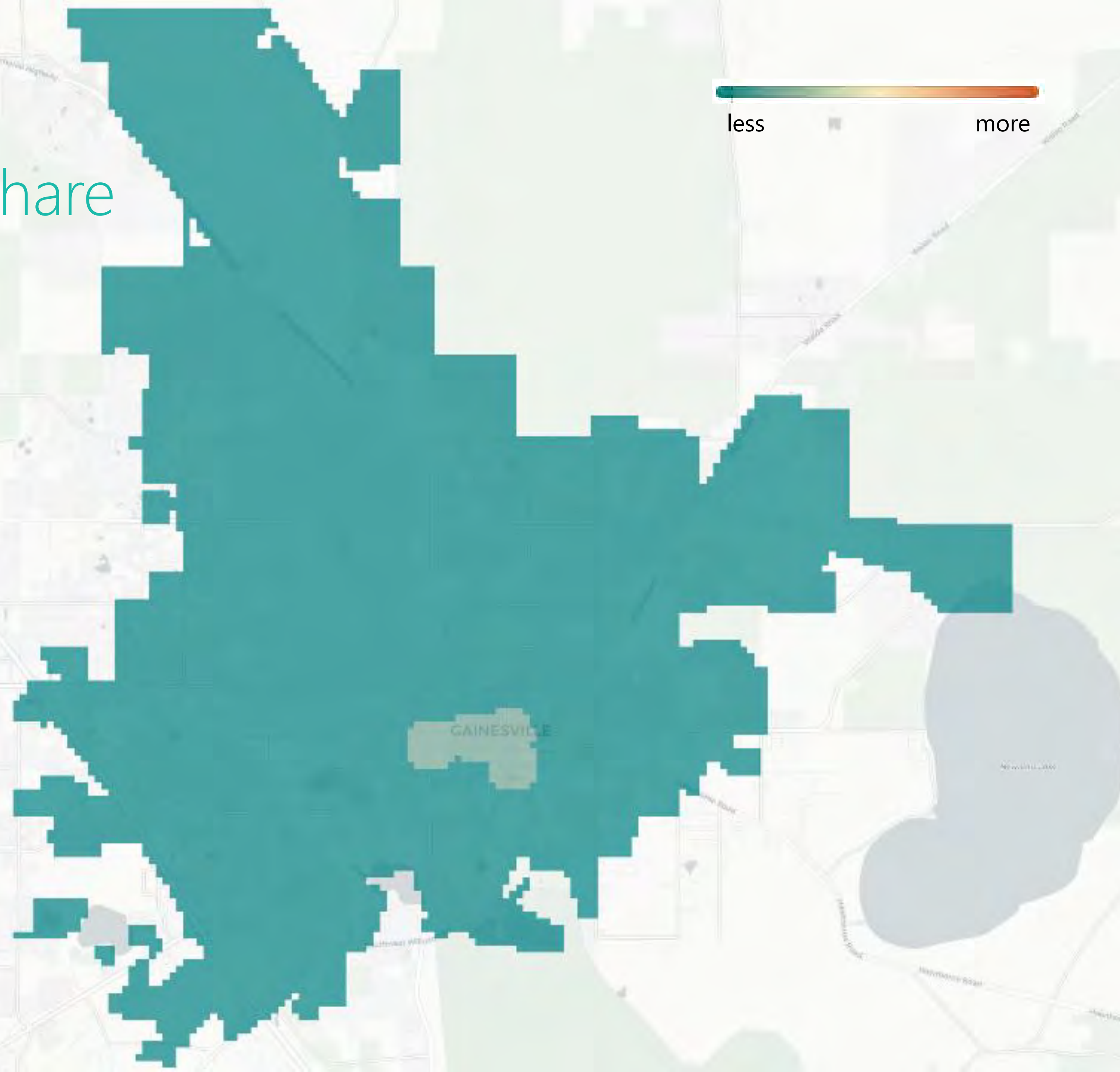


A3. Bike Lane

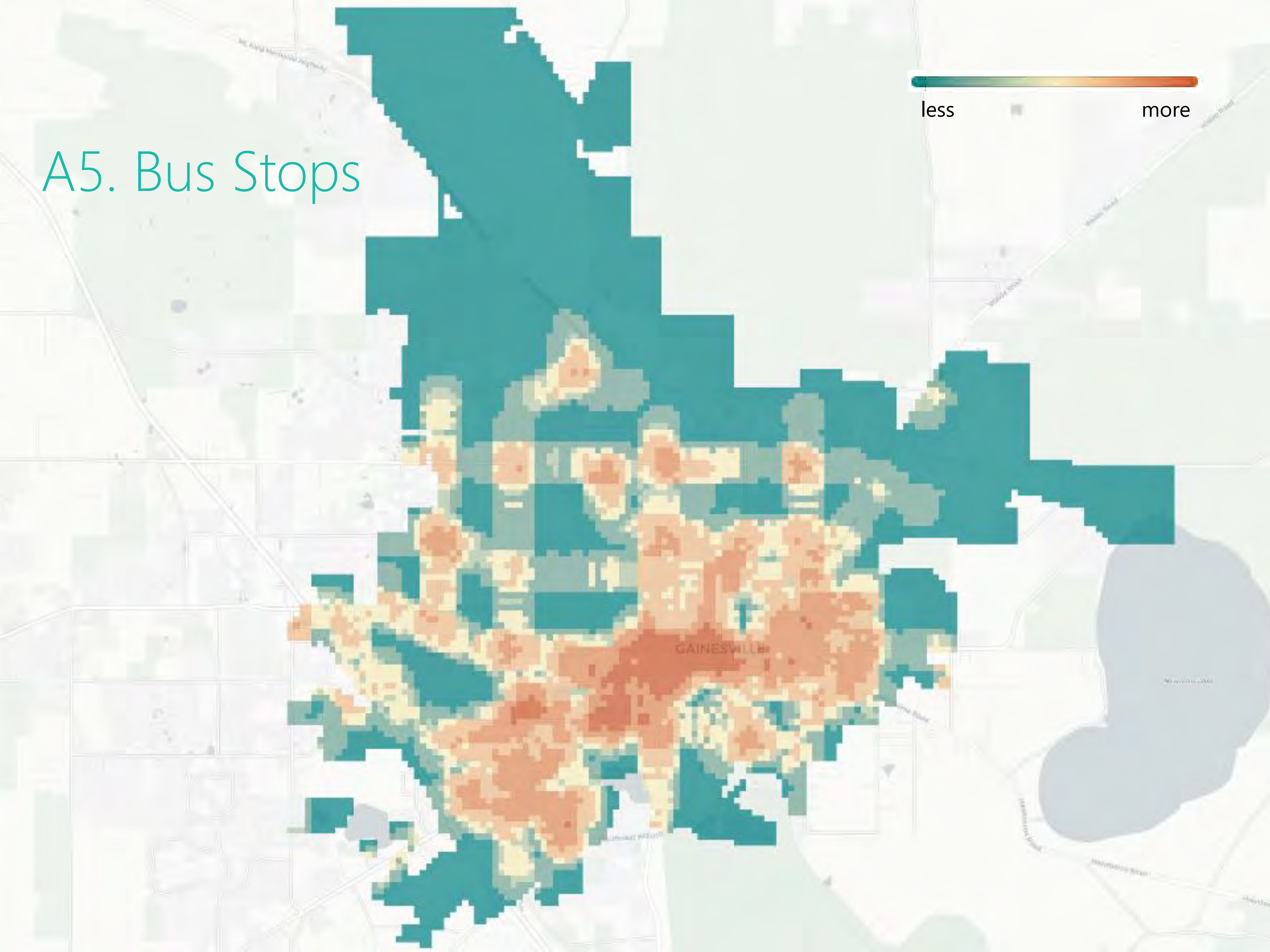


less
more
ML King Memorial Highway
Waldo Road
Waldo Road
Waldo Road
GAINESVILLE
Newnans Lake
Hawthorne Road
Hawthorne Road

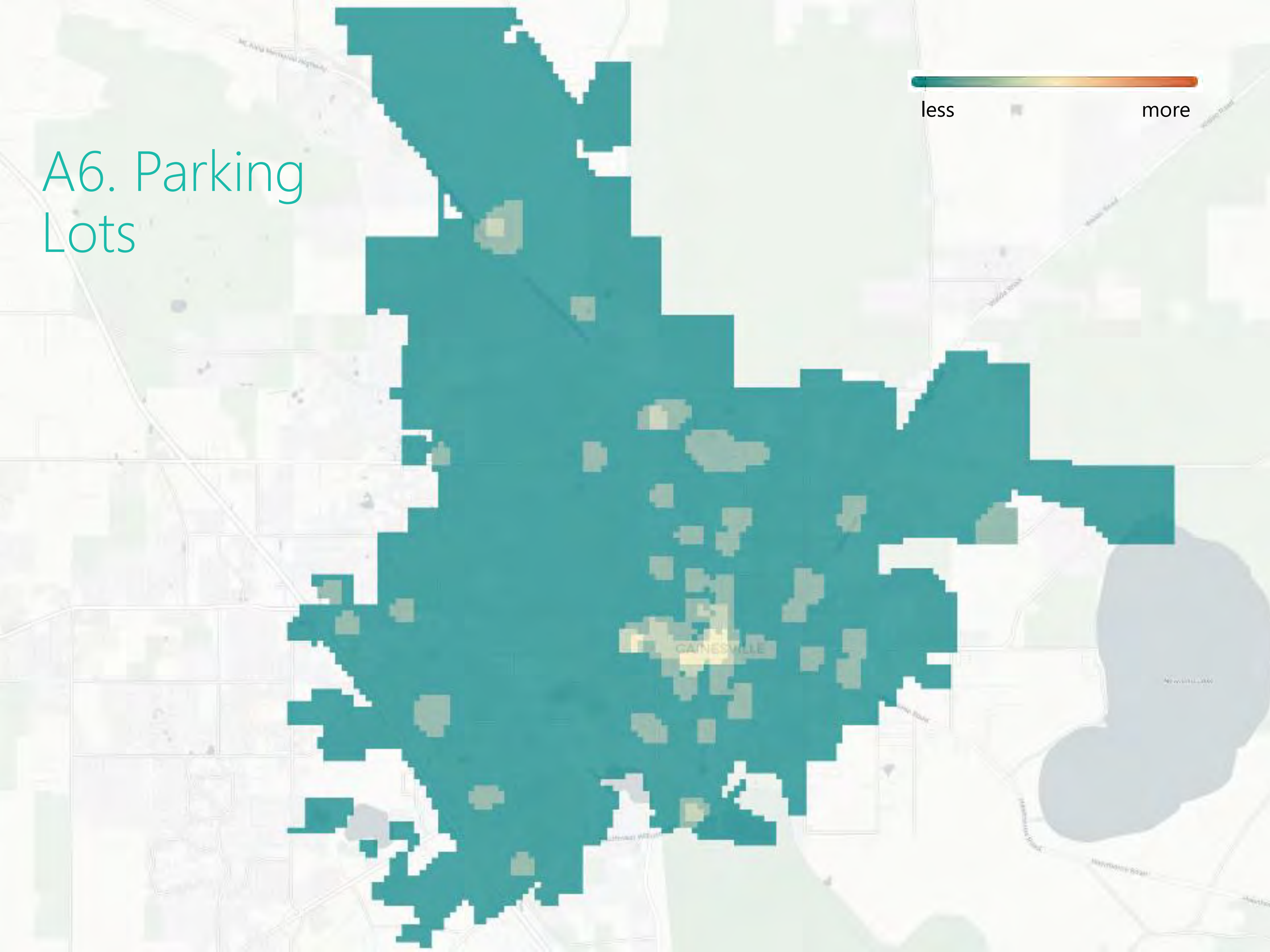
A4. Bike Share Stations



A5. Bus Stops



A6. Parking Lots

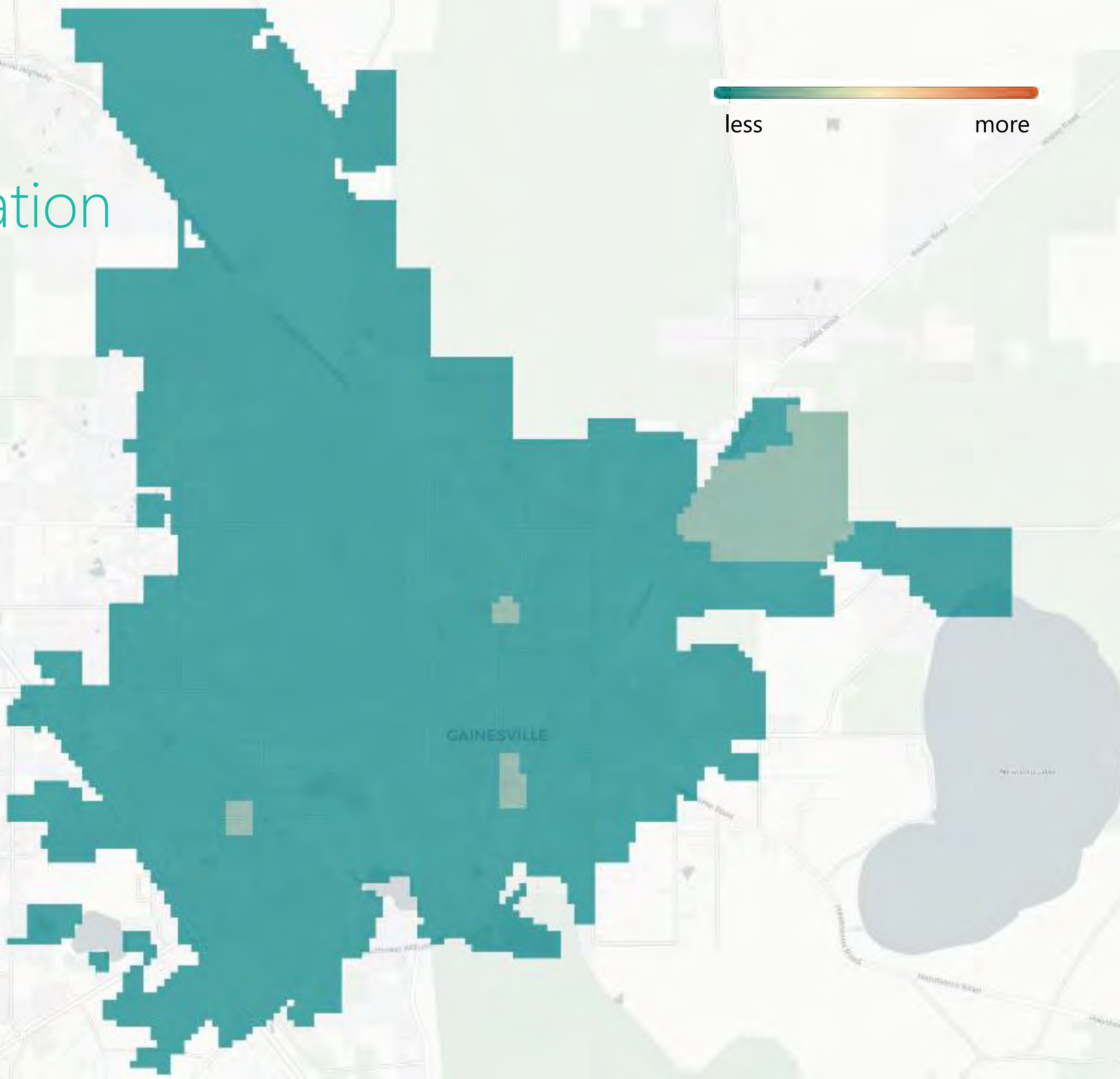


A7. Other Transportation Facilities

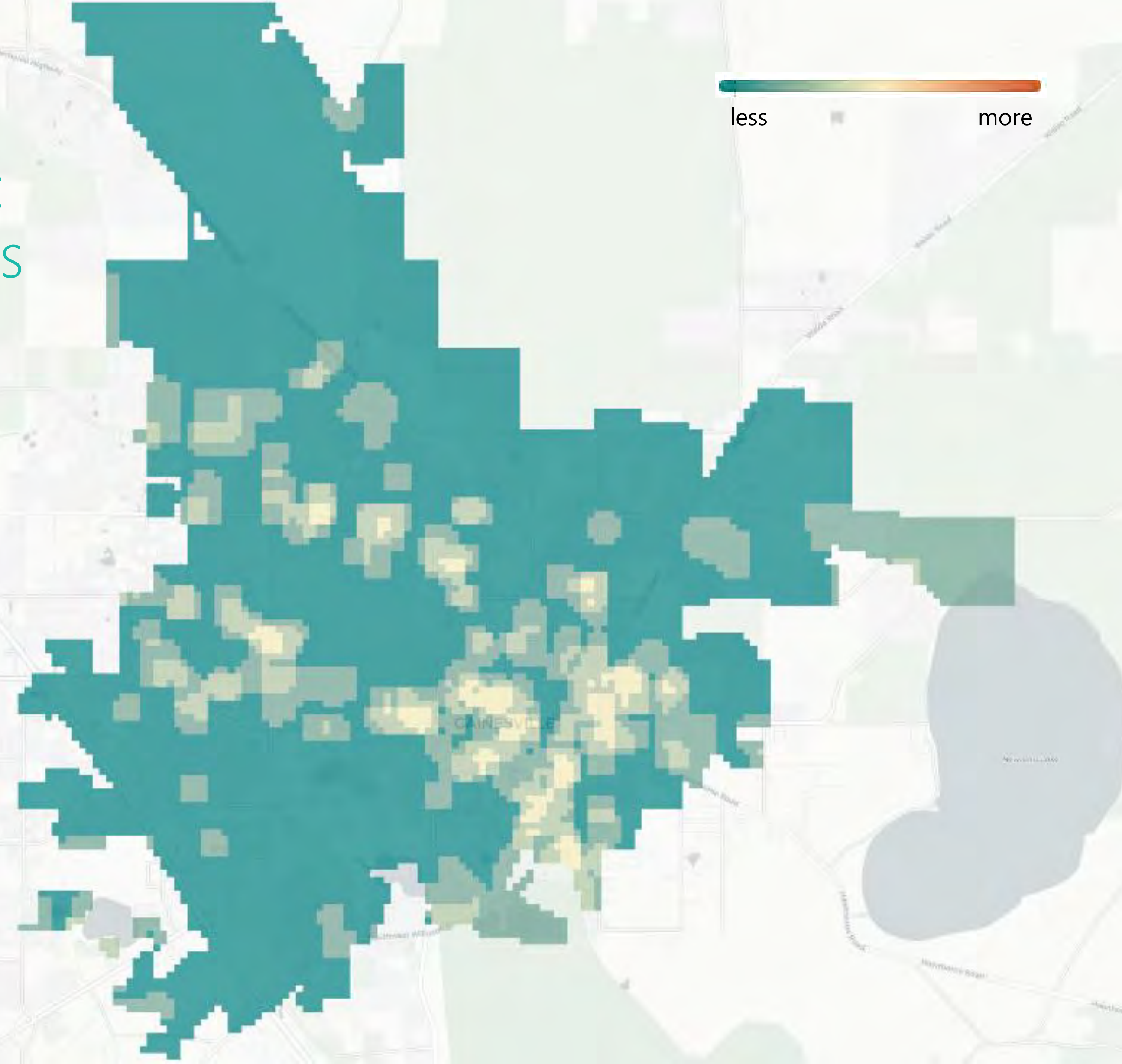
Airport,

Park-and-ride,

Coach buses

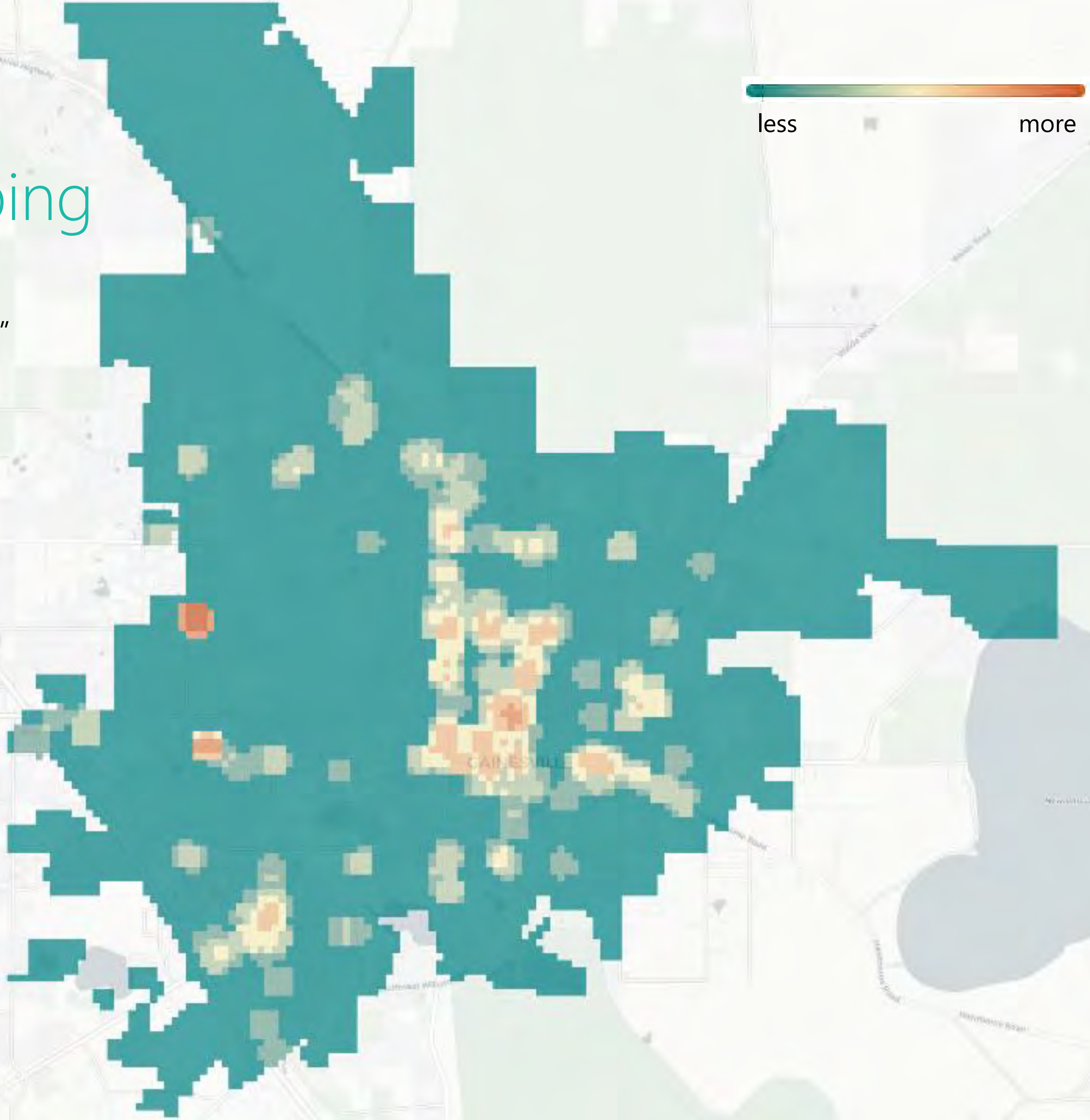


A8. Public Attractions

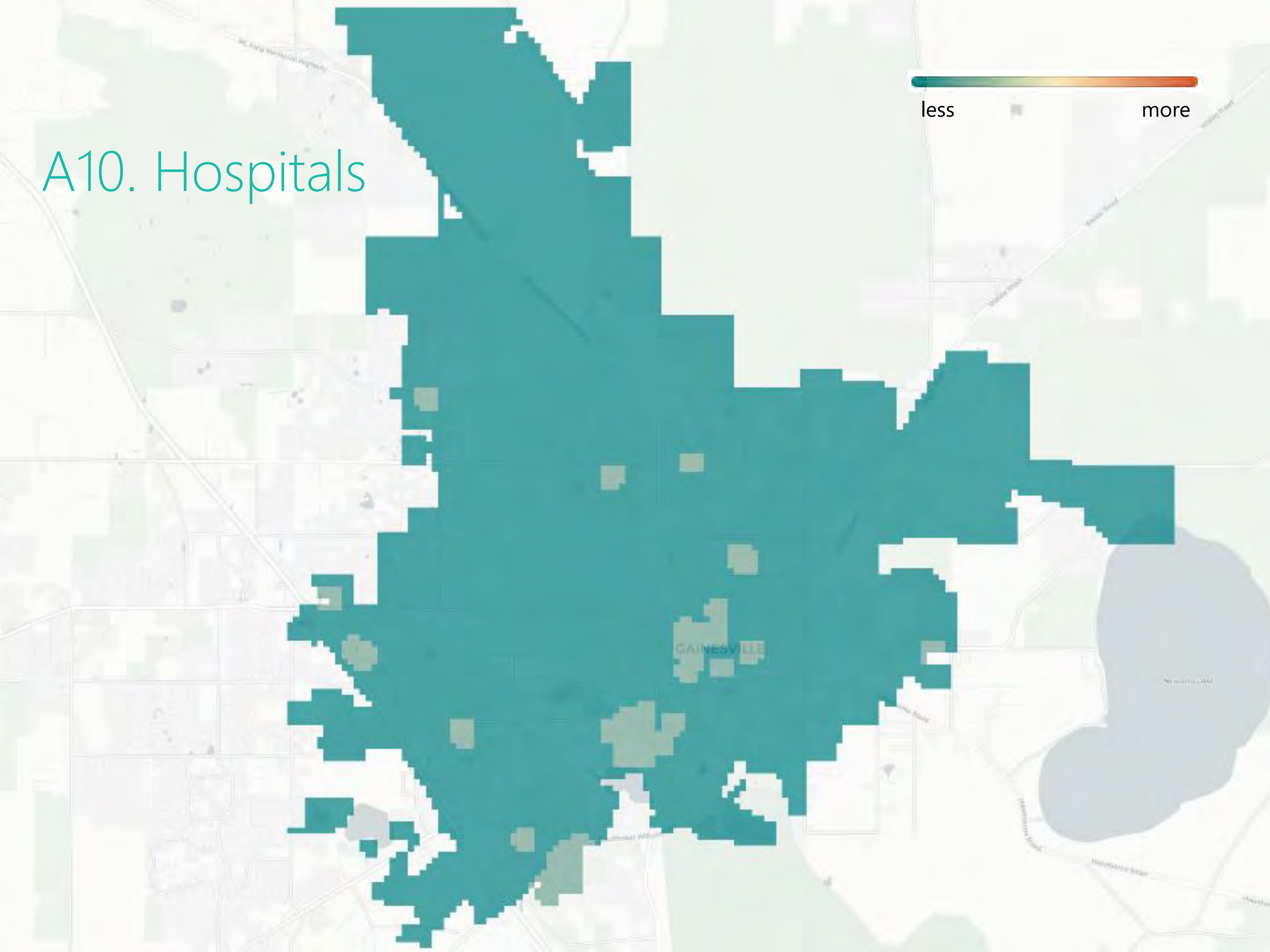


A9. Shopping Centers

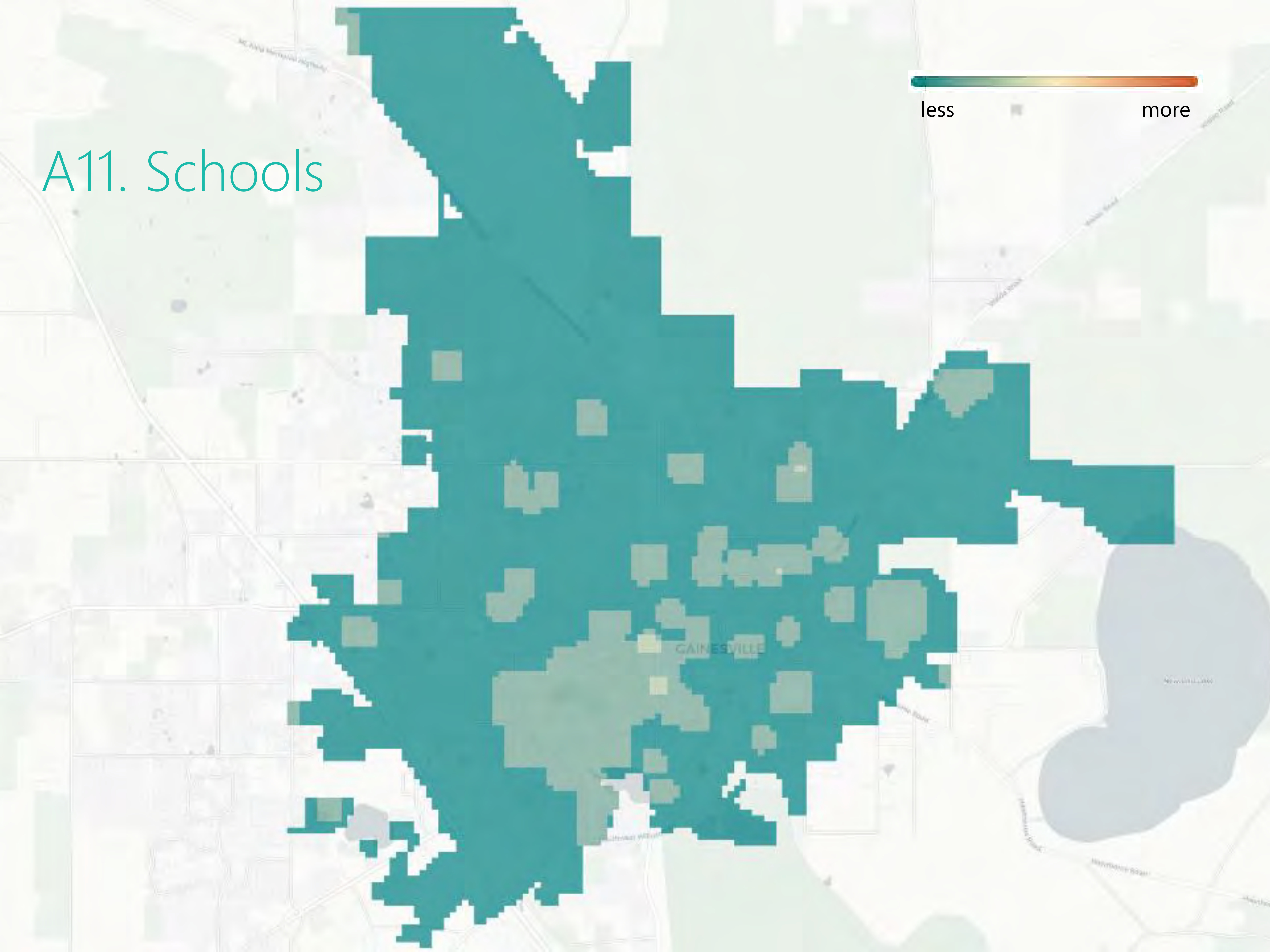
Identified as “STORES” in Land Use data



A10. Hospitals

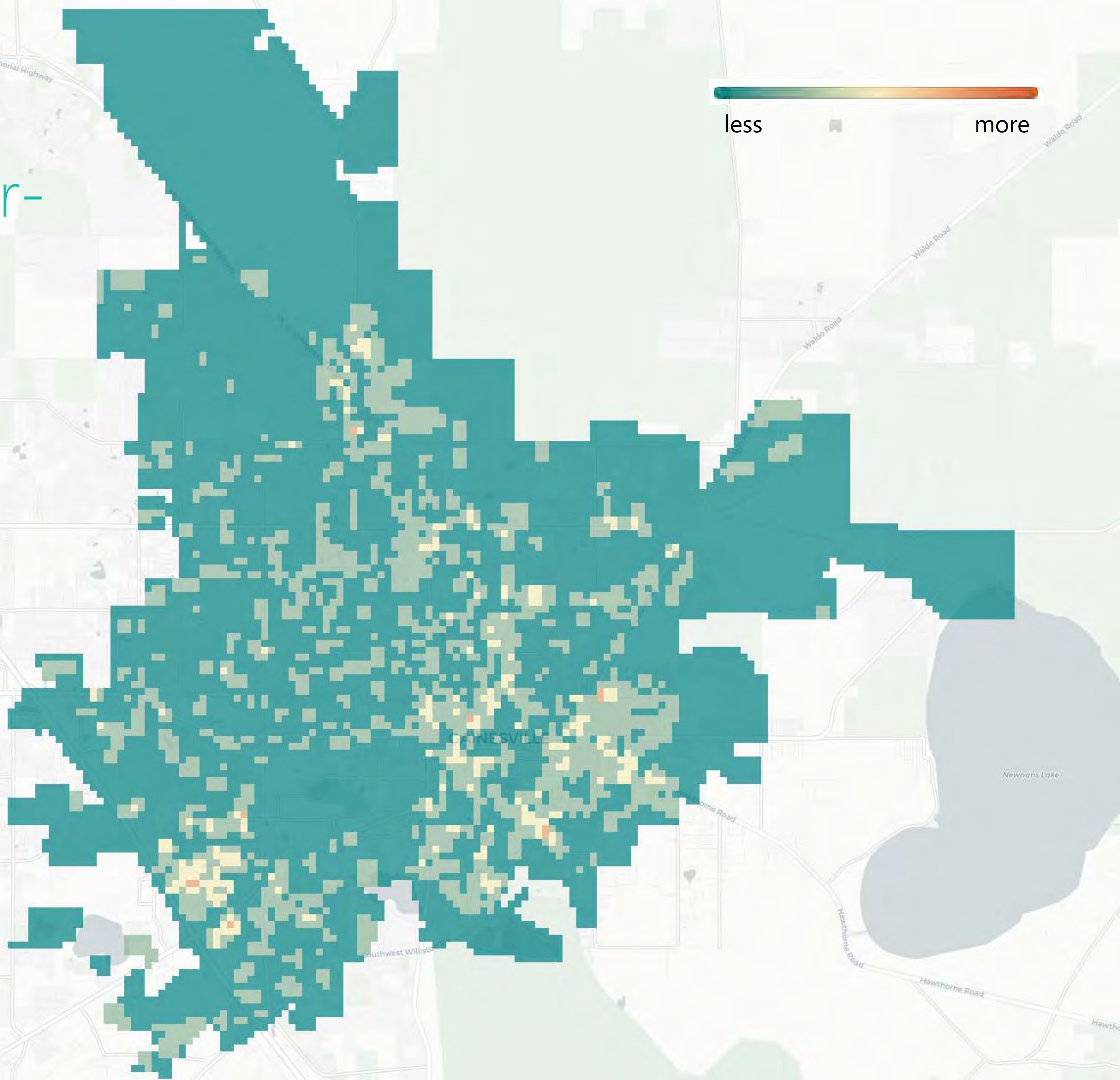


A11. Schools

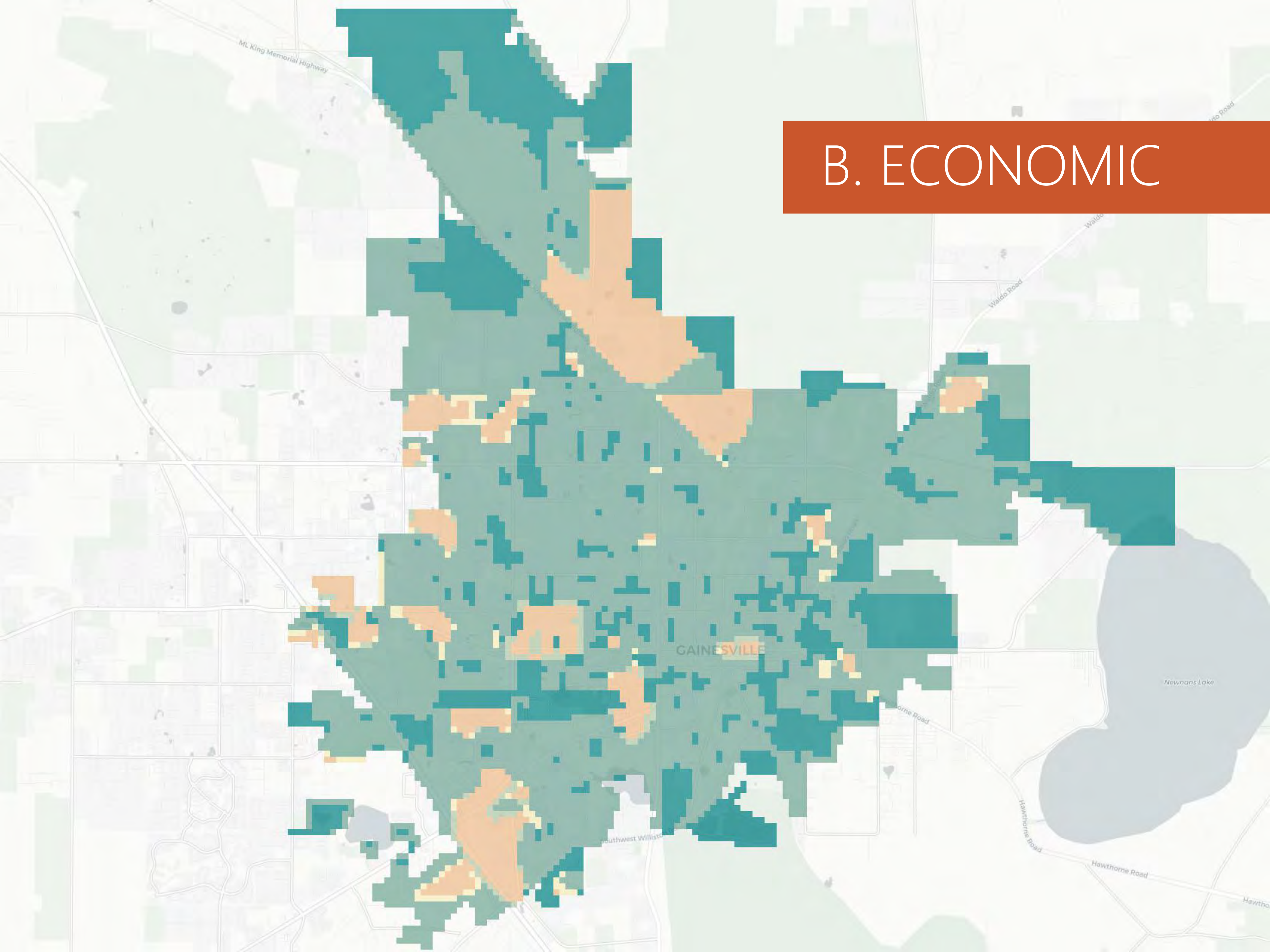


A12. Under-Utilized Land

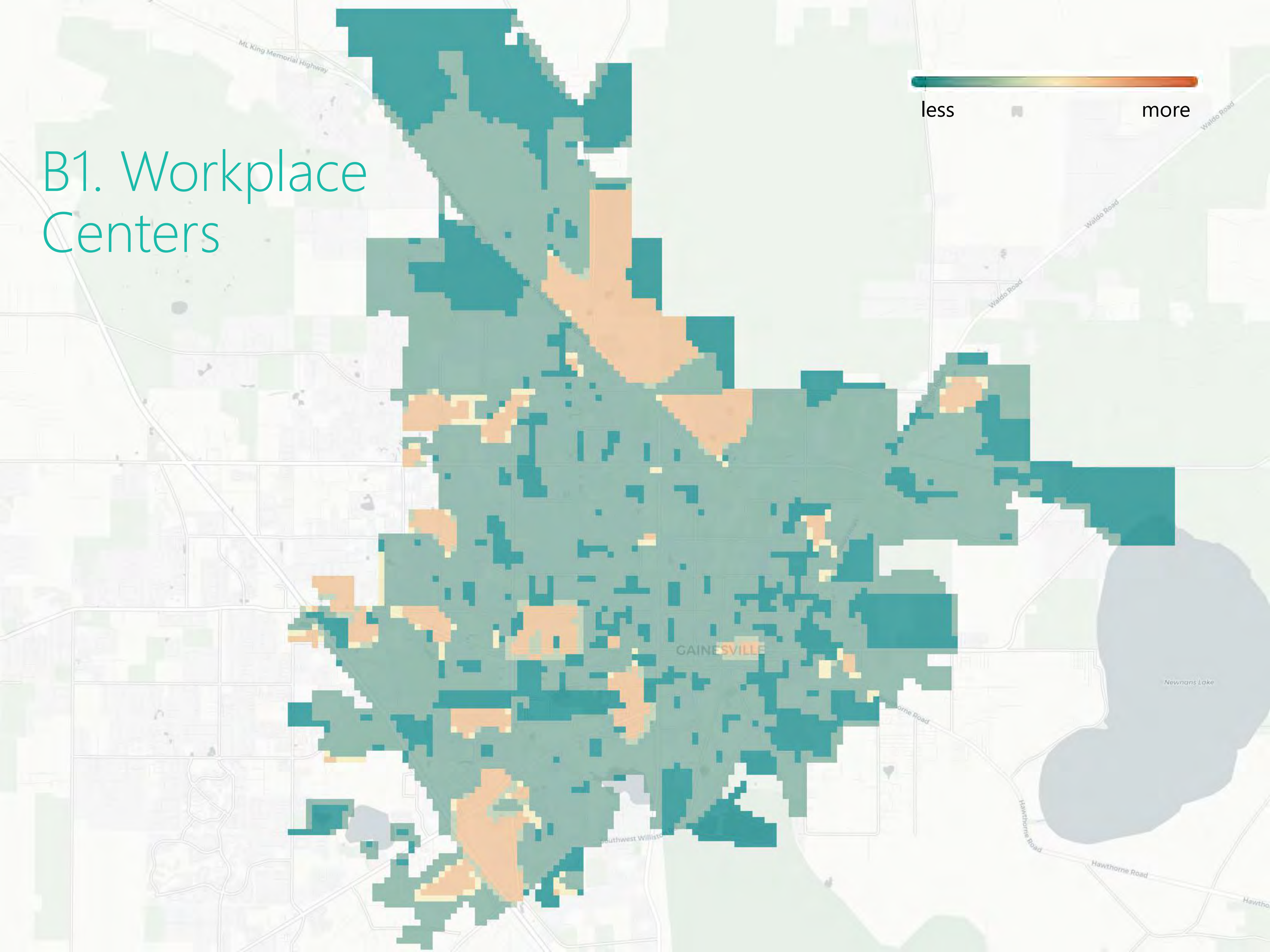
Identified as "VACANT" in Land Use data



B. ECONOMIC

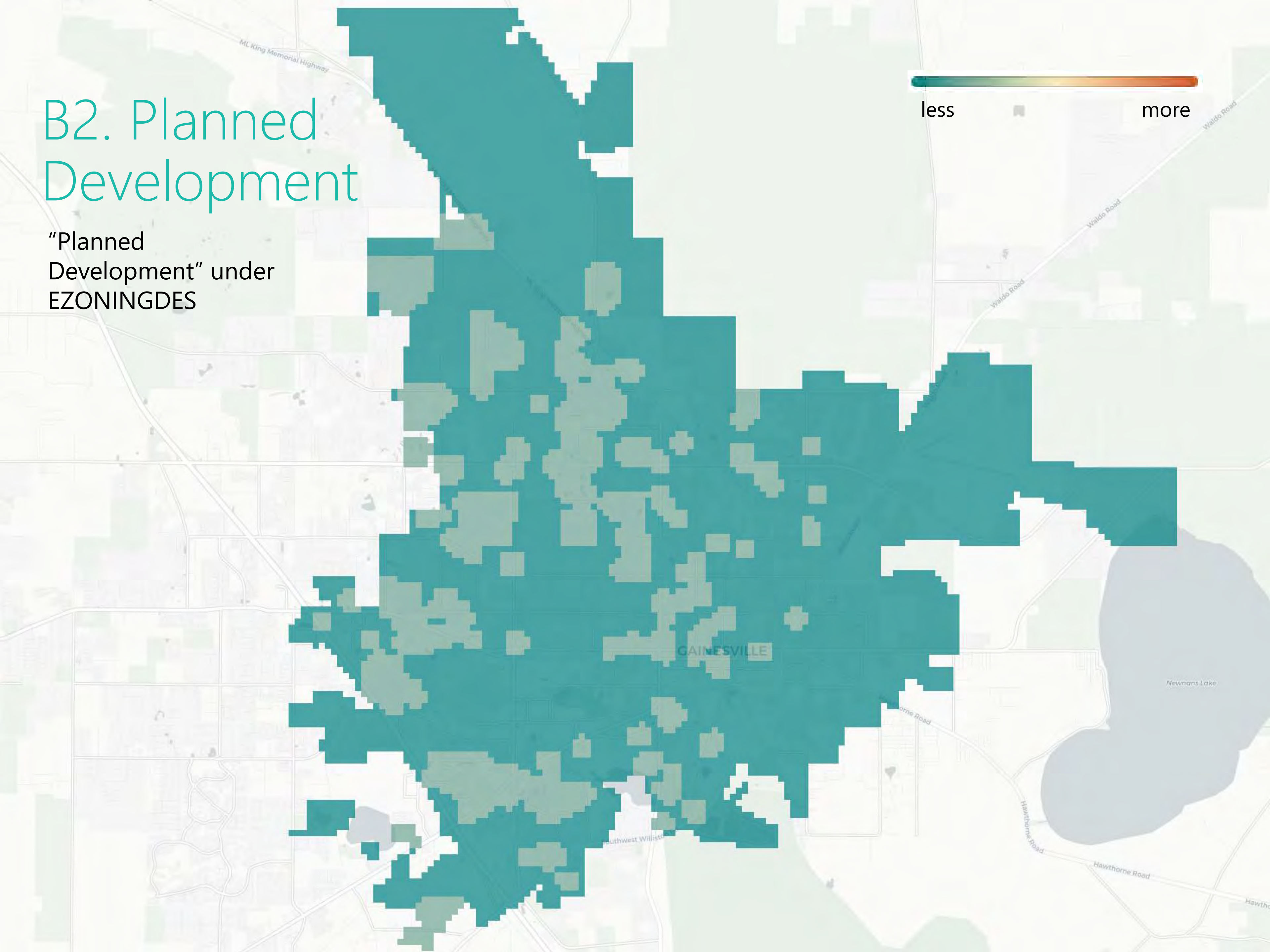

ML King Memorial Highway
Waldo Road
GAINESVILLE
Newnans Lake
Hawthorne Road

B1. Workplace Centers

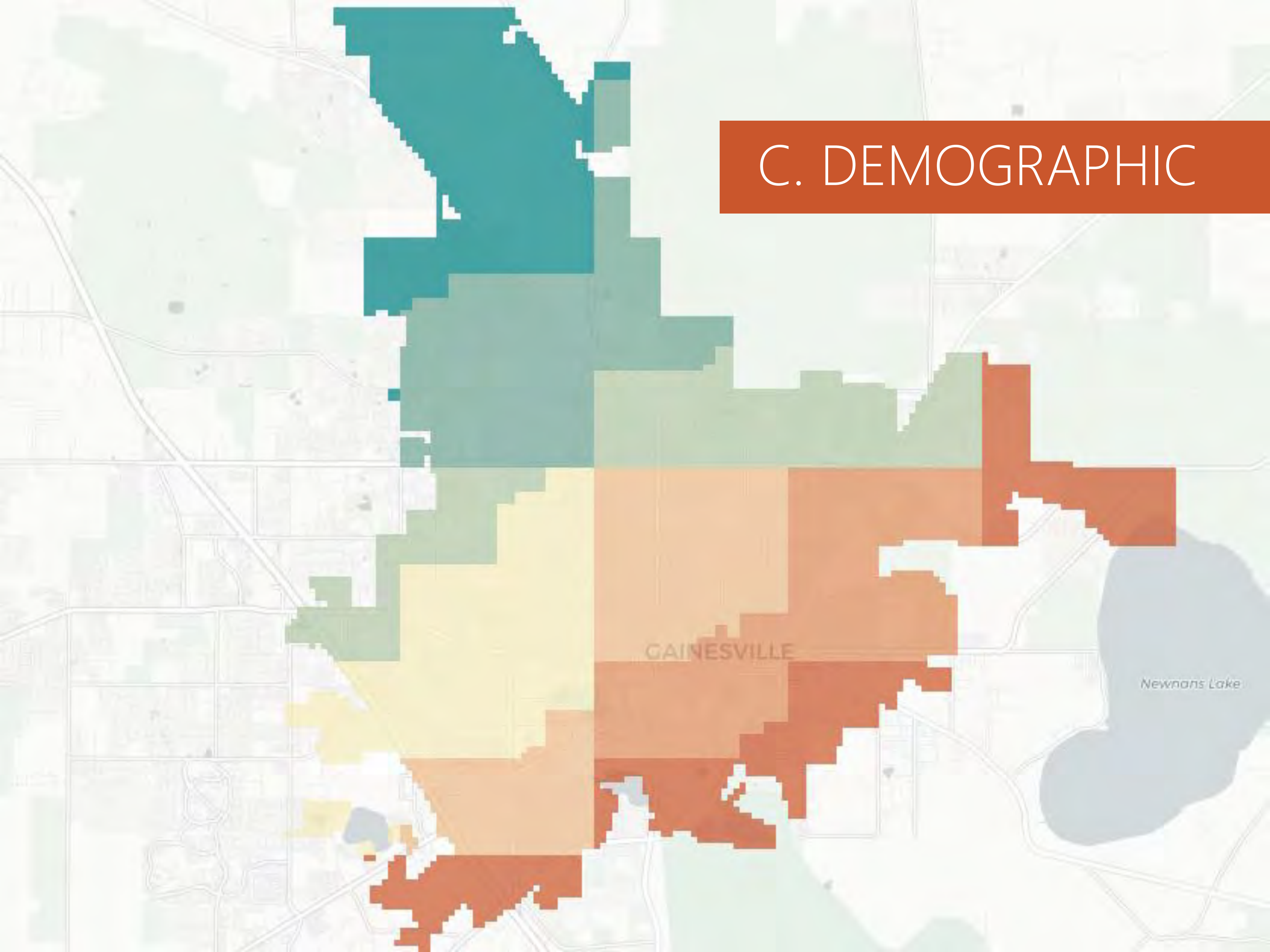


B2. Planned Development

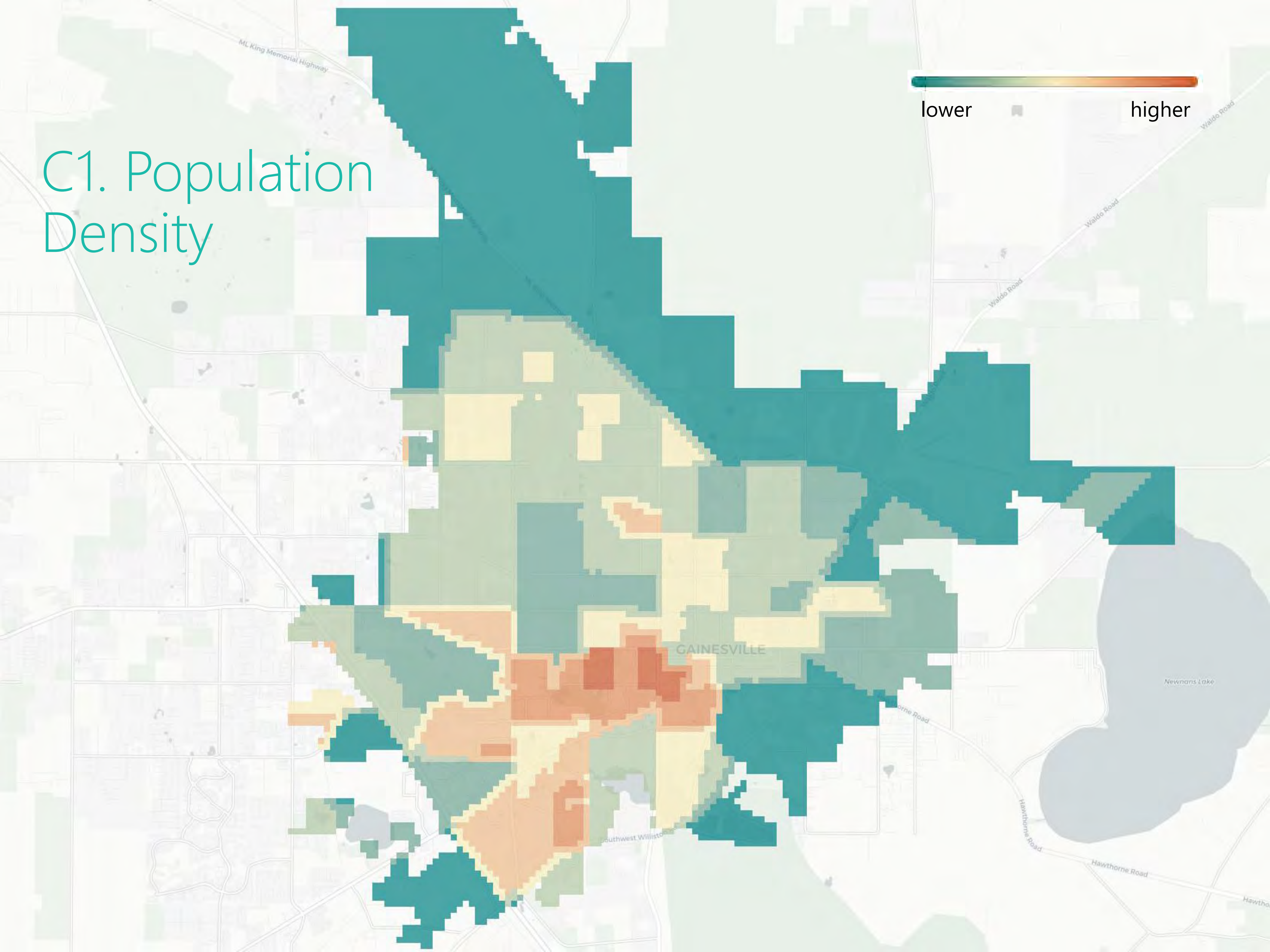
"Planned Development" under EZONINGDES



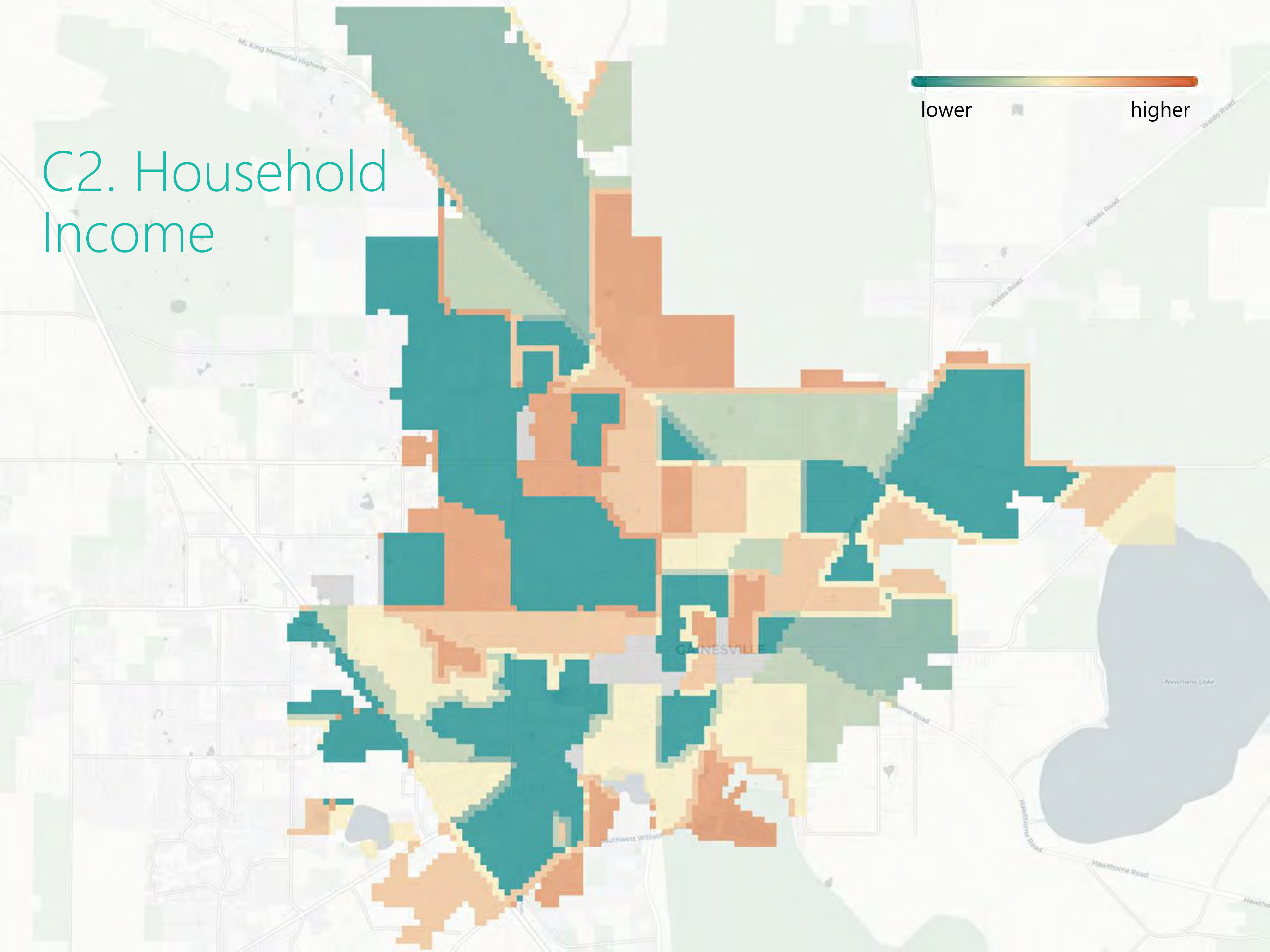
C. DEMOGRAPHIC



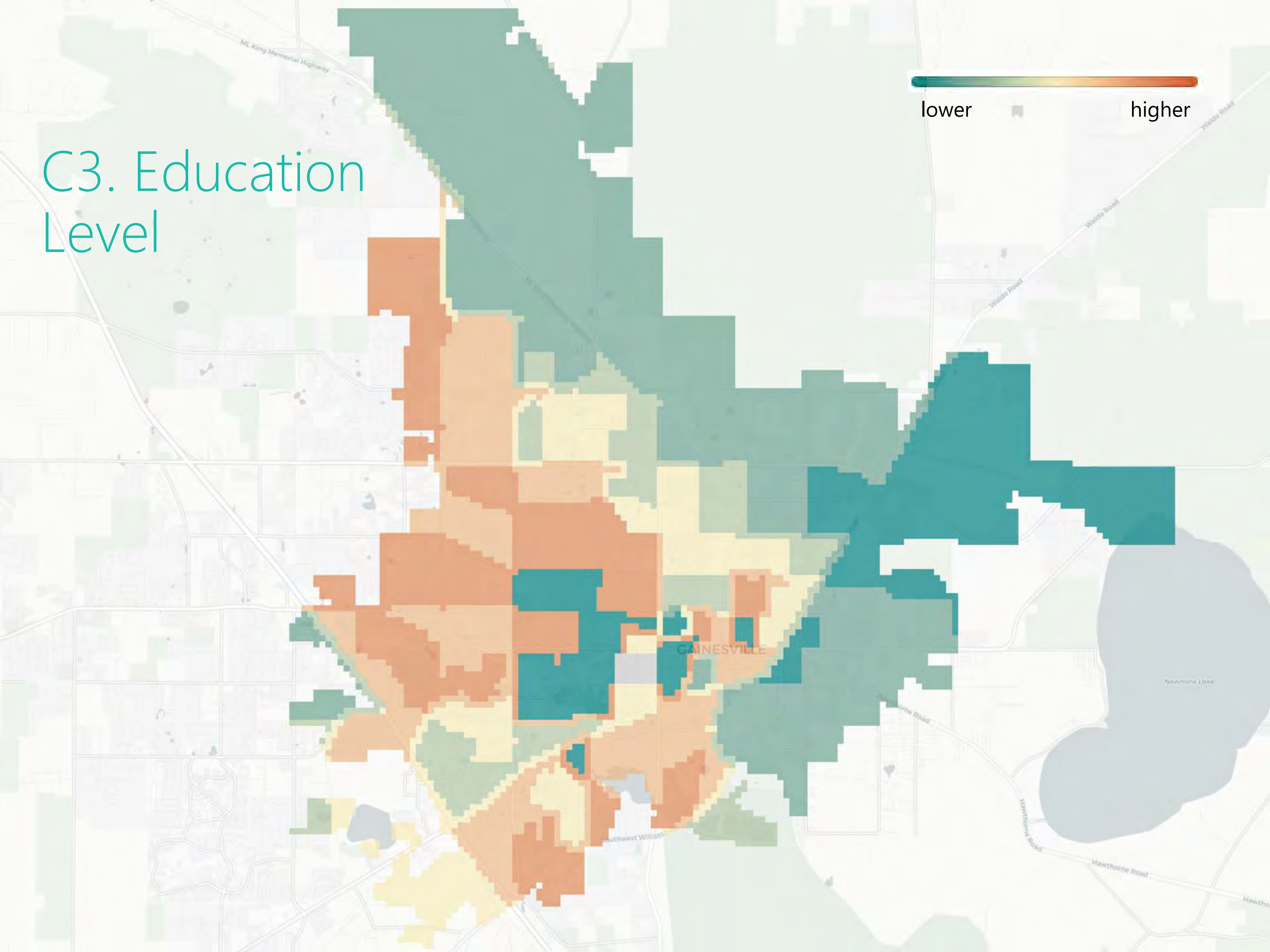
C1. Population Density



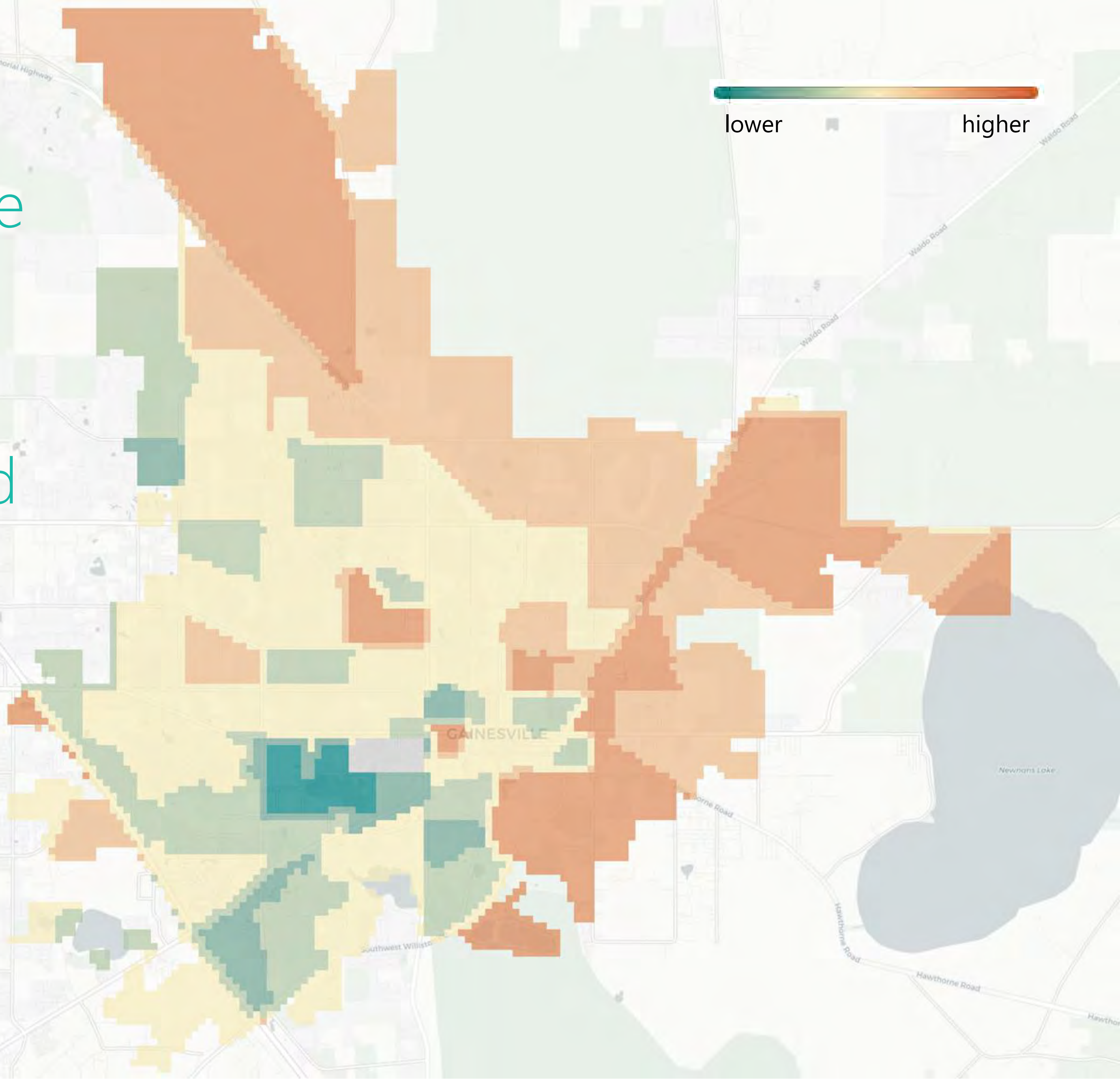
C2. Household Income



C3. Education Level

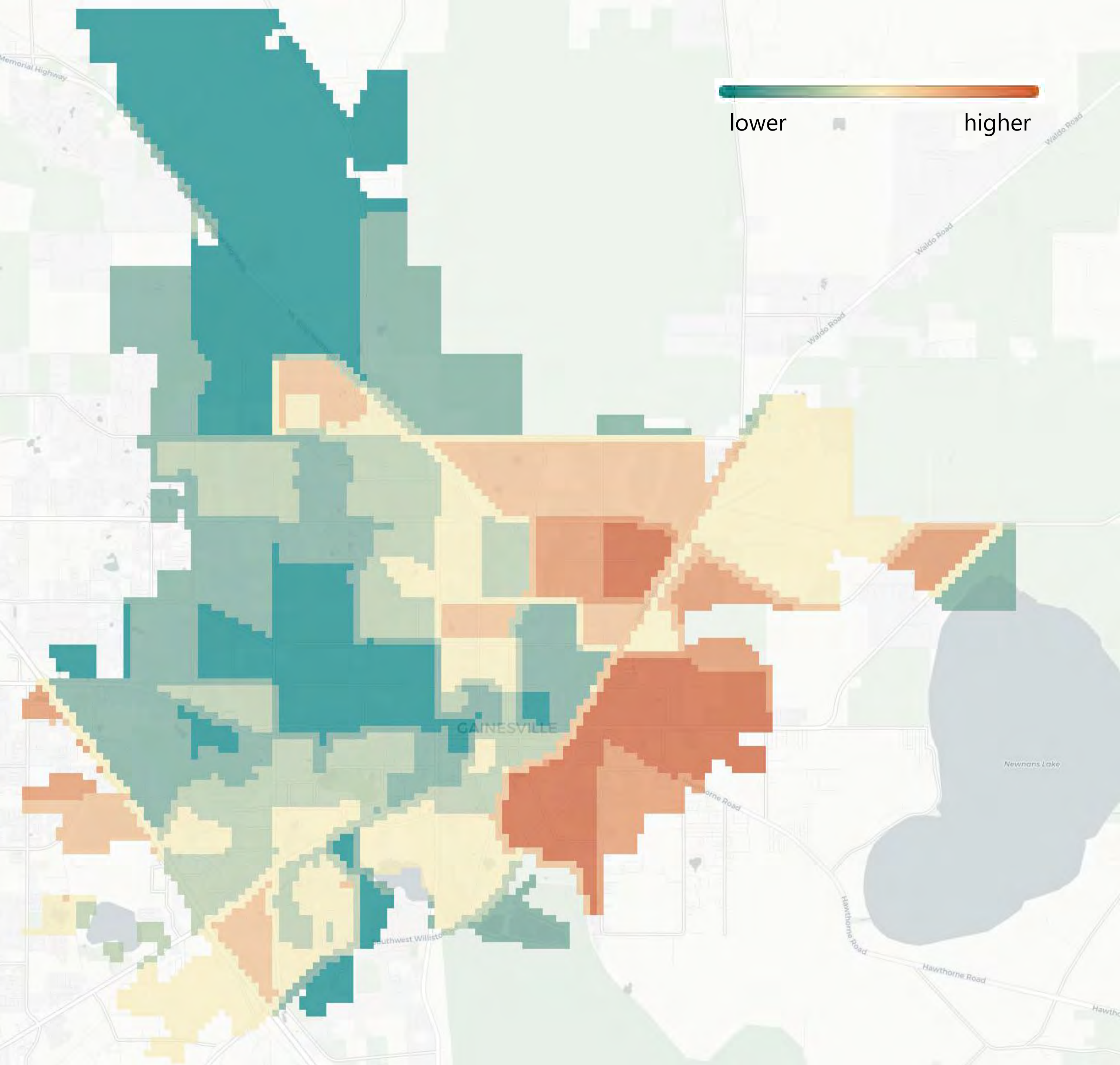


C4. Percentage Of Non-English-Speaking Household

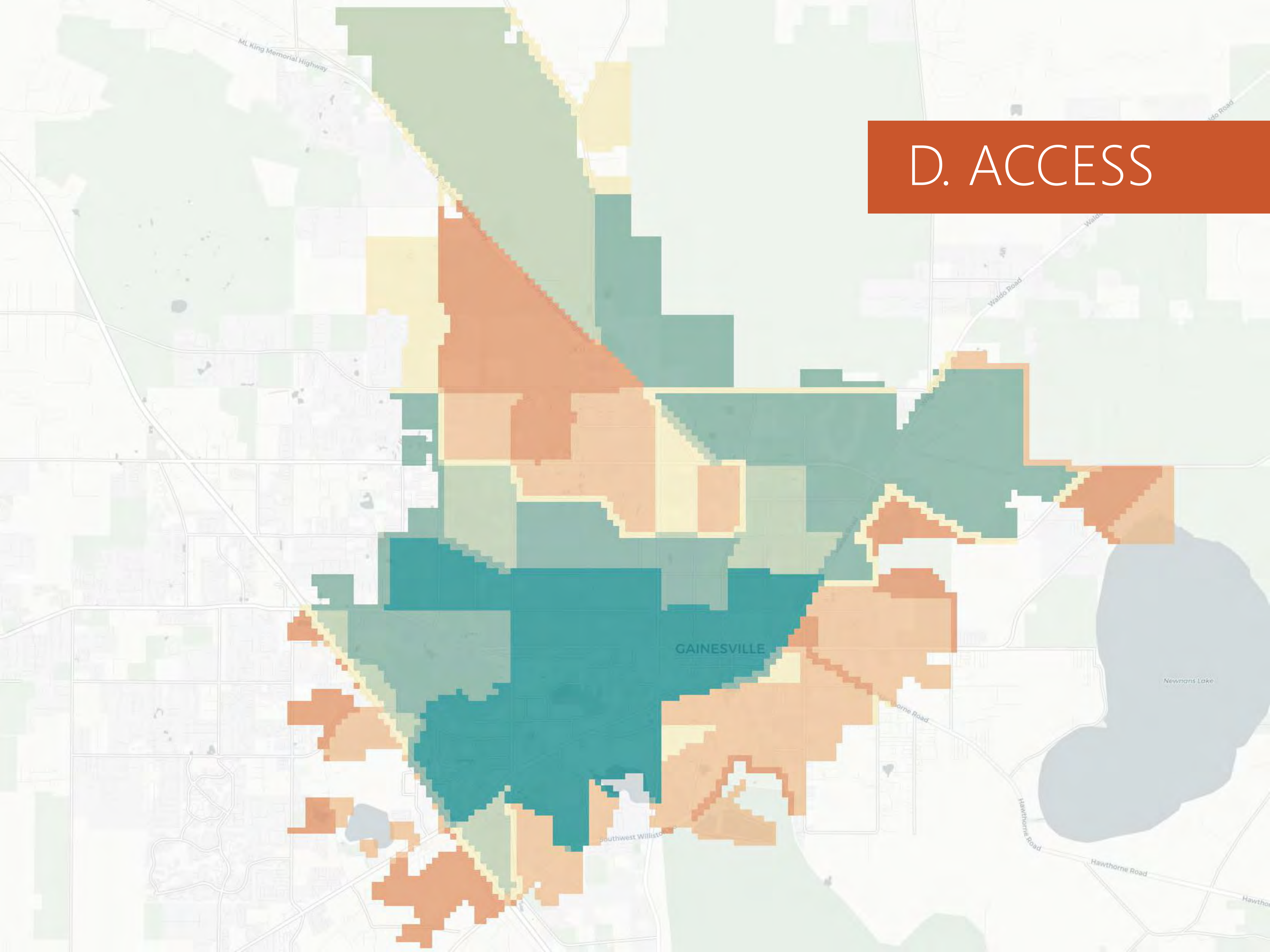


C5. Race

Percentage of Non-White person



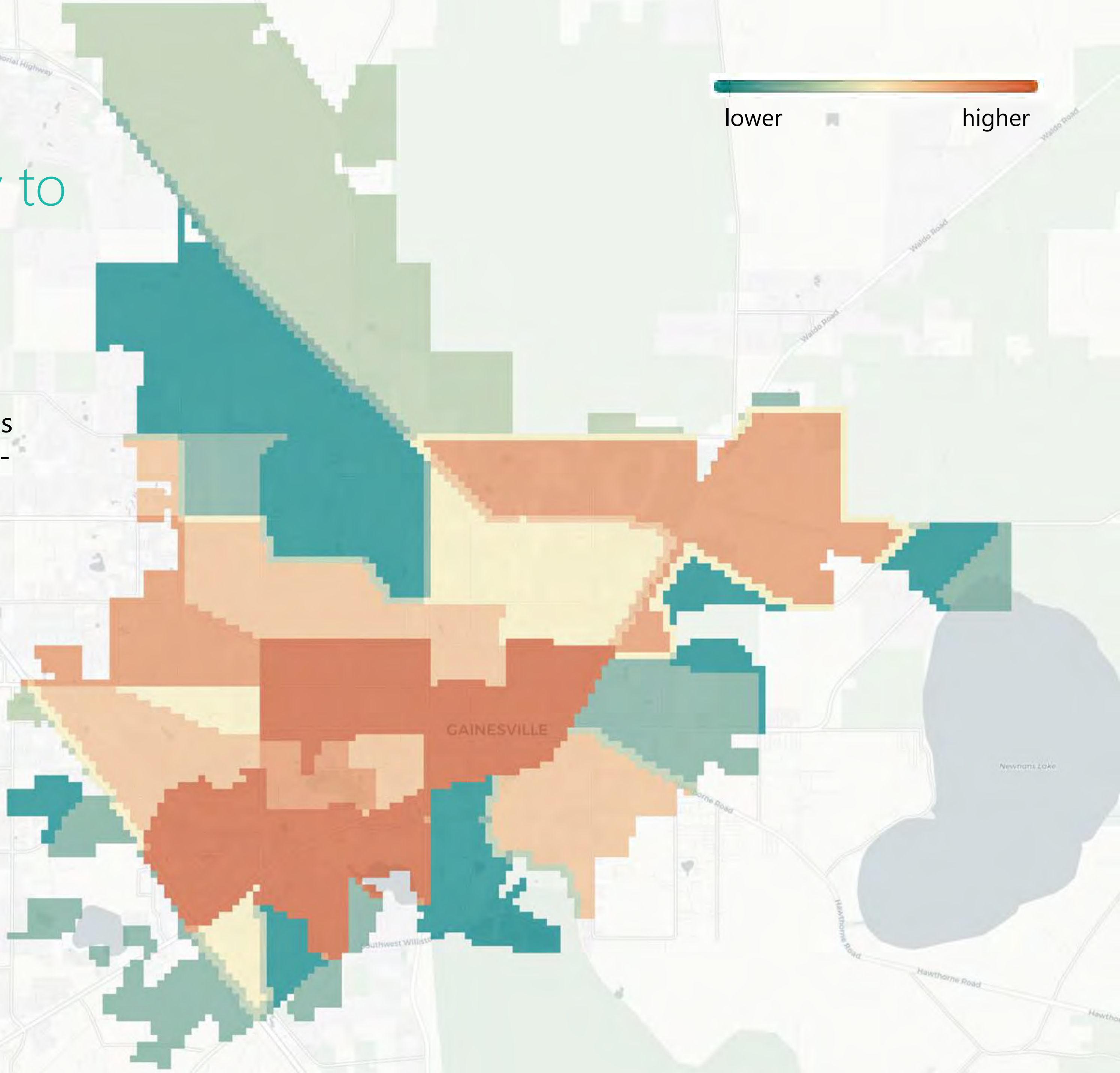
D. ACCESS



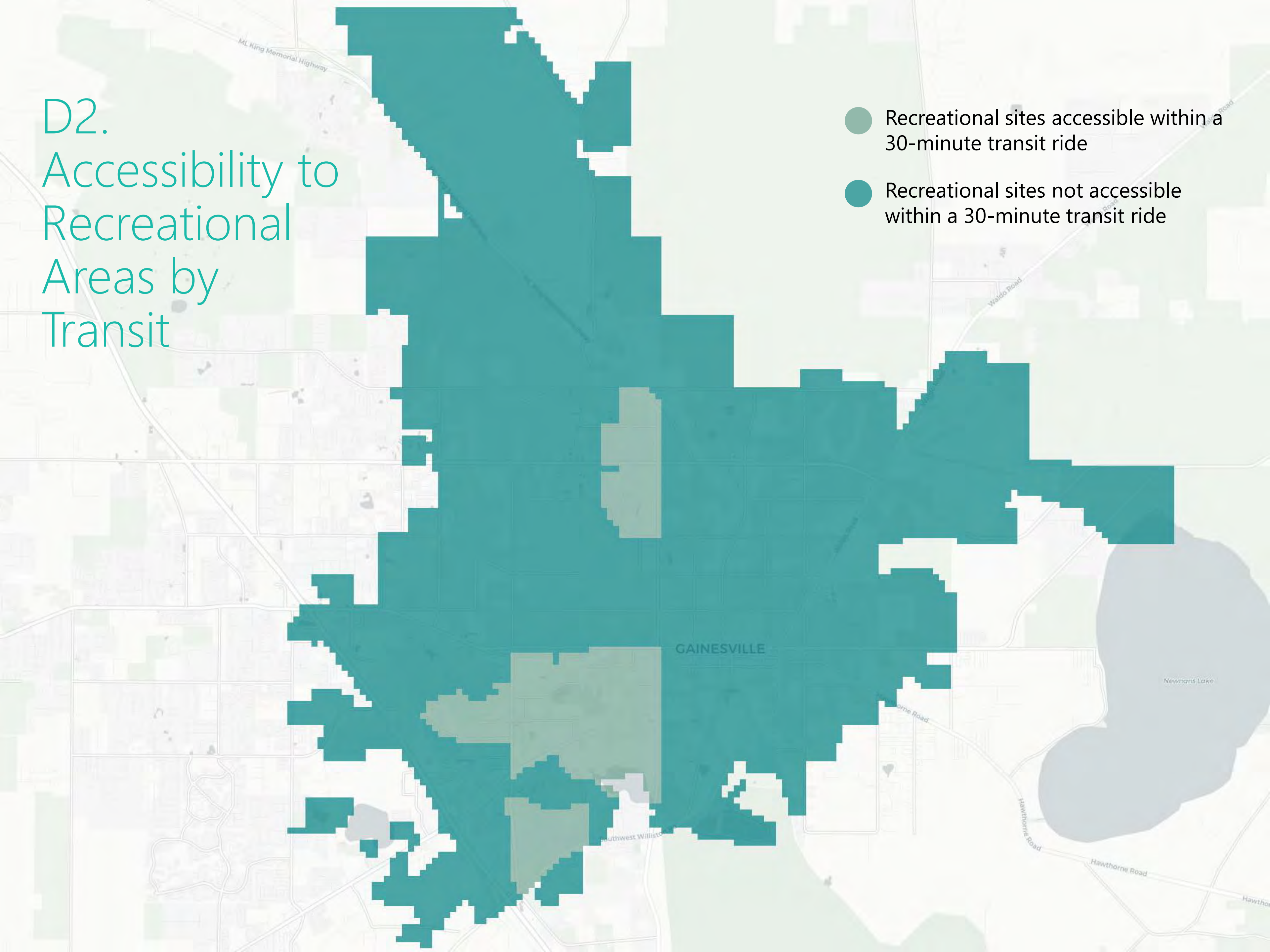
ML King Memorial Highway
Waldo Road
GAINESVILLE
Newnans Lake
Hawthorne Road

D1. Accessibility to Workplace Areas by Transit

Number of workplaces accessible within a 30-minute transit ride.

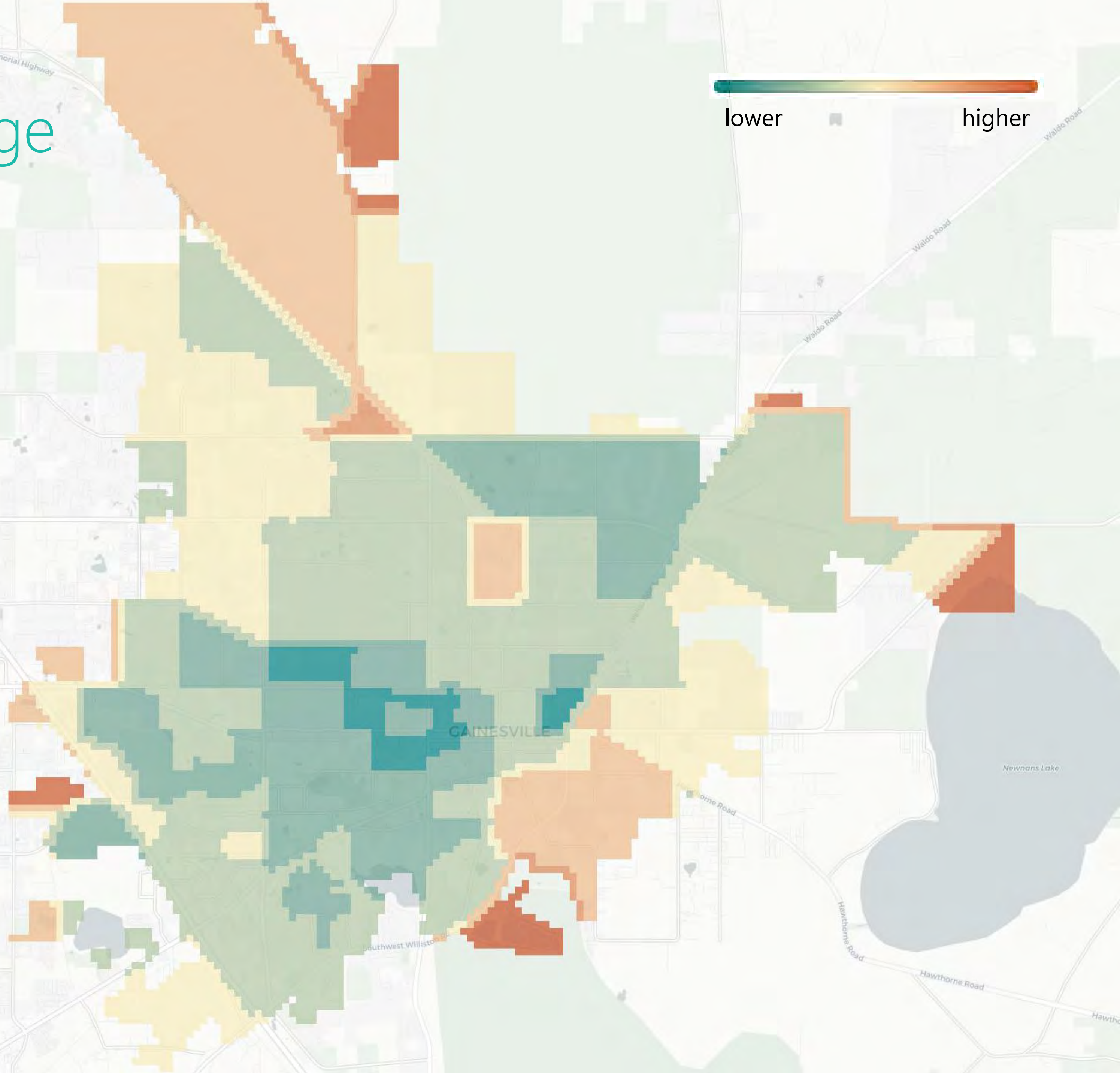


D2. Accessibility to Recreational Areas by Transit



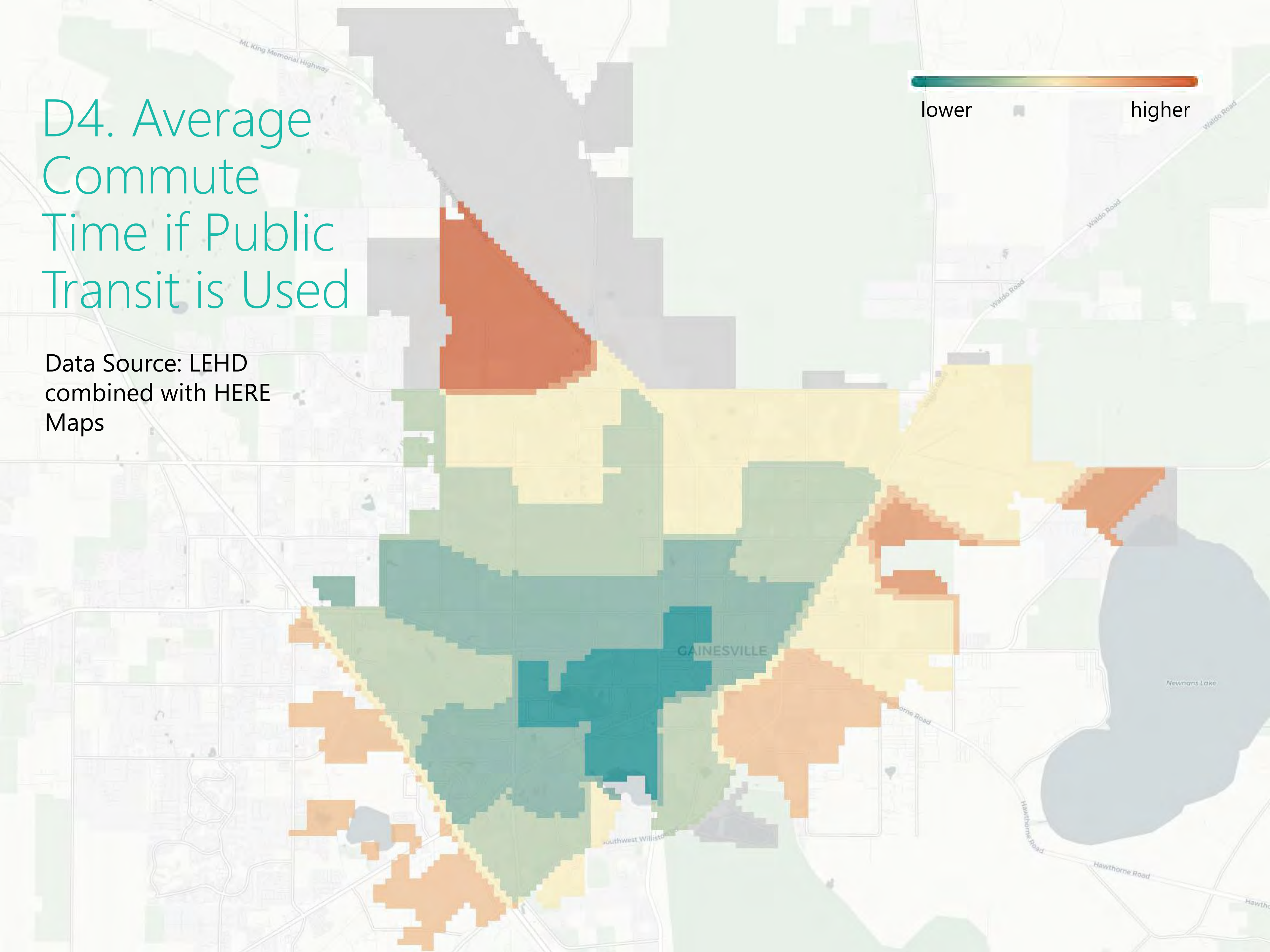
D3. Average Commute Time

Data Source: ACS; all transportation modes

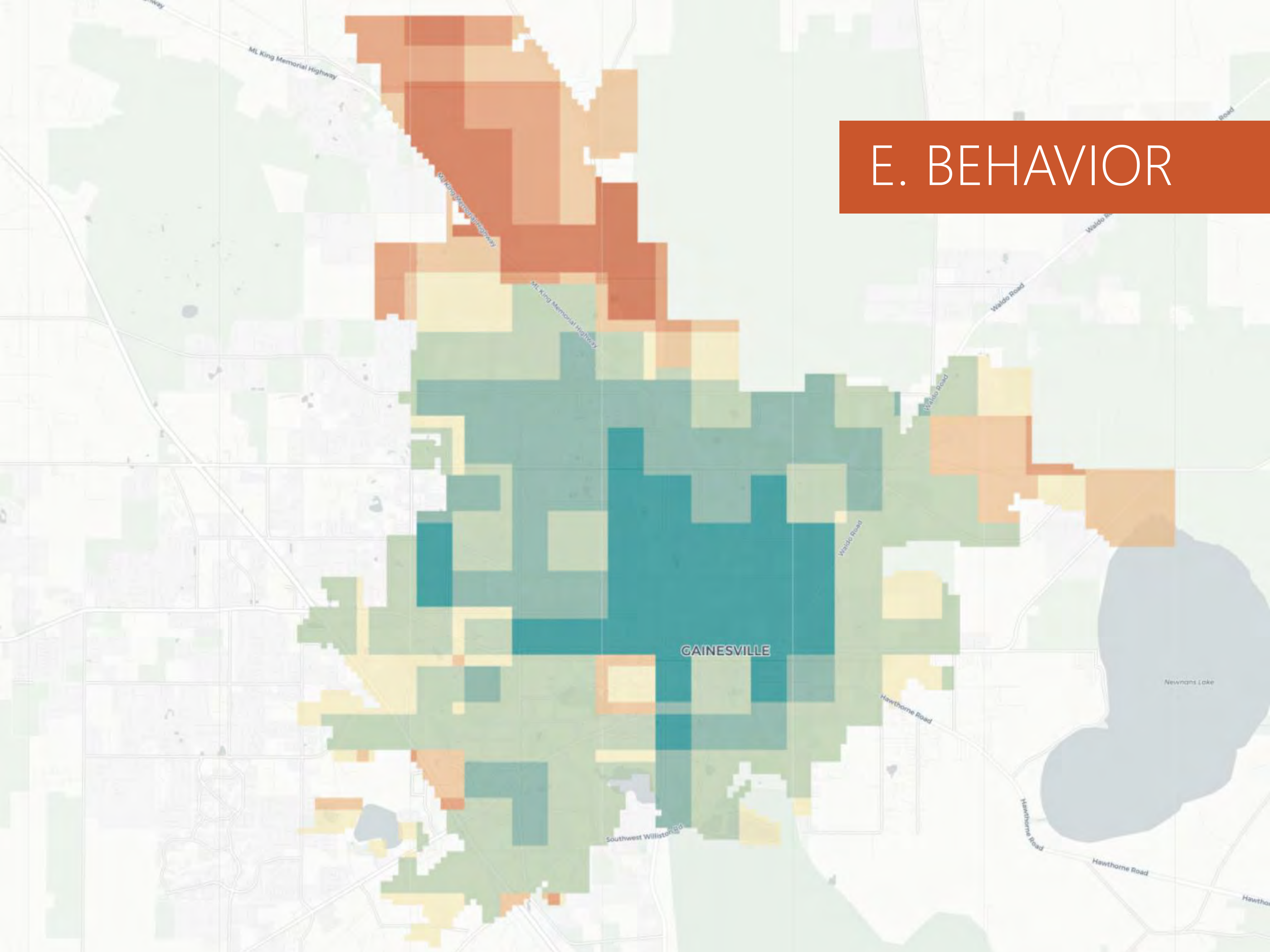


D4. Average Commute Time if Public Transit is Used

Data Source: LEHD combined with HERE Maps



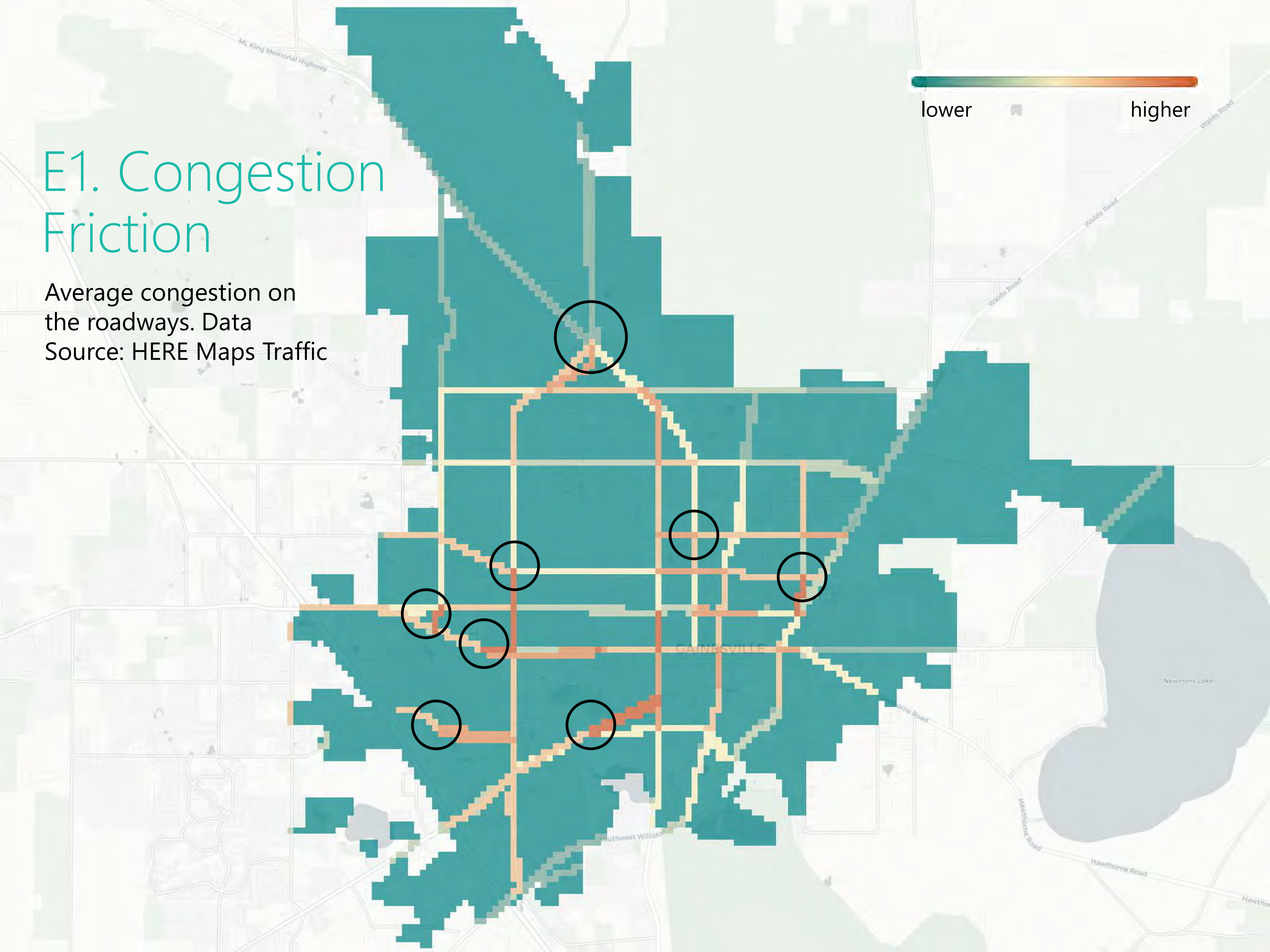
E. BEHAVIOR



ML King Memorial Highway
ML King Memorial Highway
ML King Memorial Highway
Waldo Road
Waldo Road
Waldo Road
Waldo Road
GAINESVILLE
Hawthorne Road
Hawthorne Road
Hawthorne Road
Newnans Lake
Southwest Williston Rd

E1. Congestion Friction

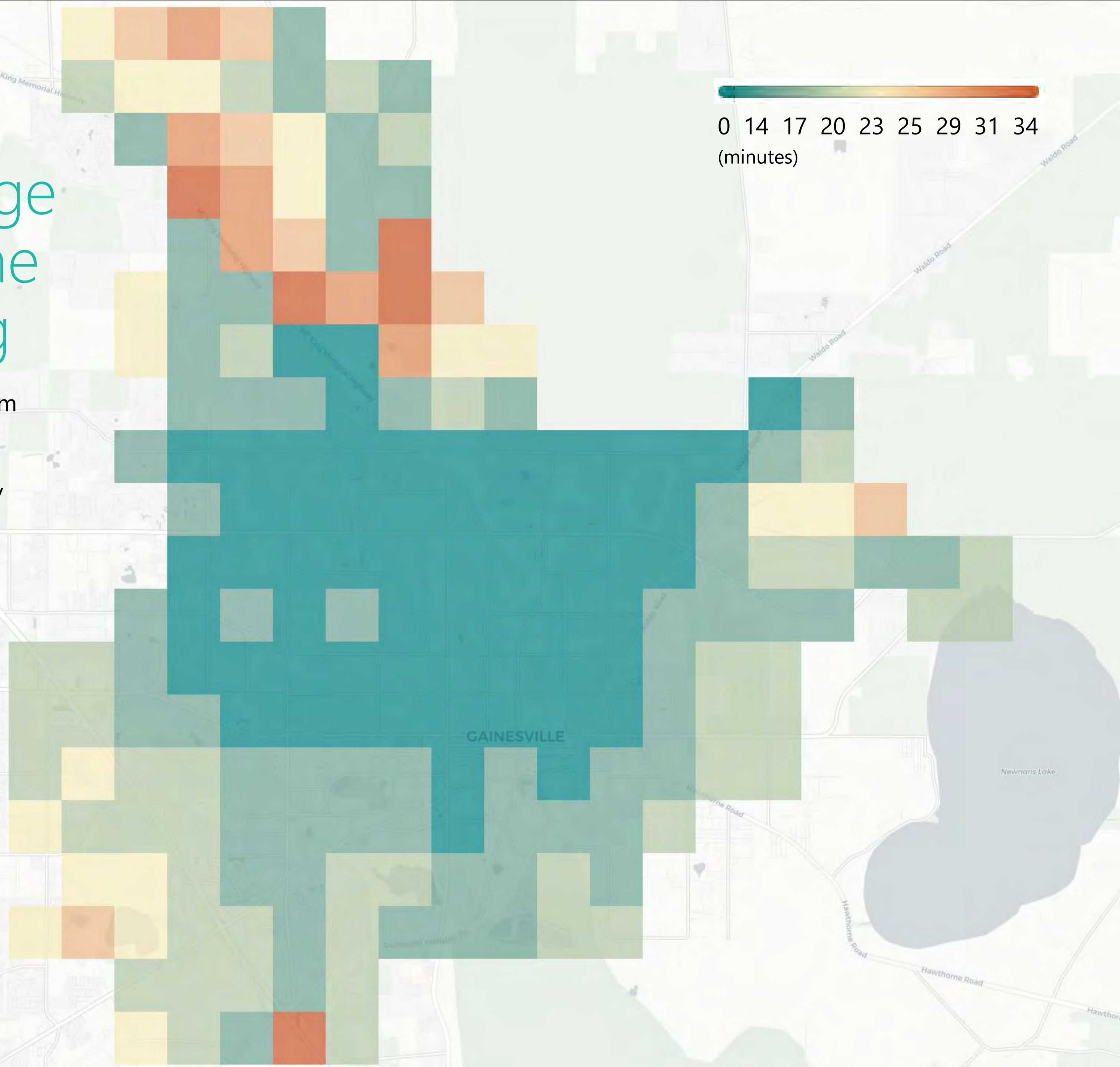
Average congestion on the roadways. Data Source: HERE Maps Traffic



E2. Average Travel Time By Driving

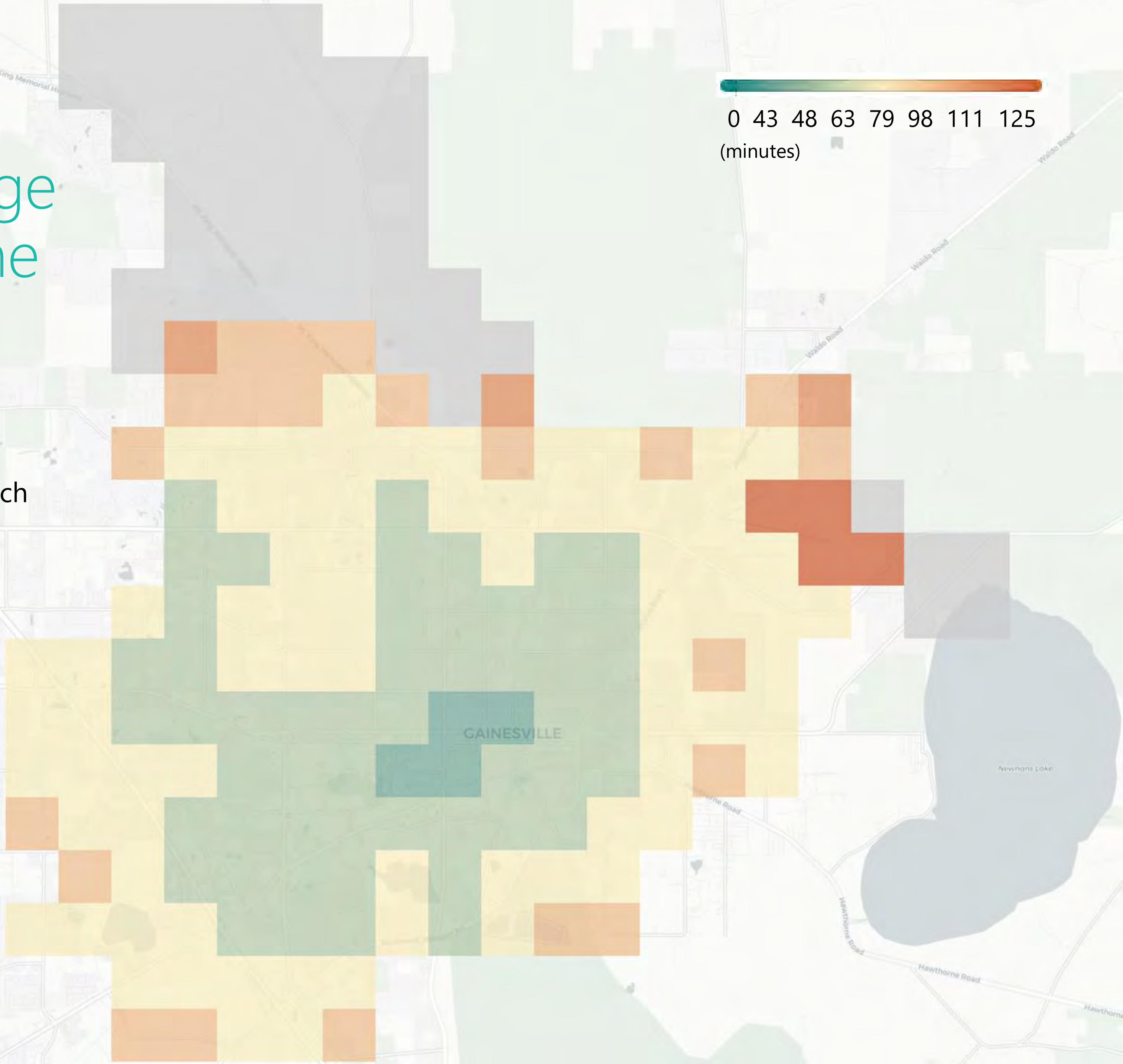
Average driving time from each block to 202 other blocks

(1 block is approximately 2/3 miles)

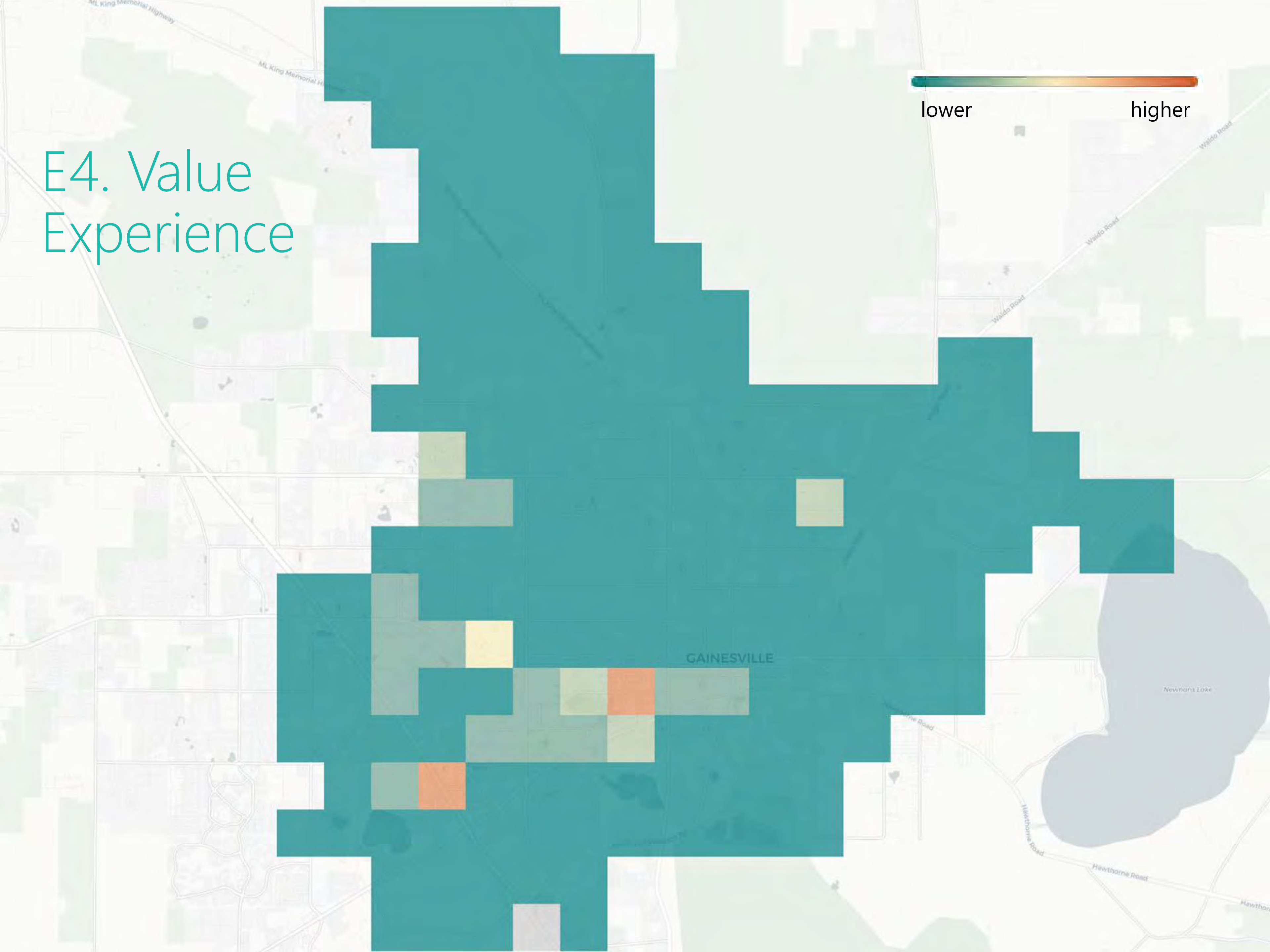


E2. Average Travel Time By Public Transit

Average travel time using transit from each block to 202 other blocks



E4. Value Experience



Average Bus Load At Stops

Data was collected between 2/4/2019 and 2/12/2019