MEMORANDUM

April 7, 2023 (originally submitted August 31, 2022)

To: Yixuan Lin
Organization: Monroe County Department of Planning & Development
From: Joanna Wang, Michael Blau, and Adam Wood
Project: Monroe County Countywide Active Transportation Plan

Re: Task 4.4 Trip Potential Analysis – FINAL

Trip Potential

Toole Design performed a trip potential analysis to determine where people would be most likely to walk and bike in Monroe County, based on factors that are positively associated with active transportation trip attraction or generation. A combination of factors related to development patterns and socioeconomic characteristics were selected as the primary elements to estimate a location's trip potential.

The results of this analysis highlight areas where enhanced pedestrian and bicycle infrastructure may potentially serve more users. This analysis may also assist Monroe County and partner agencies when prioritizing projects by identifying locations that have the greatest potential for increased walking and biking.

The trip potential analysis uses factors that impact walk and bike trip attraction or generation to estimate where people would walk or bike, assuming it is convenient and comfortable to do so uniformly across Monroe County. Existing walking and biking facilities are not considered in the trip potential analysis.

Methodology

The project team performed two trip potential analyses: the first to estimate potential walking trips and the second to estimate potential biking trips. Trip potential variables, as well as their relative weighting, are based on research and experience in similar jurisdictions. Because of the differences in trip length and purpose between walking and biking modes (as well as research on correlations between variables and actual trip activity), different variables and search distances were used for each of the two analyses.

Calculated at a 300-meter-sized hexagonal grid, the project team considered the following factors with associated weightings, as presented in Table 1 for walking trips and Table 2 for biking trips. Raw values were scaled using percentile scaling so that inputs of different units can be compared. The total trip potential score is an aggregate of the individual factor scores.

Table 1: Variables for Walk Trip Potential Analysis

Variable	Measure	Source	Description	Weight
Intersection Density	Intersections per square mile (0.25 mile)	Derived from Monroe County centerline data file	Research into travel mode choice has shown that intersection density is highly correlated with increased walking[1] and shows a higher correlation with walking activity than destination density. Locations with a high number of intersections with three or more legs tend to have better connectivity, higher densities, and more destinations; therefore, these are locations in which utilitarian trips are more likely to occur. Intersections are weighted to better reflect how connected they are to routes. Intersections with fewer legs, at cul-de-sacs, or connected to dead-end streets receive lower weight.	20%
Population Density	Population per square mile (0.25 mile)	2020 American Community Survey	Population density is another major determinant for walking trips – the more people in an area, the more people will be walking.	30%
Lower-Income Families	Families with household income below 300% of federal poverty level per square mile (0.25 mile)	2020 American Community Survey	Research indicates that people living in households below the federal poverty line are more likely to depend on transit, walking, or biking.[2]	20%
Employment Density	Jobs per square mile (0.25 mile)	Longitudinal Employer-Household Dynamics (LEHD), 2019	Employment density is another major determinant for walking trips. People walk to areas with high employment for a variety of reasons, including jobs, shopping, or errands. Moreover, some areas with high employment see a lot of midday walking activity.	15%
Transit Service	Transit stops within 0.25 mile	RTS Stops	First and last mile connections to and from transit are sources of walking trips. Stops within 0.25 mi of the hexes reflect a typical distance people are willing to walk to transit[3]. Bus stops with more routes served receive a higher weight.	15%

Table 2: Variables for Bike Trip Potential Analysis

Variable	Measure	Source	Description	Weight
Population Density	Population per square mile (1 mile)	2020 American Community Survey	Population density is a major determinant for biking trips – the more people in an area, the more people will be biking.	30%
Lower-Income Families	Families with household income below 300% of federal poverty	2020 American Community Survey	Research indicates that people living in households below the Federal poverty line	15%

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[1] Measuring Network Connectivity for Bicycling and Walking. J Dill - 82nd Annual Meeting of the Transportation Research Board, 2003

[2] Predicting Transit Ridership at the Stop Level: The Role of Service and Urban Form. J Dill, M Schlossberg, L Ma, C Meyer - 92nd Annual Meeting of the Transportation Research Board, 2013

[3] Comparing Transit Oriented Developments Based on Walkability Indicators. Schlossberg, L Ma, Brown, Na - 82nd Annual Meeting of the Transportation Research Board, 2003

Variable	Measure	Source	Description	Weight
	level per square mile (1 mile)		are more likely to depend on transit, walking, or biking to get around.[4]	
Employment Density	Jobs per square mile (1 mile)	Longitudinal Employer-Household Dynamics (LEHD), 2019	Employment density is another major determinant for biking trips. People bike to areas with high employment for a variety of reasons, including jobs, shopping, or errands.	15%
Destination Density	Destinations per square mile (1 mile)	Open Street Map destination density (as used for BNA analysis)	Destinations are places that people would bike to. They include commercial destinations such as stores and restaurants, recreational destinations such as parks and playgrounds, and community destinations such as community centers and libraries.	25%
Multi-Use Trails	Within 1 mile of a trailhead or trail access point	Erie Canalway, Lehigh Valley Trail and Greenway Trail	Trailheads are known origins and destinations for biking trips. Certain multi-use trails in the county are significant destinations for local travel and tourism alike.	15%

Results – Walk Trip Potential

Figure 1 illustrates where walking trips are most likely to occur. Areas with denser street grids, higher population densities, more lower-income families, denser employment, and more transit services tend to have higher trip potential scores due to their development patterns that support pedestrian travel. Most of Rochester has high walk trip potential scores (80-100), in addition to high walk trip potential corridors like State Route 33A, 33, 104, 18, 15, 31 and Lake Avenue that extended into adjacent jurisdictions. Other high walk trip potential areas include Easter Rochester, Fairport, Pittsford Village, Hilton, and Greece. Brockport, Spencerport, Greece, and parts of Chili, Henrietta, Pittsford, Perinton, Penfield, and Webster have relatively high walk trip potentials (60-80). Areas of low walk trip potential (scored 0-20) are concentrated on the south and west peripheral of the County, including parts of Hamlin, Clarkson, Sweden, Mendon, Parma, Ogden, Chili and most of Riga, Wheatland, and Rush. Figure 2 through Figure 5 show the individual inputs used to create the composite trip potential.

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[4] Predicting Transit Ridership at the Stop Level: The Role of Service and Urban Form. J Dill, M Schlossberg, L Ma, C Meyer - 92nd Annual Meeting of the Transportation Research Board, 2013
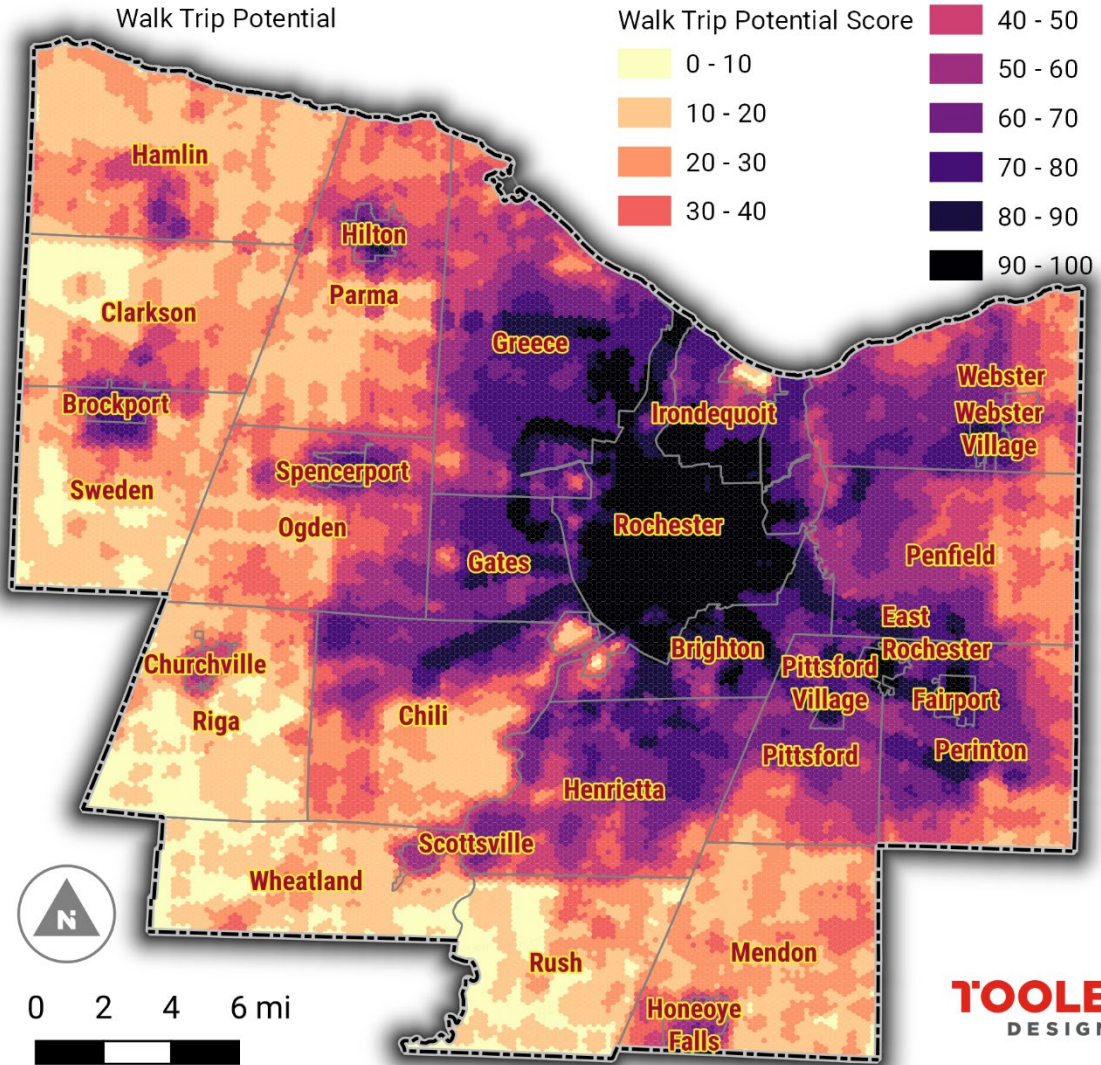
Figure 1: Composite Walk Trip Potential

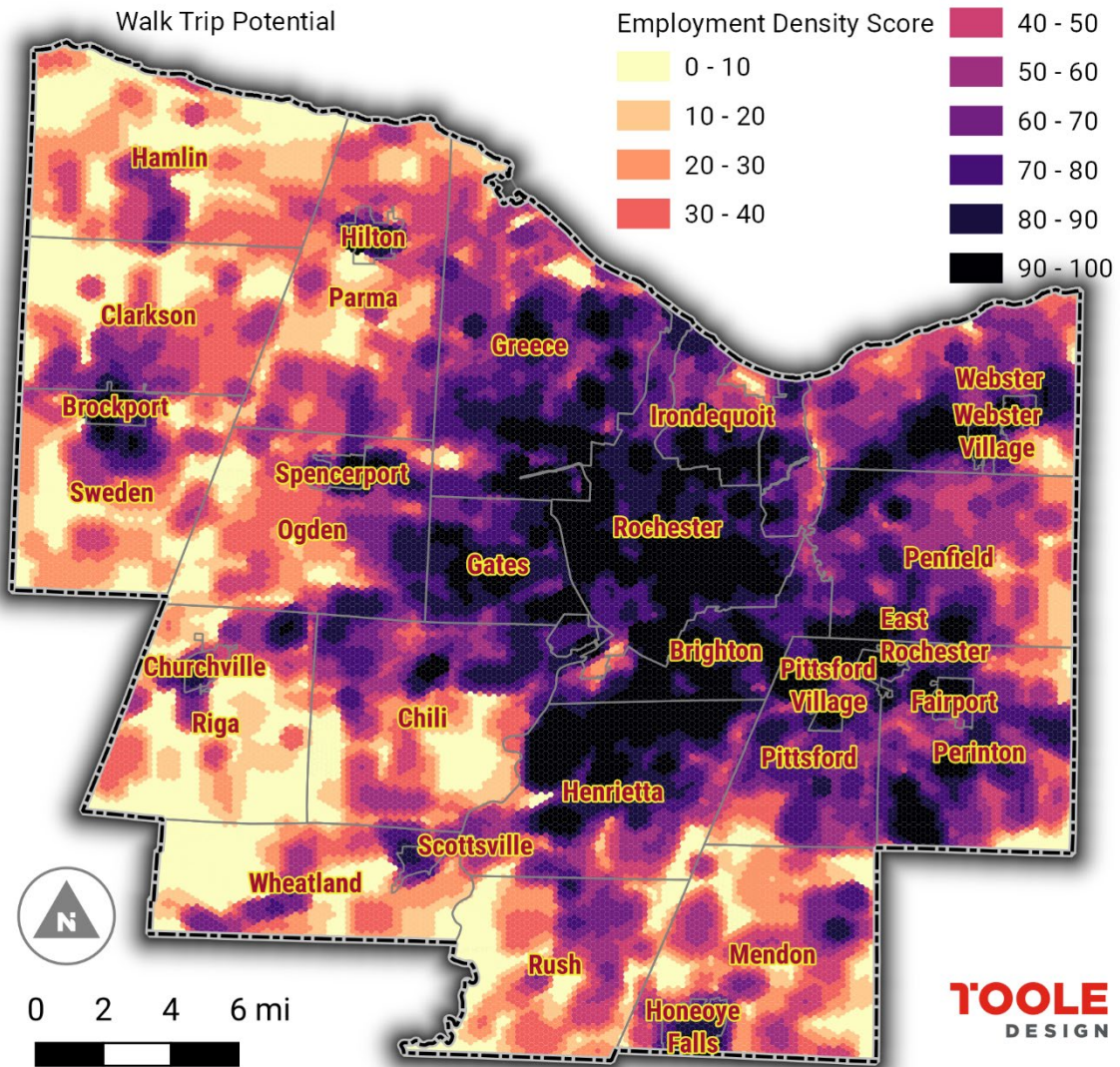**Figure 2: Walk Trip Potential – Employment Density**

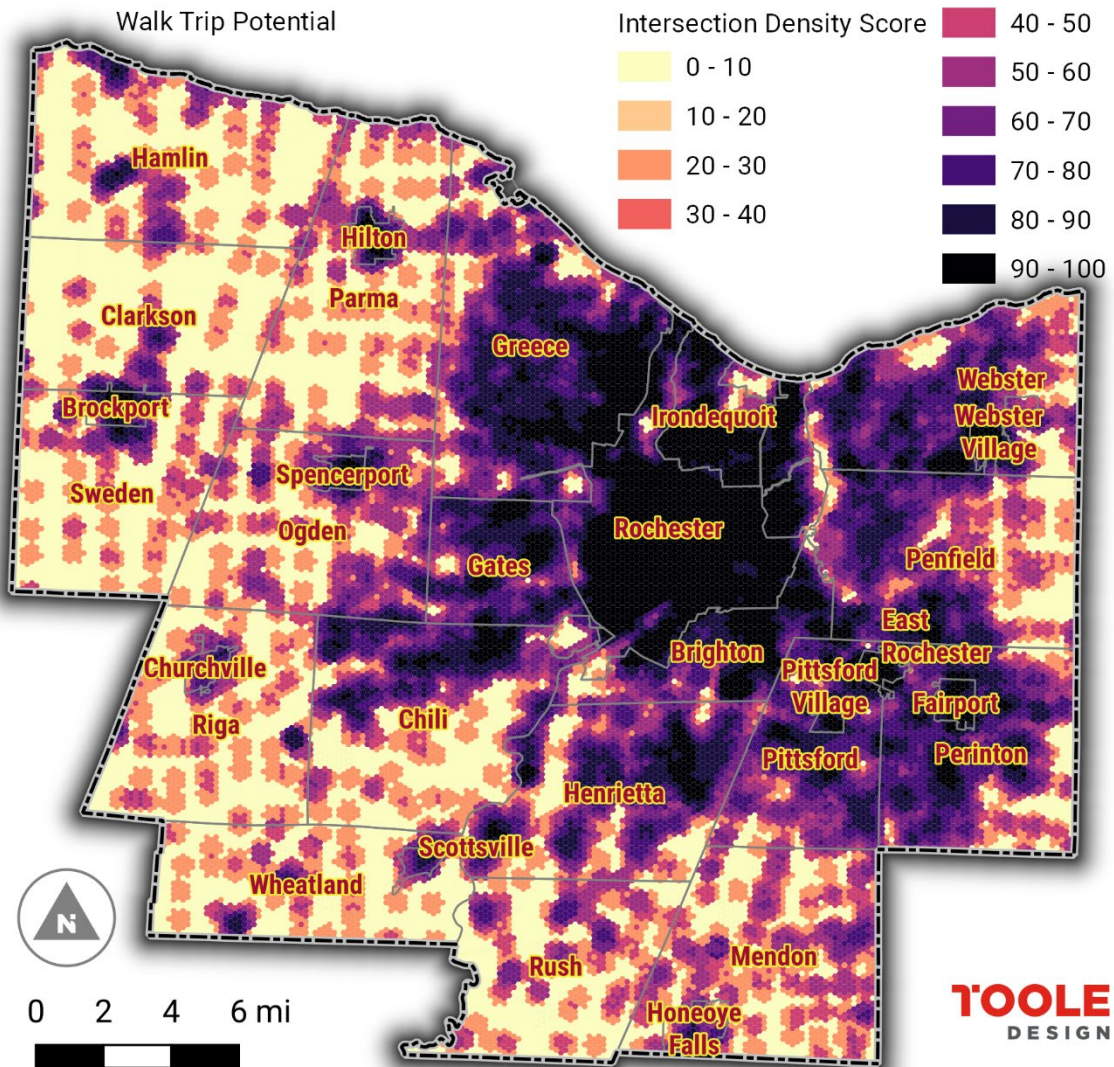**Figure 3: Walk Trip Potential – Intersection Density**
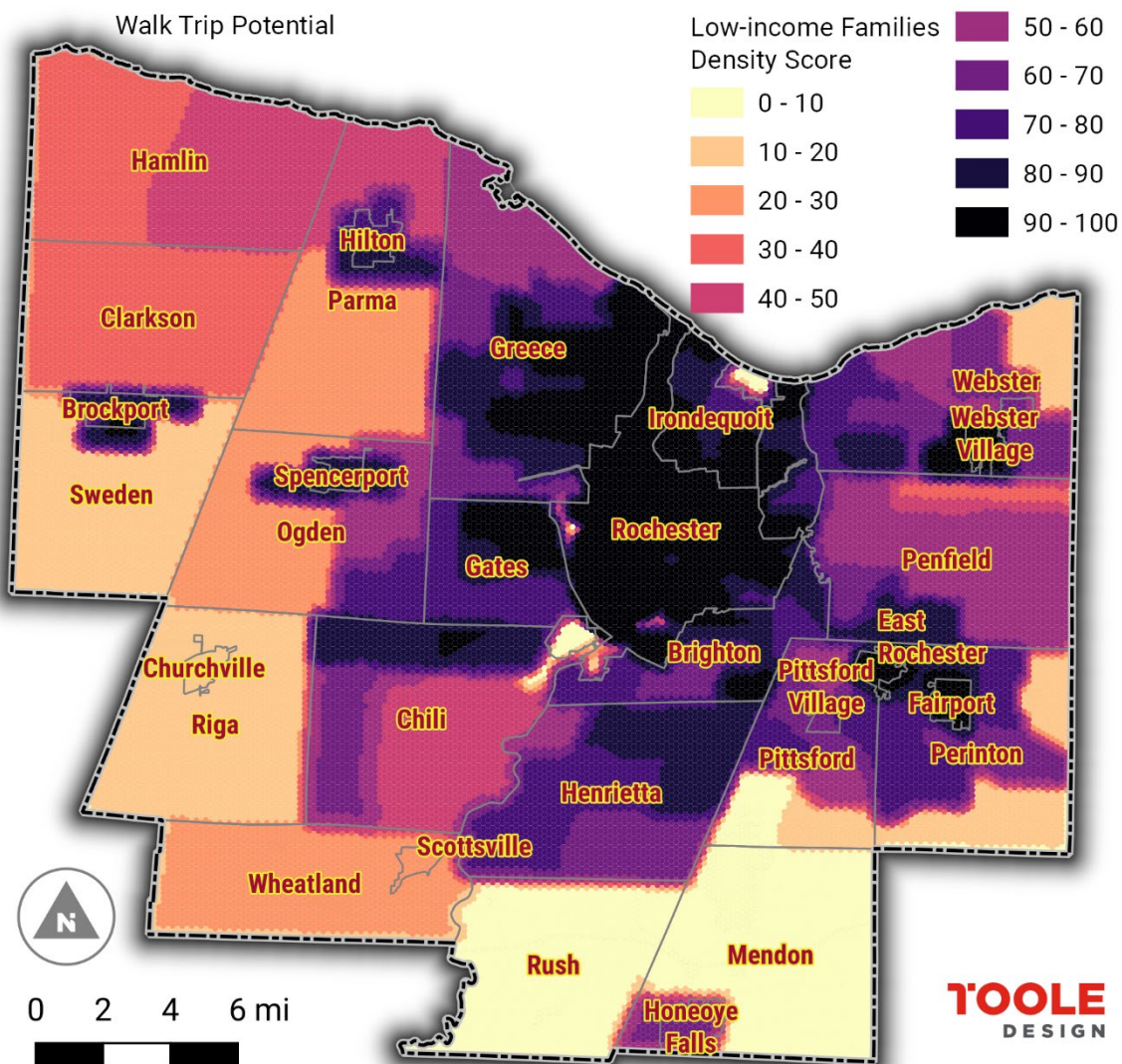

Walk Trip Potential

Intersection Density Score

0 - 10
10 - 20
20 - 30
30 - 40
40 - 50
50 - 60
60 - 70
70 - 80
80 - 90
90 - 100

0 2 4 6 mi

TOOLE
DESIGN

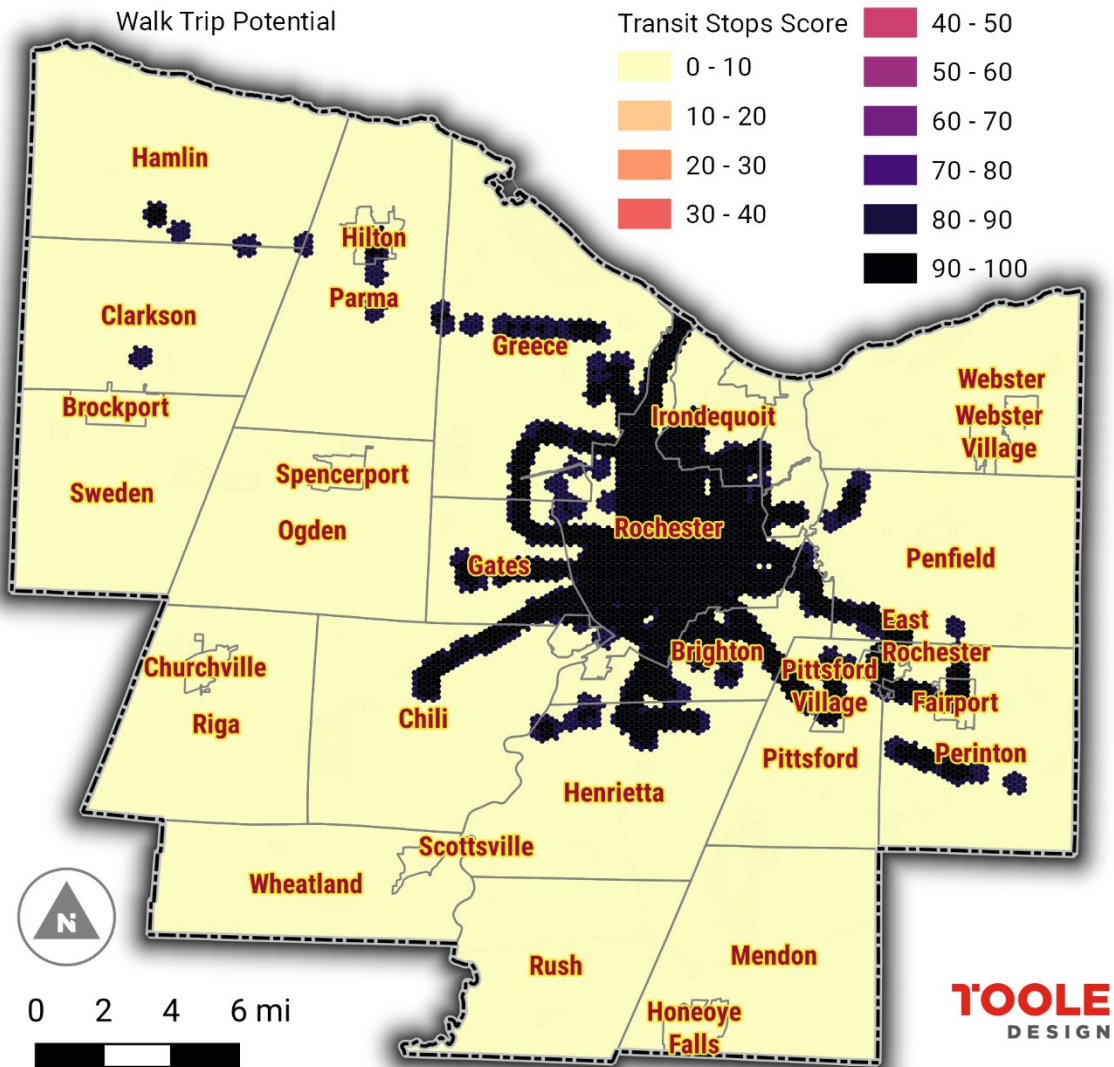**Figure 4: Walk Trip Potential – Low-Income Family Density**

Figure 5: Walk Trip Potential – Transit Stop Density

Results – Bike Trip Potential

Figure 6 shows where biking trips are most likely to occur. Areas with higher population densities, more lower-income families, employment, bikeable destinations, and multi-use trails tend to have higher trip potential scores due to their development patterns that support bike travel.

Areas of high bike trip potential (scored 80 - 100) include most of Rochester, and parts of Gates, Brighton, and Perinton in addition to Pittsford Village, Fairport, and Brockport. Areas of relatively high bike trip potential (scored 50 – 80) include Hilton, Spencerport, Scottsville, Honeoye Falls, Webster Village, Irondequoit, the outskirt of Brockport, most parts of Greece, Webster Penfield, Perinton, Pittsford, Henrietta, and parts of Chili and Ogden. Low bike trip potential area are scattered across the peripheral of the County, including parts of Hamlin, Parma, Clarkson, Sweden, Ogden, Rush, Mendon, Perinton, Penfield and Webster, as well as most parts of Riga, and Wheatland. Figure 7 through Figure 11 show the individual inputs used to create the composite trip potential score.
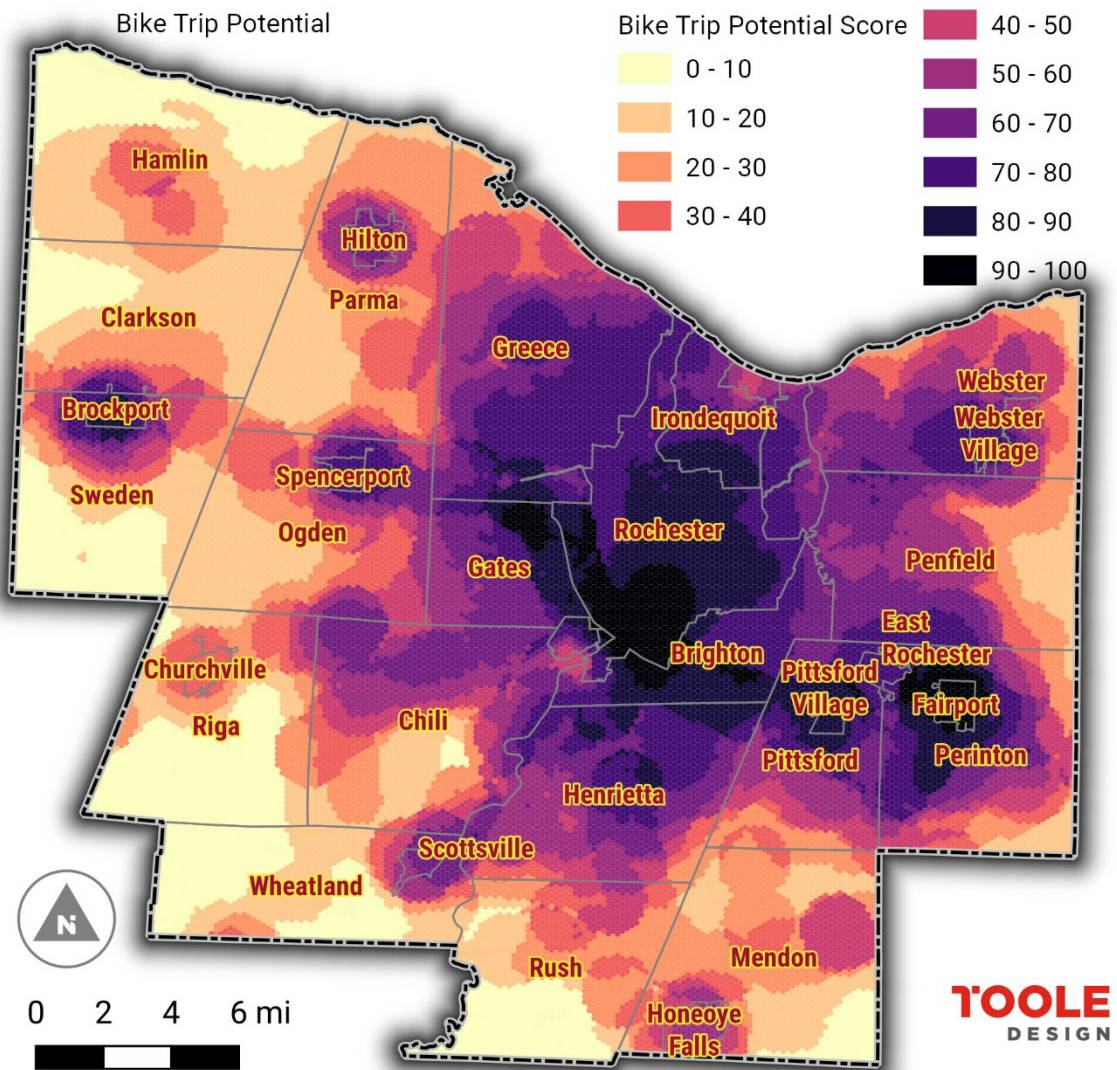
Figure 6: Composite Bike Trip Potential
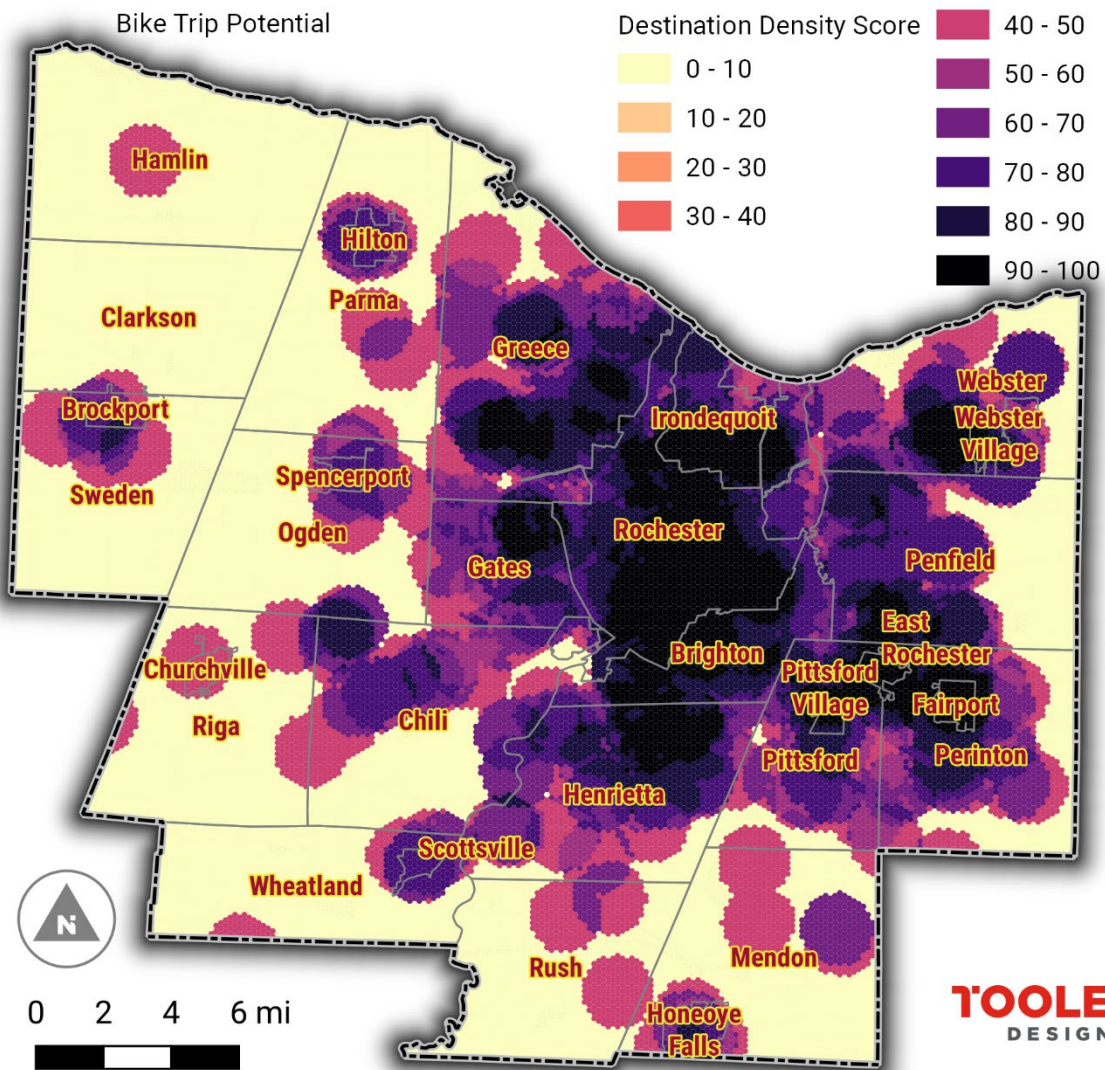
Figure 7: Bike Trip Potential – Destination Density
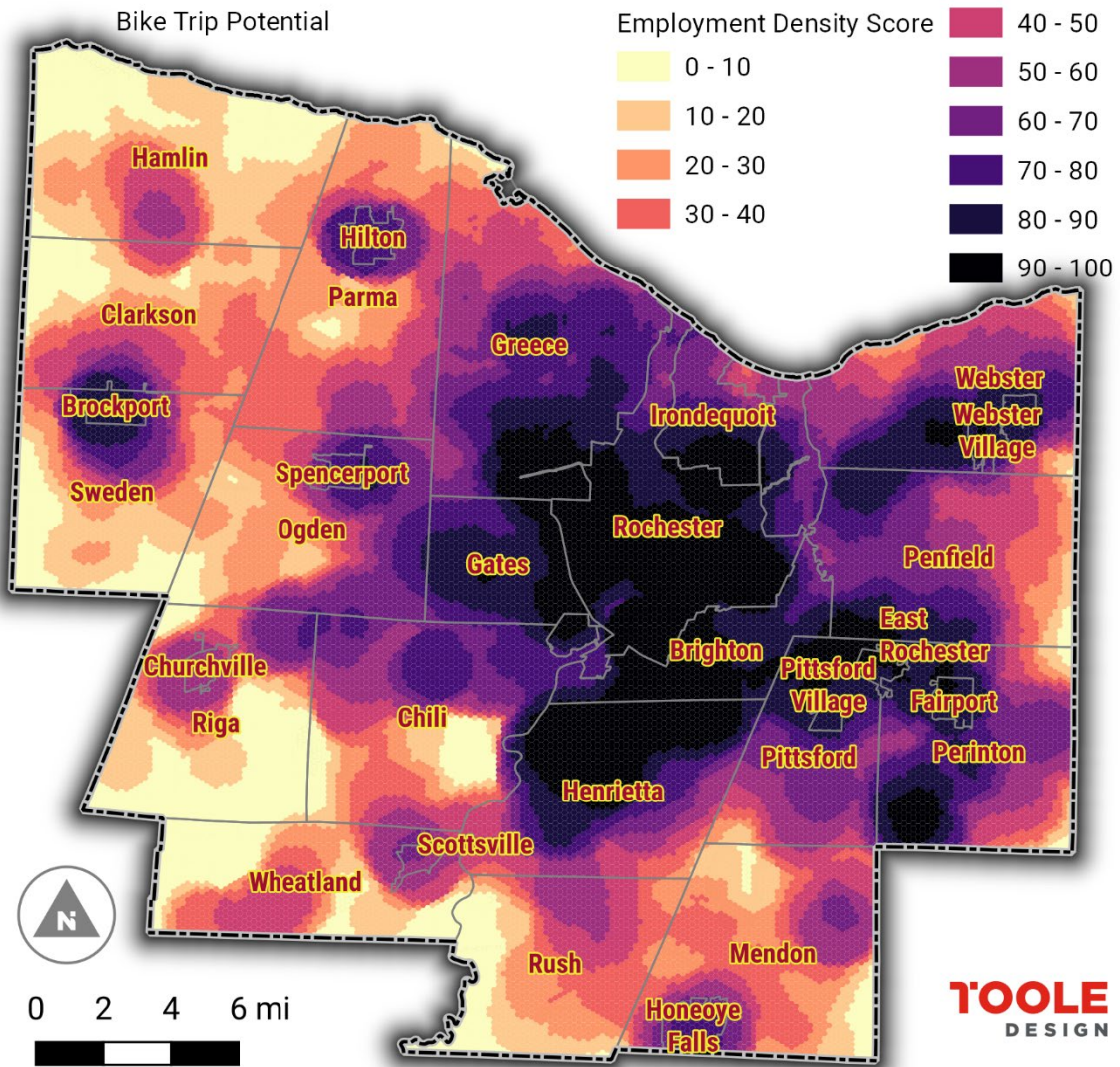

Bike Trip Potential

Destination Density Score

- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100

Hamlin

Hilton

Parma

Clarkson

Greece

Irondequoit

Webster

Webster Village

Brockport

Sweden

Spencerport

Ogden

Gates

Rochester

Penfield

Churchville

Chili

Brighton

East Rochester

Pittsford Village

Fairport

Riga

Pittsford

Perinton

Henrietta

Scottsville

Wheatland

Rush

Mendon

Honeoye Falls

TOOLE
DESIGN

0 2 4 6 mi

Figure 8: Bike Trip Potential – Employment Density

Figure 9: Bike Trip Potential – Population Density

Bike Trip Potential

Population Density Score

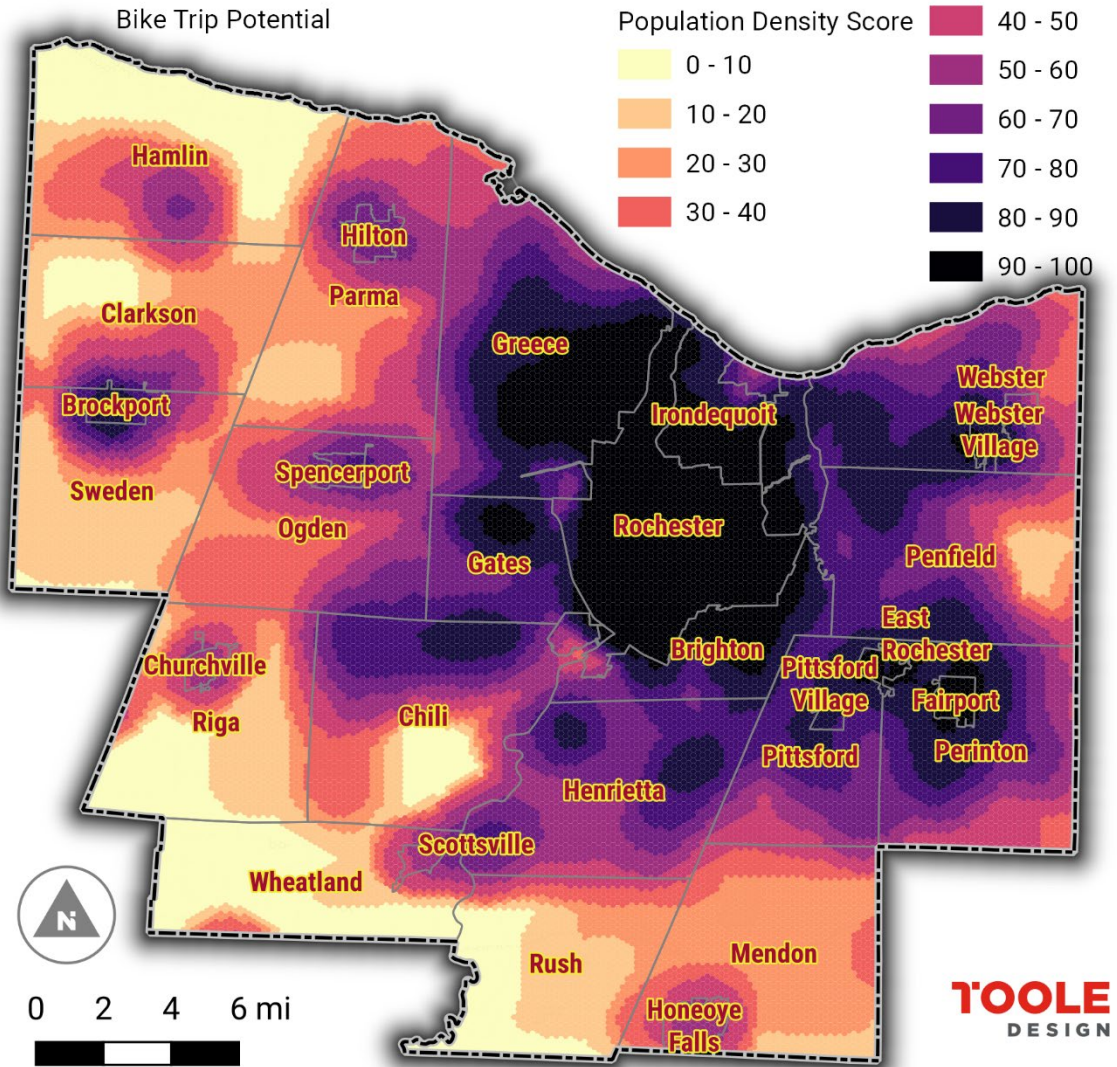| 0 - 10 | 40 - 50 |
10 - 20	50 - 60
20 - 30	60 - 70
30 - 40	70 - 80
	80 - 90
	90 - 100

0 2 4 6 mi

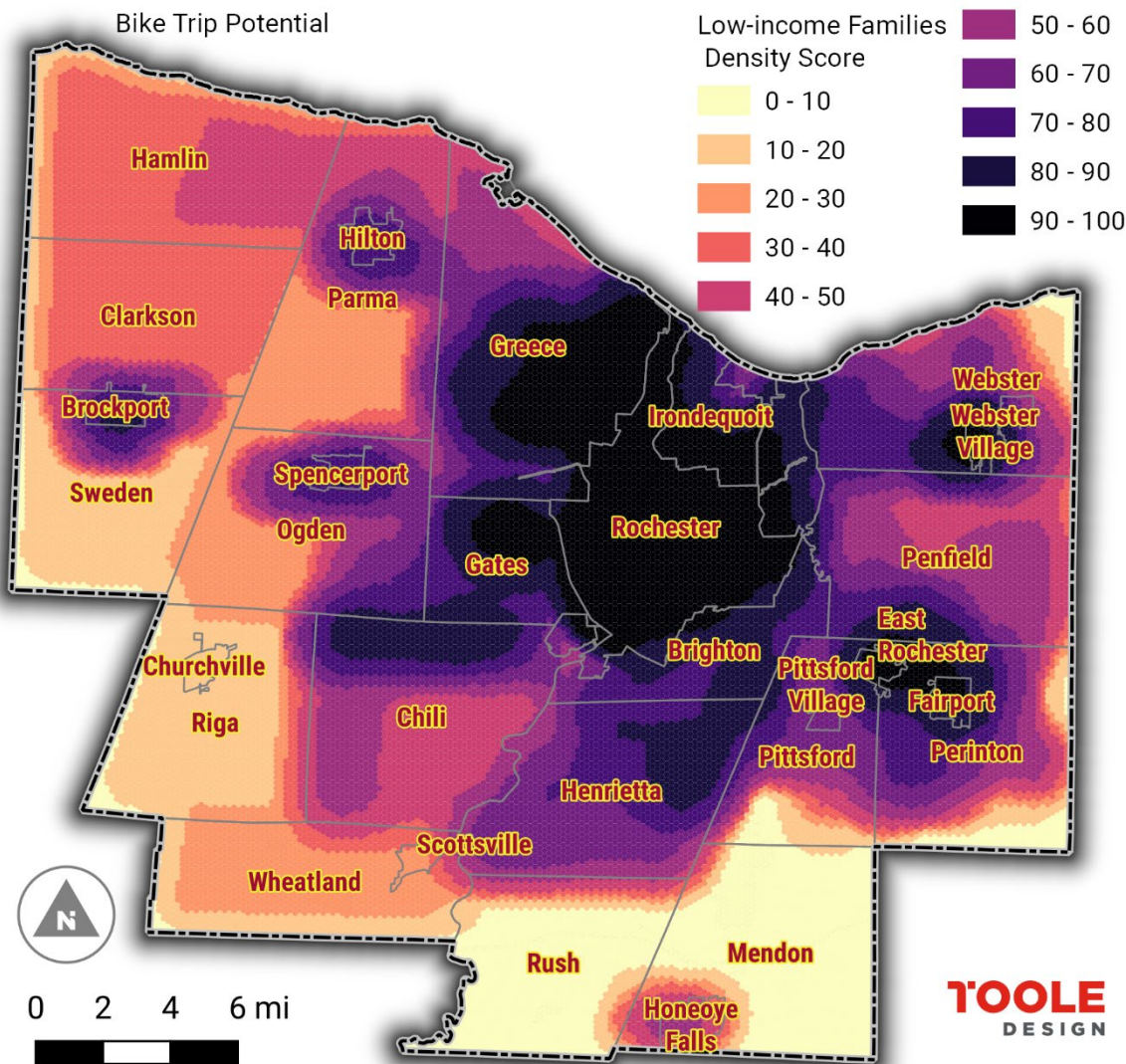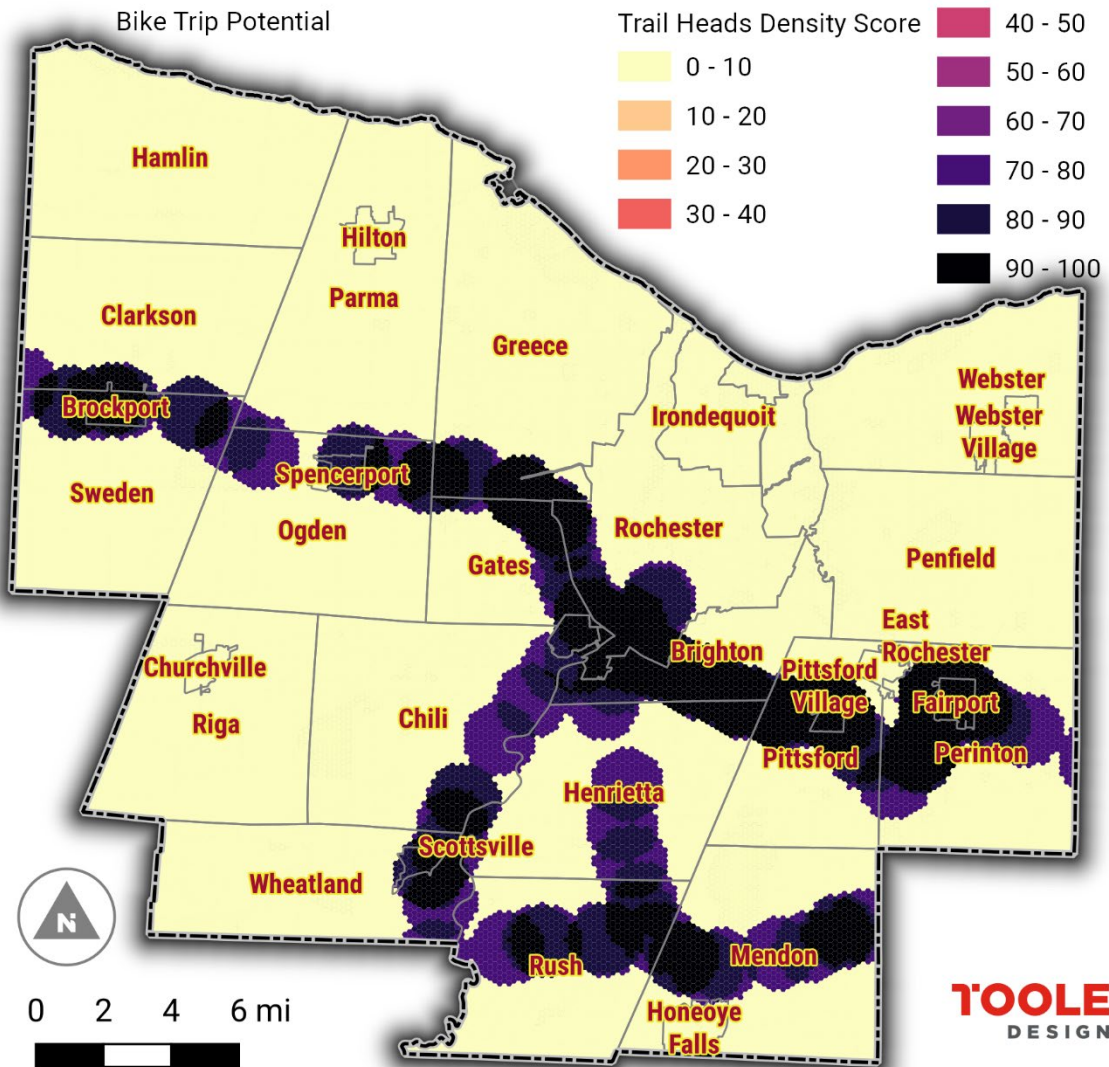**Figure 10: Bike Trip Potential – Low-Income Family Density**

Figure 11: Bike Trip Potential – Trail Heads Density

Limitations

Due to data availability, the trip potential analysis relied on metrics of various geographic levels, including low-income family (census tract), population density (census block group), and employment density (census block). Because these geographic levels tend to be larger in rural areas than in urban areas, they may offer limited granularity to describe the variations in rural areas like Wheatland, Rush, Hamlin, Clarkson, Sweden, Parma, Riga, and Mendon.

Next Steps

The project team compared the results of the trip potential analysis to the Bicycle Network Analysis to find areas with high active transportation potential and low connectivity. The project team also overlaid results with priority populations data (i.e., low-income, zero vehicle households, etc.) to determine where there is overlap between high active transportation potential and equity priorities. These served as a starting point to develop a conceptual, regional active transportation network.