APPENDIX 4 EXISTING CONDITIONS AND NEEDS ASSESSMENT

CAPE CORAL BICYCLE + PEDESTRIAN MASTER PLAN

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BICYCLE FRIENDLY & WALK FRIENDLY COMMUNITY PROGRAMS

The walk and bike friendly community assessments recognize existing success in communities that already promote walking and biking as well as provide a framework for those communities trying to achieve higher walking and bicycling rates.

The Walk Friendly Community (WFC) program is a national initiative, led by the Pedestrian and Bicycle Information Center (PBIC), intended to encourage communities to improve their local walking environments. Similarly, the Bicycle Friendly Community (BFC) program, led by the League of American Bicyclists is intended to help communities make bicycling a viable transportation and recreational option for leisure or to meet daily needs of users, regardless of age. Cape Coral currently holds bronze-level BFC status.

Both programs incorporate assessments that are useful for discovering where a community stands with respect to walking and biking facilities and activities. The WFC and BFC assessments recognize existing success in communities that already promote walking and biking as well as provide a framework for those communities trying to achieve higher walking and bicycling rates.

Both programs address the “Five E’s”: engineering, education, evaluation, enforcement, and encouragement. The engineering category refers to infrastructure-related elements (e.g., bike lanes, sidewalks, ADA accommodations, etc.), while the other four E’s refer to non-infrastructure efforts (such as safety campaigns, planning efforts, etc.). Comprehensive pedestrian and bicycle plans should address all five E’s to effectively advance walking and biking activities in a community. Communities seeking status as WFC and BFC must make relevant advances in each of the Five E’s.

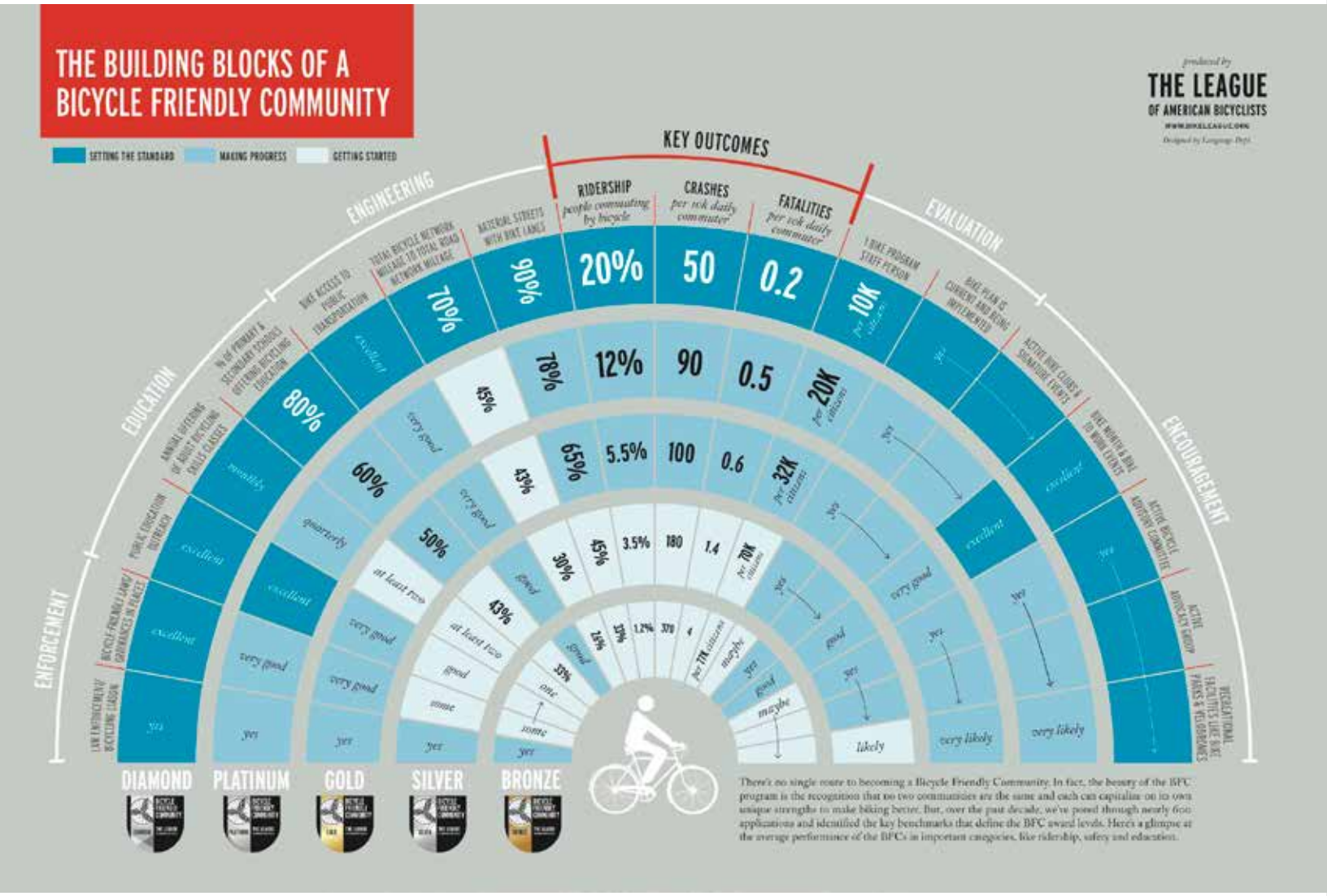


Figure 1. (Above) LAB provides this infographic as a general guideline for what's required to reach each pillar of BFC status

Figure 2. (Right) LAB provided a scorecard as part of Cape Coral's Bronze Bicycle Friendly Communtiy designation to summarize how it can achieve Silver designation.

Moving from Bicycle Friendly Community Bronze to Silver

In the fall of 2015, LAB reviewed Cape Coral's BFC application and awarded the City with bronze-level status. Along with the designation, LAB gave the City several key recommendations for moving from bronze to silver status. Additionally, LAB provides a summary score card of current community conditions and what typical Silver BFCs have for key criteria. With continued focus on expanding the bikeway network, improving safety conditions, and expanding programs to educate, encourage, and enforce biking activity, the City of Cape Coral can achieve Silver BFC designation.

CAPE CORAL, FLORIDA

BICYCLE FRIENDLY COMMUNITY
Fall 2015
BRONZE
THE LEAGUE OF AMERICAN BICYCLISTS

TOTAL POPULATION
163,599

POPULATION DENSITY
1460.2

TOTAL AREA *(sq. miles)*
120

 # OF LOCAL BICYCLE FRIENDLY BUSINESSES NA

 # OF LOCAL BICYCLE FRIENDLY UNIVERSITIES NA

10 BUILDING BLOCKS OF A BICYCLE FRIENDLY COMMUNITY

	Average Silver	*Cape Coral*
Arterial Streets with Bike Lanes	45%	**31%**
Total Bicycle Network Mileage to Total Road Network Mileage	30%	**4%**
Public Education Outreach	GOOD	**VERY GOOD**
Share of Transportation Budget Spent on Bicycling	7%	**1%**
Bike Month and Bike to Work Events	GOOD	**FEW/NONE**
Active Bicycle Advocacy Group	ACTIVE	**ACTIVE**
Active Bicycle Advisory Committee	ACTIVE	**MEETS MONTHLY OR MORE**
Bicycle–Friendly Laws & Ordinances	SOME	**FEW**
Bike Plan is Current and is Being Implemented	YES	**SOMEWHAT**
Bike Program Staff to Population	1 PER 70K	**1 PER 2.2K**

CATEGORY SCORES

ENGINEERING *Bicycle network and connectivity*	**3**/10
EDUCATION *Motorist awareness and bicycling skills*	**5**/10
ENCOURAGEMENT *Mainstreaming bicycling culture*	**2**/10
ENFORCEMENT *Promoting safety and protecting bicyclists' rights*	**4**/10
EVALUATION & PLANNING *Setting targets and having a plan*	**1**/10

KEY OUTCOMES

	Average Silver	*Cape Coral*
RIDERSHIP *Percentage of daily bicyclists*	3.5%	0.40%
SAFETY MEASURES **CRASHES** *Crashes per 10k daily bicyclists*	180	1460
SAFETY MEASURES **FATALITIES** *Fatalities per 10k daily bicyclists*	1.4	35.09

KEY STEPS TO SILVER

» Adopt bicycle facility selection criteria that increases separation and protection of bicyclists based of levels of motor vehicle speed and volume.

» Provide targeted bicycle education classes for women, seniors, families or other demographic groups in the community.

» Promote cycling throughout the year by offering or supporting more family-oriented community rides, and bicycle-themed festivals, parades or shows.

» Continue to seek grants for high visibility enforcement and institutionalize the use of bicycles by police.

» Adopt and implement the bicycle plan that is currently being prepared.

» Ensure that there is dedicated funding for the implementation of the bicycle master plan. Ensure to specifically allocate bicycle-related funding to low-income/minority communities.

The high overall score shows Cape Coral is well-positioned to achieve WFC designation and should consider applying.

Achieving Walk Friendly Community

Cape Coral has many of the qualities of a WFC already in place, and should consider applying for WFC designation. Cape Coral has a growing network of sidewalks. Likewise, the City has adopted a complete streets policy and support programs, such as Safe Routes to School and targeted law enforcement efforts to enforce pedestrian safety. Achieving a WFC designation can communicate the City's commitment to improving quality of life and the City's brand as an active and healthy community.

Since the City has not yet applied for WFC designation, the consultant team used a WFC Scorecard to provide an assessment of application readiness, the results of which are shown in Table 1. Overall, Cape Coral scored 18 of 21 possible points. Additionally, Cape Coral received the maximum number of points available for Education, Encouragement, and Enforcement and most of the points available for Engineering and Evaluation.

The high overall score shows Cape Coral is well-positioned to achieve WFC designation and should consider applying.

Table 1. Cape Coral Walk Friendly Community Scorecard

QUESTION	YES	NO	NOTES
ENGINEERING			
Does your community have a comprehensive, connected, and well-maintained pedestrian network?	1	0	Most of the major roadways are connected with sidewalks or multi-use paths.
Is there a Complete Streets Ordinance or another policy that mandates the accomodation of pedestrians on all road projects?	1	0	The City adopted a Complete Streets policy in 2015.
Has your community adopted an ADA Transition Plan for the public right-of-way?	0	1	Work in progress
If yes, provide more info (e.g., what year was the plan adopted, provide a copy of the plan, what has been implemented, etc.)			

QUESTION	YES	NO	NOTES
Does your community have a policy requiring sidewalks on both sides of arterial streets?	1	0	Sidewalks along major roadways are identified on both sides of the street with the adopted Engineering and Design Standards for the City. Sidewalks are required with new development within professional, commercial, downtown, or marketplace-residential zoning districts.
Does your community have a policy requiring sidewalks on both sides of collector streets?	1	0	Sidewalks along major roadways are identified on both sides of the street within the adopted Engineering and Design Standards for the City. Sidewalks are required with new development within professional, commercial, downtown, or marketplace-residential zoning districts.
Does your community require sidewalks to be constructed or upgraded with all (or the majority of) new private development?	1	0	Sidewalks are required with new development within professional, commercial, downtown, or marketplace-residential zoning districts.
ENGINEERING SCORE TOTAL	**5/6**		
EDUCATION			
Is there a community-wide Safe Routes to School Program that includes pedestrian education?	1	0	The City works with FDOT, Lee County MPO, and the Lee County School District to implement Safe Routes to School programs.
Are there pedestrian education courses available for adults In the community?	1	0	BikeWalk Lee and the Cape Coral Police Department conduct education classes for adults about walking and biking.
Does your community educate motorists and pedestrians on their rights and responsibilities as road users?	1	0	The City has developed public service announcements and online videos about walking and biking safety in Cape Coral. Cape Coral and the Lee County MPO also maintain a website devoted to active transportation resoures and information.

QUESTION	YES	NO	NOTES
EVALUATION SCORE TOTAL	**3/3**		
Is there a specific plan or program to reduce pedestrian/motor vehicle crashes?	1	0	The City works with FDOT and Lee County MPO to coordinate targeted enforcement and education for people walking and driving at high crash locations.
Does your community have a current comprehensive pedestrian plan or pedestrian safety action plan?	0	1	
Is there a pedestrian advisory committee that meets regularly?	1	0	The City has a bicycle and pedestrian advocacy group - Cape Coral Bike Ped - and also regularly participates with the Lee County MPO Bicycle and Pedestrian Coordinating Committee.
Does your community have a pedestrian program manager?	1	0	The City has a Public Works Planning Manager that manages the sidewalk program for Cape Coral.
Has your community established a connectivity policy, pedestrian-friendly block length standards and connnectivity standards for new developments, or convenient pedestrian access requirements?	0	1	
Is your community served by public transit, and if so, what route planning/ trip information is provided for transit passengers?	1	0	LeeTran provides transit service in Cape Coral and Lee County. Route maps and information are published online and available at select transfer centers.
ENFORCEMENT OTAL	**4/6**		
Do law enforcement officers receive training on the rights and responsibilities of all road users?	1	0	Cape Coral police officers receive regular training and certification about laws related to walking.
Does your community have law enforcement or other public safety officers on foot?	1	0	
Do local ordinances promote safety and accessibility for pedestrians?	1	0	Adopted engineering and design standards address safety and accessiblity to private property and along streets.

QUESTION	YES	NO	NOTES
ENCOURAGEMENT ORE TOTAL	**3/3**		
Does the community celebrate pedestrians with special events or media outreach?	1	0	The City promotes walking and biking thorugh Public Service Announcements and regular recreational events, such as fun runs, competitive running events, and events throught he Parks and Recreation department.
Does the community host any major community pedestrian events?	1	0	The City hosts events with local schools to promote walking and biking safety.
Is there an active pedestrian advocacy group in the community?	1	0	BikeWalk Lee and Cape Coral Bike Ped are two active advocacy organizations that help shape policy in Cape Coral and Lee County.
ENCOURAGEMENT SCORE TOTAL	**3/3**		
WALK FRIENDLY TOTAL (21 POINTS POSSIBLE)	**18/21**		

COMMUNITY PROFILE

Cape Coral is the most populous city in Lee County. The City sits on a peninsula, with the Caloosahatchee River to the east and south, and the Matlacha Pass to the west.

Cape Coral is the largest city in Lee County by land area and population. Table 2 compares the land area, population, and population density of Cape Coral to those of Lee County's other cities, Lee County, Florida, and the United States.

Table 2. Land Area, Population and Population Densities

COMMUNITY	LAND AREA (SQ MI)[1]	POPULATION (2014)[2]	POPULATION DENSITY (2014)
Cape Coral	106	161,804	1,531
Bonita Springs	39	46,384	1,202
Estero	20	22,649	1,131
Fort Myers	40	66,167	1,656
Fort Myers Beach	3	6,539	2,357
Sanibel	16	6,761	419
Lee County	785	647,554	825
Florida	53,625	19,361,792	361
United States	3,531,905	314,107,084	89

1. Source: U.S. Census Bureau, 2010 Census SF1 100% Data, Table G001; Excludes canals.

2. Source: US Census Bureau 2010-2014 American Community Survey 5-Year Estimates, Table B01003

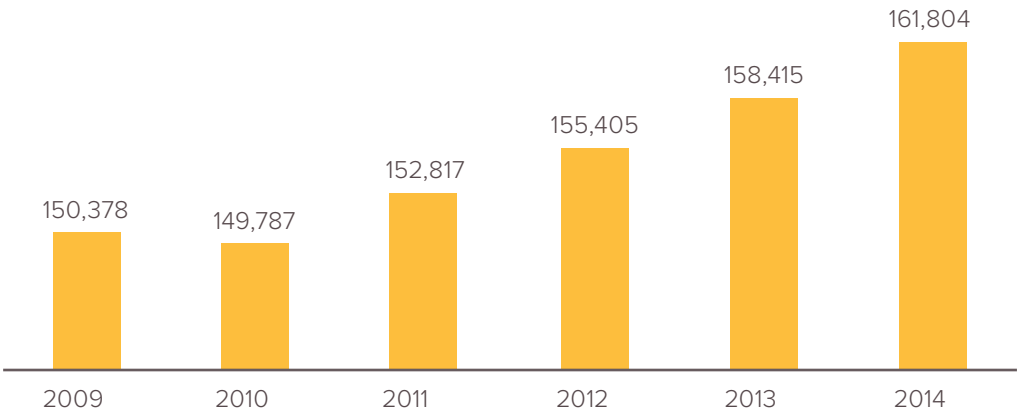


Figure 3. Cape Coral Population 2009-2014 (Source: US Census American Community Survey 5-year estimate)

Cape Coral had 161,804 residents in 2014, making it the largest city in Lee County. The population grew by about 7.5% since 2009 adding over 11,400 new residents. The population trends from 2009 to 2014 are displayed in Figure 3.

Of the city's residents, 25% are under 20 years old, 56% are between 20 and 64 years old, 18% are 65 to 84 years old, and 3% are over 85 years old. Figure 4 provides a breakdown of the age distribution in Cape Coral.

The age distribution in the City highlights the fact that roughly 1 in 4 residents are not old enough to drive a car and almost 1 in 5 resi-

4% of all households in Cape Coral have no access to a vehicle and 40% of households have access to just one vehicle.

dents are at an age where they limit their driving or do not drive due to their physical abilities related to aging. Combined, this group under the age of 20 or over the age of 65 represents almost half of Cape Coral's residential population.

Additionally, 4% of all households in Cape Coral have no access to a vehicle and 40% of households have access to just one vehicle. Combined with age distribution information, and the information highlights the fact that a significant number of people in Cape Coral could benefit from being able to walk and bike more for daily trips.

Figure 4. Cape Coral Age Distribution 2014 (Source: US Census American Community Survey 5-year estimates)

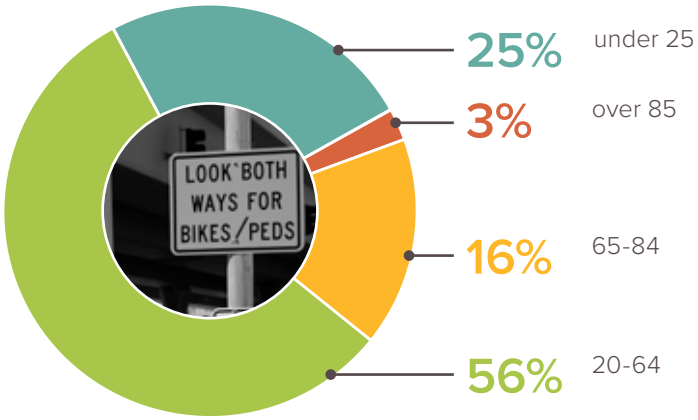
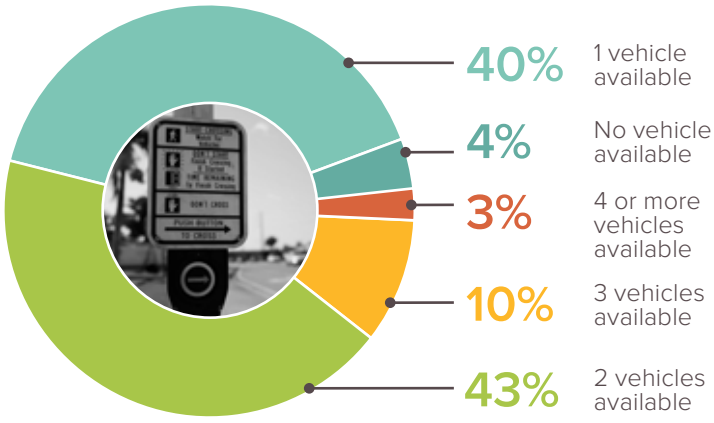


Figure 5. Number of Vehicles Available per Household in Cape Coral (Source: US Census Bureau 2005-2009 American Community Survey 5-Year Estimates, Table B08201)



The U.S. Census estimates that in 2014, 0.7% of Cape Coral residents commuted by walking and 0.4% by biking.

The U.S. Census estimates that in 2014, 0.7% of Cape Coral residents commuted by walking and 0.4% by biking. Compared to the 50 largest US cities, these proportions are low. Cape Coral's walking and biking commute shares are also relatively low when compared to most of Lee County's other cities, Lee County, Florida, and the United States.

Even though Cape Coral is the most populous city in Lee County, the commute rates for walking and biking in the City are lower than the rates for the county as a whole. Typically, cities have higher rates than the counties where they are located. Of the cities in Lee County, Ft. Myers Beach has the highest commute rates for walking and biking, followed by the City of Ft. Myers.

Part of the reason for the low walking and biking commute rates can be attributed to where residents in Cape Coral work. Cape Coral experiences an in-flow of 15,829 commute trips, 46,109 out-flow of commute trips, and 11,439 commute trips internally within the City. The total outflow is 30,280 per day.

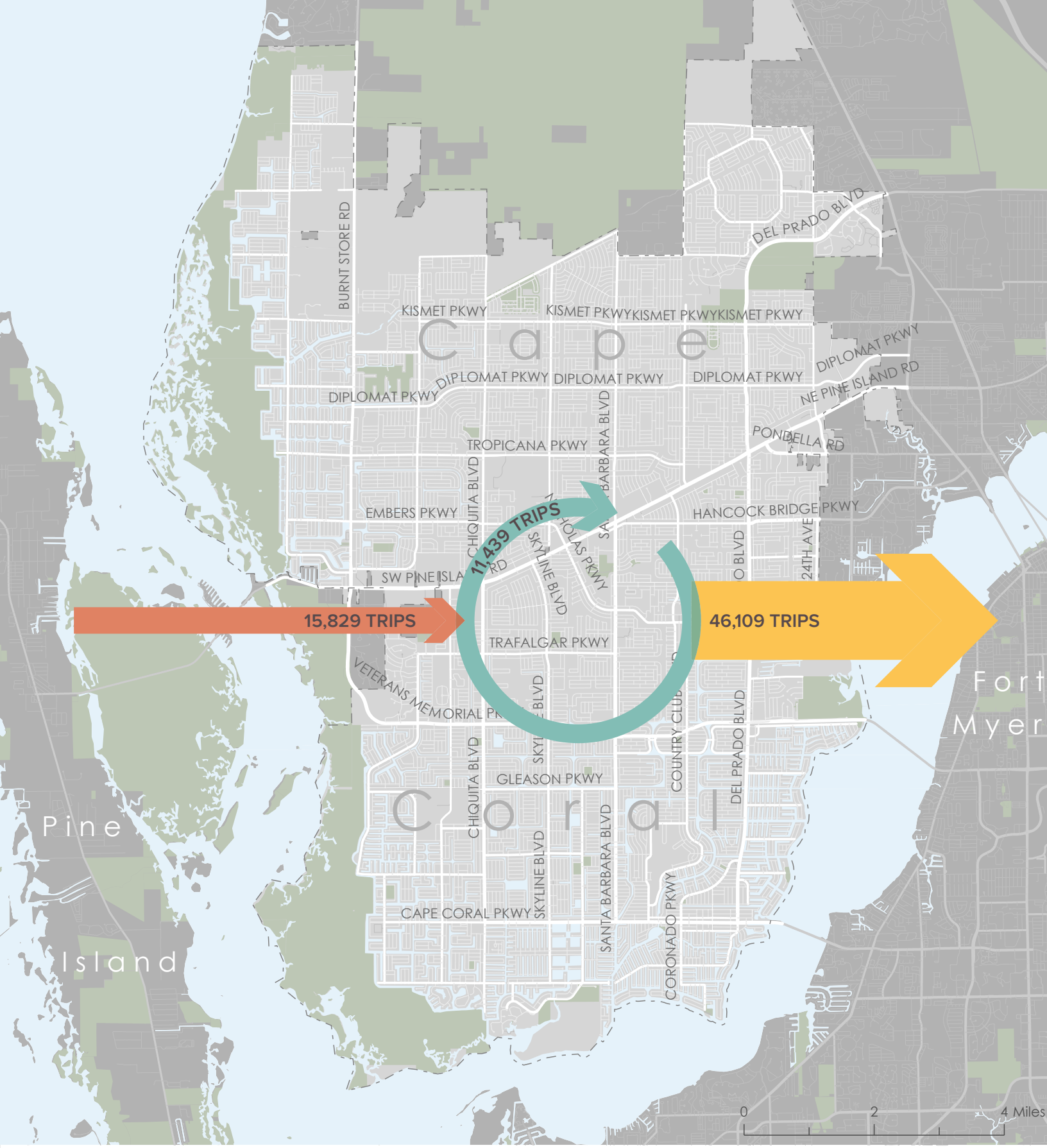
Table 3. Walking and Biking Communite Rates

COMMUNITY	WALKING	BICYCLING	TRANSIT	ACTIVE TRANSPORTATION
Cape Coral[1]	0.7%	0.4%	0.5%	1.5%
Avg. 50 Largest US Cities[2,3]	5.0%	1.2%	-	-
Bonita Springs[1]	1.0%	1.5%	2.6%	5.1%
Estero[1]	0.4%	1.9%	0.0%	2.2%
Fort Myers[1]	1.5%	1.7%	2.6%	5.7%
Fort Myers Beach[1]	7.6%	3.7%	0.0%	11.3%
Sanibel[1]	0.9%	3.6%	0.0%	4.6%
Lee County[1]	0.9%	0.9%	1.1%	3.0%
Florida[1]	1.5%	0.7%	2.1%	4.3%
United States[1]	2.8%	0.6%	5.1%	8.4%

1. Source: US Census Bureau 2010-2014 American Community Survey 5-Year Estimates, Table B08301

2. Source: Alliance for Walking and Bicycling, 2016 Benchmarking Report

3. Transit rates note available



Cape Coral City Limit

Natural Areas

Figure 6. Daily Flow of Commuters into, out of and within Cape Coral (Source: U.S. Census Longitudinal Employment and Housing Data 2014)


BB&T

In other words, Cape Coral the kind of community with the majority of employed residents in Cape Coral working outside of the City. Given the distance across bridges to neighboring cities, lack of frequent public transit, and lack of walking and biking facilities on the bridges to and from Cape Coral, for most people walking, biking, and taking public transit to work is not a reasonable option.

It should be noted that commute to work data is a blunt way to assess walking and biking activity in a community. It does not capture non-work trips, recreation trips, or trips by students to school. With more commercial development in Cape Coral and expanded walking and biking networks, rates of walking, biking, and taking transit for all trips could increase.

WALKING, BIKING & TRANSIT TRENDS

Walking, biking, and transit commuting in Cape Coral increased from 2009 to 2014. Rates were highest in 2013, with recent decreases likely due to economic changes and increasing access to a car for commuting. The development patterns and job locations in Lee County still make it difficult to commute by foot, bicycle or transit.

Walking Commutes

Commutes on foot increased steadily from 0.5% in 2009 to 0.8% in 2013. In 2014 the data shows a slight decline in the walking commute rate. Figure 7 shows the trends in walking commute rates.

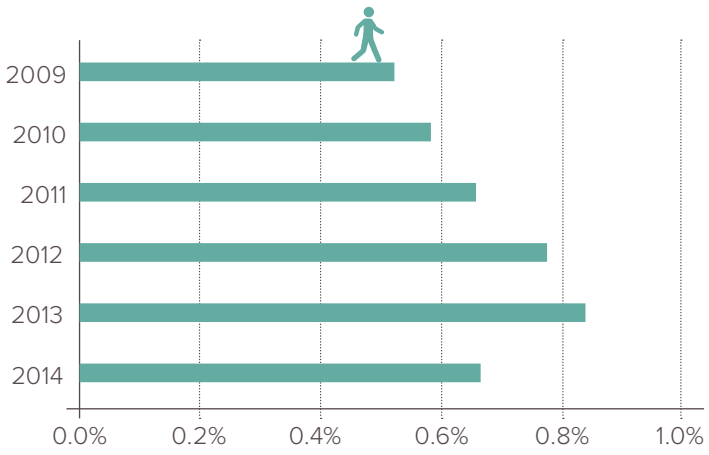
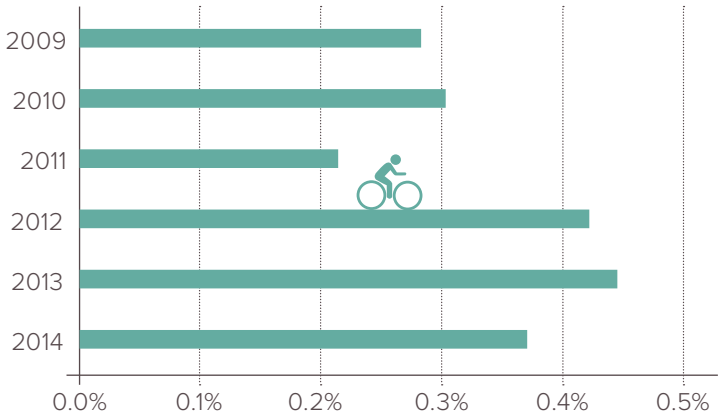


Figure 7. Rates of walking for commute trips 2009-2014 (Source: US Census American Community Survey 5-year estimates)

Figure 8. Rates of biking for commute trips 2009-2014 (Source: US Census American Community Survey 5-year estimates)

Bike Commutes

Commutes by bike have hovered around 0.2% to 0.4% from 2009 to 2014. The last three years of data show higher rates of commuting by bike. The highest rate, recorded in 2013, is about 0.45%. This value dropped by about 20% in 2014. Figure 8 shows the trend in biking commute rates.



Transit Commutes

Data from the same timeframe shows between 0.3% and 0.6% of Cape Coral residents commuting via public transit. This value was highest in 2010 at 0.59%. Like walking and biking, public transit use for commuting declined slightly in 2014. Figure 9 shows the trends in transit's commute share.

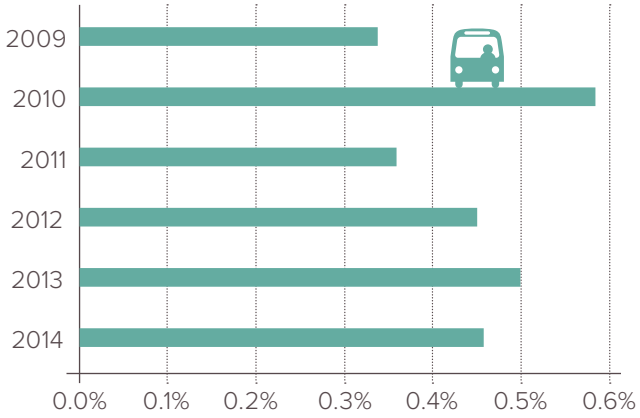


Figure 9. Rates of using public transit for commute trips 2009-2014 (Source: US Census American Community Survey 5-year estimates)

SAFETY ANALYSIS

The location and frequency of crashes involving people walking and biking in Cape Coral reveal patterns and locations of safety issues. This analysis examines the what, when, and where of crashes involving people walking and biking to identify areas where infrastructure improvements as well as other measures can be applied to improve safety in the City.

Crashes involving pedestrians and bicyclists also indicate locations where people on foot and bike are traveling. In the absence of data on total pedestrian and bike traffic, the conditions of high-crash locations must be examined carefully to determine whether crashes are indicative of a safety issue or indicative of higher volumes of people walking and biking.

Analysis for this plan used data from the State of Florida's central database for crash reports managed by the Florida Department of Highways Safety and Motor Vehicles. The database captures incident reports from local, county, and state public safety agencies. Data over a five-year period from 2011 to 2015 for all modes was analyzed. The database was queried through University of Florida's Signal Four Analytics. However, not all crashes recorded in 2011-2015 have crash location information, so the analysis uses substantial consideration for areas where multiple crashes are reported as areas with a high need for safety improvements.

Overview

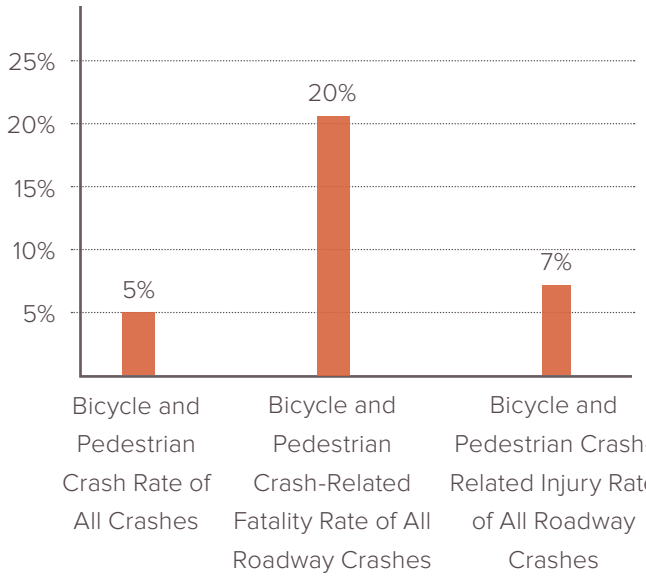
Based on the analysis of type, location, and number of crashes involving people walking and biking along Cape Coral's roadways, several key themes emerged including:

> The majority of walking and biking crashes occur on a very small portion of the total roadway network (major arterials).

> Major corridors are the areas with the highest demand, or propensity, for walking and biking activity.

> Major corridors are significant barriers to primary destinations.

Crashes involving people walking and biking account for 6% of all crashes along roadways in the City. People killed while walking and biking account for 20% of all roadway fatalities and 7% of all crashes involving injuries involved people walking and biking. These facts correspond with state and national data that shows higher rates of crash severity for people walking and biking.



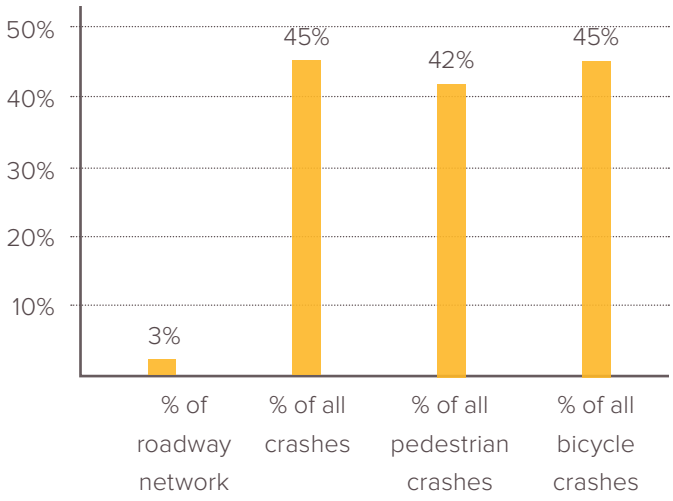


Figure 10. (Top left) Crash Rate Summary for Bicycle and Pedestrian Crashes, Fatalities, and Injuries from 2011 to 2015

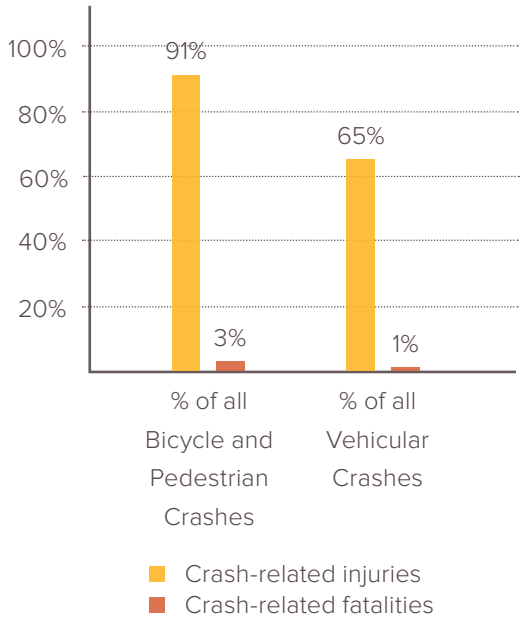
Figure 11. (Top right) Crash Summary from 2011 to 2015 along Cape Coral Parkway, Del Prado Boulevard, Pine Island Road, and Santa Barbara Boulevard

Figure 12. (Bottom right) Crash Related Injury and Fatality Rates Comparing Bicycle and Pedestrian Crash to Vehicular Crashes

Additionally, the four major corridors in Cape Coral – Del Prado Boulevard, Pine Island Road, Santa Barbara Boulevard, and Cape Coral Parkway account for 3% of the roadway network yet almost half of all crashes by all modes occur along these four corridors. Similarly, almost half of all pedestrian crashes and half of all bicycle crashes occur along these corridors. In other words, these major corridors have significant issues for public safety for all transportation modes in the community.

What

Over 8,802 people were involved in crashes during the five-year time period examined. Of these crashes, 231 involved people walking and 221 involved people biking. This results in about 46 pedestrian crashes per year and about 44 bicycle crashes per year. Additionally, there were 8,350 vehicular crashes over the same time period, or about 1,670 crashes per year or almost 5 crashes per day.



When looking just at crashes, injuries, and fatalities by mode, 91% of all bicycle and pedestrian crashes result in an injury compared to 65% for vehicles. Additionally, 3% of all bicycle and pedestrian crashes result in a fatality compared to 1% for vehicles. In other words, pedestrians and bicyclists have a much greater chance of being injured or killed compared to motorists.

Walking and biking are not inherently dangerous activities, but the conditions where people walk and bike in Cape Coral can be improved to reduce exposure to injury or death. Additionally, driving is the most dangerous activity that occurs daily in the City. Addressing roadway safety by slowing down motor vehicles and improving safety at intersections and midblock crossings can have a significant impact in safety for all roadway users in Cape Coral.

Table 4. All Roadway Crash Summary by Mode from 2011 to 2015

MODE	CRASH TOTAL	% OF ALL CRASHES
Vehicular	8,350	95%
Pedestrian	231	3%
Bicycle	221	3%
Total Crashes	**8,802**	**100%**

Table 5. All Roadway Crash-Related Fatality Summary By Mode from 2011 to 2015

MODE	FATALITY TOTAL	% OF ALL FATALITIES
Vehicular	51	80%
Pedestrian	8	13%
Bicycle	5	8%
Total Fatalities	**64**	**100%**

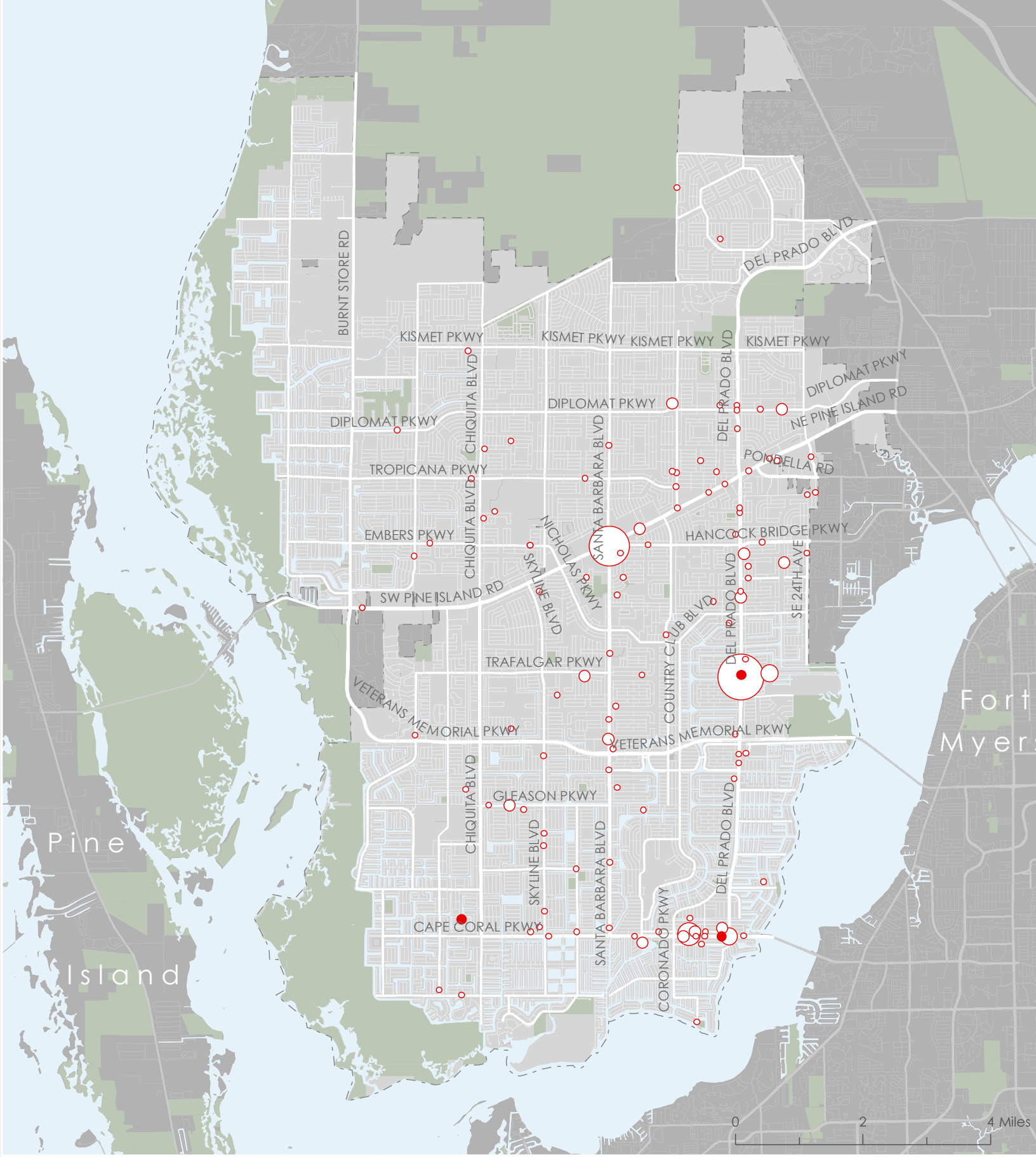
Table 6. All Roadway Crash-Related Injury Summary By Mode from 2011 to 2015

MODE	INJURY TOTAL	% OF ALL INJURIES
Vehicular	5,450	93%
Pedestrian	220	4%
Bicycle	192	3%
Total Injuries	**5,862**	**100%**

CRASHES INVOLVING PEDESTRIANS

Figure 13 shows the location of all crashes involving pedestrians between 2011 and 2015 with larger circle sizes corresponding to the number of pedestrian crashes. Pedestrian fatality locations are identified on the map as solid red dots. The map shows that many crashes in Cape Coral align with major roads, symbolized by the thicker white lines. Notable high-crash corridors can be identified such as Del Prado Boulevard, Pine Island Road, Santa Barbara Boulevard, and Cape Coral Parkway.

These are wide, high-speed arterial roads (often six lanes or more) with multiple safety hazards such as frequent driveways and long crossing distances. These roads also function as commercial corridors with multiple pedestrian generators such as job centers and transit routes. Some of the pedestrian crash hotspots can be found at the intersection of Pine Island Road and Santa Barbara Boulevard and Del Prado and Cape Coral Parkway. These locations are intersections of two major arterials. Multiple vehicle lanes with minimal pedestrian accommodations make crossing these major intersecitons by foot difficult.



Pedestrian Crashes, 2011-2015

8

1

Pedestrian Fatalities, 2011-2015

Cape Coral City Limits

Natural Areas

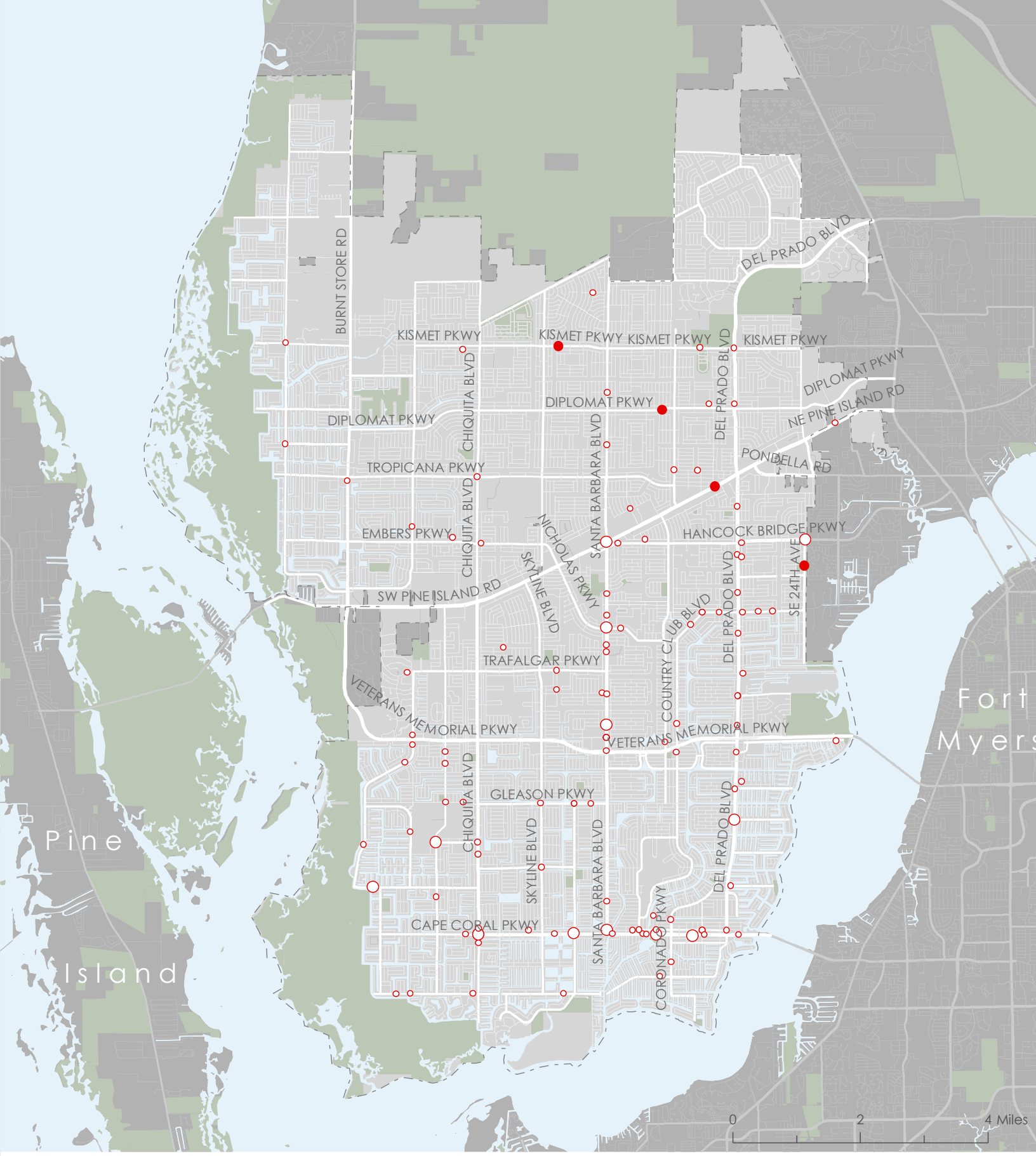
Figure 13. Crashes Involving People Walking

CRASHES INVOLVING BICYCLISTS

Figure 14 shows the location of all crashes involving bicyclists between 2011 and 2015 with circle size corresponding to the number of bicycle crashes. Bicycle fatality locations are identified on the map as solid red dots. Similar to the pedestrian crash trends, bicycle crashes in Cape Coral align with major roads. Notable high-crash corridors include Del Prado Boulevard, Pine Island Road, Santa Barbara Boulevard, and Cape Coral Parkway – all wide, high speed arterial roads with little or no dedicated bicycle infrastructure.

Other corridors with frequent bicycle crashes include Country Club Boulevard, Surfside Boulevard, and Southwest 20th Avenue. Crashes involving bicyclists are relatively dispersed in Cape Coral, with few hotspots emerging on the crash map. This suggests that bicycle activity occurs over a large part of Cape Coral, and that bicycle safety treatments are needed across a large geography.

Bicycle fatalities are concentrated in the northeast section of the City. Unlike pedestrian fatalities, bicycle fatalities do not align with general crash hotspots. However, the four bicycle fatality locations identified on the map all occurred in similar roadway typologies; median-separated four lane arterial roads that lack bike facilities and safe shoulders to separate people on bikes from fast-moving traffic. All fatalities occurred mid-block, suggesting a need for safe, barrier-separated bicycle facilities.



Bicycle Crashes, 2011-2015

- 1
- 2

Bicyclist Fatalities, 2011-2015

Cape Coral City Limits

Natural Areas

Figure 14. Crashes Involving People Biking

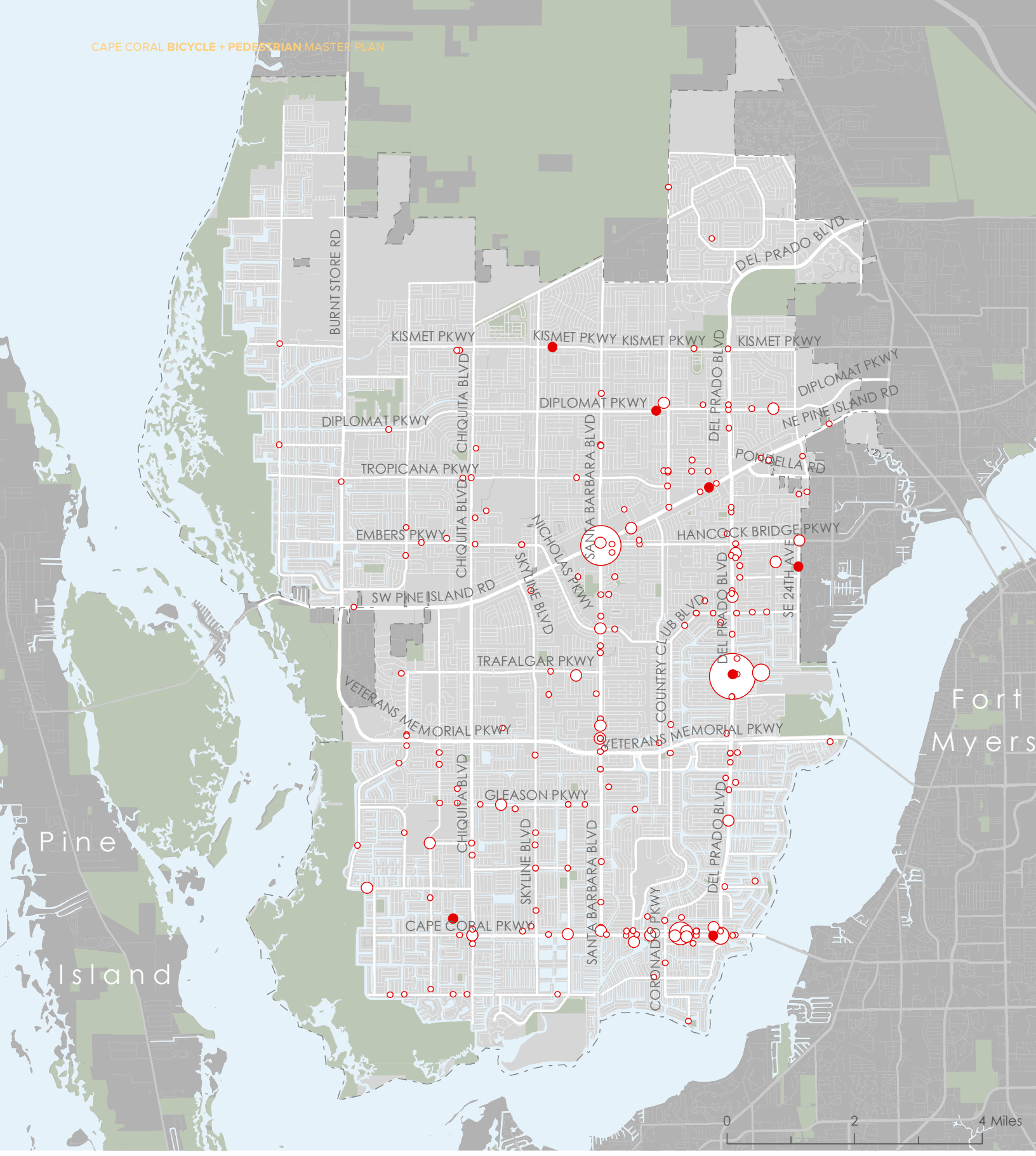


Figure 15. Injuries and Fatalities Involving People Walking and Biking

When

MONTH OF THE YEAR

Across Cape Coral crashes that involve pedestrians and bicyclists occur throughout the year. However, Figure 16 below shows more pedestrian crashes occurring during the winter months, with a peak in March. Crashes involving bicyclists peak in October and are generally more frequent in the fall and winter months. For both modes, the fewest crashes occur in June and July. This is likely indicative of greater walking and biking activity attributed to the pleasent months in the peak season.

YEAR OVER YEAR TRENDS

Pedestrian crashes have remained stable over the previous five years, with the 52 being the highest number of crashes reported in 2012, and 39 being the lowest number reported in 2014. However, as seen in Figure 17, bicycling crashes have been variable in recent years. In 2014, 67 bicycling crashes were reported. This is almost 250% higher than in 2011, when 27 bicycling crashes were reported.

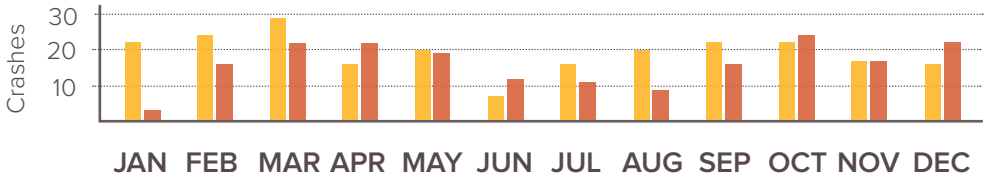


Figure 16. Pedestrian and Bicycle Crash Events by Month, 2011-2015

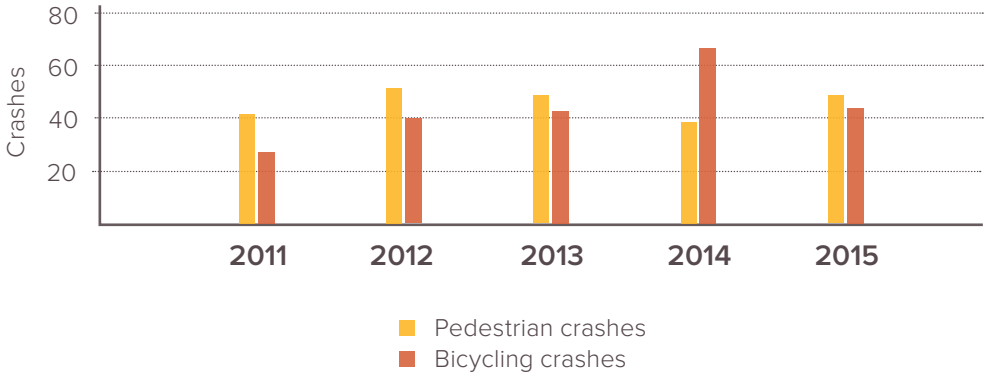


Figure 17. Pedestrian and Bicycle Crash Events by Year, 2011-2015

Where

CRASHES BY LOCATION

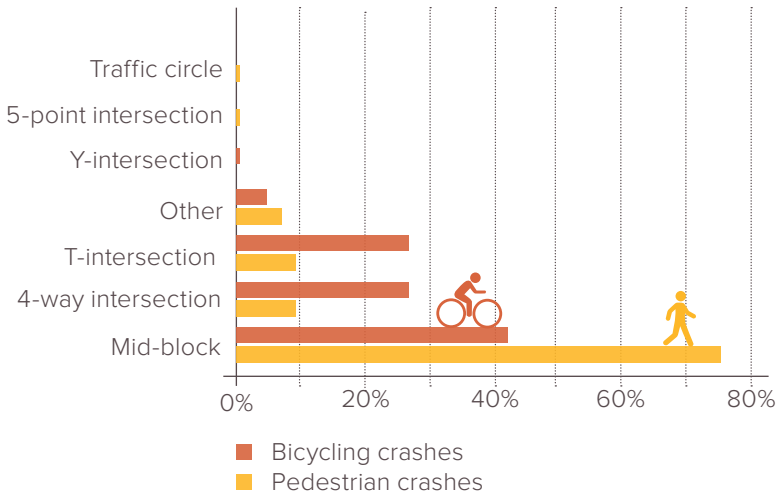
Recommendations for pedestrian and bicycle safety improvements rely on understanding where and how crashes are occurring. Data analysis can build on the field analysis to provide a picture of where safety investments need to be prioritized.

Figure 18 shows the distribution of crashes involving a pedestrian by intersection type. Almost three out of four pedestrian crashes in Cape Coral occur mid-block. While the data does not include information on the pedestrian or driver action that resulted in the crash, this suggests a possible need for: more frequent signalized crossings, mid-block crossings, safer crossing treatments, and safety education campaigns for drivers and pedestrians. However, because mid-block crashes tend to be more severe than crashes at intersections, it is possible that fewer intersection crashes are reported.

Additional high-crash locations for pedestrians include 4-way intersections and T-intersections, in roughly equal numbers. Many T-intersections lack safe crossing facilities, which can be further examined with field observations.

Approximately 42% of crashes involving people on bikes occur mid-block. Other high-frequency crash locations are at 4-way intersections (27%) and T-intersections (27%). For bicyclists, mid-block crashes may be the result of road design or driver behavior. While the data does not indicate the reasons these crashes occur, safety improvements may include traffic calming, barrier-separated bike facilities, and safety education.

Figure 18. Pedestrian and bicycle crashes by location

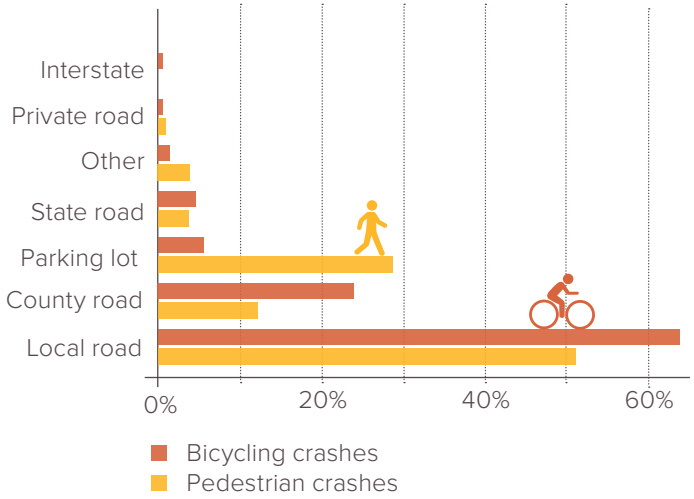


CRASH LOCATIONS BY ROAD OWNERSHIP

Signal Four Analytics crash data organizes road types by ownership. This information is helpful for determining the organization responsible for making safety improvements. The data shows that most pedestrian and bicycle crashes occur on roads owned by the City of Cape Coral (SR-78/Pine Island is a state-owned roadway and Del Prado from Cape Coral Parkway to SR-78/Pine Island is a county road). A large percentage of the overall roadway network is composed of Cape Coral-owned roadways.

53% of pedestrian crashes in Cape Coral occur on City-owned roadways. The 29% of the remaining crashes occur in parking lots, and 12% on county roads. 3% of pedestrian crashes happen on state roads, with 1% on private roads (see Figure 19). Similarly, 64% of bicycling crashes occur on City-owned roadways in Cape Coral. County roads also make up 24%, while few crashes are reported on private, State, or US roads (see Figure 19).

Figure 19. Pedestrian and bicycle crashes by road ownership



CRASH LOCATIONS BY ROAD CLASSIFICATION

Roadways in Cape Coral are split into three primary types: Arterials, Collectors, and Local Roads. Arterials are defined as major roads with higher speed limits that carry large volumes of traffic over longer, uninterrupted distances. Arterials are further divided into Principal Arterials, Major Arterials, and Minor Arterials. Collectors carry a moderate amount of traffic for shorter distances, and collect traffic from local roads and connect them to arterials. Local roads are typically residential neighborhood streets that provide little to no through movement, and accommodate low volumes of traffic at 35 mph or less.

Cape Coral is primarily composed of Local Roads. As seen in Table 7 on page 39, approximately 73% of the Cape Coral roadway network is classified as local, approximately 14% is classified as arterials, and approximately 11% is classified as collectors. While the majority of Cape Coral roadways are classified as local, these low-traffic, low-speed roads are relatively safe. 34% of pedestrian crashes and 16% of bicycle crashes occur on these roads.

In contrast, only 14% of Cape Coral roadways are classified as Arterials, but a large, disproportionate share of pedestrian and bicycle crashes occur on these dangerous roads. 54% of pedestrian crashes and 65% of bicycle crashes in Cape Coral occur on Arterials. Of these, the highest proportion of crashes for people on foot and bike are occurring on Major Arterials, followed by Minor Arterials. A smaller percentage of bicycle crashes occur on Principal Arterials (7%) than pedestrians (14%), presumably because people on bikes are more likely to avoid busy, high-speed thoroughfares. Collector roads make up 7% of the total roadway network, but comprise a slightly higher percentage of pedestrian crashes (11%), and bicycle crashes (19%).

Crashes are highly concentrated along four of Cape Coral's major thoroughfares: Cape Coral Parkway, Del Prado Boulevard, Pine Island Road, and Santa Barbara Boulevard. Nearly half of all crashes in Cape Coral occurred along these four roadways over the past five years despite the fact that they account for less than 3% of the city's roadway network. Between 2011 and 2015, 2,422 crashes occurred on these streets. Fifty-eight of these crashes involved people walking and another 59 involved people bicycling. These findings indicate that improving safety for all road users will require a focus on Cape Coral Parkway, Del Prado Boulevard, Pine Island Road, and Santa Barbara Boulevard.

Figure 20. Bicycle and Pedestrian Crashes by Road Classification

Table 7. Crashes by Roadway Type

ROAD CLASSIFICATION	ROADWAY MILES	% OF ROADWAY NETWORK	PEDESTRIAN CRASHES	% OF PEDESTRIAN CRASHES	BIKE CRASHES	% OF BIKE CRASHES
Principal Arterial	35	2%	20	14%	9	7%
Major Arterial	24.7	2%	35	25%	46	35%
Minor Arterial	59.5	4%	19	14%	29	22%
Collector	107.8	7%	17	12%	25	19%
Local	1,254.9	85%	47	34%	21	16%

Table 8. Bicycle and Pedestrian Crashes along Cape Coral Pkwy, Del Prado Blvd, Pine Island Rd, and Santa Barbara Blvd

	CAPE CORAL PKWY	DEL PRADO BLVD	PINE ISLAND RD	SANTA BARBARA BLVD	TOTAL
Roadway miles	6.5	13.4	10.6	10.6	41.1
% of roadway network	0.44%	0.9%	0.72%	0.72%	2.77%
Total mapped crashes	621	640	576	585	2422
% of all mapped crashes	12%	12%	11%	11%	45%
Mapped pedestrian crashes	12	20	13	13	58
% of mapped pedestrian crashes	9%	14%	9%	9%	42%
Mapped bike crashes	14	20	4	21	59
% of mapped bike crashes	11%	15%	3%	16%	45%

EXISTING FACILITIES & CONDITIONS

As a master planned community, Cape Coral was originally built without any sidewalks, multi-use paths, or on-street bikeways. Over the years, Cape Coral has increasingly been building dedicated space for people to walk and bike along its roadway network.

Cape Coral currently has sidewalks along one or both sides of the road on 9% of all roads. Similarly, bike lanes and buffered bike lanes cover 4% of the roadway network and multi-use paths are along 1% of the roadway network.

The City of Cape Coral has also developed a network of signed bike routes. Some of the routes have dedicated bikeways or multi-use paths but many are through local, neighborhood streets with no dedicated space for bicyclists.

Table 9. Existing Biking and Walking Facilities by Roadway Type

	% OF TOTAL NETWORK	SIDEWALK (ON ONE OR BOTH SIDES)	SIGNED BIKE ROUTES	BIKE LANES	BUFFERED BIKE LANES	MULTI-USE PATHS
Local	85%	4%	13%	0%	0%	0%
Collector	7%	29%	36%	4%	38%	0.2%
Arterial	8%	48%	24%	14%	1%	7%
All		9%	6%	1%	3%	1%

Regional Connections

Cape Coral is connected to adjacent communities primarily by bridges. To the west, routes connect to Pine Island. To the south and east, routes connect to Fort Myers and unincorporated Lee County. To the north, routes connect to Charlotte County.

Bridges and their community connection include:

> **Matanzas Bridge** provides connection to Matlacha and Pine Island via Pine Island Road

> **Cape Coral Bridge** provides a connection to Fort Myers via Cape Coral Parkway and College Parkway

> **Midpoint Bridge** provides a connection to Fort Myers via Veterans Parkway and Colonial Boulevard

> **Caloosahatchee Bridge** provides a connection to Fort Myers via Cleveland Avenue and Tamiami Trail (US 41). This bridge does not connect to Cape Coral, but rather unincorporated Lee County areas east of Cape Coral. Major routes to this bridge include Pine Island Road, Pondella Road and Hancock Bridge Parkway.

> **Edison Bridge** provides a connection to Fort Myers via North Tamiami Trail and Fowler Street and Park Avenue. This bridge does not connect to Cape Coral, but rather unincorporated Lee County areas east of Cape Coral. Major routes to this bridge include Pine Island Road and Pondella Road.

Currently, there are no dedicated facilities for people walking and biking across any of the bridges that connect Cape Coral to adjacent communities. Some of the bridges do have a paved shoulder.

Land connections do exist to unincorporated areas of Lee County to the east of Cape Coral and to the Charlotte County to the north. Major routes in northeast Cape Coral connect Cape Coral to US 41, Fort Myers, and I-75. These major routes include Del Prado Boulevard, Diplomat Parkway, Pine Island Road, Pondella Road, and Hancock Bridge Parkway. Burnt Store Road is the primary route connecting Cape Coral north to Charlotte County.

Figure 21. As Cape Coral Parkway approaches Cape Coral Bridge, signage tells pedestrians not to cross and that bicyclists are permitted in shared lanes.

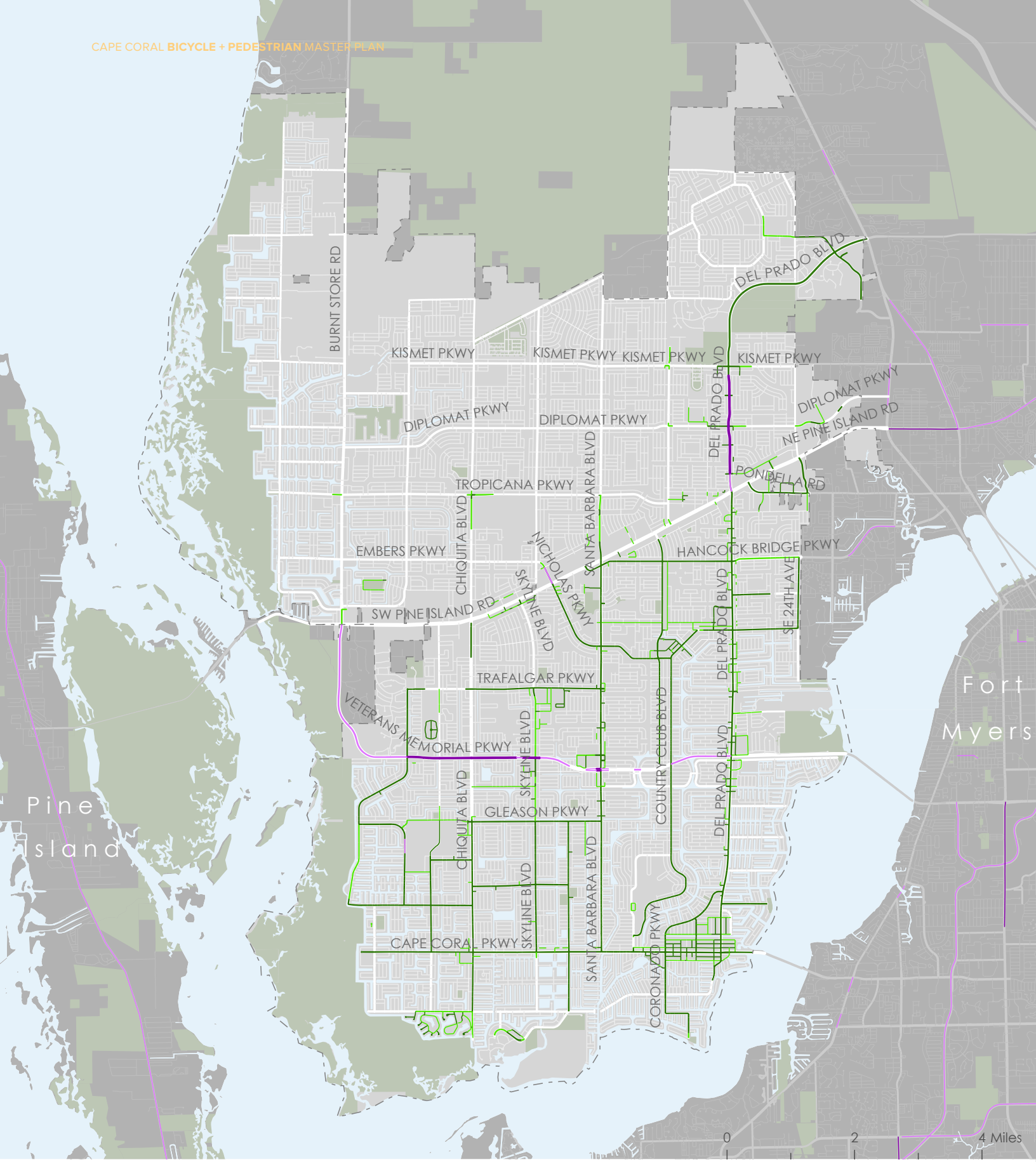


Figure 22. Existing Sidewalks and Multi-Use Paths in Cape Coral

Sidewalks and Multi-Use Paths

Table 10 provides a breakdown of the availability of sidewalks and bike lanes for each road type. Overall, 9% of Cape Coral's streets have sidewalks on one or both sides of the street and 9% of streets have bike lanes. Sidewalk coverage varies significantly by roadway type. As the roadway classification changes from local streets to collector and arterial streets, sidewalk availability increases. For example, almost half of arterials have sidewalks, but only 4% of local roads have any sidewalk. Arterials also have a higher coverage of multi-use paths. Figure 22 shows a map of Cape Coral's sidewalk and multi-use path coverage.

ISSUES FOR WALKING

> Crossing distances at major intersections are significant

> Long distances with limited crossing opportunities at midblock

> High vehicular speeds along major roadways create unsafe conditions, particularly for those walking

> Narrow facilities with no buffer along major roadways provides an uncomfortable experience for pedestrians

> Multi-use path roadway crossings and transitions to on-street facilities are often abrupt and not intuitive

> Limited landscaping and shade means pedestrians have little respite from the sun and hot conditions

> Transit stops often lack shaded waiting areas

> None of the bridges to Fort Myers have sidewalks

OPPORTUNITIES FOR WALKING

> Most intersections have marked crosswalks

> Most major intersections have pedestrian signals

> ADA treatments, such as curb ramps and pedestrian push buttons, make crossing streets easier and safer for those with disabilities

> Sidewalks are present along most major roadways

> Multi-use paths are wide and allow for safe passing of people walking and biking

Table 10. Existing sidewalks and multi-use paths

	TOTAL ROADWAY NETWORK		SIDEWALKS ON ONE OR BOTH SIDES OF THE STREET		MULTI-USE PATHS	
	% OF TOTAL NETWORK	MILES	% OF TOTAL NETWORK	MILES	% OF TOTAL NETWORK	MILES
Local	85%	1,255	13%	48	0%	0
Collector	7%	106	37%	30	0.2%	0
Arterial	8%	128	20%	57	7%	9
All	100%	1,489	6%	135	1%	9

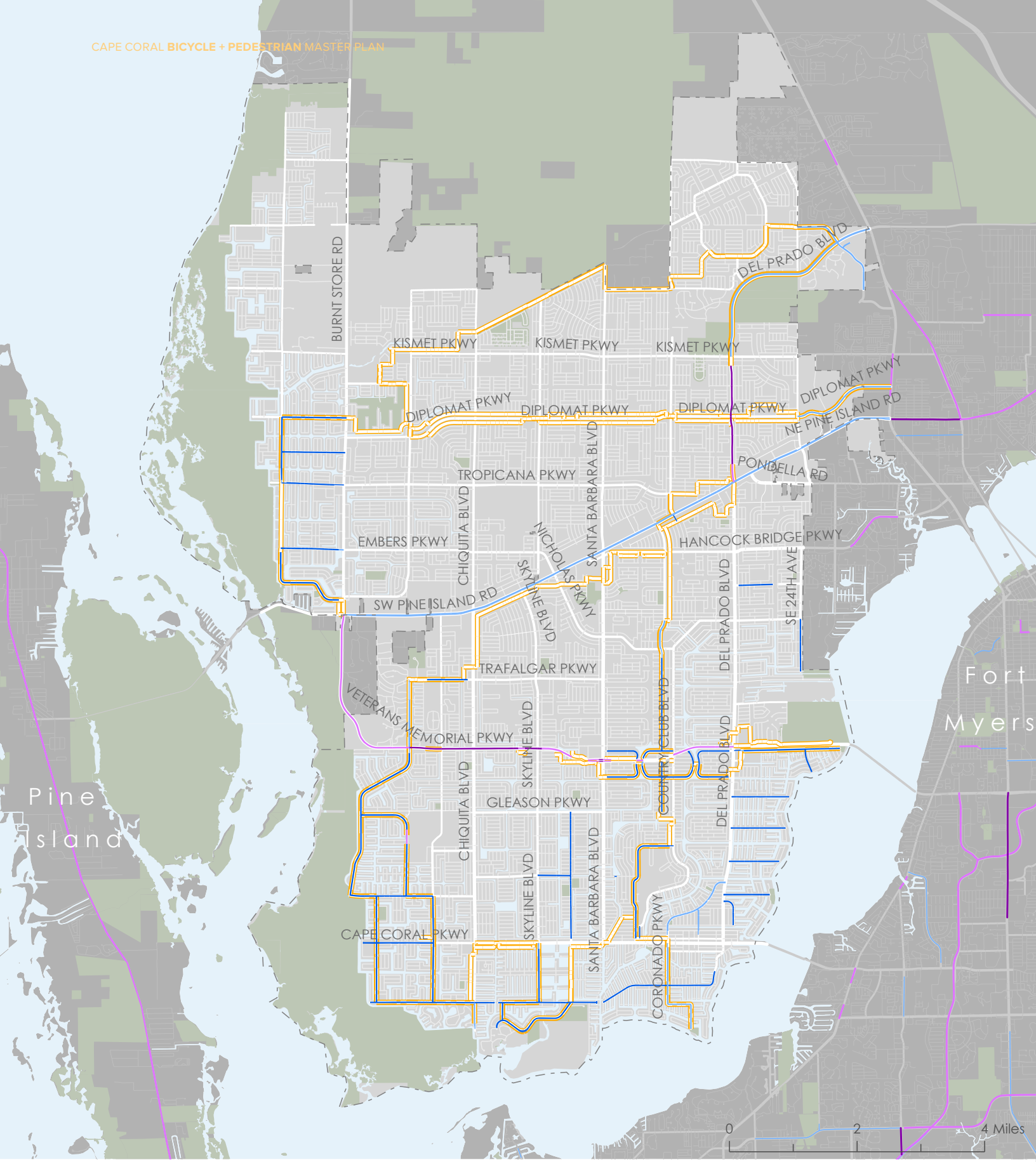


Figure 23. Existing Bike-ways and Bike Routes

Bikeways

This bikeway coverage is relatively low compared to other communities that the League of American Bicyclists has designated as Bicycle Friendly Communities. The League of American Bicyclists suggests a community have bikeways on 33% of roadways to achieve bronze status. Cape Coral's bikeways are mostly located on higher stress roads; i.e. collectors and arterials. Dedicated bikeways are available along 42% and 22% of collectors and arterials, respectively. Figure 24 shows a map of Cape Coral's bikeway coverage.

ISSUES FOR BIKING

> Minimal or no dedicated space at or through intersections (where traffic stress is highest) is provided along routes with on-street bikeways

> Debris and poor pavement conditions within bike lanes creates an unpleasant and sometimes unsafe riding experience

> No bike detection at signals

> Signed routes are not always intuitive or easy to follow, particularly at major intersections

> Most major roadways have no dedicated space for bicyclists

> Bike parking is limited, and where it is available it is often located at inconvenient locations on a property

> The bridges to Fort Myers and Pine Island do not have dedicated space for bicyclists

OPPORTUNITIES FOR BIKING

> Signed bike routes help with wayfinding, particularly for recreational riders

> Buffered bike lanes provide additional separation between vehicles and bicyclists

> Many four lane roadways have been restriped to have two lanes and buffered bike lanes

Table 11. Existing sidewalks and multi-use paths

	TOTAL ROADWAY NETWORK		SIGNED BIKE ROUTES		BIKE LANES		BUFFERED BIKE LANES	
	% OF TOTAL NETWORK	MILES	% OF TOTAL NETWORK	MILES	% OF TOTAL NETWORK	MILES	% OF TOTAL NETWORK	MILES
Local	85%	1,255	13%	36	0%	0.5	0%	2.1
Collector	7%	106	36%	39	4%	4.4	38%	41.4
Arterial	8%	128	24%	10	14%	16.7	1%	1.2
All	100%	1,489	6%	84.0	1%	21.6	3%	44.8

EXISTING PROGRAMS

Education, encouragement, and enforcement programs are a key part of creating a safe and regular walking culture in a community.

Existing Programs

Education, encouragement, and enforcement programs are a key part of creating a safe and regular walking culture in a community. Cape Coral has implemented or has several on-going programs that promote safety and encourage people to walk and bike more. A summary of program activities in Cape Coral is below:

- **Safe Routes to School –** Several schools in Cape Coral have education events about walking and biking. These events teach kids how to walk and ride safely, rules of the road, and sometimes provides free helmets to encourage safe riding choices.
- **Cape Coral Bicycle and Pedestrian Advocacy Group –** This advocacy group is dedicated to facilitate pedestrian and bicycle programs in Cape Coral. The committee meets monthly and provides input to the City Council. This group sponsored a bicycle route system within the city (see Adopt-a-Route).

Figure 24. Group rides like this one create opportunities for improving one's health and socializing while celebrating cycling.

- **User Maps –** Cape Coral has developed a cycling brochure and user map, funded in part, by the Lee County Visitor and Convention Bureau. The map highlights bike routes and areas where people typically like riding in the City. The brochures are also available at five Florida Highway System Rest Areas.
- **Walking and Biking Events –** Several organized ride events and runs take place throughout the year in Cape Coral. The Parks and Recreation Department helps organize the Tour de Cape, which includes a kids ride, 5k run, and several bike ride options varying from 15 to 100 miles. BikeWalkLee and the Caloosa Riders also help organize and promote rides and walks throughout the year in Cape Coral. All of the events help promote recreation and physical activity to promote healthy lifestyles.
- **Adopt-A-Route –** The City has worked in partnership with the Caloosa Riders, Cape Coral Bike-Ped, and the Cape Coral business community to develop an Adopt-A-Route program to fund the development and installation of signed bike routes. To date, the program has installed over 1,500 signs providing guidance along multiple routes in the City.
- **Public Safety Education and Enforcement** – The Cape Coral Police Department has led targeted safety operations as well as incorporated regular use of bicycles as part of their daily public safety operations. A Bicycle Unit was developed in 2014 and many officers are certified through the Law Enforcement Bicycle Association. Police regularly conduct patrols by bicycle, particularly during special events, have used message boards to display bicycle safety messages, and received grants from FDOT to conduct bicycle and pedestrian safety education and enforcement.

Several organized ride events and runs take place throughout the year in Cape Coral. The Parks and Recreation Department helps organize the Tour de Cape, which includes a kids ride, 5k run, and several bike ride options varying from 15 to 100 miles.

- **Bicycle Website –** The City has a dedicated page on its website devoted to biking. Links to user maps and information about the City's ongoing bike initiatives can be found at the dedicated page. People can also submit maintenance requests to the City from the page.
- **Public Service Announcements –** The City has developed several safety videos about walking and biking that have aired on public TV stations and are also hosted on the City's website.

BICYCLE SUITABILITY INDEX (BSI) & PEDESTRIAN SUITABILITY INDEX (PSI) ANALYSIS

The suitability analysis overlays supply and demand to identify areas with the highest demand but lowest supply of infrastructure. The suitability analysis will be used to prioritize projects for infrastructure investments as a part of this project.

Overview

A suitability analysis was conducted for Cape Coral to identify where demand or propensity for walking and biking is located throughout the City as well as where the greatest needs are related to gaps and infrastructure suitability in the network. Described another way, the suitability analysis overlays supply and demand to identify areas with the highest demand but lowest supply of infrastructure. The suitability analysis will be used to prioritize projects for infrastructure investments as a part of this project.

The demand analysis looked at proximity and density of factors that can indicate higher demand for walking and biking activity. Specific factors included:

- Where people live
- Where people work
- Where people play
- Where people learn
- Where people play, shop, and heal
- Where people access transit

The supply analysis was done separately for walking and biking, as the needs for infrastructure are different and travel patterns, including travel distance and travel behavior, differs too. Given the current road conditions, the basic question for both analyses is: How stressful is it for most people to walk and bike along the road or street?

Specific factors included:

- Posted speed limit
- Number of travel lanes
- Traffic volume
- Are traffic signals present at intersections?
- Is a median present?
- Are sidewalks present?
- Are bike lanes, buffered bike lanes, or multi-use paths present?

Additionally, a low stress bicycle connectivity analysis was conducted to examine how far a family could ride from a particular point in Cape Coral before they get to a street that they would consider too stressful or dangerous to ride on or cross. The analysis found that there are lots of pockets of low-stress networks in Cape Coral, but most are disconnected by larger high-speed, high volume roadways.

Based on the suitability analysis, several key themes emerged:

- Demand for walking and biking is higher in the southern portion of Cape Coral, particularly south of Pine Island Road
- Demand is concentrated along major corridors in Cape Coral, particularly along Del Prado Boulevard, Cape Coral Parkway, Pine Island Road, and Santa Barbara Boulevard
- Even without sidewalks or dedicated bikeways, most neighborhood streets in Cape Coral score as “low stress” and are comfortable to walk and bike along.
- The lowest “supply” for walking infrastructure is along the major roadways north of Pine Island Road. Most of these major roadways lack sidewalks. “Low supply” gaps exist along some of the major roadways south of Pine Island, but for the most part major roads south of Pine Island have sidewalks.
- The lowest “supply” for bicycling infrastructure is along almost all of the major roadways in Cape Coral. The high speeds, volumes, and existing conditions of bike lanes on major roadways could be deficieint and make a family feel uncomfortable biking along the roadway.
- The southern and western edges of Cape Coral have the best “supply” of low-stress bike networks and connectivity, due in large part to the network of multi-use paths and buffered bike lanes along streets with low to moderate vehicle speeds and volumes.

The technical details related to the analysis are summarized on the subsequent pages.

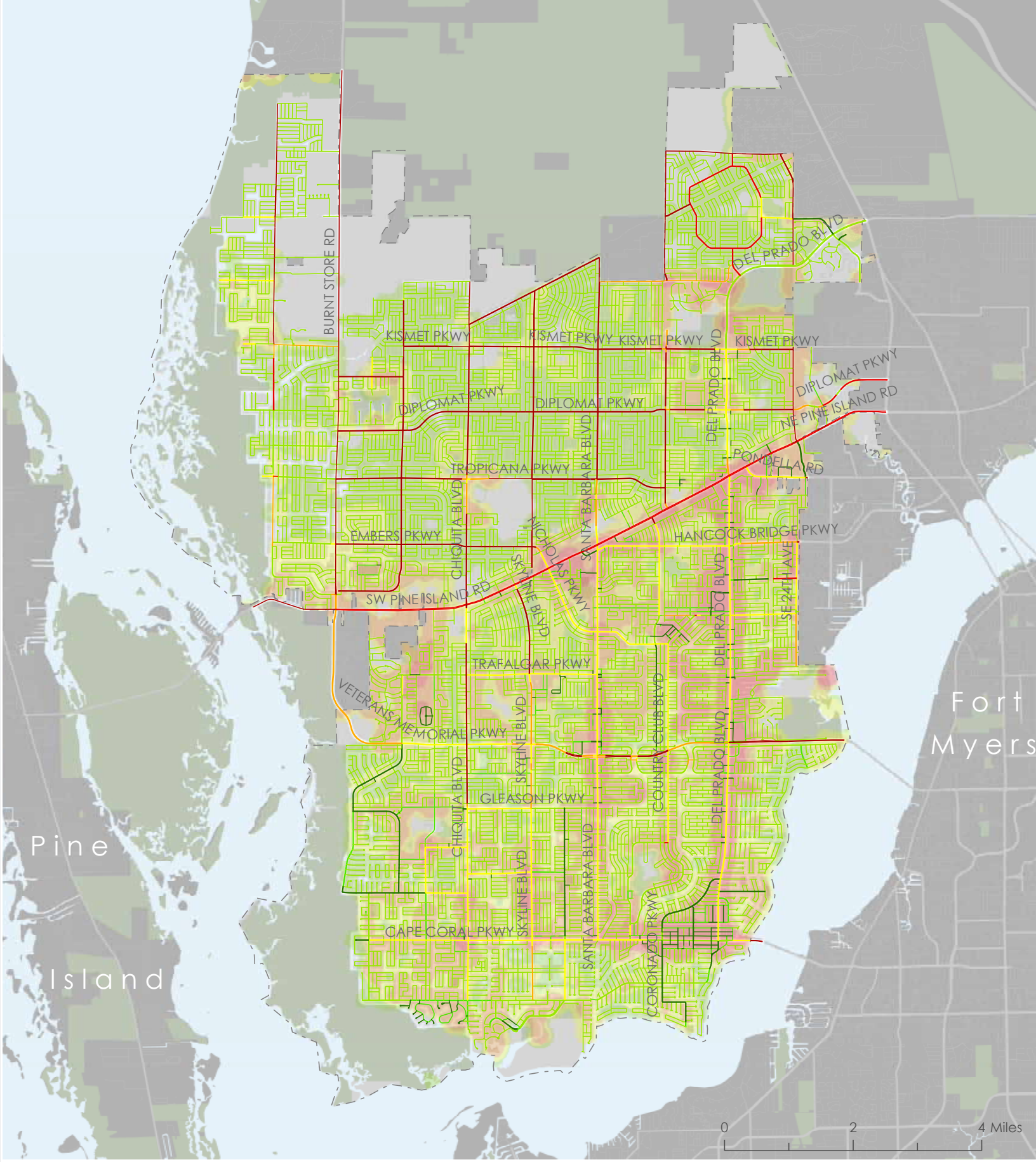


Figure 25. Pedestrian Suitability Analysis Results

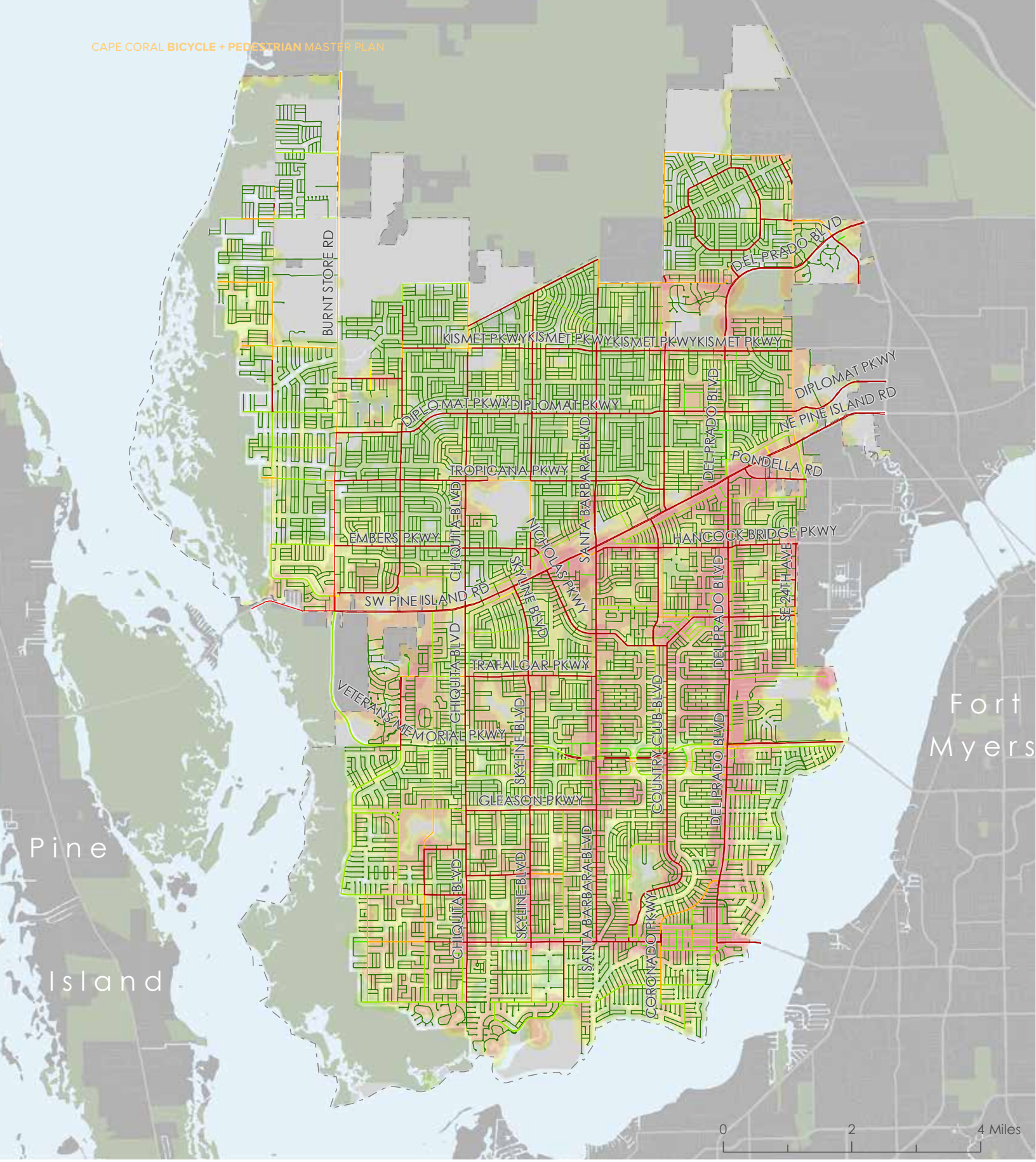


Figure 26. Bicycle Suitability Analysis Results

TECHNICAL ANALYSIS

INTRODUCTION

The consultant team conducted a Pedestrian Suitability Analysis (PSA) and Bicycle Suitability Analysis (BSA) for the City of Cape Coral. The Pedestrian and Bicycle Suitability Analysis (P/BSA) identifies areas where demand for walking and bicycling trips are high and compares these locations with supply model outputs (Pedestrian Level of Service and Bicycle Level of Traffic Stress) that estimate pedestrian and bicyclist comfort along each roadway segment. **The results can be used to identify areas in need of improvement and to prioritize pedestrian and bicycle projects where infrastructure need meets trip demand.**

The supply and demand models were tailored to the City of Cape Coral using available data. The supply model analyzed the full roadway network within Cape Coral's city limits, excluding limited access highways, to provide a full picture of connectivity around the city. The demand model estimates relative demand for walking and bicycling activity inside Cape Coral's city limits as well as a one-mile buffer around the boundary to account for demand generators near the edges of the City.

DATA SOURCES

The following data inputs were incorporated into the Pedestrian Level of Service (PLOS) and Bicycle Level of Traffic Stress (BLTS) analyses. Table 12 displays the supply model input variable, its source, and notes on limitations of the available data and assumptions that were made.

The following data inputs were incorporated into the demand side of the Pedestrian Suitability Analysis and Bicycle Suitability Analysis. Table 13 displays the demand model input variable, its source, and notes on limitations of the available data and assumptions that were made.

Table 12. Sources of Supply Model Inputs

MODEL INPUT	SOURCE	NOTES
Posted Speed Limit	City of Cape Coral	
Number of Travel Lanes	City of Cape Coral	
Annual Average Daily Traffic Volumes (AADT)	FDOT 2014 Traffic Volumes	Not available for all streets. Arterial streets without data were assumed to carry more than 20,000 AADT. Collector streets without data were assumed to carry between 3,000 – 10,000 AADT. Local streets without data were assumed to carry less than 3,000 AADT.
Marked Centerline	City of Cape Coral	Used to identify low-speed, low-volume 2-lane residential streets
Median	City of Cape Coral	
Sidewalks	City of Cape Coral	Including presence of sidewalk on one or both sides of the street
Bicycle Lanes and Buffered Bicycle Lanes	City of Cape Coral	
Multi-Use Paths	City of Cape Coral	Including presence of a multi-use path on or both sides of the street
Traffic Signals	City of Cape Coral	Used to create low stress network cluster maps only – not used as an input for roadway segment analysis

Table 13. Sources of Demand Model Inputs

MODEL INPUT	SOURCE	NOTES
Population density	2010 US Census	Summarized by census block
Employment density	2010 US Census	Summarized by census block
School locations and Enrollment	City of Cape Coral	Includes public and private elementary, middle, and high schools
Parks	Lee County Metropolitan Planning Organization (MPO)	
Commercial destinations	2010 U.S. Census	Commercial destinations are approximated by service sector jobs (Retail trade; arts, entertainment, recreation; accommodation and food services; other services)
Libraries	Lee County MPO	
Health Facilities	Lee County MPO	
Hospitals	Lee County MPO	
Bus ridership by stop	LeeTran	FY 2014 bus ridership

Pedestrian Level of Service Analysis

PEDESTRIAN LEVEL OF SERVICE METHODOLOGY

The PLOS model is rooted in the concept that a doubling of travel speed results in a four-fold increase in stopping time and resulting crash severity. According to one study, speed has the following impact on pedestrian fatalities[1].

- At 25 mph the odds of pedestrian fatality are 11%
- At 35 mph the odds of pedestrian fatality are 42%
- At 45 mph the odds of pedestrian fatality are 65%

While other studies have found some variation, the relationship between vehicle impact speed and rates of pedestrian survival have been reported consistently across available literature.

It is imperative that dedicated pedestrian facilities are provided to create safe walking conditions. This PLOS analysis is based primarily on safety and does not consider factors of the built environment known to make walking an attractive and preferred form of transportation. While built environment factors are not explicitly considered, lower posted speeds and more dedicated pedestrian space will typically correlate with places people want to walk based on the surrounding land uses and urban form (e.g., residential neighborhoods and commercial uses in lower speed urban areas).

1 Tefft, B. C. Impact speed and a pedestrian's risk of severe injury or death. Accident Analysis & Prevention 50 (2013)

The segment-based Pedestrian Level of Service Analysis (PLOS) measures pedestrian safety using four factors: posted speed limit, roadway width (number of travel lanes), pedestrian buffer (bicycle lanes), and the presence of sidewalks. Planting strips and on-street parking also provide effective buffers, but data was not available in a format that made these inputs easy to incorporate into the analysis. Table 14 outlines the scoring methodology of the PLOS analysis. The PLOS follows a seven-point scale, with 1 representing the highest comfort level. Generally, more pedestrian space on a lower speed roadway segment correlates to a higher comfort level. Where sidewalks are only provided on one side of the roadway, pedestrian comfort degrades on multi-lane roadways since pedestrians are forced to cross more than two lanes of traffic to reach that sidewalk. Bicycle lanes act as buffers between pedestrians and motor vehicle traffic, increasing comfort.

Table 14. Scoring Matrix for Pedestrian Level of Service. 1 = Highest Comfort level.

PEDESTRIAN SPACE ALONG ROADWAY	<= 30 MPH		35 MPH		>= 40 MPH	
	2 LANES	> 2 LANES	2 LANES	> 2 LANES	2 LANES	> 2 LANES
Complete sidewalk or multi-use path on both sides next to bike lanes or buffered bike lanes	1	1	1	1	2	3
Complete sidewalk or multi-use path on both sides	1	1	2	3	3	4
Complete sidewalk or multi-use path on one side next to bike lanes or buffered bike lanes	2	2	2	3	3	4
Complete sidewalk or multi-use path on one side	2	3	3	4	4	5
No dedicated space next to buffered bike lanes	2	3	3	4	5	6
No dedicated space next to bike lanes	3	4	4	5	6	6
No dedicated space	3	4	5	6	7	7

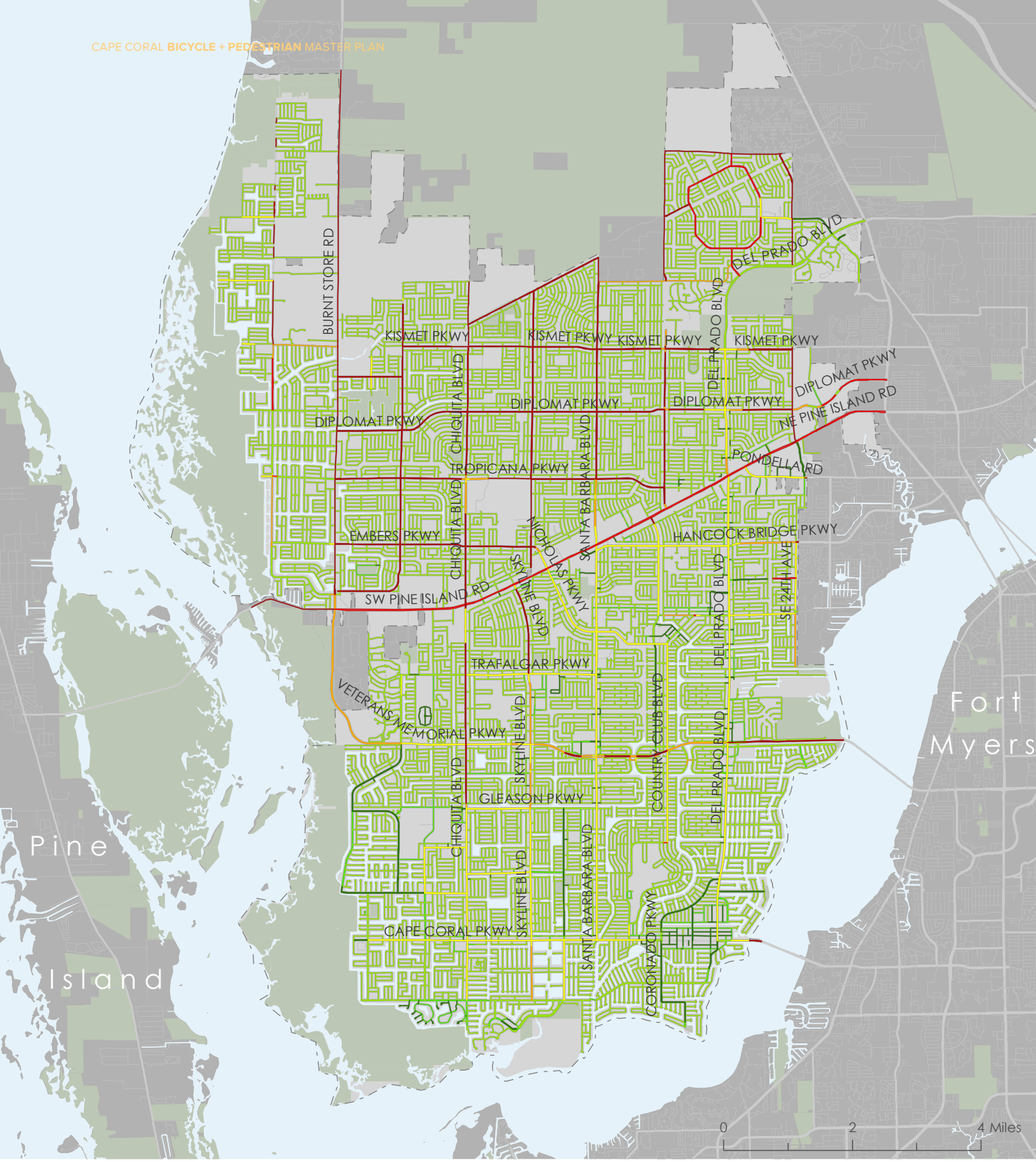


Figure 27. Pedestrian Level of Service Results

There are clusters of high-comfort pedestrian networks along local roads throughout the city, but these safe walking environments are separated from one another by low comfort links.

PEDESTRIAN LEVEL OF SERVICE RESULTS

The results of the pedestrian supply analysis can be seen in Figure 27. Roadways with the highest level of pedestrian comfort are shown in dark green. These roadway segments feature sidewalks or multi-use paths on both sides of the street and are either along low-speed streets or are paired with bike lanes as a buffer from vehicles moving up to 35mph. Bright green and yellow-green roadway segments indicate slightly higher stress conditions than the dark green segments, but are still generally comfortable. These segments exhibit a range of conditions that include sidewalks or multi-use paths along one or both sides of the roadway without bike lanes as a buffer, and no dedicated space for pedestrians along two-lane streets with posted speeds up to 30mph. Moderate to high stress segments for pedestrians are shown in yellow, orange, and red. These segments are characterized by either 1) sidewalks or multi-use paths along only one side of high speed, multi-lane roadways 2) no dedicated space for pedestrians but where bike lanes or buffered bike lanes are present along multi-lane or higher speed roadways; or 3) no dedicated space for pedestrians combined with no bike lanes or buffered bike lanes along high speed roads.

Key themes from the Pedestrian level of service analysis include:

> The highest levels of comfort are found in the commercial areas immediately north and south of Cape Coral Parkway between Del Prado Boulevard and Coronado Parkway, in low-speed residential areas, and along selected collector streets with two vehicle lanes, buffered bike lanes, and sidewalks along both sides of the street such as Pelican Boulevard north of Cape Coral Parkway.

> The majority of collector and arterial corridors south of Pine Island Road have medium levels of comfort due to the presence of sidewalks and moderate to high speed limits.

> North of Pine Island Road, the lack of sidewalks along higher speed multi-lane collector and arterial roadways creates stressful conditions for pedestrians.

> There are clusters of high-comfort pedestrian networks along local roads throughout the city, but these safe walking environments are separated from one another by low comfort links.

Bicycle Level of Traffic Stress Analysis

BICYCLE LEVEL OF TRAFFIC STRESS METHODOLOGY

The methods used for the Level of Traffic Stress (LTS) Analysis were adapted from the 2012 Mineta Transportation Institute (MTI) Report 11-19: Low-Stress Bicycling and Network Connectivity. The approach outlined in the MTI report uses roadway network data, including posted speed limit, the number of travel lanes, and the presence and character of bicycle lanes, as a proxy for bicyclist comfort level. Road segments are classified into one of four levels of traffic stress based on these factors. The lowest level of traffic stress, LTS 1, is assigned to roads that would be tolerable for most children to ride, and also to multi-use paths that are separated from motorized traffic. LTS 2 roads are those that could be comfortably ridden by the mainstream adult population. The higher levels of traffic stress, LTS 3 and 4, correspond to types of cyclists characterized by Portland's bicycle coordinator Roger Geller in his *Four Types of Cyclists* report[2]. This categorization of cyclist types is accepted throughout the bicycling planning practice across the U.S. LTS 3 is the level assigned to roads that would be acceptable to current "enthused and confident" cyclists and LTS 4 is assigned to segments that are only acceptable to "strong and

2 Source: Roger Geller. Four Types of Cyclists. http://www.portlandoregon.gov/transportation/article/237507

Table 15. Levels of Traffic Stress (LTS) Definitions. Source: Mineta Transportation Institute Report 11-19

LEVEL	DESCRIPTION
LTS 1	Presenting little traffic stress and demanding little attention from cyclists, and attractive enough for a relaxing bike ride. Suitable for almost all cyclists, including children trained to safely cross intersections. On links, cyclists are either physically separated from traffic, or are in an exclusive bicycling zone next to a slow traffic stream with no more than one lane per direction, or are on a shared road where they interact with only occasional motor vehicles (as opposed to a stream of traffic) with a low speed differential. Where cyclists ride alongside a parking lane, they have ample operating space outside the zone into with car door are opened. Intersections are easy to approach and cross.
LTS 2	Presenting little traffic stress and therefore suitable to most adult cyclists but demanding more attention than might be expected from children. On links, cyclists are either physically separated from traffic, or are in an exclusive bicycling zone next to a well-confined traffic stream with adequate clearance from a parking lane, or are on a shared road where they interact with only occasional motor vehicles (as opposed to a stream of traffic) with low speed differential. Where a bike lane lies between a throughlane and a right-turn lane. It is configured to give cyclists unambiguous priority where cars cross the bike lane and to keep car speed in the right-turn lane comparable to bicycling speeds. Crossings are not difficult for most adults.
LTS 3	More traffic stress than LTS 2, yet markedly less than the stress of integrating with multilane traffic and therefore welcome to most people currently riding bikes in American cities. Offering cyclists either an exclusive riding zone (lane) next to moderate-speed traffic or shared lanes on streets that are not multilane and have moderately low speeds. Crossing may be longer or across higher-speed roads than allowed by LTS 2, but are still considered acceptably safe to most adult pedestrians.
LTS 4	A level of stress beyond LTS 3.

fearless" bicyclists, who will tolerate riding on roadways with higher motorized traffic volumes and speeds. The definitions for each level of traffic stress are shown in Table 15.

The Level of Traffic Stress analysis completed for the City of Cape Coral builds on the MTI approach, expanding it to incorporate the impact of traffic volumes and the presence of a median and lack of a marked centerline (on local streets) on bicyclist comfort. Scoring in LTS Plus is based off of the four basic categories defined in the MTI report, but allows half points between each category to represent a more nuanced continuum of bicycle comfort for use in project prioritization. The scoring methodology is summarized in Table 16.

LTS Plus scoring increases reflect decreased cycling comfort (1 is the highest comfort level) as the number of lanes, posted speed limit, and traffic volumes increase. Traffic volumes and speed reduce the comfort level more where bicyclists share the road with motorized vehicles, but comfort level also decreases in bicycle lanes and buffered bicycle lanes as traffic volumes and speeds next to those bicycle lanes increase. The presence of a median also improves bicyclist comfort level because it provides physical separation from oncoming traffic and limits conflict points from vehicles turning left into driveways. Finally, the lack of a marked centerline on low-volume residential streets has the effect of reducing vehicle speeds on shared roadways, and was factored into the analysis.

Table 16. Scoring Matrix for Bicycle Level of Traffic Stress. 1 = Highest comfort level.

# OF LANES	TRAFFIC VOLUME (AADT)	SHARED STREET		STREET WITH BIKE LANE			STREET WITH BUFFERED BIKE LANE		
		≤ 30 MPH	≥ 35 MPH	≤ 30 MPH	35 MPH	≥ 40 MPH	≤ 30 MPH	35 MPH	≥ 40 MPH
2 lane residential with no centerline		1	2	N/A	N/A	N/A	N/A	N/A	N/A
2 - 3 lanes	<=3k	1.5	2.5	1	2	3.5	1	1.5	2.5
	3k - 10k	2	3	1	2.5	4	1	2	3
	10k - 20k	3	3.5	2	3	4	1.5	2.5	3.5
4 Lanes (w/ median)	<=3k	2.5	3.5	1.5	2.5	3.5	1	2	3
	3k - 10k	3	4	2	3	4	1.5	2.5	3.5
	10k - 20k	N/A	4	N/A	3.5	4	N/A	3	4
	>20k	N/A	4	N/A	4	4	N/A	3.5	4
4 - 5 lanes (no median)	<=3k	3	3.5	2.5	3	4	2	2.5	3.5
	3k - 10k	3.5	4	3	3.5	4	2.5	3	4
	10k - 20k	N/A	4	N/A	4	4	N/A	3.5	4
	>20k	N/A	4	N/A	4	4	N/A	4	4
6+ Lanes	All volumes	N/A	4	N/A	4	4	N/A	4	4

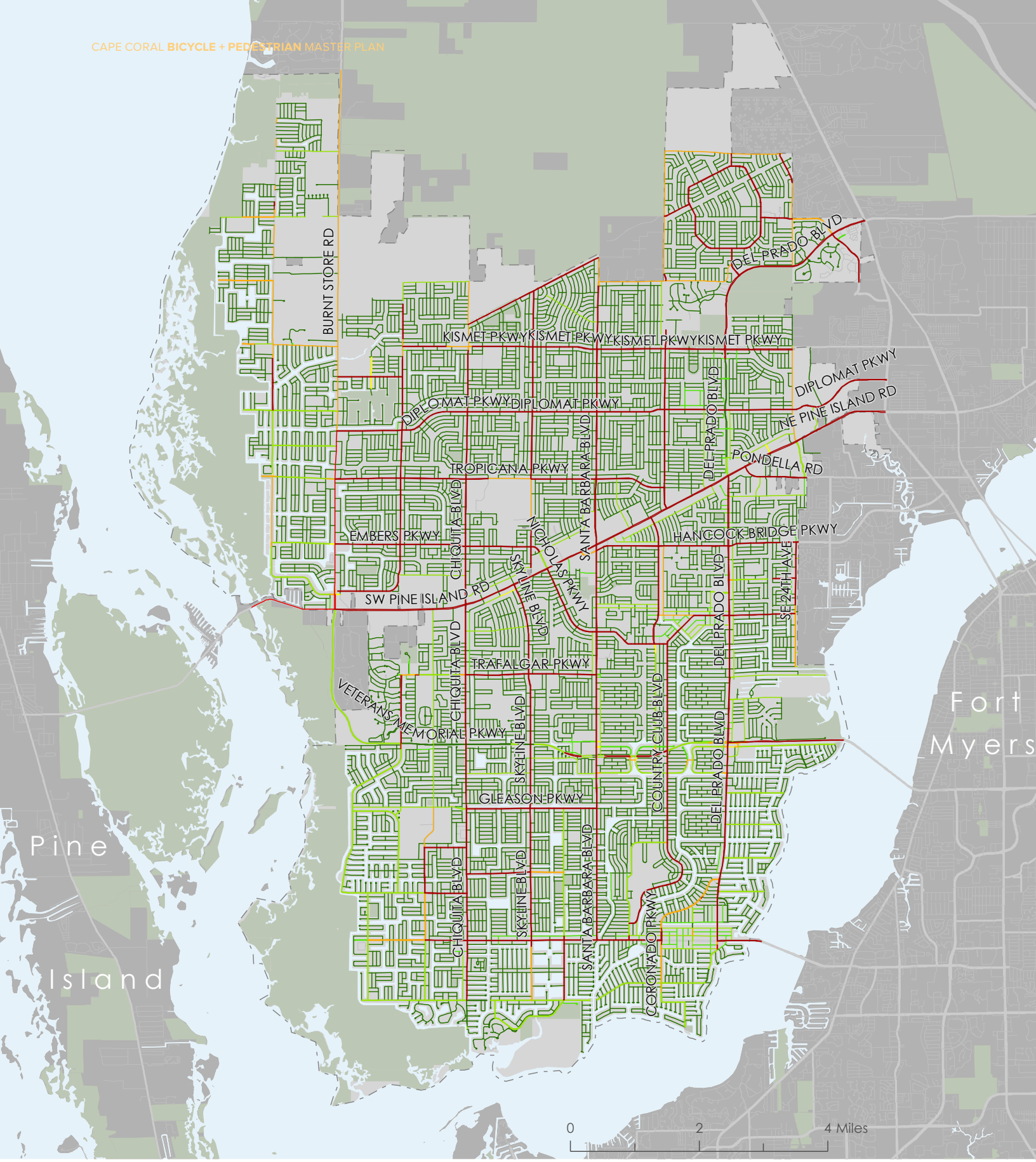


Figure 28. Bicycle Level of Traffic Stress Results

BLTS Composite Score

- Most Comfortable
- Least Comfortable

- Natural Areas
- Cape Coral City Limit

The local streets that make up the majority of the roadway network are generally comfortable places to ride a bike, but canals and major roadways are barriers between pockets of low-stress streets.

BICYCLE LEVEL OF TRAFFIC STRESS RESULTS

The results of the bicycle supply analysis can be seen in Figure 28. Roadways with the highest level of bicycle comfort are shown in dark green. These roadways include the vast majority of neighborhood residential streets due to their low-volumes and low vehicle speeds, and sections of Veterans Memorial Parkway and Del Prado Boulevard that feature multi-use paths along both sides of the roadway. Bright green and yellow-green roadway segments indicate slightly higher stress conditions than the dark green segments, but are still generally comfortable. These segments include collector roadways with buffered bike lanes and sections of Veterans Memorial Parkway that feature multi-use paths along one side of the street. Moderate to high stress segments for bicyclists are shown in yellow, orange, and red. Higher stress segments include corridors where there is either no dedicated space for bicycling despite multiple lanes, high traffic speeds, and/or high traffic volumes; or where conventional or buffered bike lanes do not provide sufficient comfort given the context of multiple lanes, higher traffic speeds, and/or higher traffic volumes.

Key findings from the Bicycle Level of Traffic Stress Plus analysis include:

> The local streets that make up the majority of the roadway network are generally comfortable places to ride a bike, but canals and major roadways are barriers between pockets of low-stress streets

> Most collector and arterial roadways in Cape Coral are not comfortable places to ride a bike, either because they lack bicycle facilities (examples include Cape Coral Parkway, Santa Barbara Boulevard, and Kismet Parkway); or because conventional bicycle lanes do not provide adequate separation from high-speed vehicle traffic (examples include Pine Island Road and Coronado Parkway)

> The multi-use paths and buffered bike lanes significantly decrease stress associated with bicycling near vehicles

> Cape Coral's signed bicycle routes help connect bicycle facilities with generally lower stress neighborhood streets

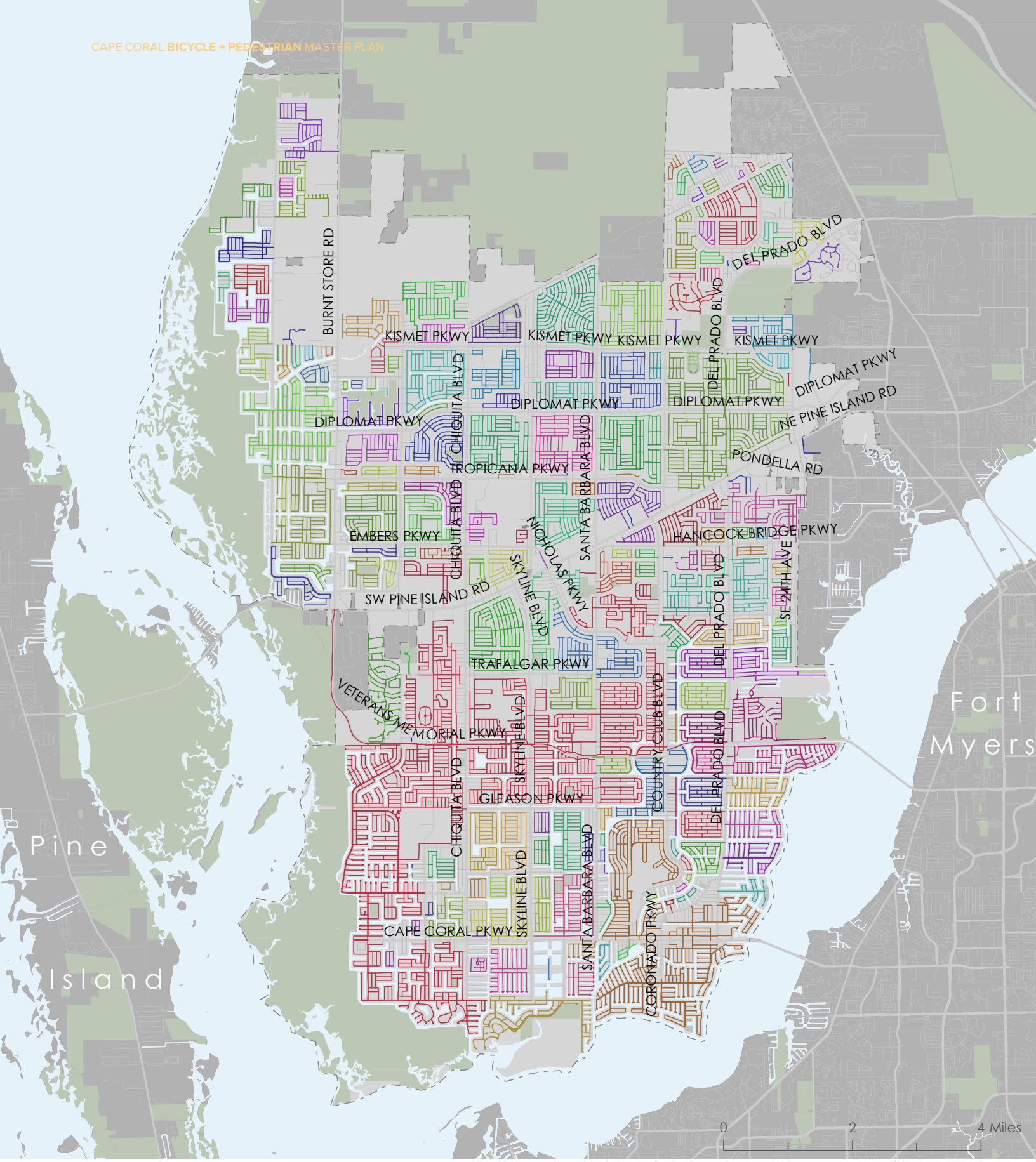


Figure 29. Bicycle Connectivity Analysis

Low Stress Islands of Connectivity (LTS 1 or 2)

Color Varies

Cape Coral City

Natural Areas

LEVEL OF TRAFFIC STRESS (LTS) BICYCLE CONNECTIVITY ANALYSIS

The BLTS analysis also identified islands of low stress connectivity in the city. A bicycle user with low traffic tolerance can comfortably navigate the set of roadways constituting one island, but cannot travel between the islands. The key finding of this analysis was that much of the bicycle network consists of disconnected clusters of low-stress (LTS 1 to 2) streets, shown in Figure 29 in shades of green. Individually, these islands of low-stress streets are comfortable to ride for most adults, but they are isolated from one another by larger roads with higher traffic speeds that disrupt bicycle mobility.

While major roadways act as barriers at unsignalized crossings, signals provide a connection for cyclists to move between low-stress neighborhood roadways. Figure 29 displays connected clusters of roadways that can be traveled without using any link or crossing with a level of stress higher than 2. Thus, each color represents a distinct cluster of roads where a bicyclist within that network could comfortably access all of the roads of that color at this low stress level. The bicyclist would not be able to access another road network cluster (shown as a different color) without using a high-stress segment or crossing.

Cape Coral's largest low-stress bicycling network cluster spans from the far SW portion of the city, along the western boundary of the developed portion of the peninsula, to a swath of neighborhoods on both sides of Veterans Memorial Parkway to Country Club Boulevard. This crescent-shaped cluster of roadways shown in red in Figure 29 is larger than any other group of roadways in the city due to three key factors:

1. Buffered bike lanes along El Dorado Parkway, Beach Parkway, Agualinda Boulevard, Sands Boulevard, and Surfside Boulevard that also feature signalized crossings at major roadways
2. <ulti-use path(s) along Veterans Memorial Parkway, also featuring signalized crossings at major roadways, and
3. Low-stress neighborhood streets such as SW 21st Street that feature signalized crossings of major streets such as Santa Barbara Boulevard

Outside of this cluster, however, low–stress roads have been built without connectivity across major roadways, making travel between neighborhoods inaccessible to most adults. Visualizing the network in this way makes apparent the gaps in the bicycle network that could be targeted for improvements to create connected bicycling routes that are comfortable for the mainstream adult population. Along with improvements along high-stress corridors, safe crossing opportunities across those corridors will greatly increase bicycling mobility and accessibility.

Demand Analysis

DEMAND METHODOLOGY

The demand model identifies expected pedestrian and bicycle activity by overlaying the locations where people live, work, play, access public transit and go to school into a composite sketch of regional demand. Figure 30 summarizes this approach.

SCALE OF ANALYSIS

The demand model relies on spatial consistency in order to generate logical distance and density patterns. It is for this reason that all scores are aggregated to a central location at the census block level, the census block corner. Census blocks closely represent the street network and therefore Census block corners closely represent street corners, where foot and bicycle traffic is prevalent. This method is based on the Low-Stress Bicycling and Network Connectivity report (Mineta Transportation Institute, May 2012). The report discusses the benefits of using a smaller geographic setting for pedestrian and bicycle demand analyses rather than using more traditional traffic model features such as census block groups, census tracts, or traffic analysis zones. Due to the low speed of pedestrian movement, a much smaller geographic unit of analysis is needed.

SCORING METHOD

The demand model's scoring method is a function of density and proximity. Scores are a result of two complementing forces. Distance decay, being the effect of distance on spatial interactions and yields lower scores for features farther away from one another. Spatial density, being the effect of closely clustered areas of interest and yields higher scores. Scores will increase in high feature density areas and if they are close together. Scores will decrease in low feature density areas and if they are farther apart.

Each demand input is scored on a scale of 1 to 5 based on density and proximity and then assigned weighted multipliers to reflect the relative influence categories have on pedestrian activity. Table 17 explains how each feature is weighted.

Figure 30. Demand Model Approach

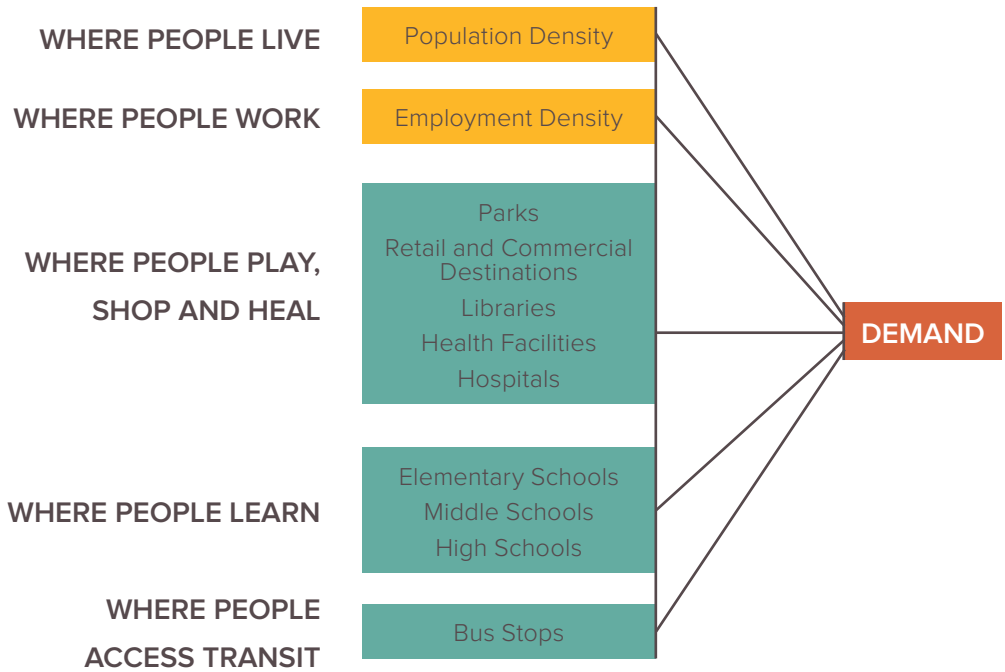


Table 17. Demand Scoring Table

CATEGORY	INPUT	SCORE METHOD	SCORE RANGE	WEIGHT	MAXI ITEM SCORE	MAX CATEGORY SCORE	INFLUENCE
Live	Total Population	Range of density per block	1-5	15	75	75	20%
Work	Total Employment	Range of density per block	1-5	15	75	75	20%
Learn	Elementary Schools	Based on number of students	1-5	5	25	75	20%
	Middle Schools	Based on number of students	1-5	5	25		
	High Schools	Based on number of students	1-5	5	25		
Play	Parks	Presence of feature within block	1-5	3	15		
	Retail & Commercial Destinations	Range of density per block	1-5	3	15	75	20%
	Library	Total features per block	1-5	3	15		
	Health Facilities	Total features per block	1-5	3	15		
	Hospital	Total features per block	1-5	3	15		
Transit	Bus Stops	Based on ridership per stop	1-5	15	75	75	20%
All Categories						**375**	**100%**

Demand Results

The results of the demand analysis are presented in the following map series.

WHERE PEOPLE LIVE

This category includes 2010 census block level population density. These locations represent potential trip origin locations. More trips can be made in areas with higher population density if conditions are right. As for all maps, the areas shaded more deeply in red represent higher demand areas relative to other colors on the ramp. The results for this category are shown in Figure 31.

WHERE PEOPLE WORK

This category represents trip ends for people working in the City of Cape Coral regardless of residency. Its basis is 2010 total employment by census block. Depending on the type of job, employment can act as a trip attractor (i.e., retail stores or cafes) or trip generator (i.e., office parks and office buildings) or both. Specific employment types, such as retail, are also used in the where people play category. The results of the employment category are shown in Figure 32

WHERE PEOPLE LEARN

This category shows demand for walking and bicycling based on the locations and enrollment size of all public and private elementary, middle, and high schools. The results for this category are shown in Figure 33.

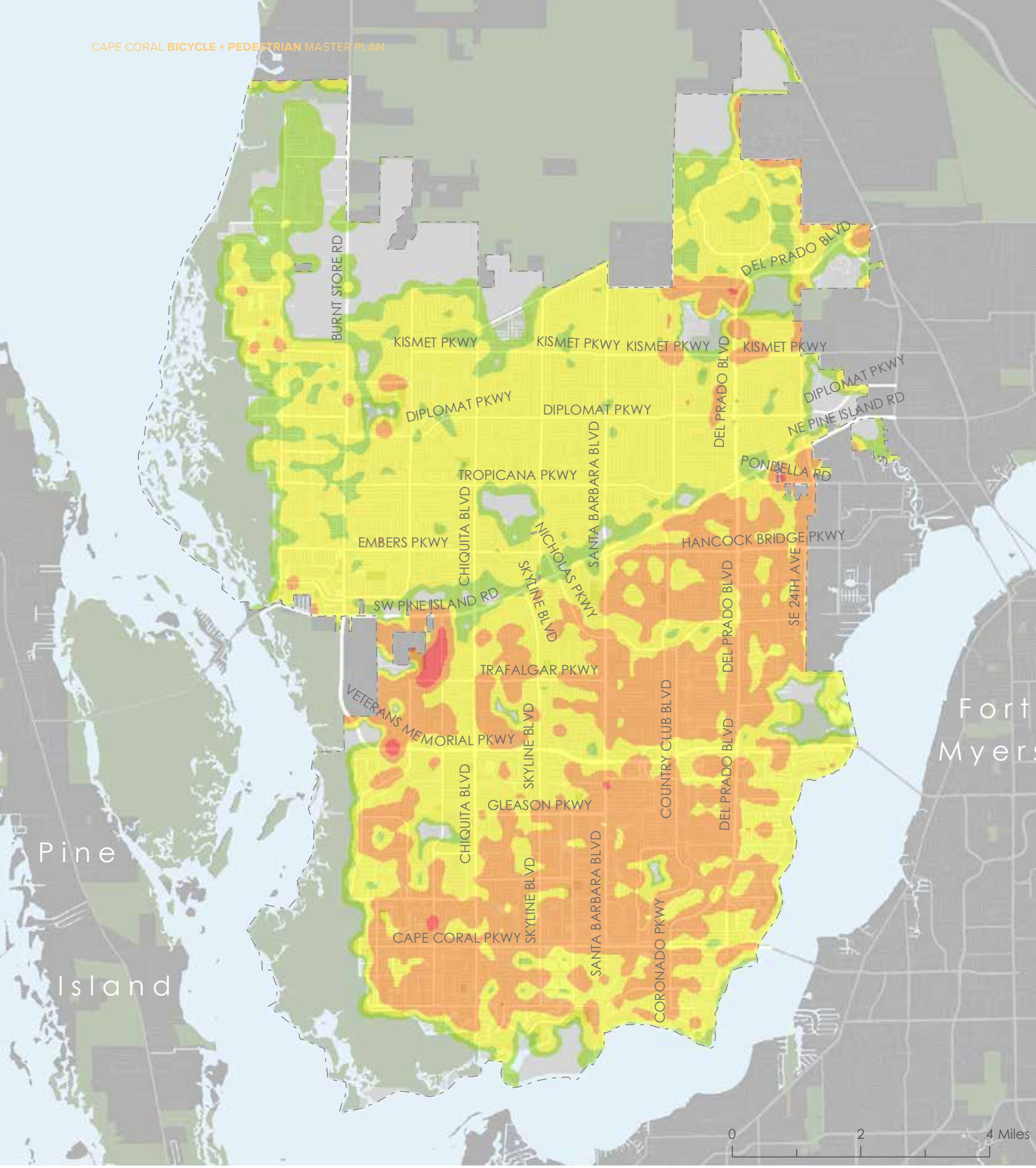


Figure 31. Where people live

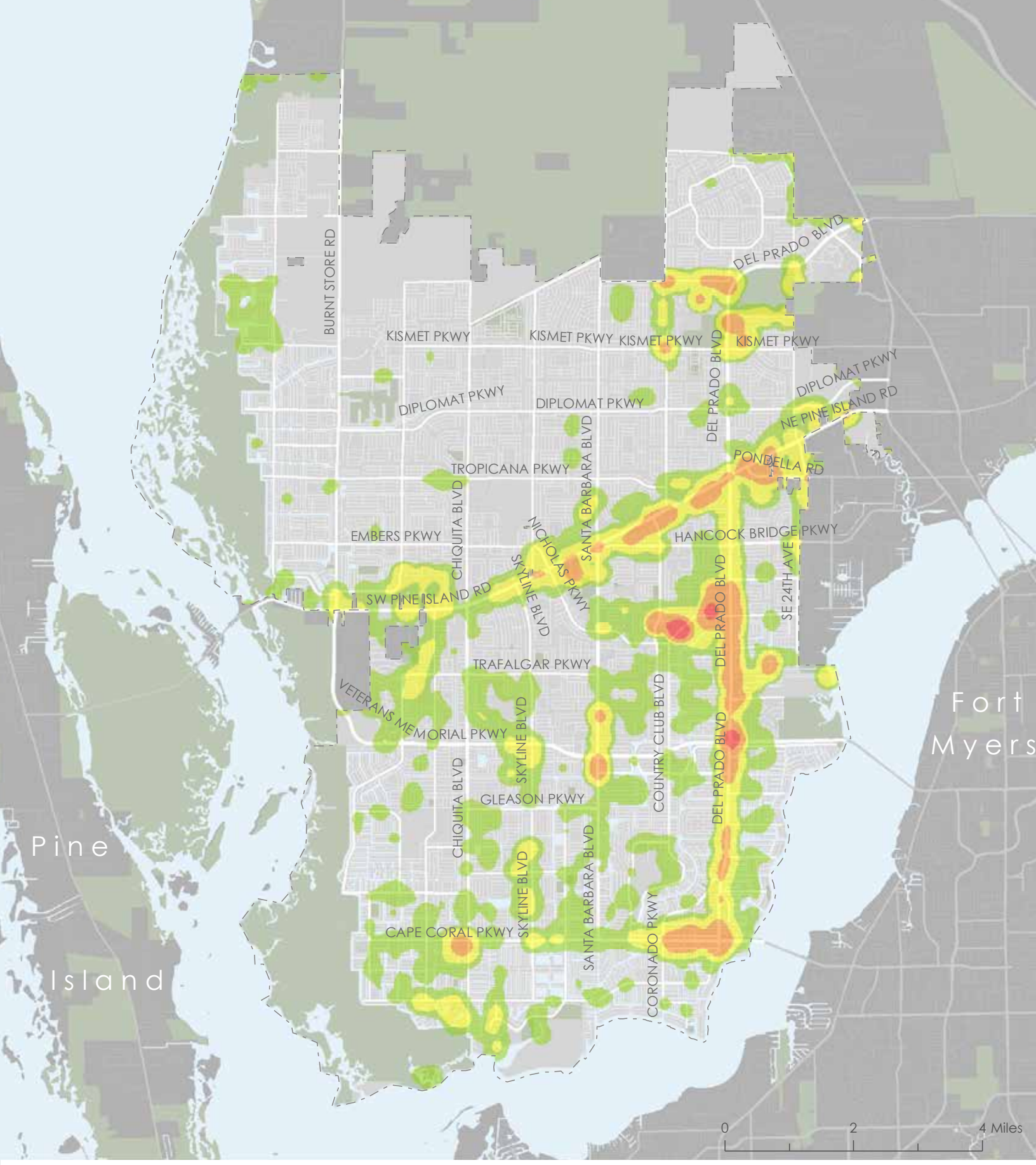


Figure 32. Where people work

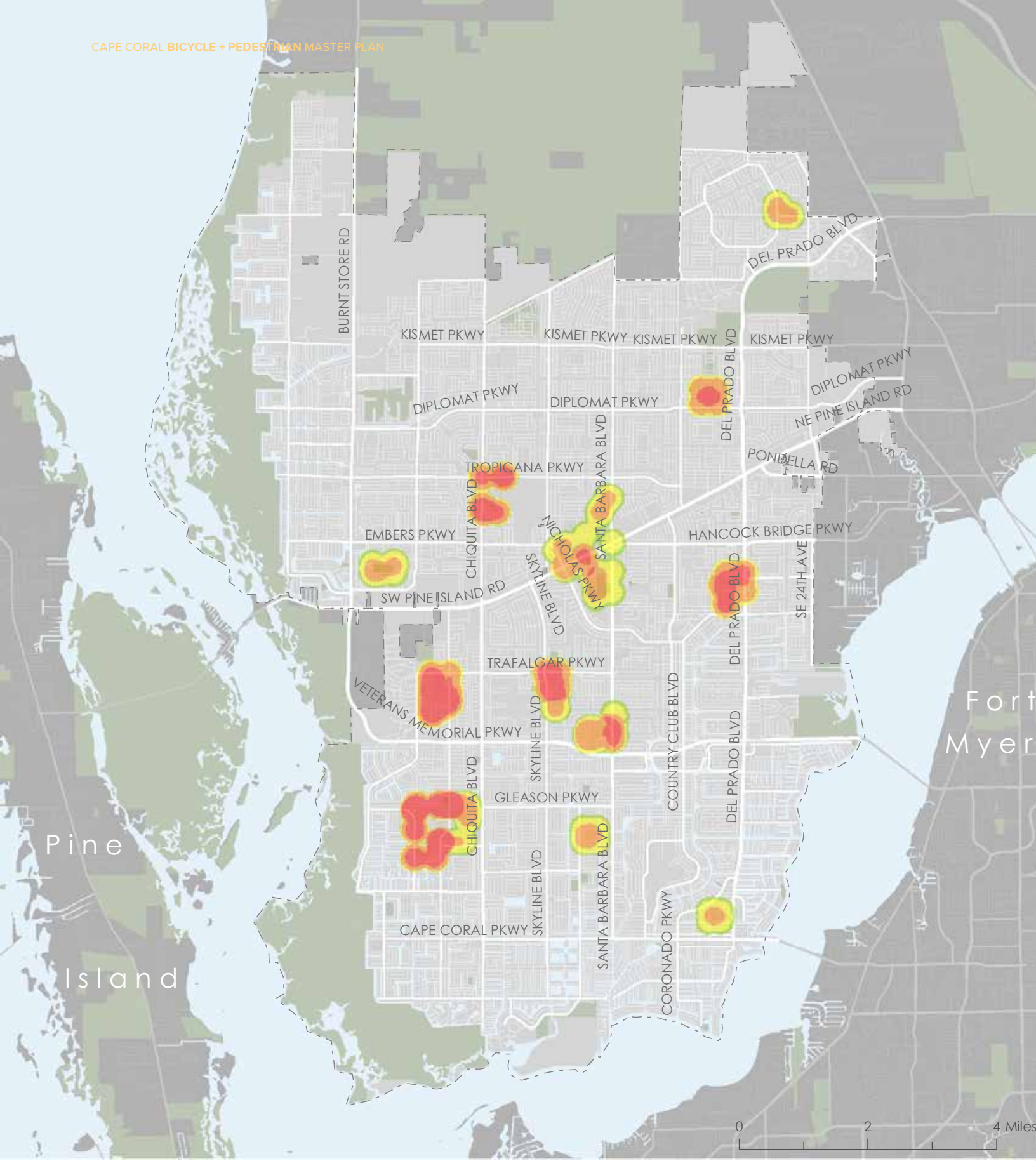
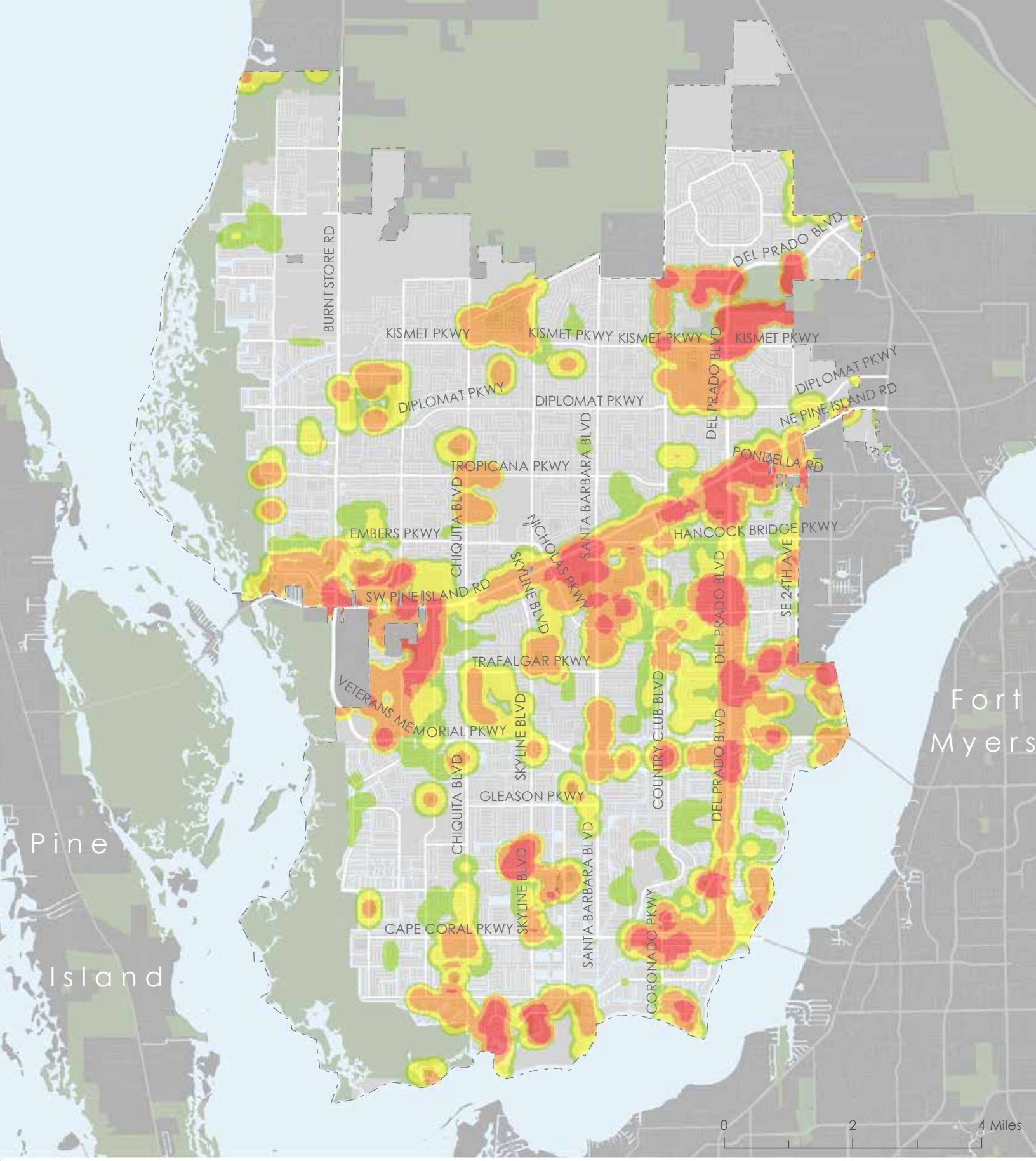


Figure 33. Where people learn



Parks, Retail, Libraries, Hospitals, and Healthcare Faciliites Composite Score

Lower

Higher

Natural Areas

Cape Coral City Limit

Figure 34. Where people play, shop and heal

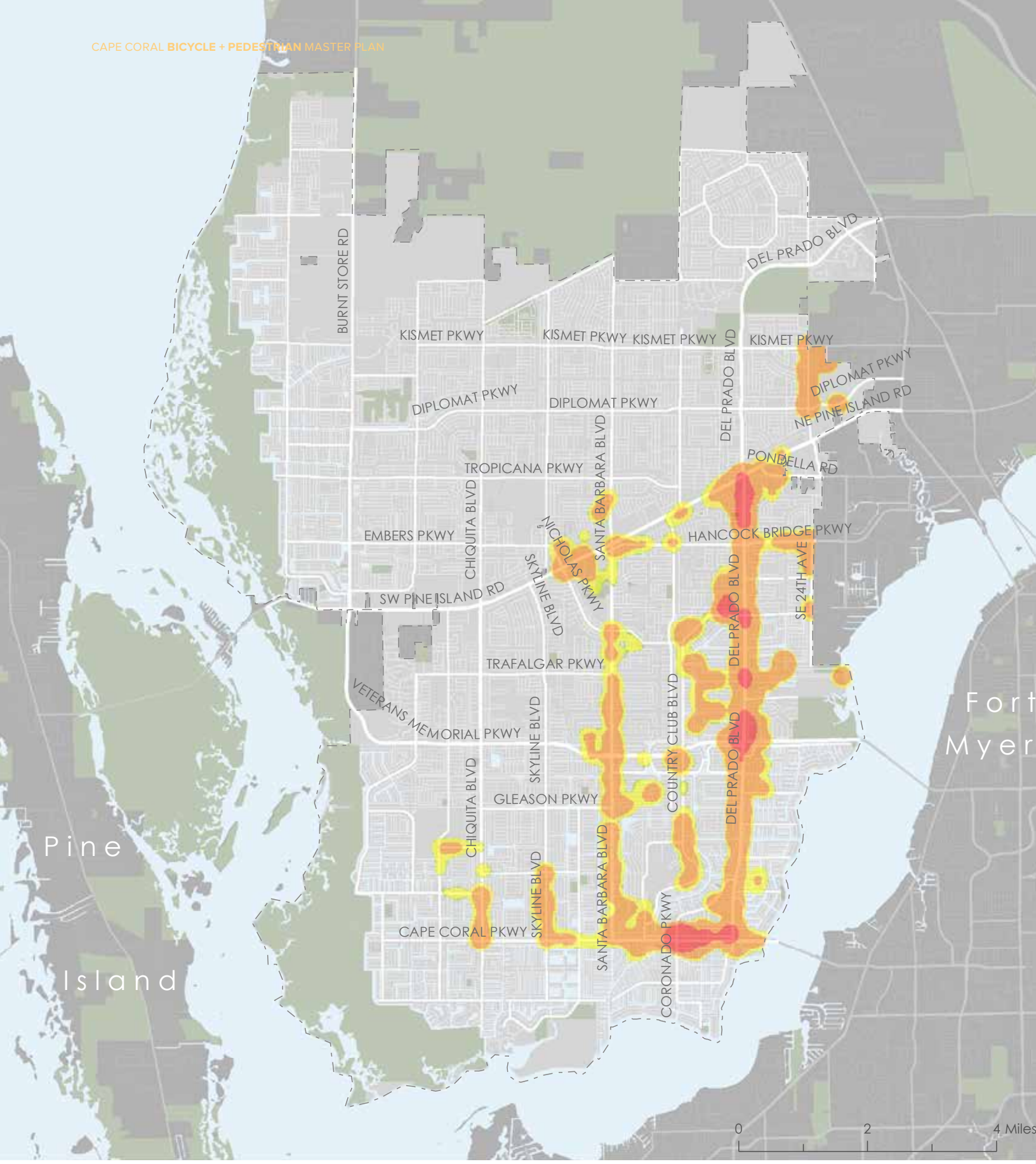
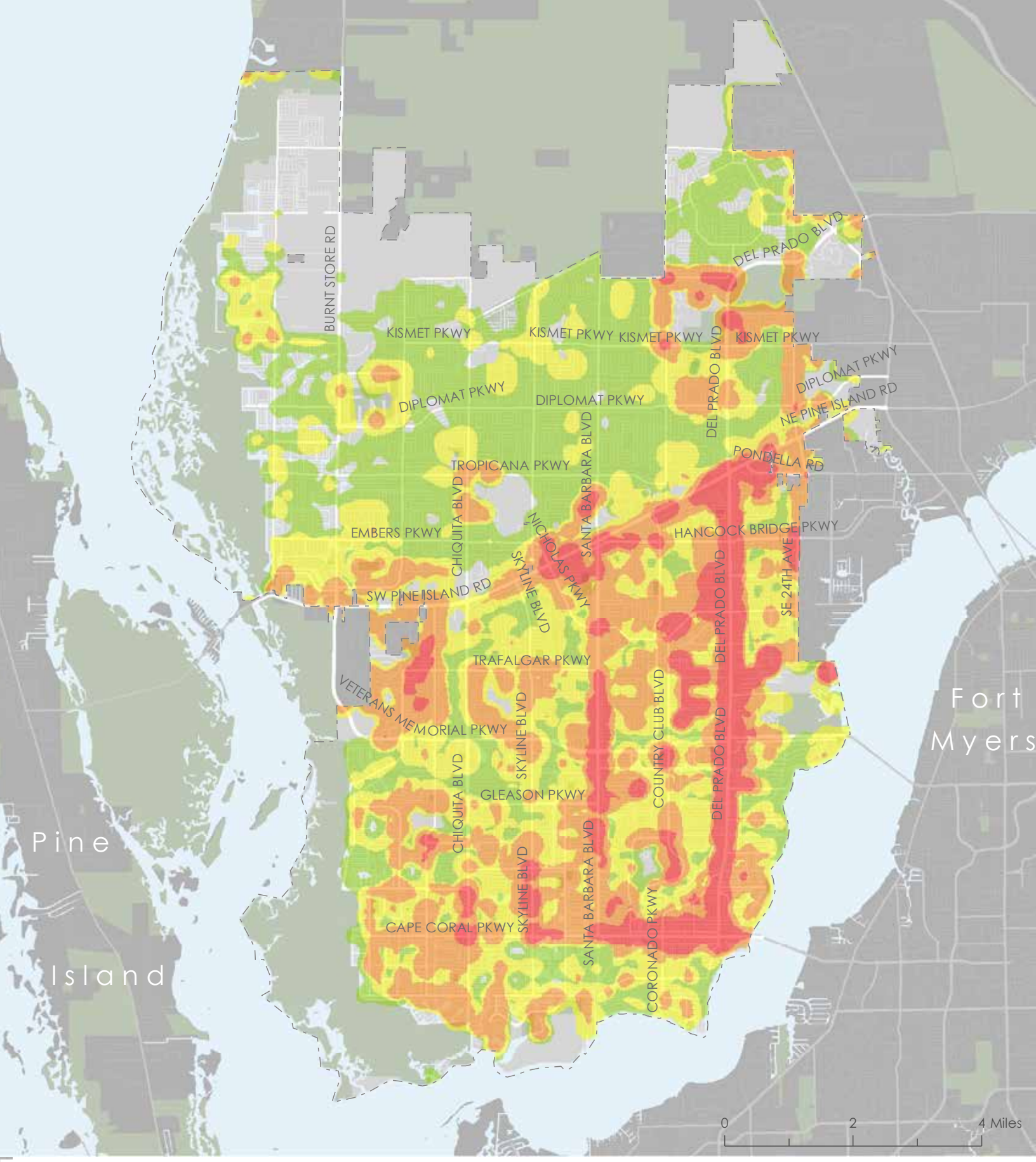


Figure 35. Where people access transit



Composite Demand Score

Lower

Higher

Natural Areas

Cape Coral City Limit

Figure 36. Where people want to walk and bike

WHERE PEOPLE PLAY, SHOP, AND HEAL

This category is a combination of varied land use types and destinations. Retail destinations, parks, libraries, health facilities, and hospitals all contribute to this category. The results for the play, shop, and heal category are shown in Figure 34.

WHERE PEOPLE ACCESS TRANSIT

This category includes locations and relative ridership (based on FY 2014 data) of all LeeTran bus stops. The results of the transit category are shown in Figure 35.

COMPOSITE DEMAND

The composite demand map combining all categories is shown in Figure 36. Demand higher in the southeastern portion of the city, along major corridors such as Del Prado Boulevard, Santa Barbara Boulevard, Cape Coral Parkway, and Pine Island Road.

Suitability Analysis

SUITABILITY METHODOLOGY

The Pedestrian and Bicycle Suitability Analysis (P/BSA) is a data-driven process to identify network gaps as potential projects in areas where pedestrian and bicycle activity is high. In the first step, the quality of the user experience along the existing network of roadways and trails was evaluated and termed Supply. Next, the potential for walking and bicycling trips was measured based on the proximity and density of trip generators (such as homes and workplaces) and trip attractors (such as shopping centers and parks) and termed Demand. The Suitability Analyses overlay supply and demand to identify priority areas for infrastructure improvements.

PEDESTRIAN SUITABILITY RESULTS

Figure 38 displays composite pedestrian supply and demand results. When supply is overlaid on top of demand, several things stand out:

> Conditions along Pine Island Road are very stressful for pedestrians due to a lack of sidewalks on a multi-lane, high-speed, high-volume road. Demand for walking along this corridor is high, particularly along the northeastern section, and pedestrian improvements are needed.

> The two major north-south commercial corridors, Del Prado Boulevard and Santa Barbara Boulevard, are high demand corridors that could also benefit from wider sidewalks, buffers from fast-moving traffic, intersection improvements, and midblock crossing treatments.

> Cape Coral Parkway, another high-demand corridor, could benefit from improved pedestrian facilities along key segments (for example, between Santa Barbara Boulevard and Coronado Parkway) and at key intersections (for example, at Chiquita Boulevard, Skyline Boulevard, and Pelican Boulevard).

> South of Pine Island Road, sidewalk gaps along portions of Skyline Boulevard and Chiquita Boulevard are resulting in low supply scores. Some of these sections of roadway are along or connect to high demand areas.

> North of Pine Island Road, conditions along nearly all collector and arterial roadways are stressful. Providing sidewalks along these roadways would dramatically improve conditions for pedestrians. However, few of these roadways run through high demand areas, meaning that investments will result in less “bang for the buck.”

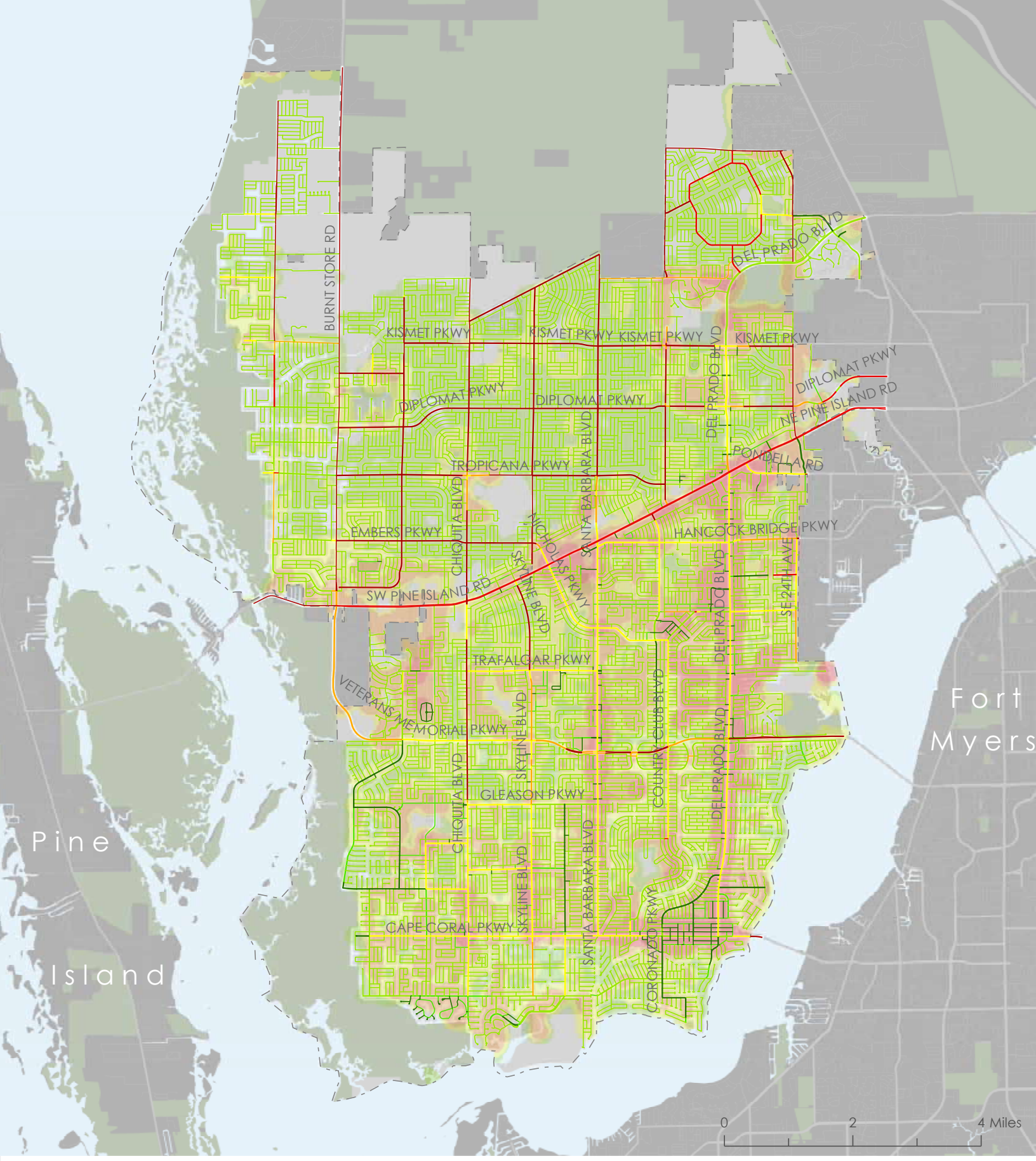


Figure 37. Pedestrian Suitability Analysis Results

BICYCLE SUITABILITY RESULTS

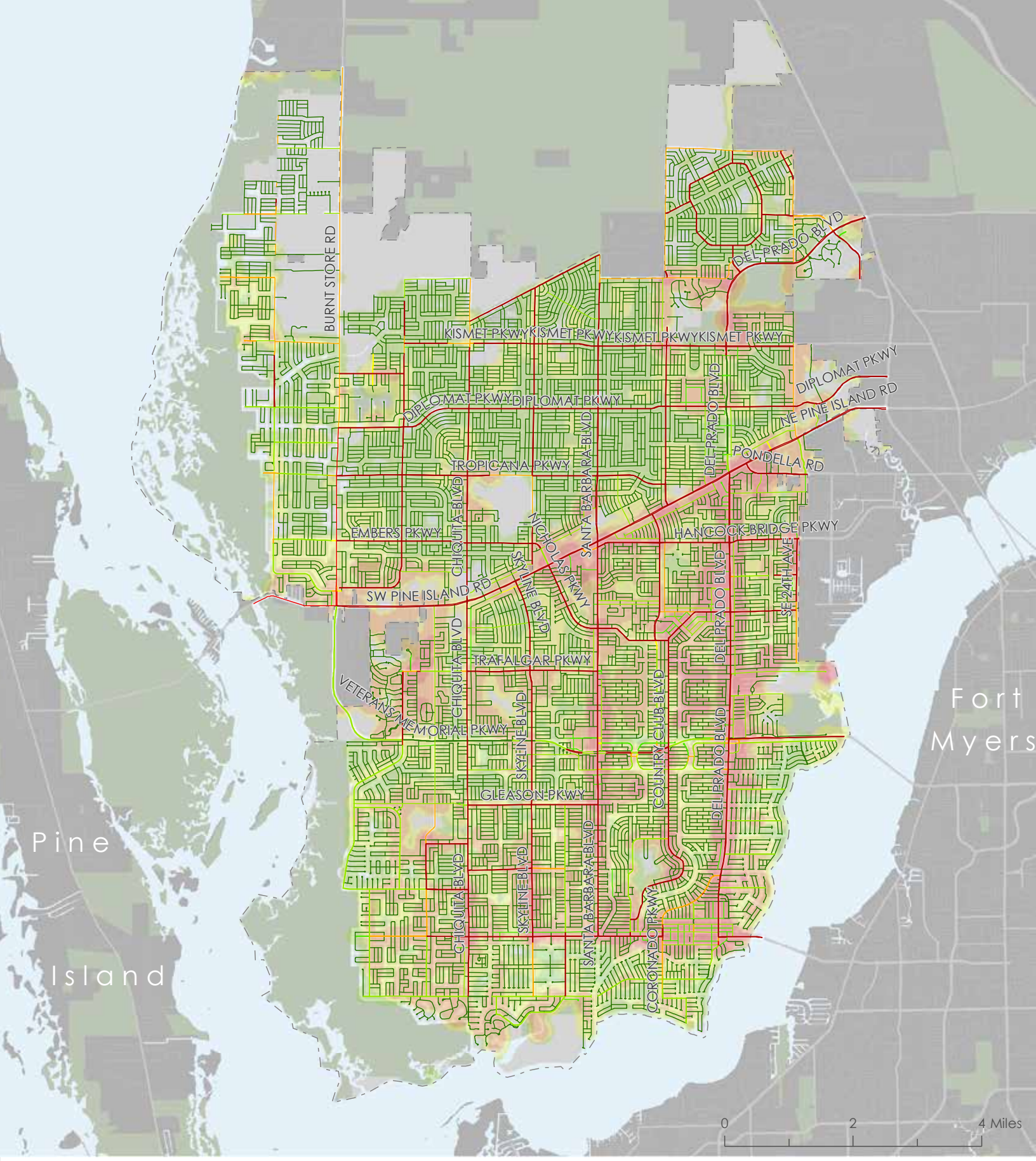
Figure 38 displays composite bicycle supply and demand results. When supply is overlaid on top of demand, several things stand out:

> The greatest need to improve conditions for bicycling is along Cape Coral's four major commercial corridors: Del Prado Boulevard, Santa Barbara Boulevard, Cape Coral Parkway, and Pine Island Road. These are the corridors with both the highest demand and the lowest supply. Bicycle facilities are needed along Del Prado Boulevard, Santa Barbara Boulevard, and Cape Coral Parkway. On Pine Island Road, the existing bike lane does not provide adequate separation for fast-moving vehicles.

> Other high-priority network improvements for bicycling include portions of Skyline Boulevard, Chiquita Boulevard, Trafalgar Parkway, Nicholas Parkway, Hancock Bridge Parkway, Pondella Road, Country Club Boulevard/Viscaya Parkway, Surfside Boulevard, and Diplomat Parkway.

Conclusions

The Cape Coral Pedestrian and Bicycle Suitability Analyses provide a data-driven illustration of the quality of infrastructure serving pedestrians and bicyclists and the demand for infrastructure in the City. The results demonstrate the need to provide or improve bicycle and pedestrian facilities along major commercial corridors and near schools, parks, libraries, and healthcare facilities. Together, the supply and demand models will guide prioritization of infrastructure investments where they will be most useful to residents and visitors and have the greatest impact on safety.



Demand

Lower

Higher

Supply

Higher

Lower

Natural Areas

Cape Coral City Limit

Figure 38. Bicycle Suitability Analysis Results