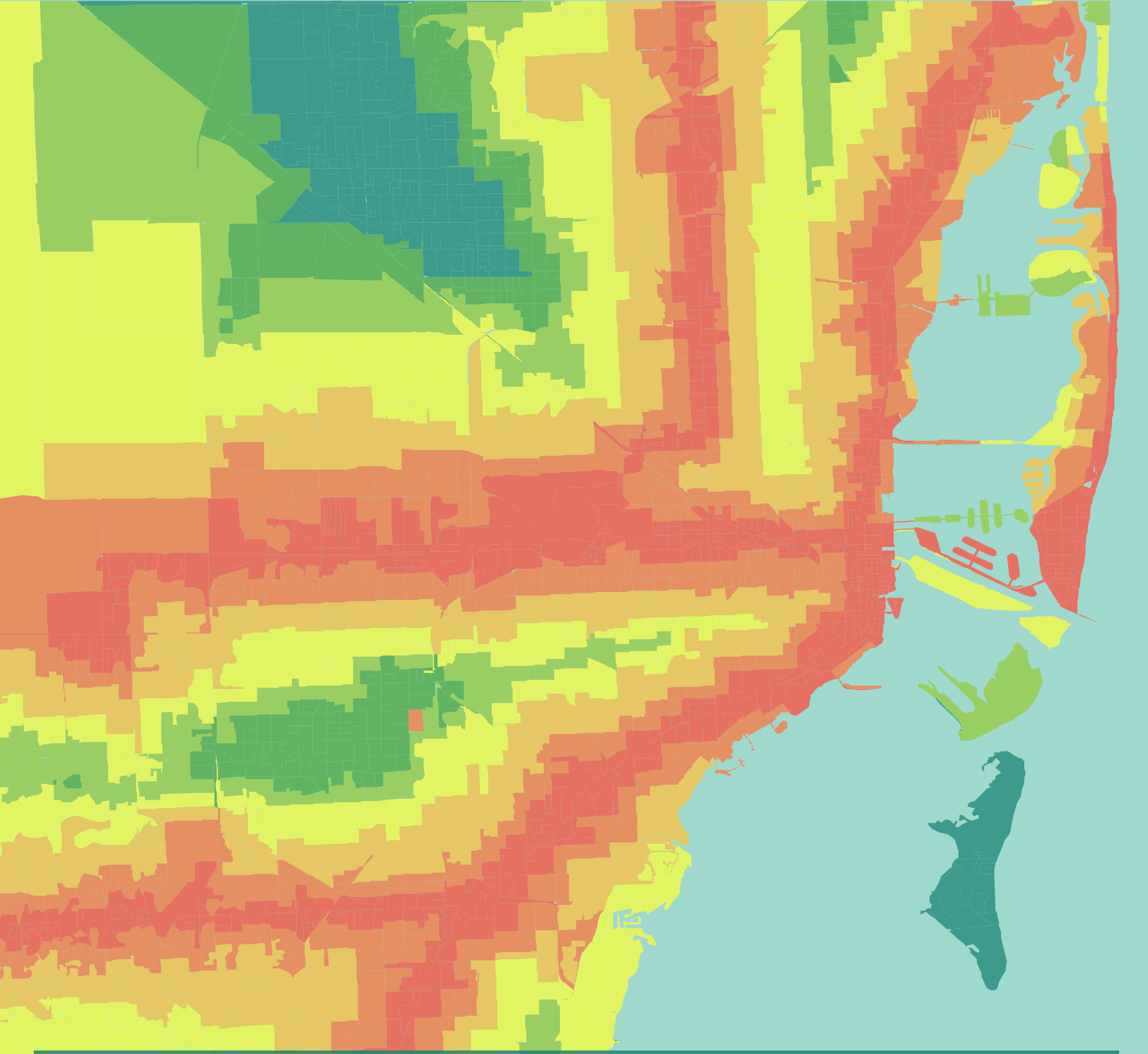

MIAMI-DADE

MULTIMODAL ACCESSIBILITY-BASED NEEDS ASSESSMENT

PREPARED FOR:

Miami-Dade Transportation Planning Organization

TPO
Miami-Dade Transportation Planning Organization

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Introduction

The Miami-Dade TPO has long been an innovator in planning process and results, playing a leadership role in the Southeast Florida region and beyond through the development and implementation of technical and procedural techniques to continuously improve its plans. The TPO's Long Range Transportation Plan (LRTP) has showcased those innovations over the years. The LRTP is due to be updated in October 2019 and the TPO has elected to develop and test a multimodal accessibility-based needs assessment methodology in anticipation of the actual plan update process. The initial testing of the methodology was completed in the context of the 2040 Long Range Transportation Plan. Needs assessment is the principal technical procedure used to develop a program of transportation improvements to be included in the plan and has historically been informed by the SouthEast Regional Planning Model (SERPM). In spite of its advanced capability to simulate time-constrained activity patterns there are some limitations of the SERPM, including its inability to simulate non-motorized trips and the time and effort involved in running the model.

The multimodal accessibility-based process described in detail below provides a complementary tool to support the LRTP. Used in coordination with the SERPM, it offers a new approach, complete with new metrics and a new perspective on transportation planning. Multimodal accessibility provides analytics for all four primary modes of travel, which include walking, biking, transit, and personal automobile but, rather than focusing on levels of service at the link or segment level, it offers a more comprehensive view of performance inclusive of level of service, network connectivity, and land use. Because accessibility analysis is multimodal in nature and comprehensive, the performance measures that can be derived from it add enormous value to the planning process, particularly in light of federal requirements to incorporate performance in plan development and system monitoring.

What is Accessibility?

The concept of accessibility can be defined simply as access to opportunities, where access is defined as the ability to reach those opportunities by some mode of travel. Opportunities are defined either broadly, in terms of non-residential places, or more specifically, in terms of particular types of destinations, like hospitals or food stores. The consideration of land use is the primary differentiator of accessibility analysis, relative to conventional travel demand analysis. Accessibility analysis inherently and necessarily involves the simultaneous reflection of both transportation networks and underlying land uses. Accessibility analytics inform a comprehensive metric in long range transportation planning, as they account for mobility, network connectivity,

economic vitality, livability, and environmental issues, including the distinction of non-motorized, transit, and automobile-oriented accessibility.

The relevance of accessibility to the Goals and Objectives (G&O) of the 2040 Long Range Transportation Plan (LRTP) is plainly evident in six of the eight LRTP Goals depicted in **Figure 1**, supporting the use of accessibility as an overall framework to inform the LRTP needs assessment process. The specific goals addressed by multimodal accessibility include the following:

Figure 1. 2040 LRTP Goals and Objectives

- **Goal 1 - Improve System & Travel: Mobility** – Travel time, aka mobility, is one of the direct influencers of accessibility, particularly for motorized modes of travel.
- **Goal 2 - Increase Safety** – Multimodal safety is directly enhanced by network-derived improvements to accessibility.
- **Goal 4 - Support Economic Vitality** – A fundamental measure of accessibility is access to jobs, which is one of the central objectives in the Economic Vitality goal.
- **Goal 5 - Environment/Quality of Life** – Livability and environmental improvements are reflected in improved multimodal accessibility, in terms of better walk access to opportunities and mode shift from motorized to non-motorized, respectively.
- **Goal 6 - Enhance Connectivity** – Network connectivity is one of the direct influencers of accessibility for all modes of travel.

- **Goal 8 - Preserve Existing System** – Accessibility analysis supports targeted network improvements and land use strategies that inherently minimize the need for major capacity improvements and focusing on maximizing the existing system.

Accessibility Measurement

Traditional metrics like roadway congestion, vehicle miles traveled, and transit ridership to assess transportation performance implicitly account for travel demand, but they merely represent the performance of a particular link, segment, or system, without explicit reflection of the trip making that is contributing to that performance. The focus on network link performance is thus not very informative of broader system performance as it relates to demand and ultimately, travel. Accessibility, on the other hand, gets to the "heart of the matter" in terms of the fundamental objective of trip making and travel demand, which is to move from one place to another to reach opportunities. The concept of opportunities is analogous to trip purpose in the travel demand model but can be much more specific and targeted in accessibility analysis due to the nature and input data used in the analytical process.

One of the key advantages of accessibility analysis is that it is very customizable and can be utilized to test specific equity or land use planning questions. An example of equity analysis in the context of accessibility might involve the quantification of multimodal access to food markets in a disadvantaged area. Such analysis can be designed to test both land use and non-motorized network solutions to determine their respective accessibility benefits. The results can be utilized in a number of ways, including the identification of food deserts, or accessibility deficiencies, the identification of areas of high multimodal accessibility where a focus on safety or comfort improvements to the multimodal infrastructure may be beneficial, or to inform a return on investment, or other performance metric.

The software used to perform accessibility analysis for this study is Citilabs' Sugar Access. There are three primary inputs into the Sugar Access software, including land use, infrastructure, and distance decay. All three of the inputs are easily manipulated to test various scenarios, although the distance decay should remain a constant in testing infrastructure and/or land use scenarios and should only be manipulated to test the tool itself. Each of the three inputs is described in detail below.

Land use – The Citilabs Sugar Access software package includes land use datasets called Points of Interest (POI). The POI data is organized in 70 categories of land use types, enabling customization of the definition of opportunities. For the purpose of the needs assessment study, two categories of opportunities are used. The first is total jobs and the second is a customized list of points of interest consisting of essential destinations. The latter category includes the following types of land uses:

- Health care
- Food stores
- Government offices
- Educational institutions
- Cultural/recreational facilities
- Shopping centers

The advantage of using specific categories of land use, whether it is essential destinations or some other type of super-category, is the ability to test particular equity or policy issues.

Transportation networks – The roadway network input used in the Sugar Access software is the HERE network, which includes all roadways in Miami-Dade County, including minor collectors and minor roads in residential subdivisions. The richness of the roadway network is crucial to the walk and bike accessibility simulations. The transit network is a modified version of the General Transit Feed Specification (GTFS) dataset obtained from the Miami-Dade County Department of Transportation and Public Works. GTFS datasets include important operational characteristics of the transit network, including timed transfers, schedule-based frequencies, and accurate routing paths.

Travel time decay – Accessibility is "decayed" in the tool by travel time, meaning the longer it takes to reach an opportunity, the less accessible it is. In mathematical terms, the tool literally considers some destinations as fractions of opportunities. The curves in **Figure 2** display the relationship of travel time to the value of opportunities. While fractions of opportunities are conceptual in nature, the accessibility scores represent an aggregate number of opportunities.

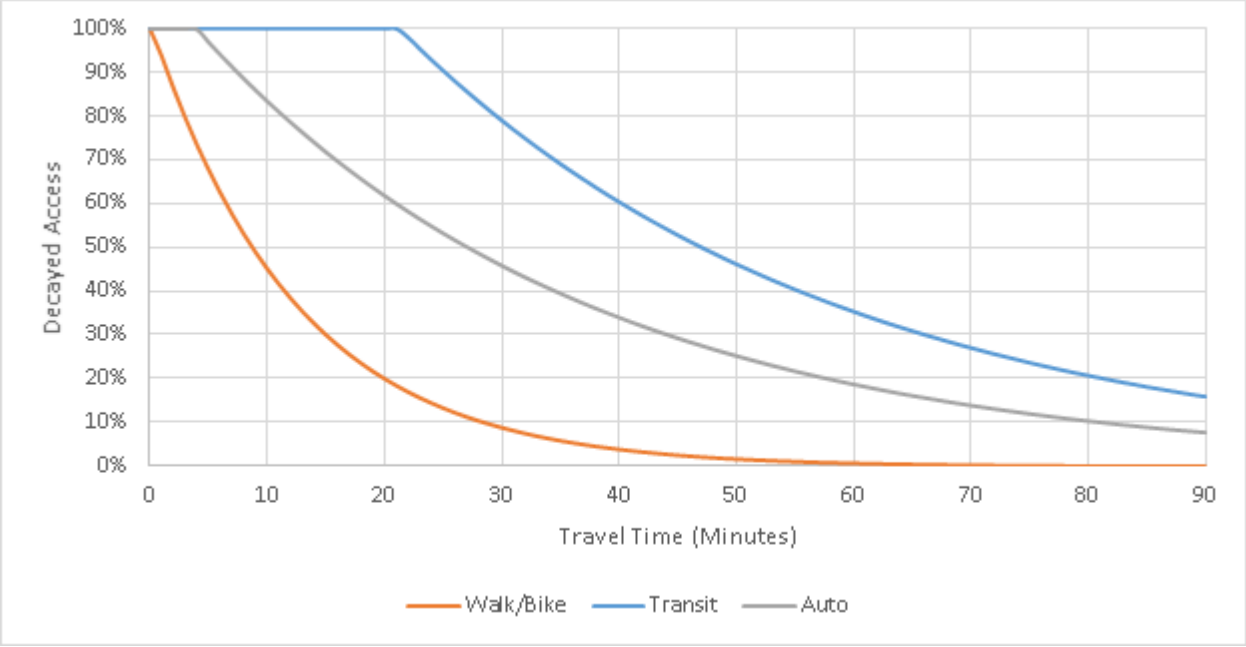


Figure 2. Modal Time Decay Curves

Accessibility Diagnostics

Accessibility scores, as they are defined in the toolset used in this study, are comprehensive, in that they represent an aggregate measure of all the primary sources of inefficiency that stand between travel origins and destinations. These inefficiencies, or impedances, include congestion on the roadways (mobility); circuitous nature of the network for all modes (connectivity); and the proximity of destinations to where people live. These are the three pillars of accessibility for personal automobile or public transit bus travel. For walk and bike accessibility, the mobility impedance is not relevant.

Accessibility scores, respective to travel mode, can be skewed by any of the three factors, although proximity of destinations is often the most influential. Both the accessibility scores, whether averaged for the County or for sub-aggregate geographical areas, and heat maps depicting them are very useful in the identification of areas in need of improvement. The nature of needed improvements, however, whether they include land use or network interventions, is more nuanced. Because accessibility is comprehensive, raw scores alone are not sufficient to inform specific needs. For example, the identification of roadway capacity versus the need for better network connections requires a diagnostic tool in addition to the raw scores. There are two network diagnostic tools that can be used to distinguish the primary influencers of accessibility scores. The two diagnostics are designed to isolate the impacts of network congestion and connectivity on accessibility scores.

Mobility Diagnostic – The impact of congestion on personal automobile and bus accessibility is measured through a ratio of accessibility scores in congested conditions to accessibility scores in uncongested conditions. The two scenarios of accessibility are run using two different versions of the roadway network from the SERPM. The first uses the PM peak period congested network and the second uses the free-flow uncongested network. The ratio of the two distinct sets of accessibility scores represents the impact of congestion on accessibility. For example, if the number of destinations that are accessible in a given area in congested conditions is ten and the destinations accessible from the same area in uncongested conditions is twenty, the impact of congestion is that it reduces accessibility by 50%. In another area, the ratio might be 25%, meaning that congestion is only half as impactful. **Figure 3** illustrates the concept of the mobility diagnostic ratio.

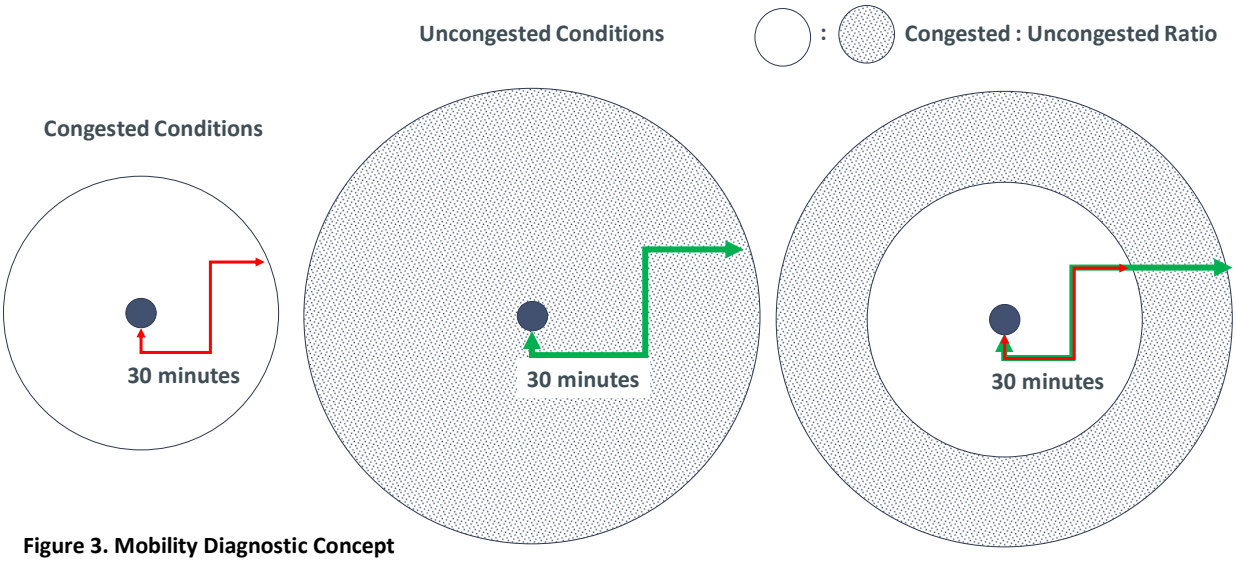


Figure 3. Mobility Diagnostic Concept

Figure 4 depicts a map of the mobility ratio in Miami-Dade County, clearly highlighting the areas with the greatest impact of congestion. An interesting conclusion that can be drawn from this map is the fact that congestion in the Dolphin Expressway corridor and the I-95 corridor and in downtown Miami do not have a great impact on accessibility. In fact, the highest mobility ratios are in the Dolphin corridor west of the Miami International Airport. The reason for this is that congestion is outweighed by other factors like network connectivity and land use. It can be said that, in areas with a high degree of accessibility resulting from those other factors, congestion is simply not as important or as impactful. In other words, if destinations are nearby and they are well connected via infrastructure, the effect of congestion is not as great because geographical proximity of destinations, combined with effective connectivity make travel speed almost irrelevant. By way of example, traveling to a destination by automobile that is only two miles away would take ten minutes in severely congested conditions, traveling at an average velocity of twelve miles per hour. That destination is accessible in spite of the congestion because it is effectively only ten minutes away. A different scenario in which a destination is thirty miles away would take almost an hour traveling at an average velocity of

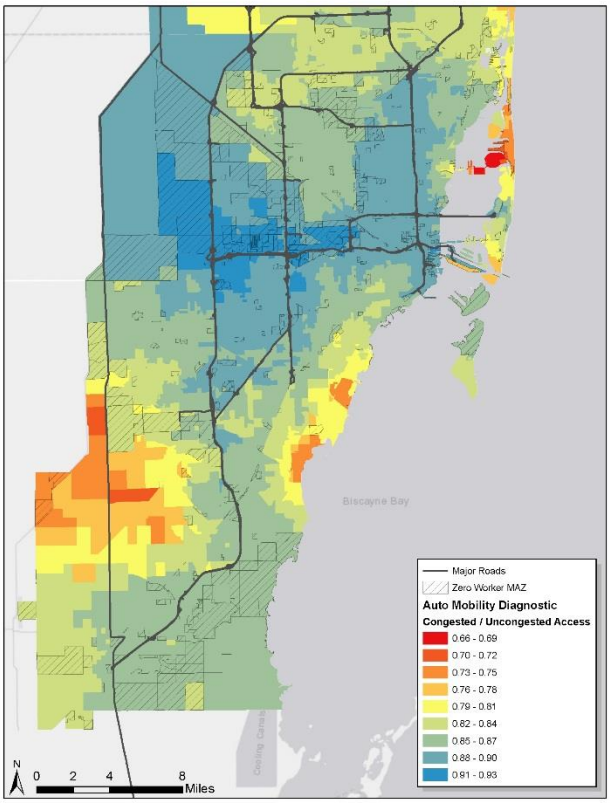


Figure 4. Mobility Diagnostic Ratio Map

forty miles per hour in uncongested conditions. The former scenario has a far greater level of accessibility due to proximity of land uses and network connectivity, in spite of traffic congestion.

Connectivity Diagnostic – The impact of network connectivity on accessibility can be measured through a ratio of accessibility scores using the actual network to accessibility scores using a synthetic "crow-fly" network for all modes. The crowfly network scenario is synthetic in that it does not represent any version of an actual network; rather, it assumes that all zones can be accessed from all zones "as the crow flies" and therefore not limited by network connectivity inefficiencies. The idea of the crowfly network is not that it be used as a viable network scenario, but that it be used to isolate the impact of connectivity, or lack thereof, on accessibility. The lower the ratio of actual to crowfly based accessibility, the more network connectivity limitations are playing a role in the accessibility score. **Figure 5** below illustrates the concept of the connectivity ratio.

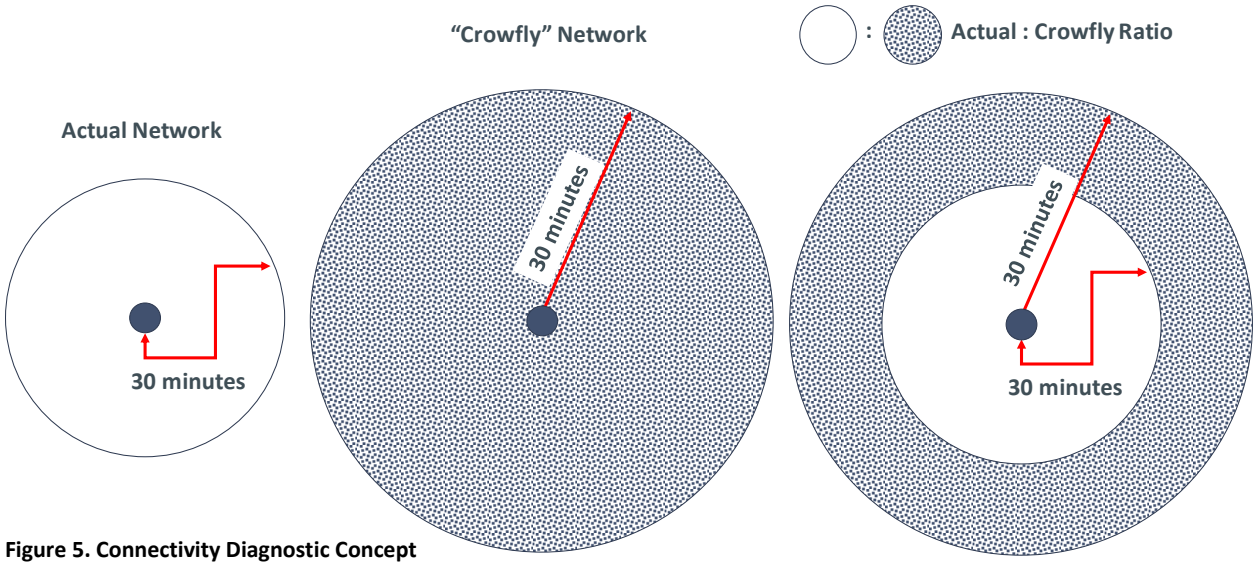


Figure 5. Connectivity Diagnostic Concept

The connectivity ratio for auto, walk, and bike accessibility uses the same actual **:** crowfly ratio concept. For transit, however, which is by its nature much more limited in terms of connectivity relative to the other modes, a ratio of actual transit **:** actual auto networks was used. The fact that the auto mode is the dominant mode of travel makes it an attractive measure against which to measure the connectivity of the transit network, while still maintaining some semblance of a plausible comparison, albeit still synthetic. The auto and transit connectivity ratio scenarios are depicted in **figures 6** and **7**, respectively.

It is evident in **Figure 6** that the southwest area, coastal areas south of downtown Miami and the beach communities are most limited by network connectivity, while areas along the major highway arteries and the majority of the City of Miami are least affected by network connectivity. These are interesting and in fact predictable results, as the limited infrastructure connecting the south part of the County to the major activity centers to the north and the

islands to the mainland are and have always been significant challenges. The transit connectivity plot in **Figure 7** tells more or less the same story, with a larger portion of the County experiencing accessibility challenges related to transit network connectivity. The fixed guideway Metrorail corridor predictably demonstrates the highest levels of connectivity ratio, given its direct connection to the largest activity center in the region in downtown Miami.

Other Diagnostics – A land use balance diagnostic is another potential tool to determine the extent to which existing land use and land use policy impacts accessibility. Such a diagnostic was not developed as part of this study, but it is recommended as part of the LRTP update scenario planning process to inform potential land use scenarios.

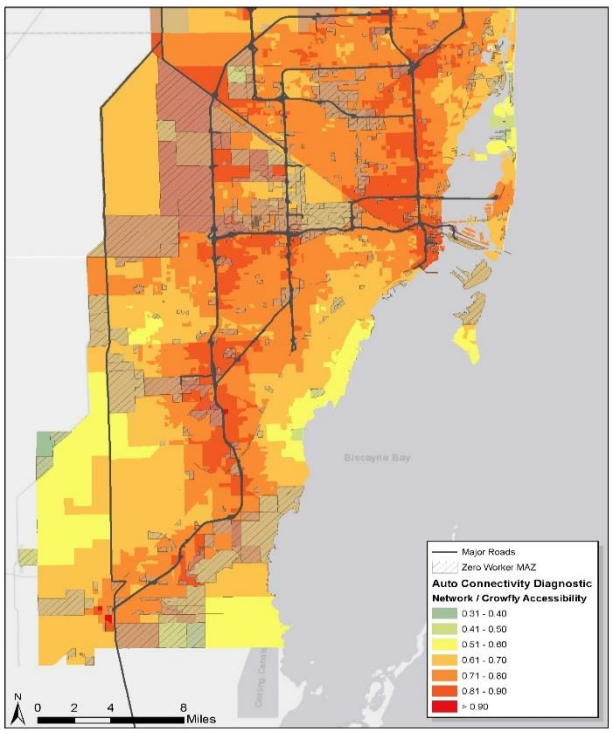


Figure 6. Auto Connectivity Diagnostic Ratio Map

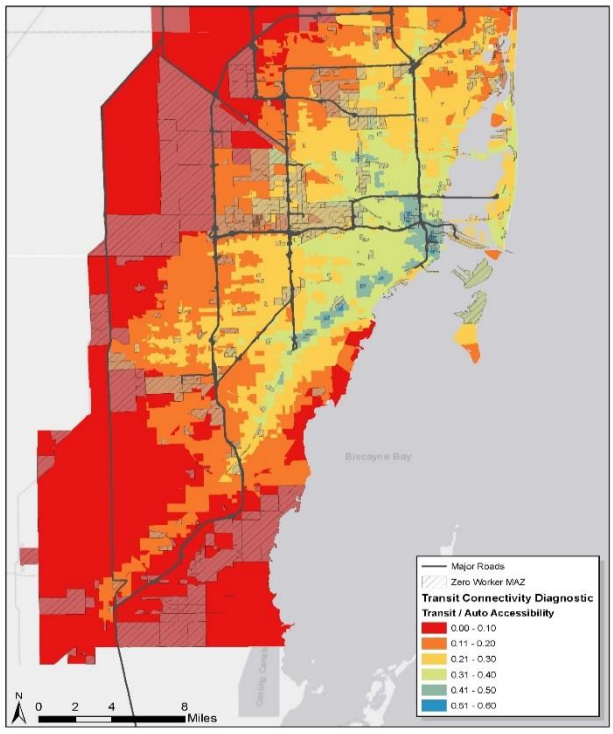


Figure 7. Transit Connectivity Diagnostic Ratio Map

2040 LRTP Accessibility Analysis

As described above, the intent of this study is to develop a needs assessment methodology to inform the 2045 LRTP update. The development of any technical methodology is greatly enhanced by testing on real-world scenarios to confirm its value and identify needed adjustments. The scenarios developed to test the accessibility needs assessment emanated from the 2040 LRTP Cost Feasible Plan, which consists of a broad array of non-motorized, transit, and roadway improvements ideal for a comprehensive accounting of both the value and pitfalls of applying a new needs assessment framework. One of the most difficult aspects of

systems planning is the technical challenge of analytics with respect to specific improvements, with consideration of the inevitable symbiotic relationships of improvement strategies consisting of multiple improvements. A scenario testing framework was established to facilitate this process and provide results that can be attributed to specific improvements.

The scenarios are multi-dimensional, in terms of varying improvement strategies in pre-defined geographic areas. The three dimensions used to define the scenarios include:

- **Corridor** – defined as ten primary corridors
- **Primary Mode** – defined as transit, limited access roadway, or non-limited access roadway
- **Access Mode** – defined as bicycle, pedestrian, or roadway

There are numerous north-south travel corridors in Miami-Dade County, serving local, regional, and inter-regional travel needs in the US-1, SR 826, and I-95/Turnpike corridors, respectively. There are also several east-west corridors serving primarily local and regional travel markets, including the Kendall Drive and SR 836 corridors. Six of these corridors are slated for premium transit service in the Miami-Dade Strategic Miami Area Rapid Transit (SMART) plan. These and other corridor definitions for accessibility scenario testing are broadly defined as three to five mile wide areas centered on major facilities within the County. A depiction of corridor boundaries is included in **Figure 8**.

The dimensional variables were used to define a total of 16 scenarios tested in six corridors. The remaining five corridors were not tested, as the results of the analysis on the tested corridors are sufficient to establish the usefulness of the framework. For the tested corridors, not all primary and access modes are relevant to every corridor. For example, Corridor 4, which is an east/west corridor centered on the Palmetto Expressway, does not include premium transit improvements in the 2040 LRTP Cost Feasible Plan. Both of the scenarios tested in Corridor 4, then, are roadway improvement strategies, as defined in scenario three and four templates.

The scenario types are organized in terms of four combinations of primary and access mode, specifically designed to enable analysis of respective benefits for different travel markets and the combined

Figure 8. Corridors

benefits of primary and access modes. The combined accessibility benefit, for example, of a premium transit improvement strategy and a multimodal strategy improving walk access to transit stations in the corridor, can be assessed and compared across strategies, as outlined in the scenario definitions.

Projects in 2040 Cost Feasible Plan

Improvements in the 2040 Cost Feasible Plan (CFP) include three distinct categories defined as priorities two, three, and four, which correspond to five- or ten-year time bands between the years 2021-2025, 2026-2030, and 2031-2040, respectively. The improvements in the CFP were bundled, without regard for particular priority category, into modal improvement strategies within each corridor as described above. Project bundles by corridor are included in **Appendix A** for reference. The pool of projects included in the CFP include a total of 463 improvements, broken down as follows:

- 124 roadway projects
- 118 transit projects
- 202 bike/ped projects
- 19 freight projects

Future Year Inputs Development

Networks – The base roadway networks used for the 2040 accessibility runs are the HERE local roads network with Existing plus Committed (E+C) model network congested speeds ported to the HERE network. For scenario improvement runs, the congested speeds from the cost feasible network were ported to the HERE network for improved links in the scenario. Initial testing indicated the likelihood of reduced speeds on improved links in the cost feasible scenario due to induced demand. To mitigate this effect, speeds on parallel facility links were ported in addition to the improved links. Parallel facilities include at least one non-local roadway on either side of the improved facility.

Land use – The definition of opportunities or destinations in the future year scenarios is number of jobs in the 2040 MAZ dataset developed for the 2040 LRTP. The points of interest data provided in the Sugar Access

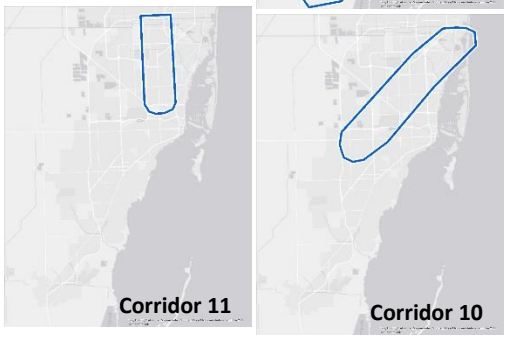


Figure 8. Corridors

software were used to evaluate base scenario accessibility to essential destinations, but were not carried forward into future year scenarios.

Diagnostics – The network inputs used for the diagnostic analysis include the uncongested, or free-flow, and PM peak period congested networks from the SERPM E+C model scenario for the mobility diagnostic. The connectivity diagnostic calls for a synthetic scenario that simulates a "crowfly" connection between all zones in the region, thus representing a "perfectly connected" network against which to compare the actual network. The travel times associated with the crowfly network were estimated by computing distances between all MAZs. This was done by taking the difference of the X,Y coordinates of the centroids of all zones and using the Pythagorean theorem to compute the straight line distance between them. For non-motorized modes a static speed of 3 miles per hour for walking and 9.6 miles per hour for biking were used to mirror the assumptions used in CUBE's Sugar Access to compute travel time across the straight-line. For auto, average congested speed between the MAZs (using speed skims from Sugar) were used to compute travel time across the straight line.

Future Year Accessibility Results

The base case, or no-build, network scenario for future year accessibility testing is the Existing plus Committed (E+C) network, which can be characterized as a short term minimum investment scenario that includes improvements programmed in the first five years of the 2040 LRTP. The raw accessibility scores are defined in two principal ways, as access to jobs and access to essential destinations. For the purpose of overall needs assessment and the needs evaluation framework access to jobs was used as a surrogate for general accessibility. Access to essential destinations is a much more specific type of accessibility that should be reserved for specific testing of improvements tailored to the particular travel markets included in the definition of essential destinations. The E+C scenario accessibility results presented in the following figures nevertheless include representations of both work accessibility and essential destinations accessibility, both of which present noteworthy and interesting results.

The essential destinations results are summarized in percentage terms to facilitate the aggregation of distinct categories of destinations. The reason is that if the total number of essential destinations is used as a metric, that number could be weighted to one or another particular type of destination within the category of essential destinations. In percentage terms, the measure reflects the proportion of different types of essential destinations that are accessible. So, a score for example of 50% indicates that only half of the destinations types are accessible.

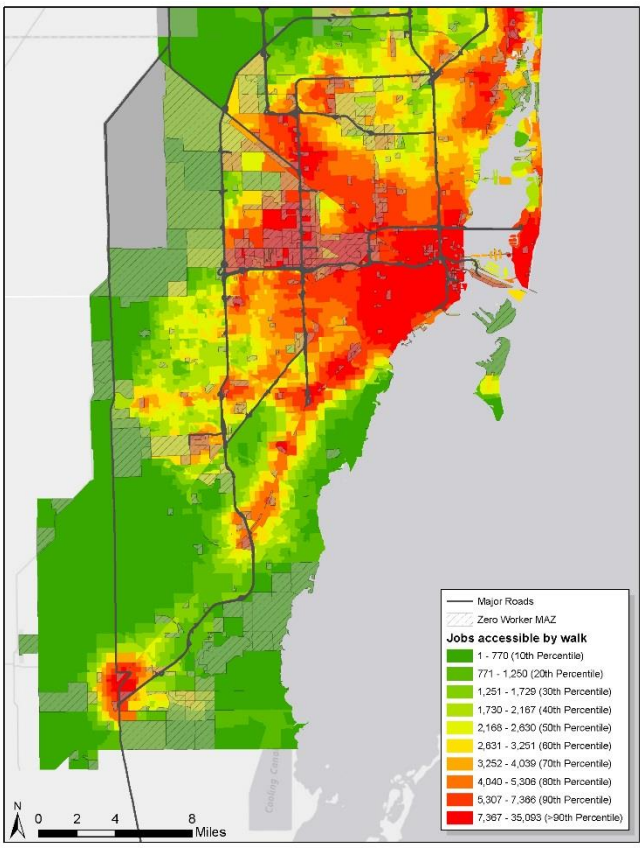


Figure 9. Walk Access to Jobs

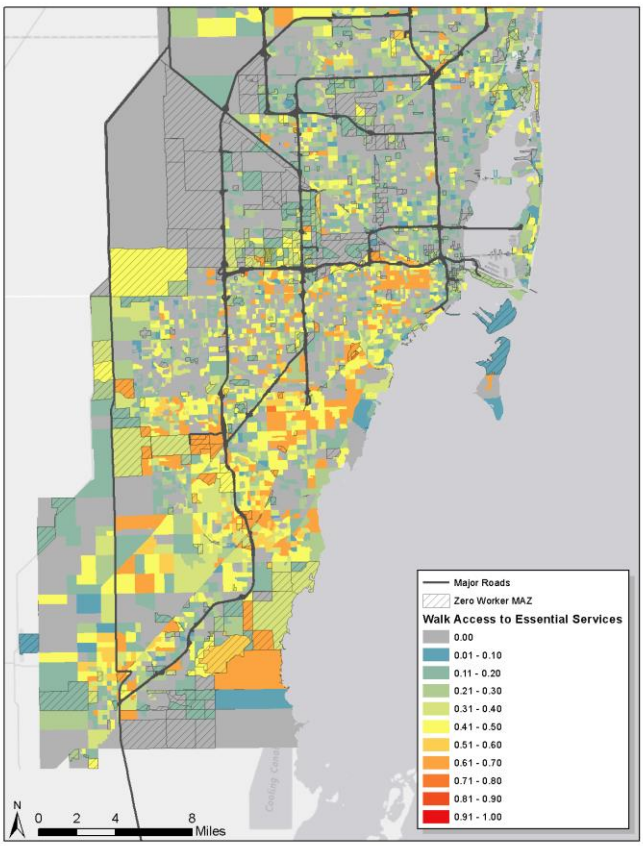


Figure 10. Walk Access to Essential Destinations

The walk access to jobs and essential destinations in **figures 9** and **10** display a predictable pattern of high walk accessibility in the central and east central portions of the County, and along the I-95, US 27, SR 836, Kendall and US1 corridors with a countywide average jobs accessibility score of 5,500 and 6,200 in Title VI areas. The fringes of the County to the north, south and west are relative accessibility deserts, with the exception of Homestead. The low accessibility area between Homestead and Dadeland along the US1 corridor indicates a relative lack of significant activity units. The essential destination accessibility in **Figure 10** tells a slightly different story, with a much higher degree of accessibility in the southern part of the County, relative to the north. This is partly due to the different metric described above for essential destinations, which favors smaller urban areas that do not necessarily include concentrations of destination types, but rather a broader array of destination types within a walkable area.

Bike accessibility follows generally the same patterns as walk, but with a much broader range, therefore improving the scores dramatically. The bike access to essential destinations map in **Figure 12** reflects this in a much more even distribution of the high accessibility areas, relative to the walk results. The countywide average work accessibility for bike is 49,400, and 55,300 in Title VI areas. The essential destination average is 66% countywide and in Title VI areas.

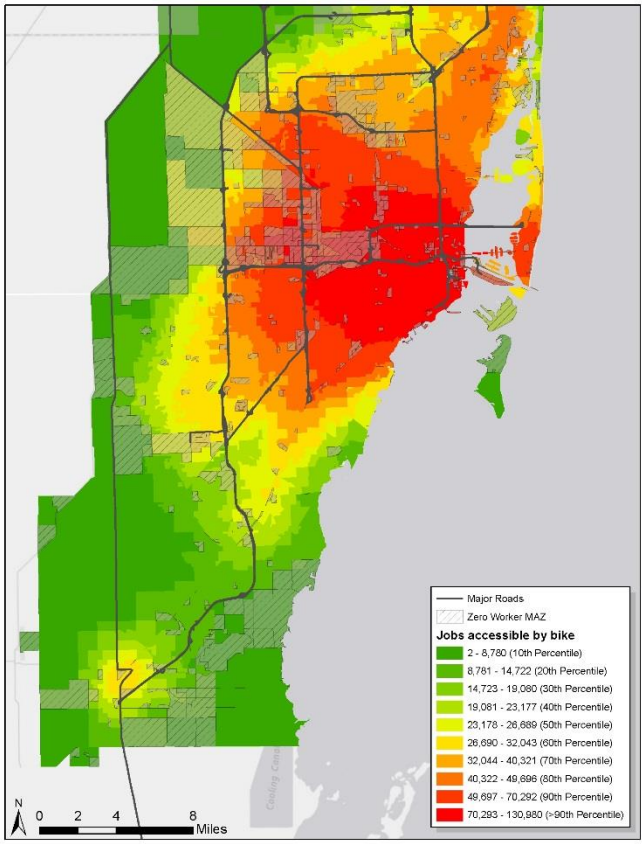


Figure 11. Bike Access to Jobs

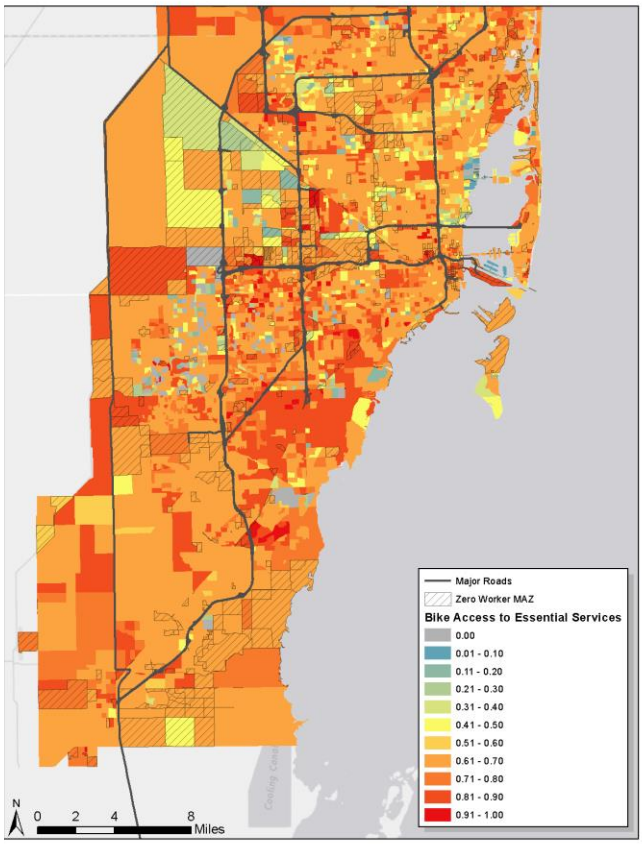


Figure 12. Bike Access to Essential Destinations

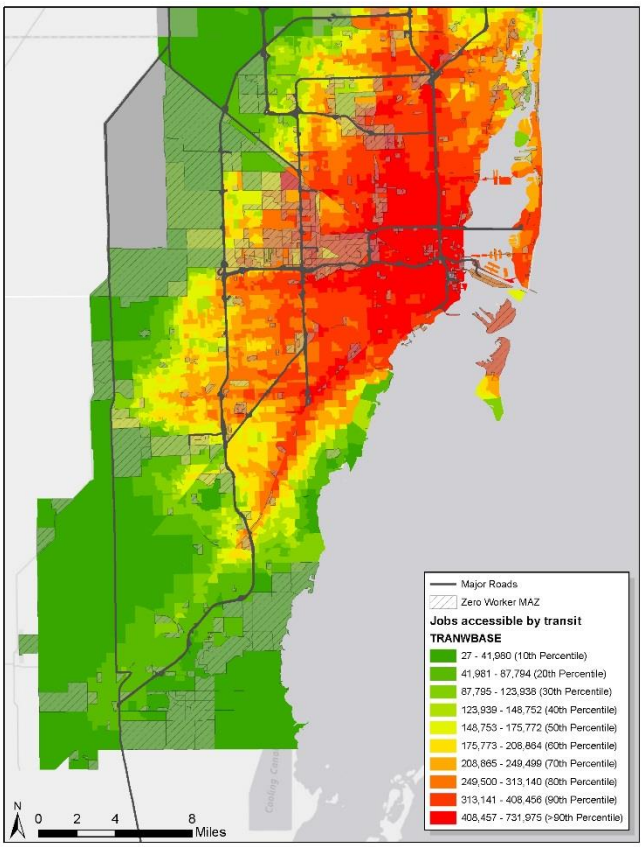


Figure 13. Transit Access to Jobs

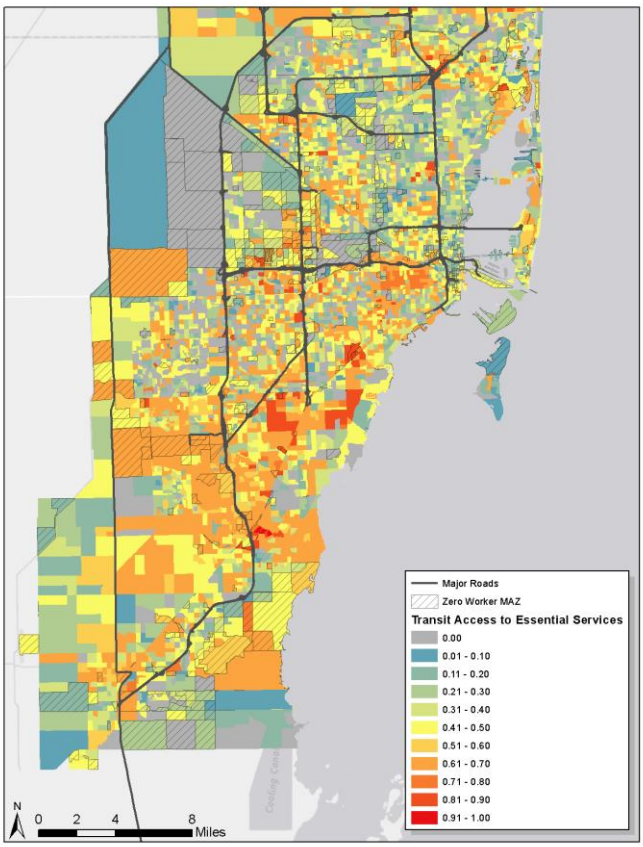


Figure 14. Transit Access to Essential Destinations

The transit accessibility scores are depicted for employment and essential destinations in **figures 13** and **14**, with countywide and Title VI area averages of 288,200 and 312,300 for employment and 34% for essential destinations both countywide and in Title VI areas.

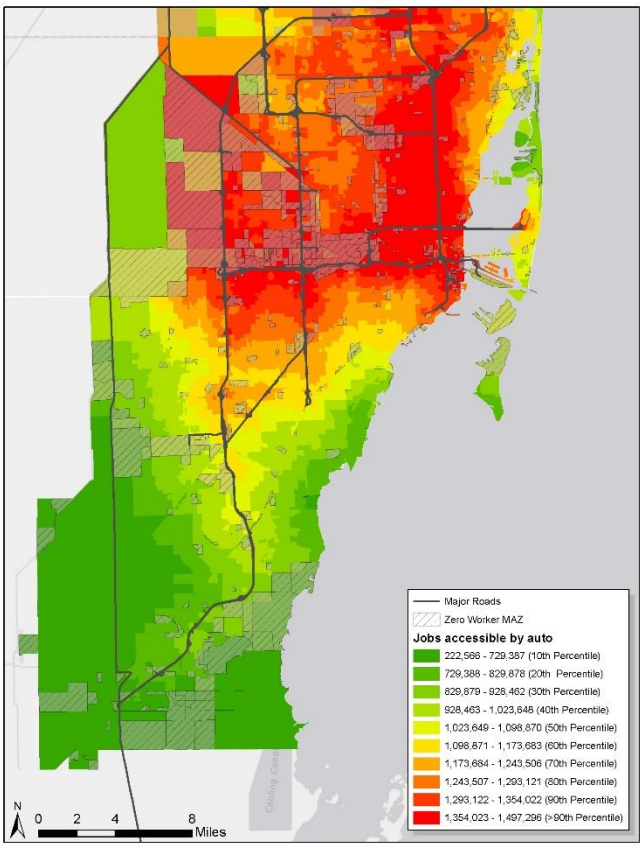


Figure 15. Auto Access to Jobs

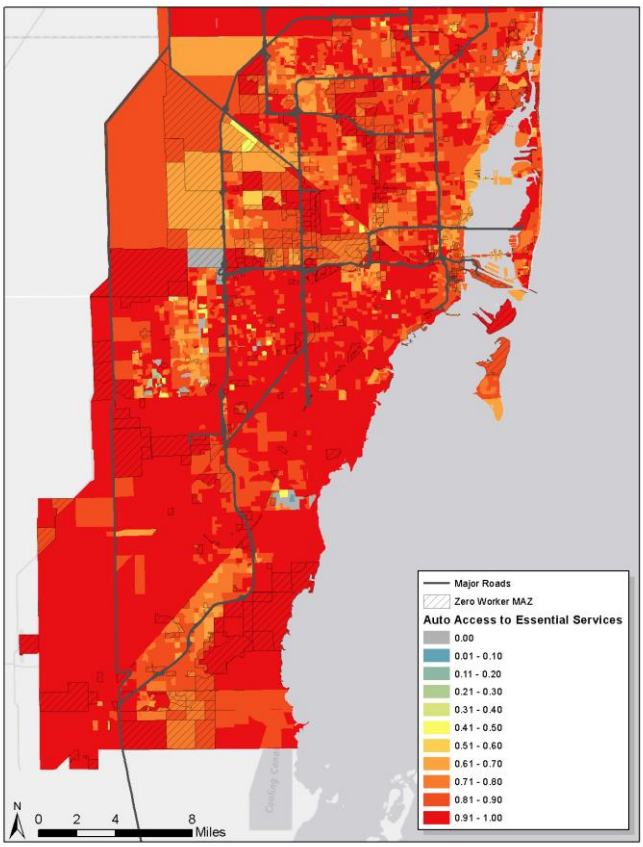


Figure 16. Auto Access to Essential Destinations

Auto accessibility scores depicted for employment and essential destinations in **figures 15** and **16**, respectively, indicate a clear dividing line between the north and south parts of the County in the, particularly with respect to employment accessibility. The countywide average for employment accessibility is 1,184,000 and for essential destinations, the highest of all modes at 88% countywide average and 87% in Title VI areas.

The raw accessibility scores presented in the figures and statistics above are informative as to the areas of the County that have high levels of accessibility, by mode, and the areas that are comparatively less accessible. Applying the mobility and connectivity diagnostics at the corridor level yields more actionable information about the principal contributors to the accessibility scores across the County. The bubble chart in **Figure 17** provides a snapshot of the walk accessibility connectivity diagnostic in each of the corridors. The chart depicts both the raw scores in the size of the bubbles, and the diagnostic ratios on the X-axis. Also depicted are the average values of the County at large and downtown Miami in the dotted and vertical lines, respectively, as a point of reference. Connectivity bubble charts for the other modes and an auto mobility chart are included in Appendix C.

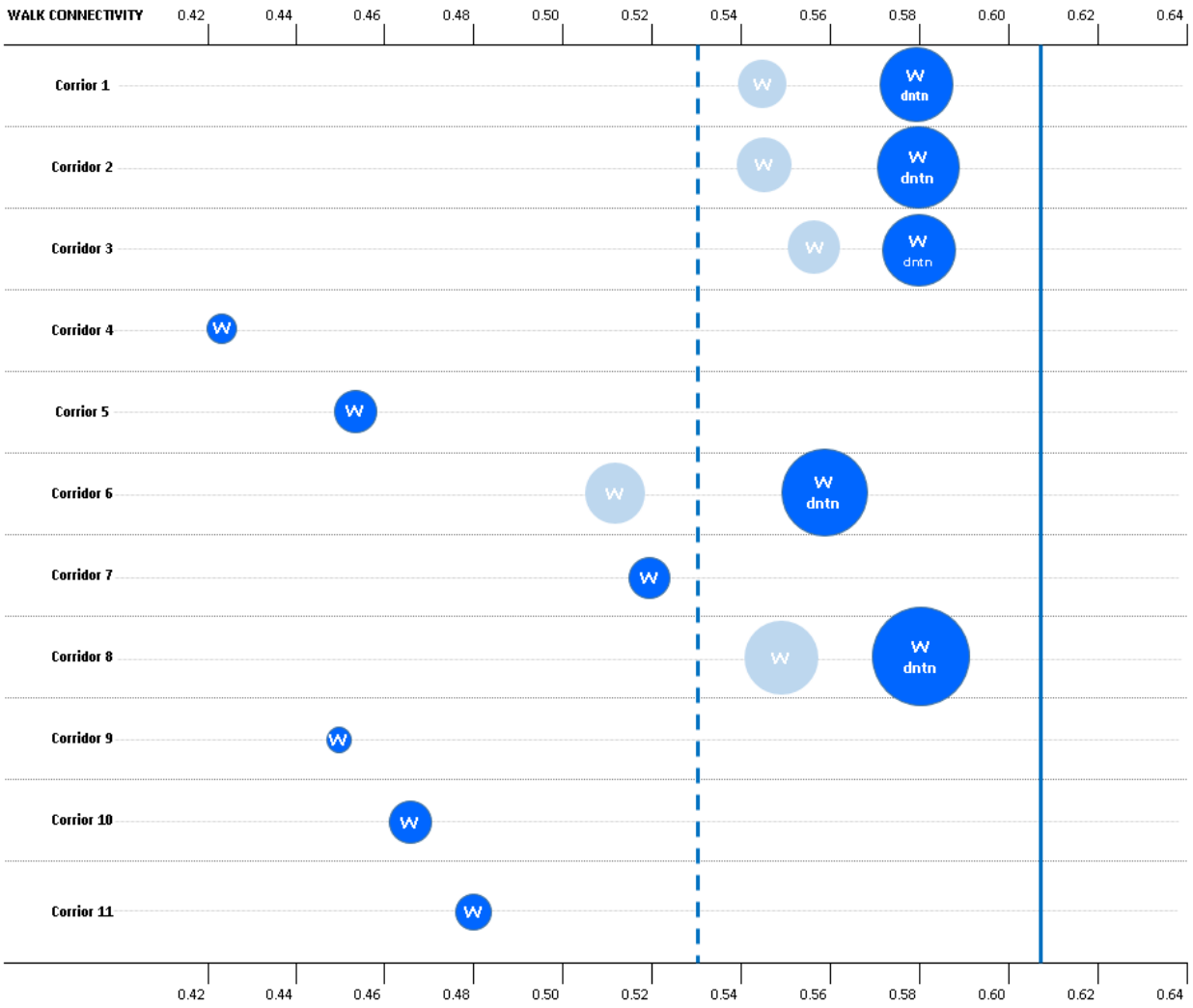


Figure 17. Walk Connectivity Ratio by Corridor

Needs Evaluation Framework

Performance based planning requirements in federal transportation legislation call for the development of quantitative metrics that effectively measure and monitor system performance. The project evaluation and prioritization process to be undertaken in the development of a cost feasible plan can be informed almost entirely by the accessibility results developed in this study. The specific goals to which accessibility applies, either directly or indirectly, include:

- **Goal 1. Improve System and Travel –** One of the primary objectives this goal is to reduce congestion.
- **Goal 4. Support Economic Vitality –** One of the primary objectives of this goal is to increase access to employment.
- **Goal 5. Protect and Preserve the Environment and Quality of Life** – Some of the core objectives of this goal are to support livable communities and reduce environmental impacts of transportation.
- **Goal 6. Enhance Connectivity** – The core objective of this goal is to improve the connectivity of the transportation system.

Evaluation metrics for goals 1 and 6 are based on the mobility and connectivity diagnostic ratios, respectively. The change in those ratios resulting from investment scenarios described above is a direct measure of mobility and connectivity improvement, as measured through an accessibility lens. The metric for goal 4 represents perhaps the most direct relationship of accessibility to the objective(s) of the goal. The change in the number of jobs accessible, by mode of travel, is that metric and the specific application of the metric for Title VI populations facilitates an equity measure that, while not explicit in the LRTP goals and objectives, is an important consideration. The environmental metric for goal 5 is derived through ratios of the modal accessibility scores. The relationship of auto and transit accessibility, for example, can be directly related to mode share. The quantitative representation of this relationship is the ratio of transit accessibility to auto accessibility scores, and wall/bike to auto, both of which are directly proportional to potential mode shift from auto to transit and bike/ped. In turn, the transit to auto ratio (TAR) and walk/bike to auto ratio (WAR) are logical variables that measure both environmental and livability impacts of transportation investment scenarios. Each of the aforementioned goals are presented below in light of the scenario strategies associated with the six tested corridors.

Project bundle tables in Appendix A provide a key to associate scenarios with specific improvements from the LRTP Cost Feasible Plan.

Goal 1. Improve System and Travel

The mobility ratio delta associated with improvement strategies serves as a mobility metric, isolating the impact of congestion on accessibility. Most of the scenarios 1 and 2 in the six tested corridors do not have an impact on congestion, as scenario 1 is a transit and multimodal improvement scenario and scenario 2 a transit and auto access to transit focus. Of the remaining scenario scores in **Figure 18**, scenario 3 in both corridors four and five have the highest mobility deltas, reflecting express lane improvements in both corridors and a limited access roadway extension in corridor five. Corridor eight includes express lane improvements on SR 836, scoring highly, but with only 50% of the mobility improvement relative to corridor four, which includes express lanes on SR 826. The primary reason for the difference in mobility gains is that congestion is not as impactful to mobility in the SR 836 corridor. While that particular facility experiences high levels of peak period congestion, it also traverses an area rich in "destinations" and in network connectivity. It therefore stands to reason that highway capacity improvements are more valuable in the SR 826 corridor relative to SR 836, from an accessibility standpoint.

CORRIDOR DELTA	MOBILITY - cong. ratio delta
	Auto
Corridor 1	
Scenario 1	-
Scenario 2	-
Scenario 4	***0.0008***
Corridor 2	
Scenario 1	-
Scenario 2	-
Scenario 4	***0.0022***
Corridor 3	
Scenario 1	-
Scenario 2	-
Scenario 4	***0.0032***
Corridor 4	
Scenario 3	***0.0160***
Scenario 4	***0.0016***
Corridor 5	
Scenario 3	***0.0115***
Scenario 4	***0.0025***
Corridor 8	
Scenario 2	***0.0075***
Scenario 3	***0.0075***
Scenario 4	***0.0014***
Corridor N	

Figure 18. Mobility

Goal 4. Support Economic Vitality

CORRIDOR DELTA	ECONOMIC VITALITY - access to jobs delta			
	Auto	Transit	Bike/Ped	***TOTAL***
Corridor 1				
Scenario 1	0	13,800	**1,200**	***15,000***
Scenario 2	0	13,800	1,200	***15,000***
Scenario 4	1,200	6,500	1,200	***8,900***
Corridor 2				
Scenario 1	0	3,800	700	***4,500***
Scenario 2	0	5,600	800	***6,400***
Scenario 4	2,800	0	800	***3,600***
Corridor 3				
Scenario 1	0	16,500	900	***17,400***
Scenario 2	2,300	**17,000**	900	***20,200***
Scenario 4	4,600	1,100	1,000	***6,700***
Corridor 4				
Scenario 3	**24,000**	0	0	***24,000***
Scenario 4	2,400	300	100	***2,800***
Corridor 5				
Scenario 3	**15,400**	0	0	***15,400***
Scenario 4	2,300	800	1,200	***4,300***
Corridor 8				
Scenario 2	100	3,000	700	***3,800***
Scenario 3	10,200	0	0	***10,200***
Scenario 4	1,500	300	1,100	***2,900***
Corridor N				

Figure 19. Economic Vitality

The economic vitality goal is the most directly measureable of the LRTP goals using accessibility. The metric is the average number of jobs accessible by mode, or in aggregate, resulting from the improvement strategies. The highest scoring alternative for this metric is the limited access roadway scenario tested for corridor 4, which includes capacity and operational improvements on the Turnpike, the HEFT, SR 826 and the Golden Glades Interchange, which is one of the largest interchanges and intermodal facilities in the County. Second highest for the aggregate access to jobs change is in scenario 2 of corridor 3, driven by east/west and north/south premium transit improvements increasing transit connectivity across Biscayne Bay and along Biscayne Blvd and NW 7th Avenue, respectively. With the barrier islands experiencing one of the lowest connectivity ratios in the County, these transit connectivity improvements yield competitive access to jobs scores.

From a modal investment standpoint, it is noteworthy that the average aggregate improvement for roadway-oriented scenarios (scenarios 3, 4) is just under 9,000, while the average for transit-oriented scenarios (scenarios 1, 2) is almost 50% higher, at just over 12,000. The increased transit accessibility from the barrier islands to the mainland is the primary driver of this, resolving a significant accessibility problem between the beaches and the mainland. The accessibility perspective yields a very different result than a focus on link congestion or level of service, which would not even result in a demonstrable improvement in the transit scenarios.

Goal 5. Protect and Preserve the Environment and Quality of Life

The environment and quality of life goal is measured with accessibility as the ratios of transit to auto accessibility and walk/bike to auto accessibility as a surrogate for mode share. The use of those ratios is supported in the household survey data used to estimate the distance decay curves described above as a statistically significant predictive variable for mode shift. The data suggest that the higher those ratios, the higher the respective transit and walk/bike mode share.

The ratio deltas in **Figure 20** demonstrate the predictable result of transit-oriented scenarios scoring highly. Roadway-oriented scenarios, on the other hand, experience negative change in these ratios, as they tend to improve auto accessibility, but not necessarily transit and multimodal accessibility.

CORRIDOR DELTA	ENVIRONMENTAL - modal ratio delta		
	Transit : Auto	Walk/Bike : Auto	***TOTAL***
Corridor 1			
Scenario 1	0.013	0.00110	***0.01369***
Scenario 2	0.016	0.00110	***0.01734***
Scenario 4	0.006	0.00102	***0.00664***
Corridor 2			
Scenario 1	0.0032	0.00059	***0.00376***
Scenario 2	0.0048	0.00067	***0.00543***
Scenario 4	-0.0007	0.00051	***-0.00022***
Corridor 3			
Scenario 1	0.013	0.00073	***0.01420***
Scenario 2	0.022	0.00064	***0.02290***
Scenario 4	0.000	0.00062	***0.00044***
Corridor 4			
Scenario 3	-0.0033	-0.00051	***-0.00378***
Scenario 4	-0.0001	0.00003	***-0.00007***
Corridor 5			
Scenario 3	-0.0026	-0.00052	***-0.00311***
Scenario 4	0.0002	0.00088	***0.00106***
Corridor 8			
Scenario 2	0.0023	0.00054	***0.00284***
Scenario 3	-0.0024	-0.00055	***-0.00295***
Scenario 4	-0.0001	0.00077	***0.00065***
Corridor N			

Figure 20. Environmental

CORRIDOR DELTA	CONNECTIVITY - crowfly ratio delta			
	Auto	Transit	Bike/Ped	***TOTAL***
Corridor 1				
Scenario 1	-	0.0086	0.0128	***0.0214***
Scenario 2	-	0.0086	0.0128	***0.0214***
Scenario 4	0.0007	0.0017	0.0128	***0.0152***
Corridor 2				
Scenario 1	-	0.0014	0.0156	***0.0170***
Scenario 2	-	0.0014	0.0156	***0.0170***
Scenario 4	0.0019	-	0.0156	***0.0174***
Corridor 3				
Scenario 1	-	0.0128	0.0010	***0.0137***
Scenario 2	-	0.0133	0.0010	***0.0143***
Scenario 4	0.0027	-	-	***0.0027***
Corridor 4				
Scenario 3	0.0140	-	-	***0.0140***
Scenario 4	-	-	0.0004	***0.0004***
Corridor 5				
Scenario 3	0.0099	-	-	***0.0099***
Scenario 4	0.0021	-	0.0167	***0.0188***
Corridor 8				
Scenario 2	-	-	0.0090	***0.0090***
Scenario 3	0.0064	-	-	***0.0064***
Scenario 4	-	-	0.0088	***0.0088***
Corridor N				

Figure 21. Connectivity

Goal 6. Enhance Connectivity

Connectivity ratio deltas, presented by mode in **Figure 21**, can be used to evaluate mode-specific improvements by focusing on the modal connectivity delta, or in aggregate to evaluate improvement strategy scenarios. The results indicate the transit improvement scenarios (1 and2) employed in Corridor 1 yield the greatest improvement in connectivity across all modes. This is the result of the combined benefits associated with the transit and non-motorized improvements tested in these scenarios. By comparison, isolating the transit connectivity ratio improvement points to Corridor 3, which includes multiple premium transit improvements on the 79th Street Causeway, NW 7th Avenue and Biscayne Boulevard, improving

transit connectivity of Miami Beach to the mainland. By contrast, improvement strategies scoring relatively low against the connectivity metric are the capacity-oriented strategies tested in corridors 4 and 8, which do not result in any appreciable connectivity improvement.

Other goals supported by accessibility principals include the Safety, System Preservation, and Optimize Investment goals. Multimodal safety is implicitly supported through the increased accessibility associated with improving the non-motorized network. System preservation and optimization of investment also are implicit in the accessibility-based planning process. The network connectivity benefit, for example, of a ramp connection between two limited access facilities relative to the significantly more costly widening of one of those facilities is an example of the value of a quantitative connectivity metric that can be used in the context of benefit cost analysis.

The accessibility-based metrics can be summarized to inform a single comprehensive score, but because the individual metric scores have different units of measurement, the scores are orders of magnitude different from one another. For example, the change in connectivity diagnostic ratios ranges from hundredths to thousandths of one, while the access to jobs score deltas number in the thousands or tens of thousands. Each of the individual metrics, then, must be normalized to the highest score across all scenarios, meaning that the score for each scenario or improvement is a function of the score for the highest scoring scenario. This results in comparable scoring across all metrics and facilitates aggregation of the scores. The evaluation matrix with normalized scores for the six tested corridors is presented in **Figure 22**.

CORRIDOR DELTA (norm.)	CONNECTIVITY - crowfly ratio delta				MOBILITY - cong. ratio delta	ENVIRONMENTAL - modal ratio delta			ECONOMIC VITALITY - access to jobs delta				EQUITY - access to jobs delta (in Title VI areas)			*TOTAL Score (unweighted)*
	Auto	Transit	Bike/Ped	*TOTAL*	*Auto*	Transit : Auto	Walk/Bike : Auto	*TOTAL*	Auto	Transit	Bike/Ped	*TOTAL*	Transit	Walk/Bike	*TOTAL*	
Corridor 1																
Scenario 1	-	0.64	0.76	***1.41***	-	0.57	1.00	***1.57***	0.00	0.81	1.00	***1.81***	0.72	0.43	***1.15***	**5.94**
Scenario 2	-	0.64	0.76	***1.41***	-	0.73	1.00	***1.73***	0.00	0.81	1.00	***1.81***	0.72	0.43	***1.15***	**6.10**
Scenario 4	0.05	0.13	0.76	***0.94***	***0.05***	0.25	0.94	***1.19***	0.05	0.38	1.00	***1.43***	0.19	0.43	***0.62***	**4.23**
Corridor 2																
Scenario 1	-	0.11	0.93	***1.04***	-	0.14	0.53	***0.68***	0.00	0.22	0.58	***0.81***	0.19	0.29	***0.47***	**2.99**
Scenario 2	-	0.11	0.93	***1.04***	-	0.21	0.61	***0.82***	0.00	0.33	0.67	***1.00***	0.19	0.29	***0.47***	**3.33**
Scenario 4	0.13	-	0.93	***1.06***	***0.14***	-0.03	0.47	***0.44***	0.12	0.00	0.67	***0.78***	0.00	0.29	***0.29***	**2.71**
Corridor 3																
Scenario 1	-	0.96	0.06	***1.02***	-	0.60	0.67	***1.28***	0.00	0.97	0.75	***1.72***	0.95	0.14	***1.09***	**5.10**
Scenario 2	-	1.00	0.06	***1.06***	-	1.00	0.58	***1.58***	0.10	1.00	0.75	***1.85***	1.00	0.14	***1.14***	**5.63**
Scenario 4	0.19	-	-	***0.19***	***0.20***	-0.01	0.57	***0.56***	0.19	0.06	0.83	***1.09***	0.08	0.14	***0.22***	**2.26**
Corridor 4																
Scenario 3	1.00	-	-	***1.00***	***1.00***	-0.15	-0.47	***-0.61***	1.00	0.00	0.00	***1.00***	0.07	0.00	***0.07***	**2.45**
Scenario 4	-	-	0.02	***0.02***	***0.10***	0.00	0.03	***0.02***	0.10	0.02	0.08	***0.20***	0.08	0.14	***0.22***	**0.57**
Corridor 5																
Scenario 3	0.71	-	-	***0.71***	***0.72***	-0.12	-0.48	***-0.59***	0.64	0.00	0.00	***0.64***	0.08	0.00	***0.08***	**1.55**
Scenario 4	0.15	-	1.00	***1.15***	***0.16***	0.01	0.81	***0.81***	0.10	0.05	1.00	***1.14***	0.11	0.86	***0.96***	**4.23**
Corridor 8																
Scenario 2	-	-	0.54	***0.54***	***0.47***	0.10	0.49	***0.60***	0.00	0.18	0.58	***0.76***	0.28	0.71	***0.99***	**3.36**
Scenario 3	0.46	-	-	***0.46***	***0.47***	-0.11	-0.50	***-0.61***	0.43	0.00	0.00	***0.43***	0.00	0.00	***0.00***	**0.74**
Scenario 4	-	-	0.53	***0.53***	***0.09***	-0.01	0.71	***0.70***	0.06	0.02	0.92	***1.00***	0.01	1.00	***1.01***	**3.32**

Values represent normalized scores, reflecting a proportion of the highest value for each respective metric

Scenario 1: Premium Transit with Bike/Ped transit access improvements
Scenario 2: Premium Transit with Bike/Ped and Roadway transit access improvments
Scenario 3: Limited Access Roadway improvements
Scenario 4: Arterial/Collector and Bike/Ped improvements

Figure 22. Needs Evaluation Matrix

Conclusions and Recommendations

The process, technical tools, and results of the accessibility-based needs assessment all point to a reliable and effective tool to inform the technical portion of the LRTP update. Some of the unique features of the process include its inclusion of non-motorized and motorized analysis; an integrated approach facilitating scenario planning; unique performance metrics to support a performance-based planning process; and a comprehensive streamlined project evaluation framework reflecting most of the LRTP goals. One other key feature of the methodology is the fact that it can easily be customized and adjusted to both improve the process and add specialized metrics for specific policy issues. Recommendations below are suggestions for the 2045 LRTP update process.

- Move forward with methodology in the testing and assessment/evaluation of multimodal improvements across a system of corridors
- Incorporate land use (and other dimensional) scenarios to enable a full accounting of the impacts of land use, relative to infrastructure interventions
- Develop a land use diagnostic to isolate the impact of land use. The diagnostic would require the development or identification of an ideal land use mix, either for the County as a whole, or specific to sub areas of the County.
- Test the prioritization framework across a broad range of corridors and improvements to ensure the appropriate differentiation of improvement benefits.
- Develop a benefit cost component to add to the prioritization framework, taking cost into consideration.
- Develop complementary evaluation criteria in addition to accessibility-based criteria. While the framework presented above incorporates the majority of considerations, other issues are best handled separately, including security, safety, and system preservation.

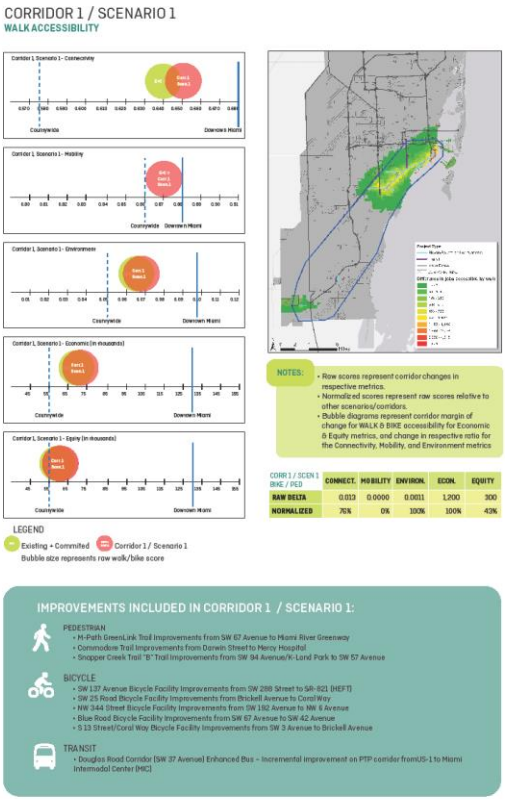


Figure 23. Scenario Summary

The scenario summary sheet in **Figure 23** is a suggested visualization tool for the dissemination of scenario makeups and results. Other sample summary sheets are included in Appendix D.

Appendix A. Project Bundles

Corridor	Project Mode			Facility	From	To	Description	Scen. 1	Scen. 2	Scen. 3	Scen. 4
Corridor 1	Walk	NM11	3	M-Path GreenLink	SW 67 Ave	Miami River Greenway	Trail Improvements	X	X		X
		NM53	2	Commodore Trail improvements	Darwin St	Mercy Hospital	Trail Improvements	X	X		X
		NM90	3	Snapper Creek Trail "B"	SW 94 Ave / K-Land Park	SW 57 Ave	Trail Improvements	X	X		X
	Bike	NM152	4	SW 137 Ave	SW 288 St	SR-821 (HEFT)	Bicycle Facility Improvements	X	X		X
		NM253	3	SW 25 Road	Brickell Ave	Coral Way	Bicycle Facility Improvements	X	X		X
		NM145	4	NW 344 St	SW 192 Ave	NW 6 Ave	Bicycle Facility Improvements	X	X		X
		NM155	4	Blue Road	SW 67 Ave	SW 42 Ave	Bicycle Facility Improvements	X	X		X
		NM75	3	S 13 St / Coral Way	SW 3 Ave	Brickell Ave	Bicycle Facility Improvements	X	X		X
	Transit	MDT151	2	Douglas Road Corr (37 Ave) Enhanced Bus	US-1	Miami Intermodal Center (MIC)	Incremental improvement on PTP corridor	X	X		
		MDT189	2	Metrorail Park-and-Ride Facility	At Dadeland South		Expand Park-and-Ride facility with 1000 parking space garage		X		
		MDT114	2	Busway Park-and-Ride Facility	US-1 Busway	SW 104 St	Park-and-Ride facility with 250-300 surface parking spaces		X		
		MDT186	2	Expand Overcapacity Park-and-Ride lot	at SW 152 St		New parking garage with 500 parking spaces		X		
	Auto	FDOT129	4	SW 152 St (Coral Reef)	SR-821 (HEFT)	US-1	Add 2 lanes and reconstruct				X
		HS100	3	SW 162 Ave (Farm Life)	SW 312 (Campbell)	SW 328 (Lucy)	Add 2 lanes and center turn lane and reconstruct				X
		PW156	4	SW 312 St (Campbell)	NW 14 Ave/SW 176 Ave	SW 197 Av	Add 2 lanes and reconstruct				X
		PW136	3	SW 152 Ave	US-1	SW 312 St (Campbell)	Add 2 lanes and reconstruct				X
		PW142	2	SW 200 St	US-1	Quail Roost Dr	Add 2 lanes and reconstruct				X
		PW145	3	SW 320 St (Mowry)	SW 187 Ave S. Dixie Hwy	SW 197 Ave SW 142 Ave	Add 2 lanes and reconstruct				X
		HS105	2	SW 312 St (Campbell)	SW 152 Ave	SW 137 Ave	Add 2 lanes with left turn lanes and reconstruct				X
		HS102	4	North Canal Dr	SW 162 Ave	SW 152 Ave	Add 2 lanes and divided roadway with left turn lanes				X
		HS101	2	SW 320 St (Mowry)	SW 197 Ave US-1	SW 187 Ave SW 142 Ave	Add 2 lanes with left turn lanes and reconstruct				X
		NP107	4	US-1	at SW 27 Ave		Grade separation of US-1 over SW 27 Ave				X
		FDOT130	4	US-1	at SW 344 St (Palm)		Grade separated overpass				X
Corridor 2	Walk	NM51	2	Snapper Creek Trail "A"	K-Land Park / SW 88 St	SW 72 St	Trail Improvements	X	X		X
		NM90	3	Snapper Creek Trail "B"	SW 94 Ave / K-Land Park	SW 57 Ave	Trail Improvements	X	X		X
		NM11	3	M-Path GreenLink	SW 67 Ave	Miami River Greenway	Trail Improvements	X	X		X
		NM53	2	Commodore Trail improvements	Darwin St	Mercy Hospital	Trail Improvements	X	X		X
	Bike	NM144	4	SW 48 St	SW 117 Ave	SW 82 Ave	Bicycle Facility Improvements	X	X		X
		NM153	4	SW 40 St	SW 117 Ave	SW 57 Ave	Bicycle Facility Improvements	X	X		X
		NM155	4	Blue Road	SW 67 Ave	SW 42 Ave	Bicycle Facility Improvements	X	X		X
		NM75	3	S 13 St / Coral Way	SW 3 Ave	Brickell Ave	Bicycle Facility Improvements	X	X		X
		NM141	4	SW 137 Ave	SW 152 St	SW 72 St	Bike Boulevard Improvements	X	X		X
	Transit	MDT133	2	Kendall Corridor (Kendall Enhanced Bus)	West Kendall Transit Terminal	Dadeland North Metrorail Station	Incremental improvement on PTP corridor	X	X		
		MDT114	2	Busway Park-and-Ride Facility	US-1 Busway	SW 104 St	Park-and-Ride facility with 250-300 surface parking spaces		X		
		NP107	4	US-1	at SW 27 Ave		Grade separation of US-1 over SW 27 Ave				X
		PW149	3	SW 72 St	SW 117 Ave	SW 157 Ave	Add 2 lanes and reconstruct				X
		PW185	4	SW 104 St	SW 147 Ave	SW 137 Ave	Add 2 lanes and reconstruct				X
		PW186	4	SW 104 St	Hammocks Blvd	SW 147 Ave	Add 2 lanes and reconstruct				X

Corridor	Project Mode			Facility	From	To	Description	Scen. 1	Scen. 2	Scen. 3	Scen. 4
Corridor 3	Walk	NM66	2	Biscayne Boulevard	NE 191 St	Aventura Boulevard	Pedestrian Facility Improvements	X	X		X
		NM69	2	Lehman Causeway Pedestrian Facility	Aventura	Sunny Isles Beach	Pedestrian Facility Improvements	X	X		X
		NM92	3	NW 3 Court	NW 2nSt	NW 8 St	Pedestrian Facility Improvements	X	X		X
		NM150	4	Atlantic Trail (north of Miami Beach)	North Shore Park	Haulover Park	Trail Improvements	X	X		X
		NM151	4	Atlantic Trail (north of Haulover Park)	Haulover Park	Broward County Line	Trail Improvements	X	X		X
	Bike	NM82	3	NE 62 St	Biscayne Boulevard	NE 2nd Ave	Bicycle Facility Improvements	X	X		X
		NM89	3	NW 5 Ave	NW 4 St	NW 11 St	Bicycle Facility Improvements	X	X		X
		NM103	3	SW/NW 1 Ave	SW 2 St	NW 11 St	Bicycle Facility Improvements	X	X		X
		NM132	4	Biscayne Road	NE 187 St	NE 191 St	Pedestrian Facility Improvements	X	X		X
		NM48	2	NE 2 Ave	NE 20 St	NE 36 St	Bicycle Facility Improvements	X	X		X
		NM49	2	NE 2 Ave	NE 62 St	West Little River Canal/NE 84 St	Bicycle Facility Improvements	X	X		X
		NM61	2	NW 2 Ave	NW 20 St	NW 79 St	Bicycle Facility Improvements	X	X		X
		NM54	2	Atlantic Trail	4600 Block / Indian Beach Park	6400 Block / Allison Park	Trail Improvements				X
		NM80	3	North Miami Ave / NE 1st Ave	NW 5 St	NW 17 St	Bicycle Facility Improvements				X
		NM139	4	Atlantic Trail (Boardwalk Replacement Project)	23 St	4600 Block / Indian Beach Park	Trail Improvements				X
		NM156	4	Pine Tree Drive/La Gorce	23 St	63 St	Bicycle Facility Improvements				X
	Transit	MDT150	2	79 St Causeway (JFK Cwy) Enhanced Bus	Northside Metrorail Station	Miami Beach Convention Center	Improve/implement transit service	X	X		
		MDT171	3	NW 7 Ave Enhanced Bus	Downtown Miami	Golden Glades Interchange Terminal	Premium limited stop transit service	X	X		
		MDT283	2	North Corridor (Biscayne) Enhanced Bus**	Miami Downtown Terminal	Aventura Terminal	Incremental improvement on PTP corridor	X	X		
	Auto	COM105	4	NW 79 St/NW 81 St/NW 82 St	NW 13 Ct	Biscayne Bay	Capacity improvements		X		
		COM107	2	NW 20 St	NW 27 Ave	I-95	Roadway infrastructure improvements		X		
		PW169	2	W Dixie Hwy	NE 163 St	NE 175 St	Widen to 4 Lanes		X		X
		PW154	2	Venetian Causeway Bridge	Bayshore Dr	Purdy Ave	Bridge replacement		X		
		PW104	3	NE 151 St	NE 10th Ave	West Dixie Highway	Add 2 lanes and reconstruct		X		
		PW105	4	NE 159 St	NE 6 Ave	West Dixie Highway	Add 2 lanes and reconstruct		X		
		PW180	4	N. Miami Ave	NW 14 St	Miami City Limitis	Roadway improvements		X		X
		PW184	4	NW 14 St	Civic Center	US-1	Widen to 3 lanes and resurface		X		
Corridor 4	Walk	NM106	3	SR-9 Extension Frontage Road	NW 27th Ave	SR 9 Extension	Pedestrian Facility Improvements				X
	Bike	NM59	2	NW 22 Ave	NW 111 St	NW 183 St	Bicycle Facility Improvements (Restriping)				X
	Auto	PW105	4	NE 159 St	NE 6 Ave	West Dixie Highway	Add 2 lanes and reconstruct				X
		TP114	4	SR-821 (HEFT)	NW 57 Ave (Red)	Turnpike (Mainline)	Widen to 8 lanes			X	
		TP105	4	SR-821 (HEFT)	I-75	NW 57 St (Red)	Widen to 8 lanes			X	
		TP101	3	Turnpike (Mainline)	Golden Glades Interchange	SR-821 (HEFT)	Widen to 8 lanes			X	
		927	3	SR-826	NW 154 St	NW 17 Ave	Managed Lanes			X	
		930	4	SR-826	NW 103 St	NW 154 St	Widen with Express lanes			X	
		1272	3	Golden Gladed Interchange	SB Turnpike	SB I-95 at NW 135 St	Modify Interchange			X	
		1273	3	Golden Gladed Interchange: SR-826	NW 17 Ave at SR-826	NB I-95 at NW 183 St	Modify Interchange			X	
		DT4283582	2	Golden Gladed Interchange: SR-826	NW 17 Ave	Golden Glades Interchange	Managed lanes			X	
		DT4283585	2	Golden Gladed Interchange: I-95	Biscayne River Canal	Miami Garden Dr	Add 2 auxiliary lanes			X	
		DT4283583	2	Golden Gladed Interchange: SR-826	At I-95		New express lane ramps on I-95			X	
		TP126	3	Turnpike (Mainline)	Golden Glades Interchange		Add SB ramp capacity			X	

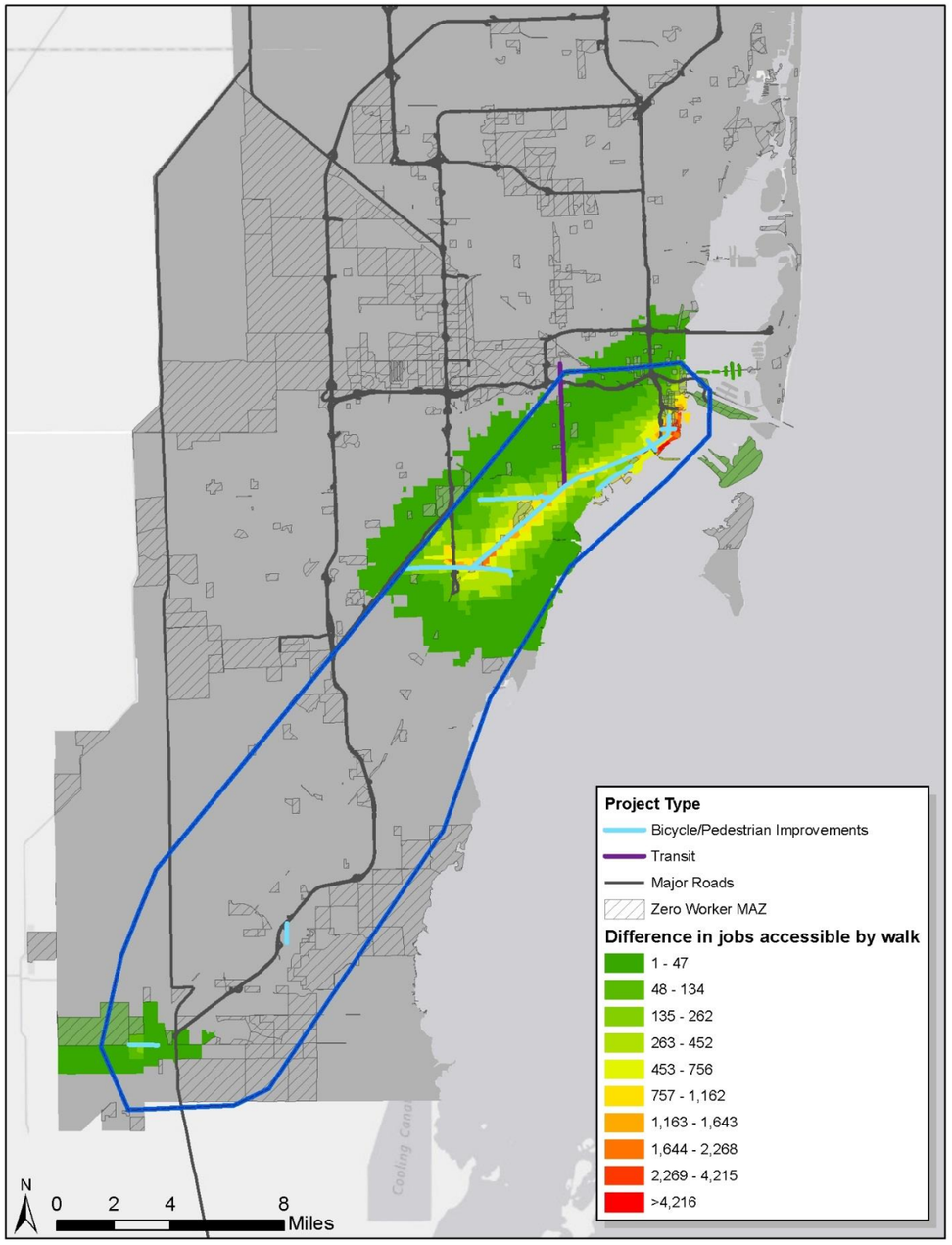
Corridor	Project Mode			Facility	From	To	Description	Scen. 1	Scen. 2	Scen. 3	Scen. 4
Corridor 5	Walk	NM65	2	NW 103 St	W 28 Ave	W 24 Ave	Pedestrian Facility Improvements				X
		NM94	3	W Okeechobee Road	NW 103 St	W 18 Ave	Pedestrian Facility Improvements				X
	Auto	MDX110	3	SR-836 (Dolphin) Managed Lanes	SR-821 (HEFT)	SR-826 /SR-836 Interchange	Two new managed lanes within the ROW of SR 836 (Dolphin)			X	
		927	3	SR-826 (Palmetto)	NW 154 St	NW 17 Ave	Managed lanes			X	
		929	4	I-75	SR-826 (Palmetto)	NW 170 St	Widen with express lanes			X	
		930	4	SR-826 (Palmetto)	NW 103 St	NW 154 St	Widen with express lanes			X	
		1200	4	SR-826 (Palmetto)	SR-836 (Dolphin)	NW 103 St	Add 4 special use lanes			X	
		MDX109	2	SR-924 Gratigny West Extension	SR-826 (Palmetto)/I-75	SR-821 (HEFT)	Extend SR-924 to SR-821 (HEFT) with connections to I-75 and SR-826			X	
		H106	3	I-75 Ramp	At NW 87 Ave		Construct an off ramp from SB I-75 to SB W 28 Ave/NW 87 Ave			X	
		FP1028	2	NW 12 St	NW 107 Ave	SR-826 (Palmetto)	Widening				X
		FP1059	2	NW South River Dr	NW 107 Ave	NW 74 Ave	Roadway and operational improvements				X
		NP105	4	NW 36 St	At NW 72 Ave (Milam Dairy)		Grade separation of NW 36 St over NW 72 Ave				X
Corridor 6	Walk/Bike	NM94	3	W Okeechobee Road	NW 103 St	W 18 Ave	Pedestrian Facility Improvements				X
	Auto	H104	3	SR-826 (Palmetto)	NW 138 St	NW 103 St/W 49 St	Add a braided off ramp to W 68 St/NW 122 St			X	
		927	3	SR-826 (Palmetto)	NW 154 St	NW 17 Ave	Managed Lanes			X	
		930	4	SR-826 (Palmetto)	NW 103 St	NW 154 St	Widen with Express lanes			X	
		1200	4	SR-826 (Palmetto)	SR-836 (Dolphin)	NW 103 St	Add 4 special use lanes			X	
		FP1020	2	Medley Freight Access Roadway Improvements	US-27 (Okeechobee)	Medley	Bridge widening and canal improvements				X
		FP1059	2	NW South River Dr	NW 107 Ave	NW 74 Ave	Roadway and operational improvements				X
		FP1015	3	NW 42 Ave (LeJeune)	US-27 (Okeechobee)		Improve advance signage for intersection lane alignment				X
		FP1022	3	NW 72nd Ave (Milam Dairy)	Hialeah Expy		Operational improvements				X
		FP1072	3	US-27 (Okeechobee)	NW 42 Ave (Le Jeune)		Improve access at intersection				X
		FP1073	3	US-27 (Okeechobee)	SR-826 (Palmetto)		Operational improvements				X
		FDOT250	4	US-27 (Okechobee)/ SR-826Interchange	W 95 St	W 16 Ave	Ramp improvements				X
		FP1018	2	Medley Bridge/Canal Improvement Program			Improvements at; NW 121 Way, NW 116 Way, NW 105 Way, NW 79 Ave				X
		1127	4	US-27 (Okeechobee)	SR-826 (Palmetto)	SR 997 (Krome)	Operational/Capacity improvements with grade separated intersection				X
		1128	4	NW 74 St	SR-826 (Palmetto)	FEC Intermodal Yard	Modify connector				X
Corridor 7	Bike	NM49	2	NE 2 Ave	NE 62 St	West Little River Canal/NE 84 St	Bicycle Facility Improvements	X	X		X
		NM60	2	NW 22 Ave	NW 36 St	NW 111 St	Bicycle Facility Improvements / Road Diet	X	X		X
		NM61	2	NW 2 Ave	NW 20 St	NW 79 St	Bicycle Facility Improvements	X	X		X
		NM249	4	Bike Boulevard Demonstration Project	NW 32 Ave/NW 41 St	NW 11 Ave/Little River Drive	Bike Boulevard Improvements	X	X		X
	Transit	MDT150	2	79 St Causeway (JFK Cwy) Enhanced Bus	Northside Metrorail Station	Miami Beach Convention Center	Improve/implement transit service	X	X		
		MDT171	3	NW 7 Ave Enhanced Bus	Downtown Miami	Golden Glades Interchange Terminal	Premium limited stop transit service	X	X		
		MDT283	2	North Corridor (Biscayne) Enhanced Bus	Miami Downtown Terminal	Aventura Terminal	Incremental improvement on PTP corridor	X	X		
	Auto	COM105	4	NW 79 St/NW 81 St/NW 82 St	NW 13 Ct	Biscayne Bay	Capacity improvements		X		X
		PW180	4	N. Miami Ave	NW 14 St	Miami City Limitis	Roadway improvements		X		X

Corridor	Project Mode			Facility	From	To	Description	Scen. 1	Scen. 2	Scen. 3	Scen. 4
Corridor 8	Walk	NM92	3	NW 3 Court	NW 2nSt	NW 8 St	Pedestrian Facility Improvements		X		
		NM91	3	SW 117 Ave	SW 17th St	SW 8 St	Pedestrian Facility Improvements				X
		NM68	2	Miami River Greenway	NW 36 St	NW 12 Ave	Trail Improvements		X		X
	Bike	NM79	3	North Miami Ave	NW 17 St	NW 29 St	Bicycle Facility Improvements				X
		NM154	4	NW 22 Ave	SW 22 St	Airport Expyway/ SR -12	Bicycle Facility Improvements				X
		NM80	3	North Miami Ave / NE 1st Ave	NW 5 St	NW 17 St	Bicycle Facility Improvements				X
		NM76	3	Tamiami Canal Road	West Flagler St	NW 7 St	Bicycle Facility Improvements				X
		NM88	3	Tamiami Canal Road	SW 8 St	West Flagler St	Bicycle Facility Improvements				X
		NM143	4	SW 16 St	SW 107 Ave	SW 82 Ave	Bicycle Facility Improvements				X
		NM75	3	S 13 St / Coral Way	SW 3 Ave	Brickell Ave	Bicycle Facility Improvements				X
		NM89	3	NW 5 Ave	NW 4 St	NW 11 St	Bicycle Facility Improvements		X		
		NM103	3	SW/NW 1 Ave	SW 2 St	NW 11 St	Bicycle Facility Improvements		X		
	Transit	MDT103	2	Dolphin Station Transit Terminal	West of SR-821 & N of NW 12 St		PnR facility with kiss-and-ride, 12 bus bays, and 1000 parking spaces		X		
	Auto	COM107	2	NW 20 St	NW 27 Ave	I-95	Roadway infrastructure improvements		X		
		PW184	4	NW 14 St	Civic Center	US-1	Widen to 3 lanes and resurface		X		
		MDX102	3	SR-836 Managed Lanes	SR-826/SR-836	Just West of 27 Ave	Two new managed lanes within the right-of-way of SR-836			X	
		MDX110	3	SR-836 Managed Lanes	SR-821 (HEFT)	SR-826/SR-836 Interchange	Two new managed lanes within the ROW of SR 836			X	
		1200	4	SR-826	SR-836	NW 103 St	Add 4 special use lanes			X	
Corridor 9	Walk	NM51	2	Snapper Creek Trail "A"	K-Land Park / SW 88 St	SW 72 St	Trail Improvements				X
		NM52	2	Snapper Creek Trail "A"	SW 72 St	SW 8 St / FIU	Trail Improvements				X
		NM70	2	Black Creek Trail "B"	Larry and Penny Thompson Park	Krome Trail	Trail Improvements				X
		NM91	3	SW 117 Ave	SW 17th St	SW 8 St	Pedestrian Facility Improvements				X
		NM138	4	SW 137 Ave	US-1	SW 184 St	Bicycle Facility Improvements				X
		NM141	4	SW 137 Ave	SW 152 St	SW 72 St	Bike Boulevard Improvements				X
		NM142	4	SW 137 Ave	SW 56 St	SW 8 St	Bicycle Facility Improvements				X
		NM144	4	SW 48 St	SW 117 Ave	SW 82 Ave	Bicycle Facility Improvements				X
		NM152	4	SW 137 Ave	SW 288 St	SR-821 (HEFT)	Bicycle Facility Improvements				X
		NM153	4	SW 40 St	SW 117 Ave	SW 57 Ave	Bicycle Facility Improvements				X
	Transit	MDT103	2	Transit	Dolphin Station Transit Terminal	West of SR-821 and N of NW 12 St				X	
	Auto	TP107	4	SR-821 (HEFT)	SR-874 (Don Shula)	Killian Pkwy	Widen to 10 lanes			X	
		TP106	3	SR-821 (HEFT)	SW 288 St	SW 137 Ave (Speedway)	Widen to 8 lanes			X	
		TP102	3	SR-821 (HEFT)	SW 137 Ave	SW 216 St	Widen to 8 Lanes. Include Express lanes portions of project length.			X	
		TP100	3	SR-821 (HEFT)	SW 312 (Campbell Dr)	SW 288 St	Widen to 6 lanes			X	
		TP103	4	SR-821 (HEFT)	SW 88 St (Kendall)	SW 40 St (Bird)	Transportation System Management and Operation (TSM&O)			X	
		FDOT130	4	US-1	SW 344 St (Palm)		Grade separated overpass				X
		FDOT129	4	SW 152 St (Coral Reef)	SR-821 (HEFT)	US-1	Add 2 lanes and reconstruct				X
		FP1024	2	NW 107 Ave	NW 12 St	NW 74 St	Operational and capacity improvements where feasible				X
		HS100	3	SW 162 Ave (Farm Life)	SW 312 (Campbell)	SW 328 (Lucy)	Add 2 lanes and center turn lane and reconstruct				X
		PW170	4	SW 120 St	SW 137 Ave	SW 117 Ave	Add 2 lanes and reconstruct				X
		PW168	4	SW 137 Ave	US-1	SW 184 St	Add 2 lanes and reconstruct				X
		PW107	3	NW 107 Ave	1,000 feet North of W 122 St	US-27 (Okeechobee)	Widen bridge over Miami Canal				X
		PW110	4	NW 107 Ave	NW 170 St	Broward County line	Extend NW 107 Ave to the County Line				X
		PW130	3	SW 107 Ave	Quail Roost Dr	SW 160 St	Add 2 lanes and reconstruct				X
		PW133	2	SW 127 Ave	SW 120 St	SW 144 St	Add 2 lanes and new 4 lane road construction				X
		PW135	3	SW 147 Ave	SW 184 St (Eureka)	SW 152 St (Coral Reef)	Add 2 lanes and reconstruct				X
		PW136	3	SW 152 Ave	US-1	SW 312 St (Campbell)	Add 2 lanes and reconstruct				X
		PW139	4	SW 157 Ave	SW 8 St (Tamiami)	SW 42 St	Add 2 lanes and construct new 4 lane road				X
		PW142	2	SW 200 St	US-1	Quail Roost Dr	Add 2 lanes and reconstruct				X
		PW146	4	SW 40 St	SW 157 Ave	SW 167 Ave	New 2 lane road construction				X
		PW183	4	SW 42 St	SW 162 Ave	SW 157 Ave	Add 2 lanes and reconstruct				X
		PW185	4	SW 104 St	SW 147 Ave	SW 137 Ave	Add 2 lanes and reconstruct				X

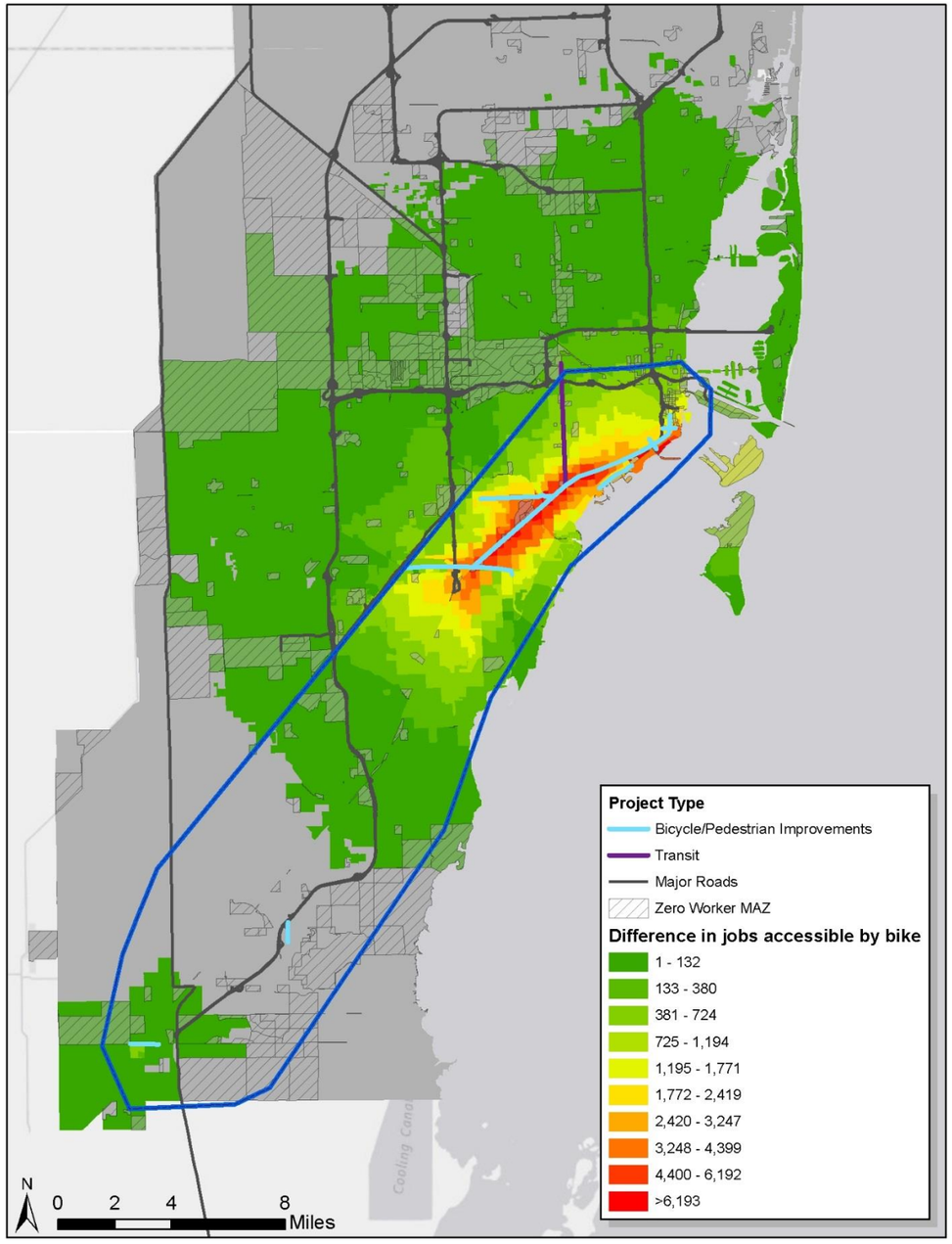
Corridor	Project Mode			Facility	From	To	Description	Scen. 1	Scen. 2	Scen. 3	Scen. 4
Corridor 11	Walk	NM106	3	SR-9 Extension Frontage Road	NW 27th Ave	SR 9 Extension	Pedestrian Facility Improvements	X	X		
		NM119	4	NW 71 St	NW 32 Ave	NW 27 Ave	Pedestrian Facility Improvements	X	X		
		NM129	4	NW 167 St	NW 32 Ave	NW 27 Ave	Pedestrian Facility Improvements	X	X		
		NM93	3	NW 167 St	NW 27 Ave	NW 22 Ave	Pedestrian Facility Improvements	X	X		
	Bike	NM249	4	Bike Boulevard Demonstration Project	NW 32 Ave/NW 41 St	NW 11 Ave/Little River Drive	Bike Boulevard Improvements	X	X		
	Transit	MDT237	4	North Corridor (NW 27 Ave) BRT (excl ROW)	Miami Intermodal Center (MIC)	NW 215 St	Full bus rapid transit	X	X		
	Auto	TP114	4	SR-821 (HEFT)	NW 57 Ave (Red)	Turnpike (Mainline)	Widen to 8 lanes			X	

Appendix B. Scenario Heat Maps

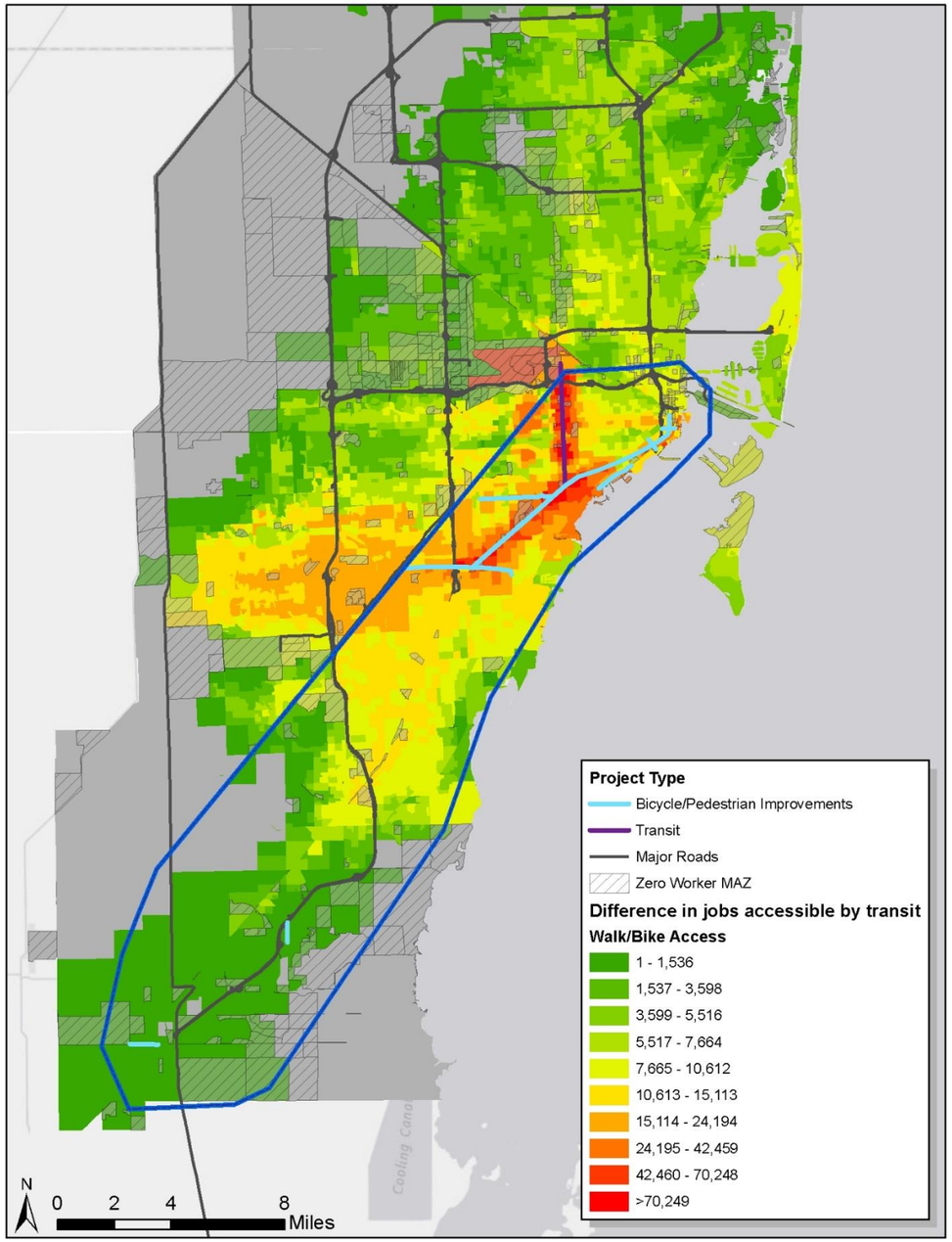
Corridor 1. Scenario 1. Walk Accessibility Delta



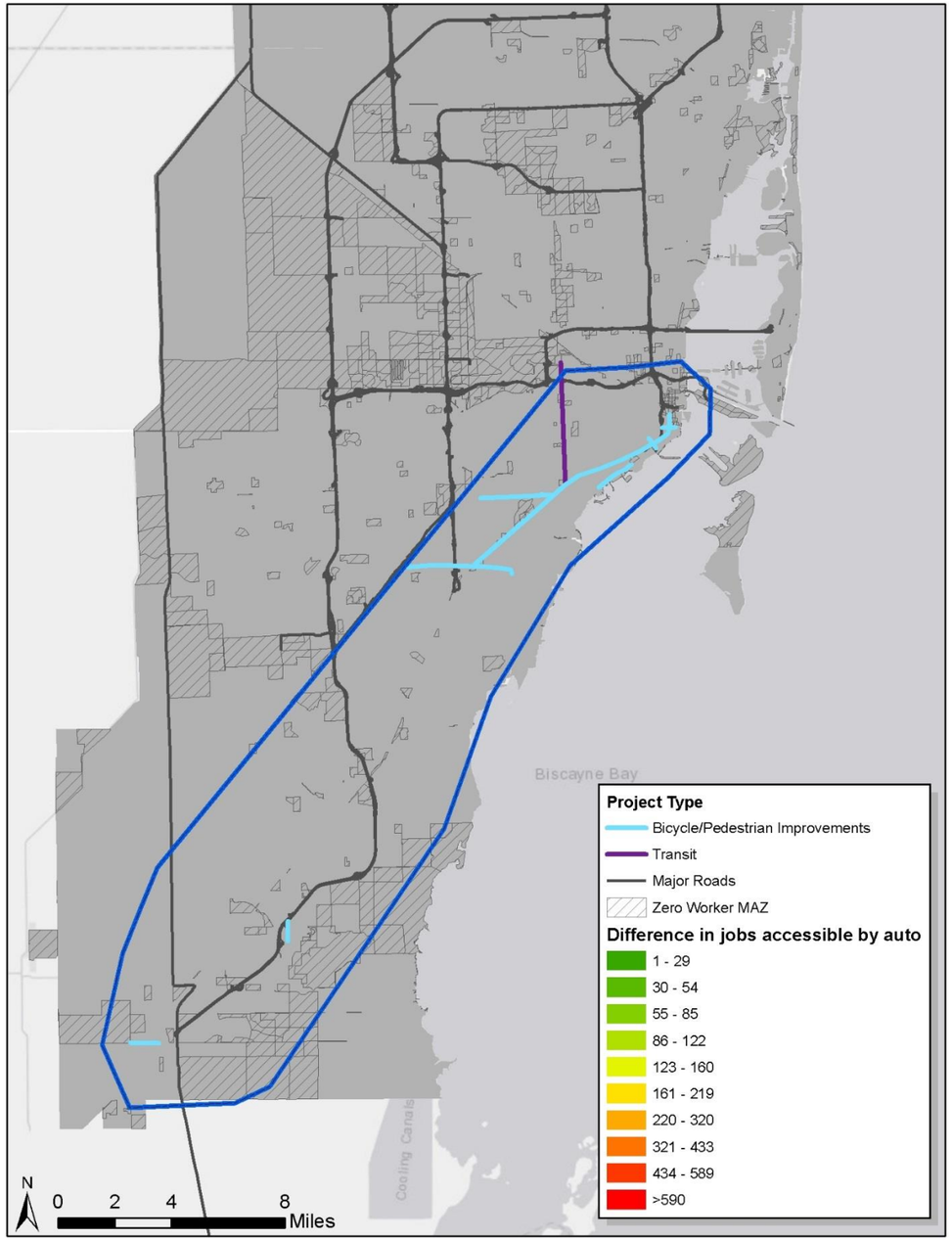
Corridor 1. Scenario 1. Bike Accessibility Delta



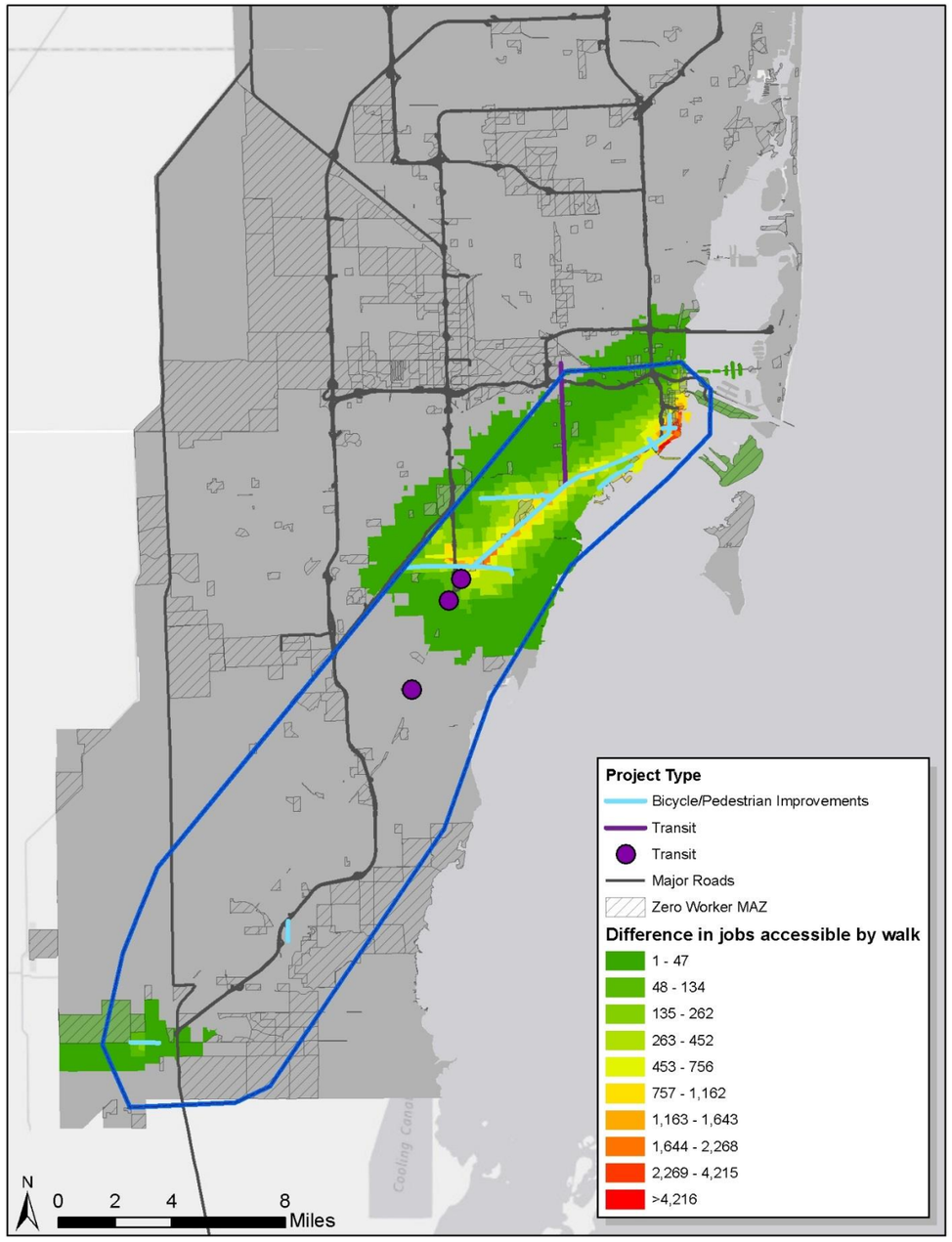
Corridor 1. Scenario 1. Transit Accessibility Delta



Corridor 1. Scenario 1. Auto Accessibility Delta



Corridor 1. Scenario 2. Walk Accessibility Delta



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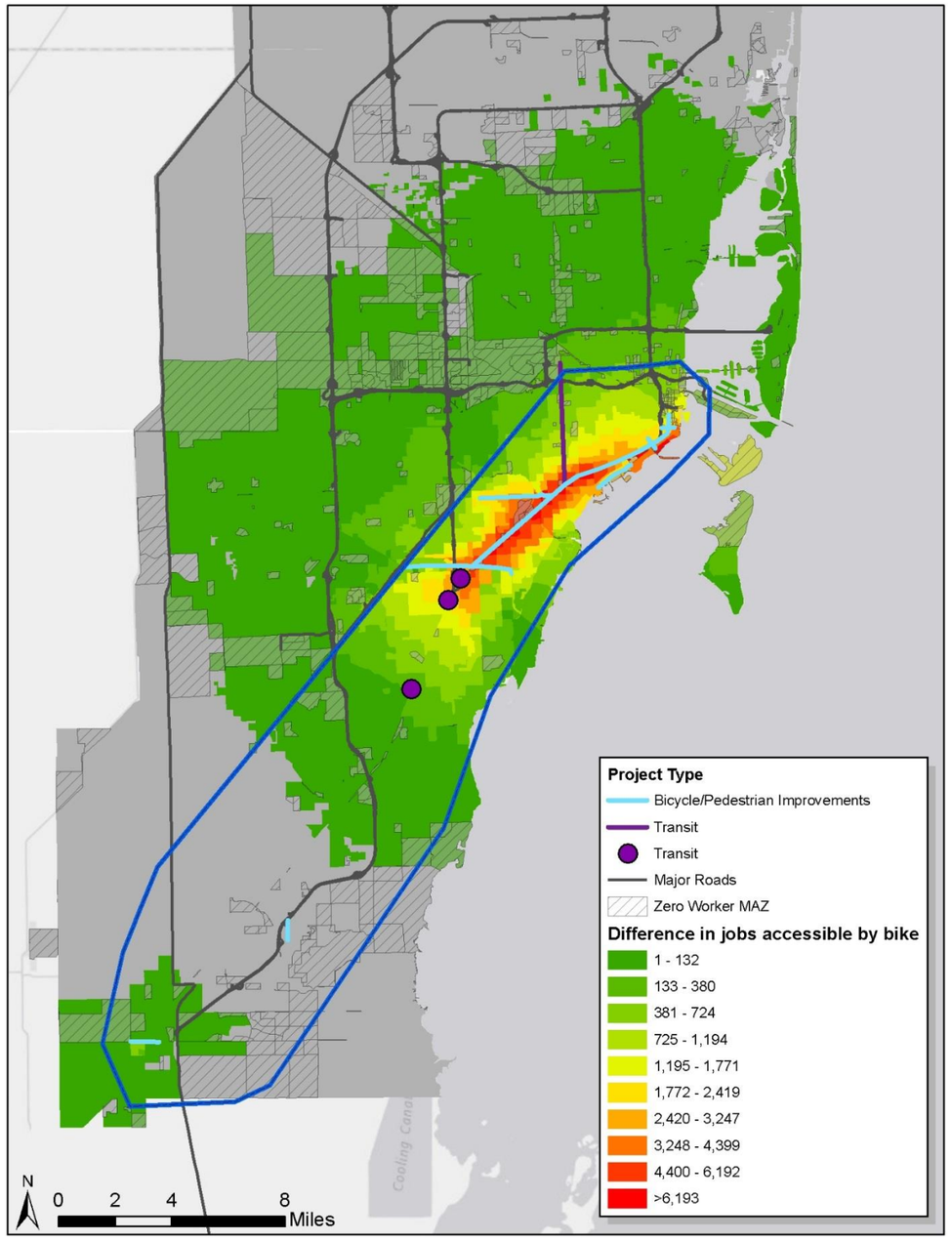

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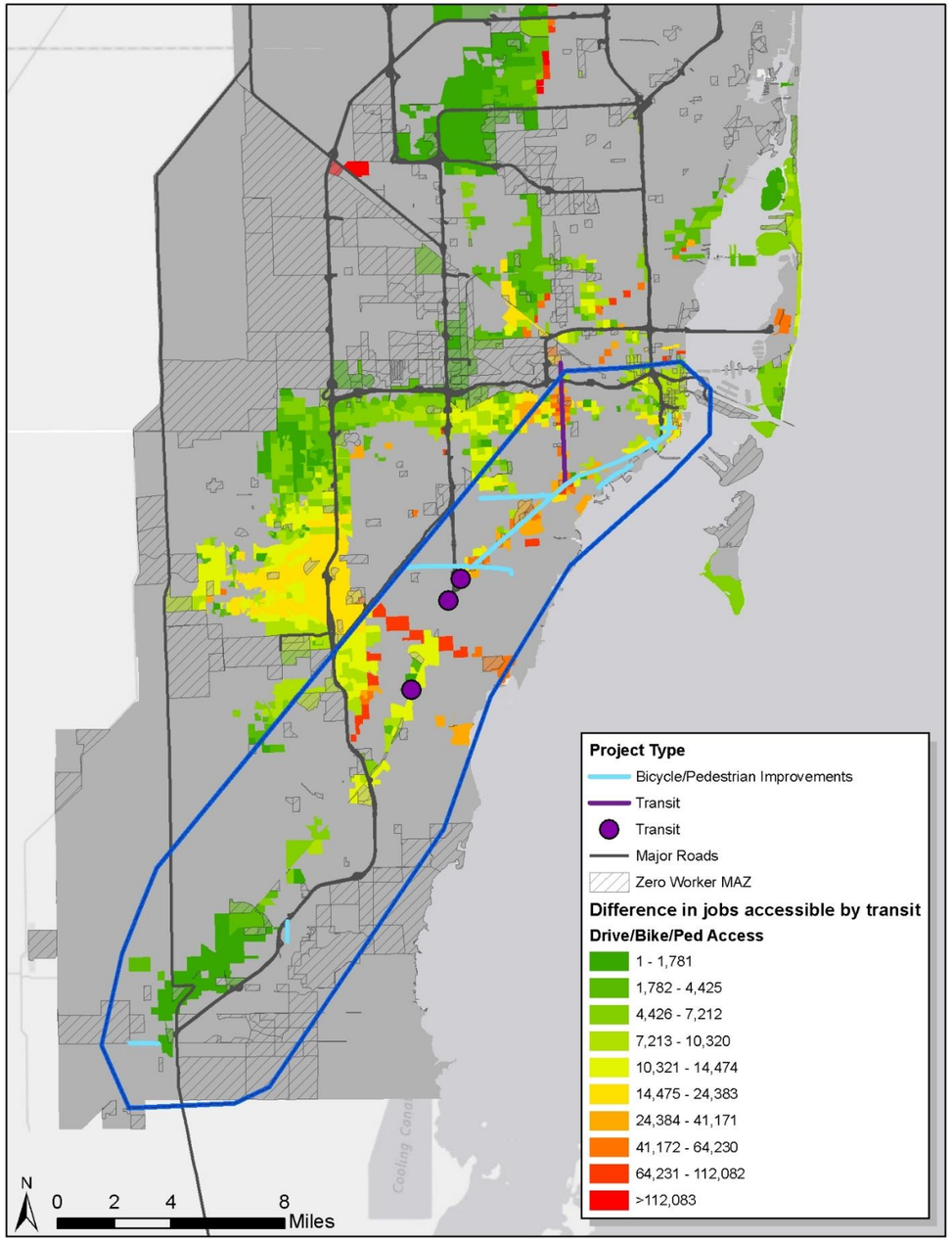

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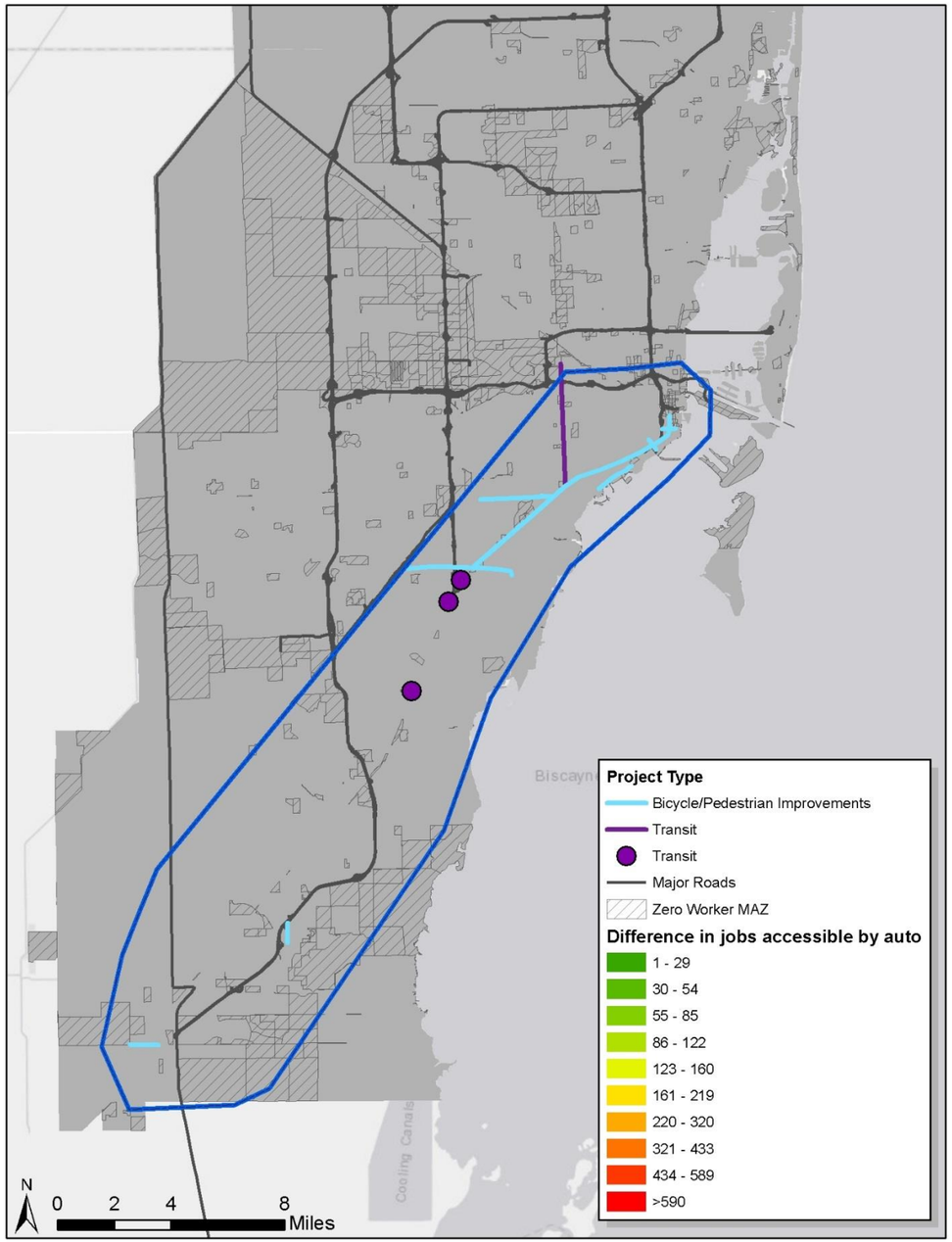
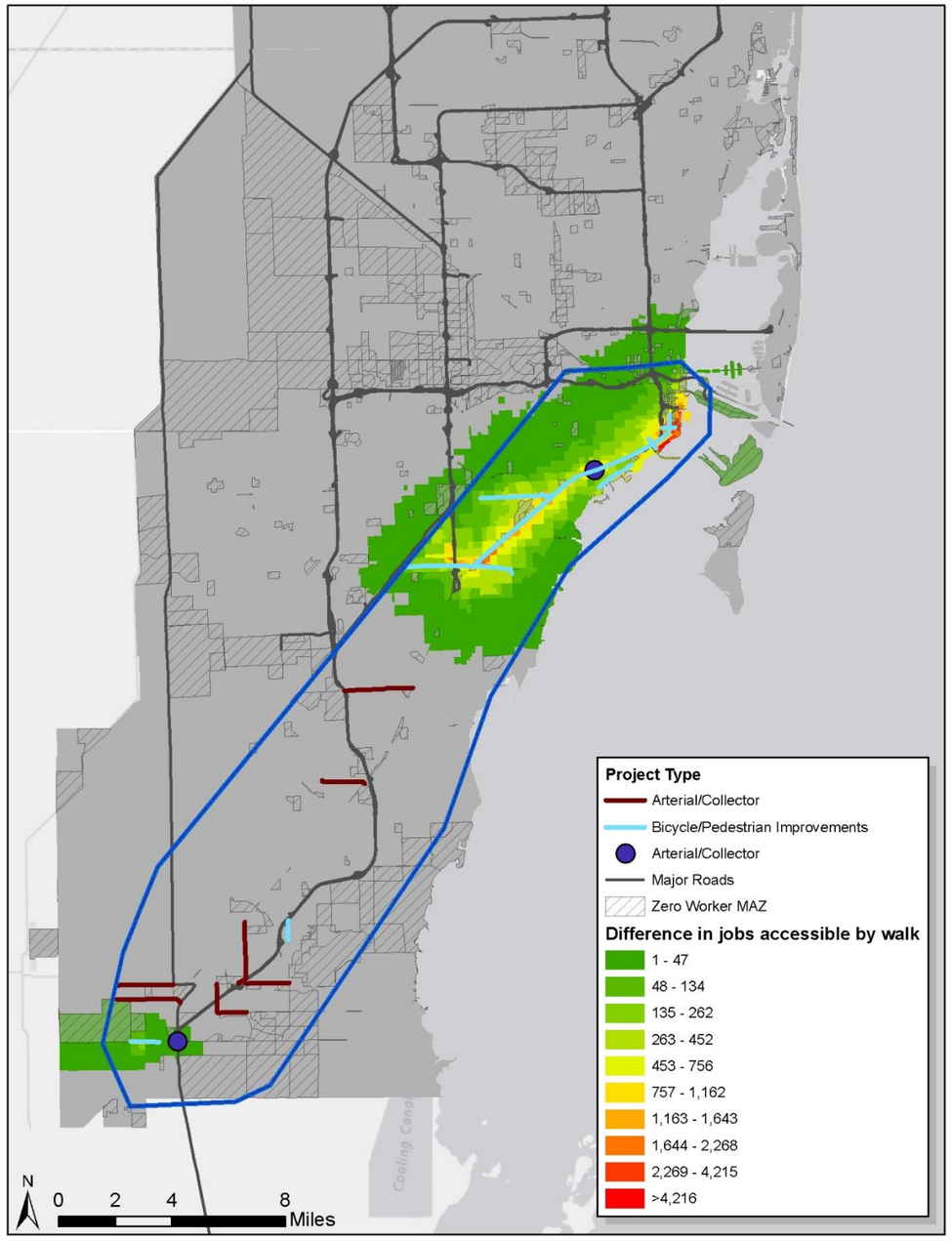
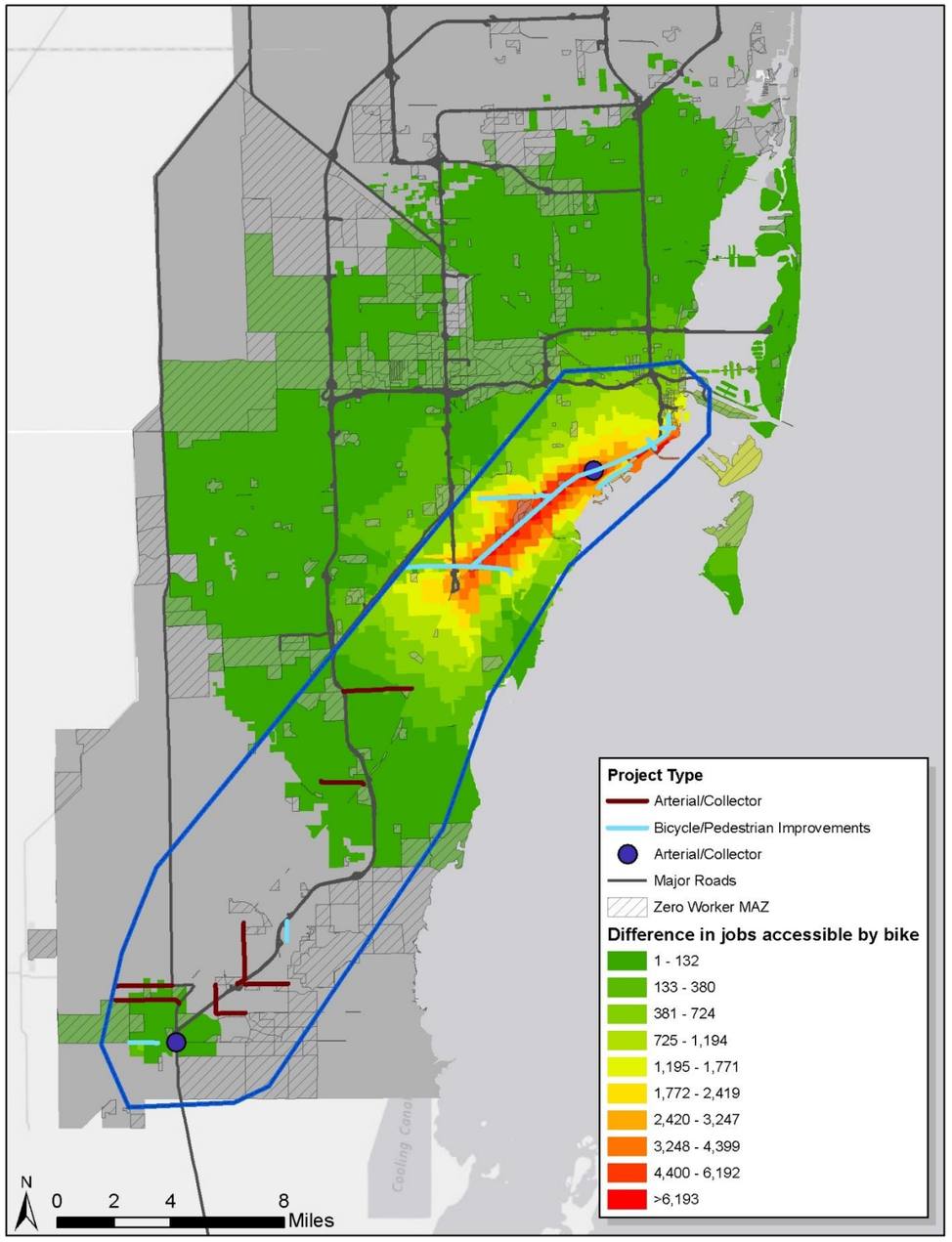


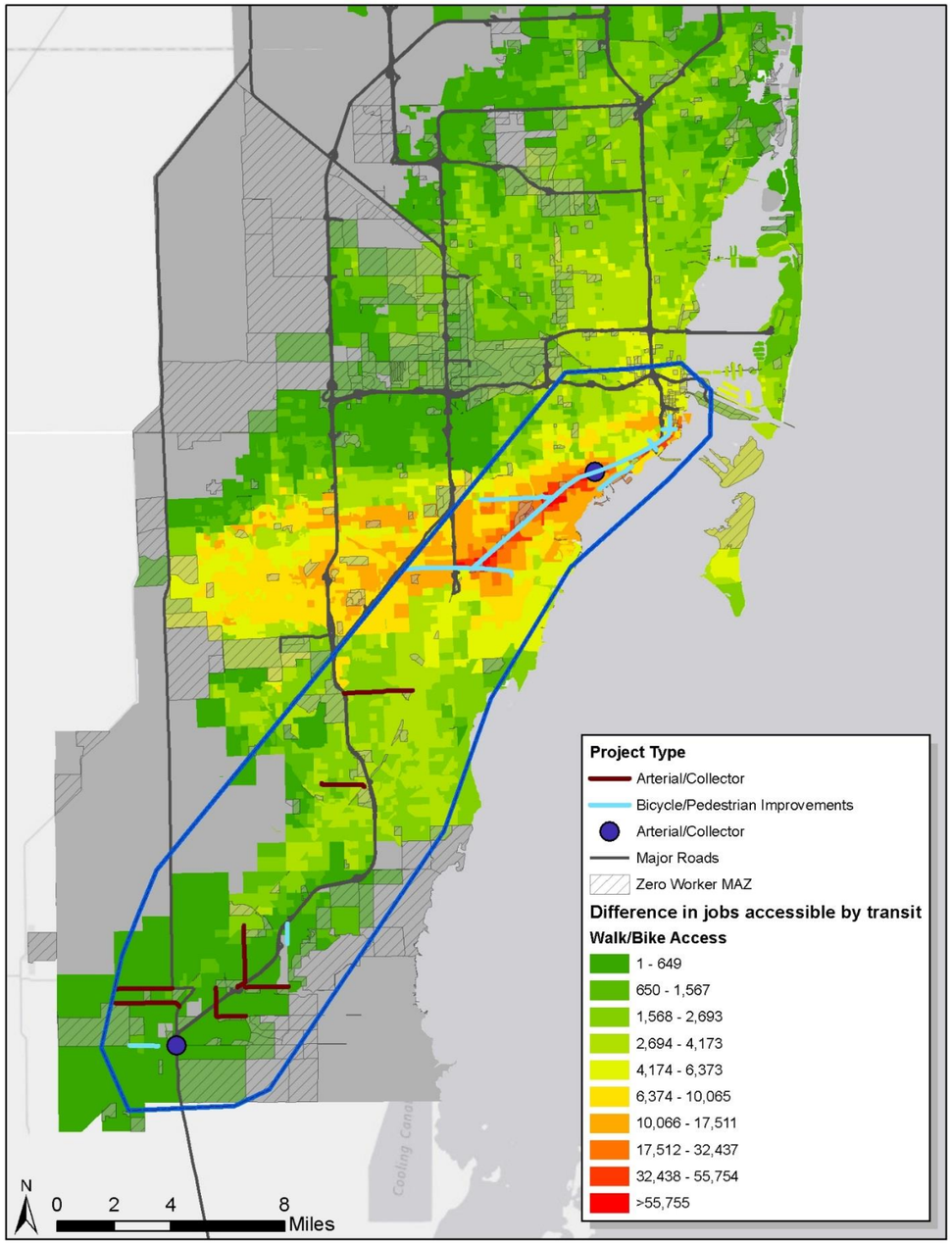
Corridor 1. Scenario 4. Walk Accessibility Delta



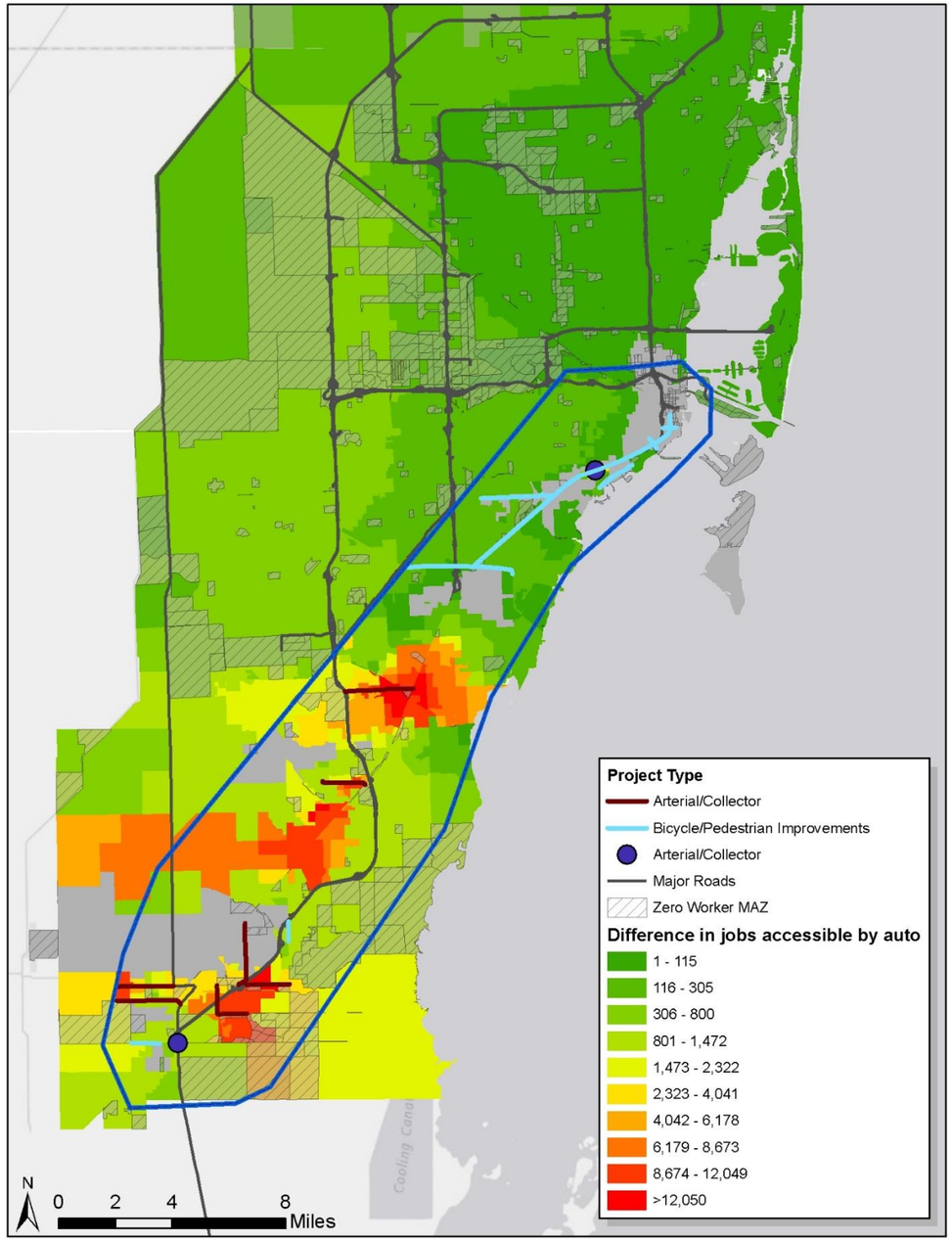
Corridor 1. Scenario 4. Bike Accessibility Delta



Corridor 1. Scenario 4. Transit Accessibility Delta



Corridor 1. Scenario 4. Auto Accessibility Delta



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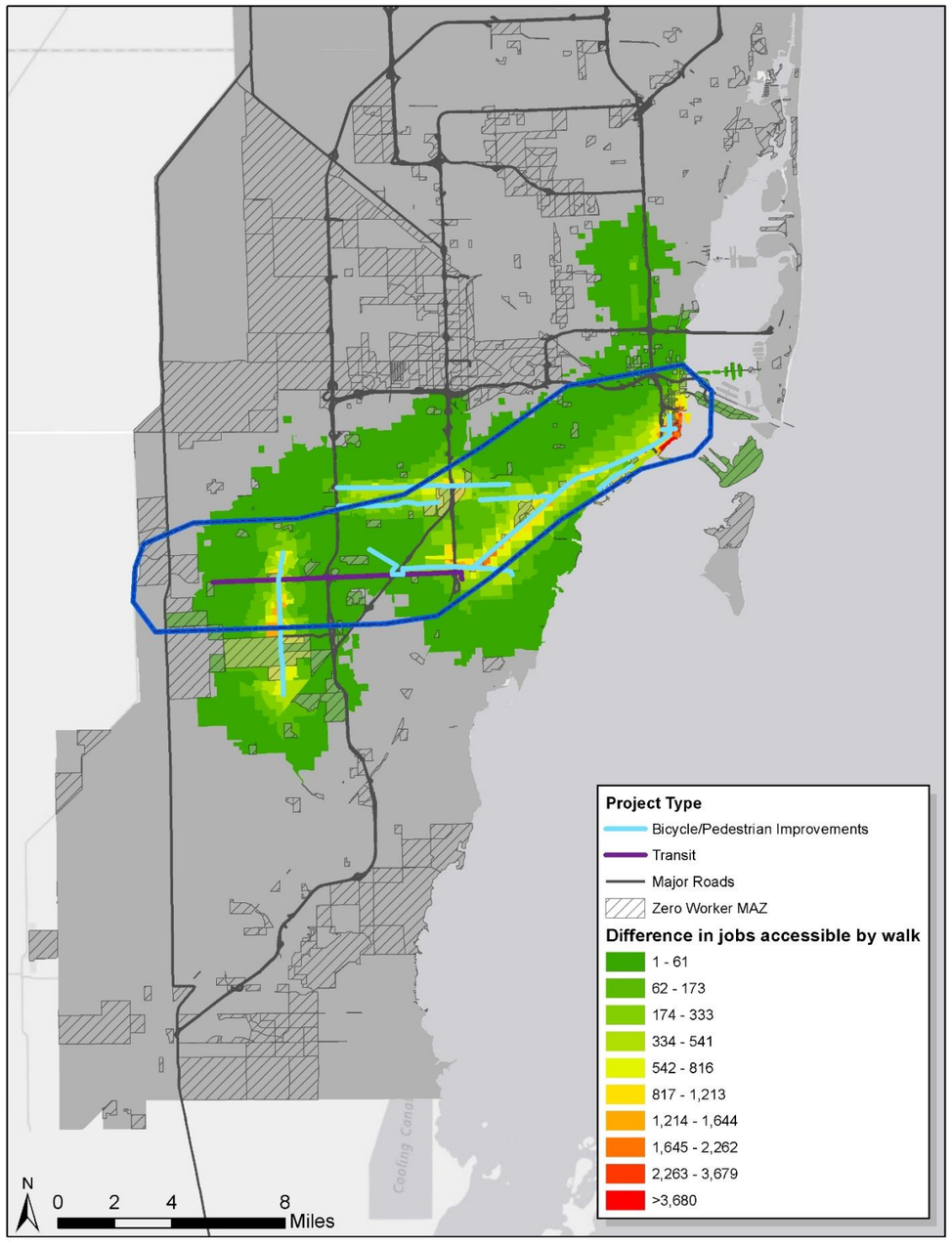

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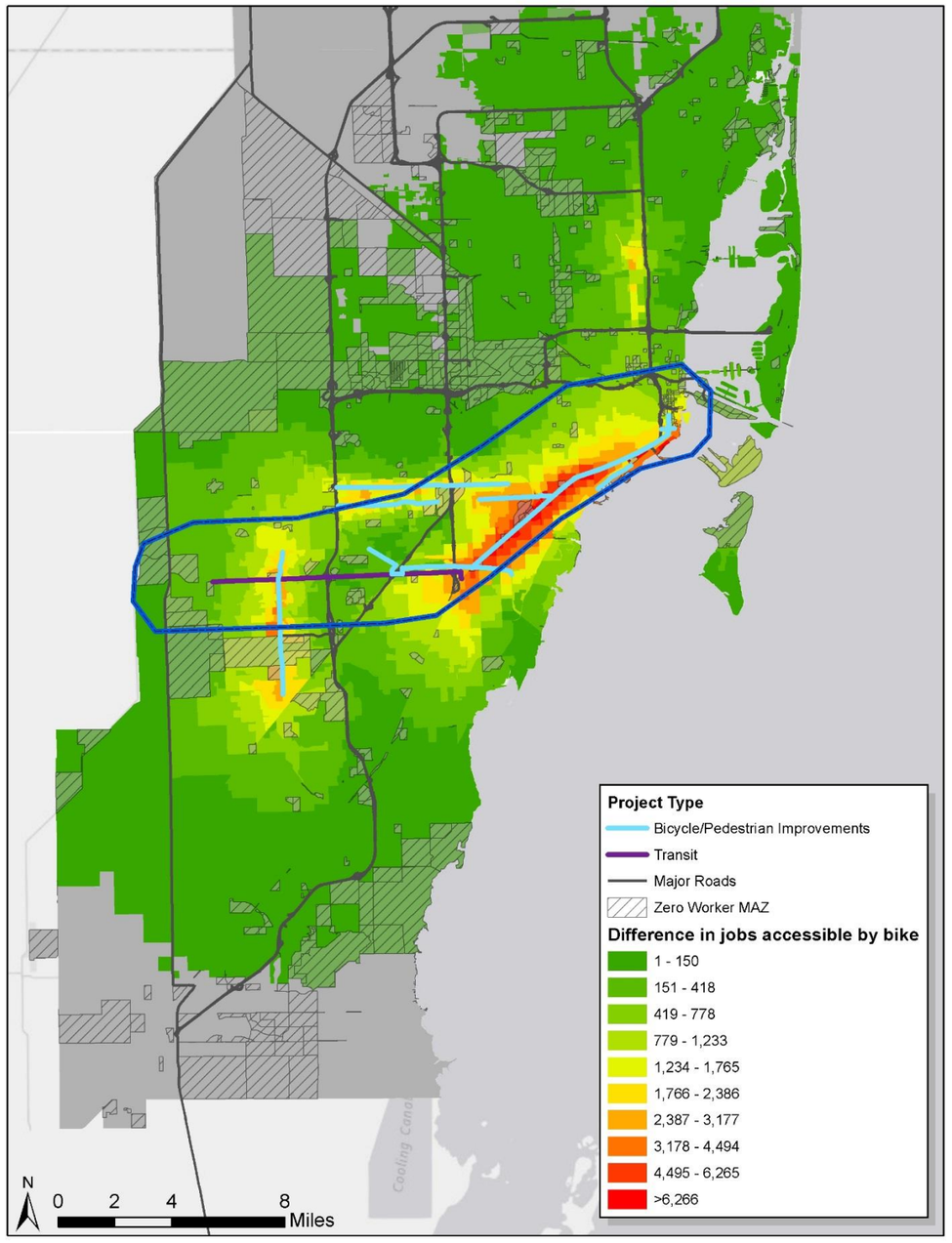

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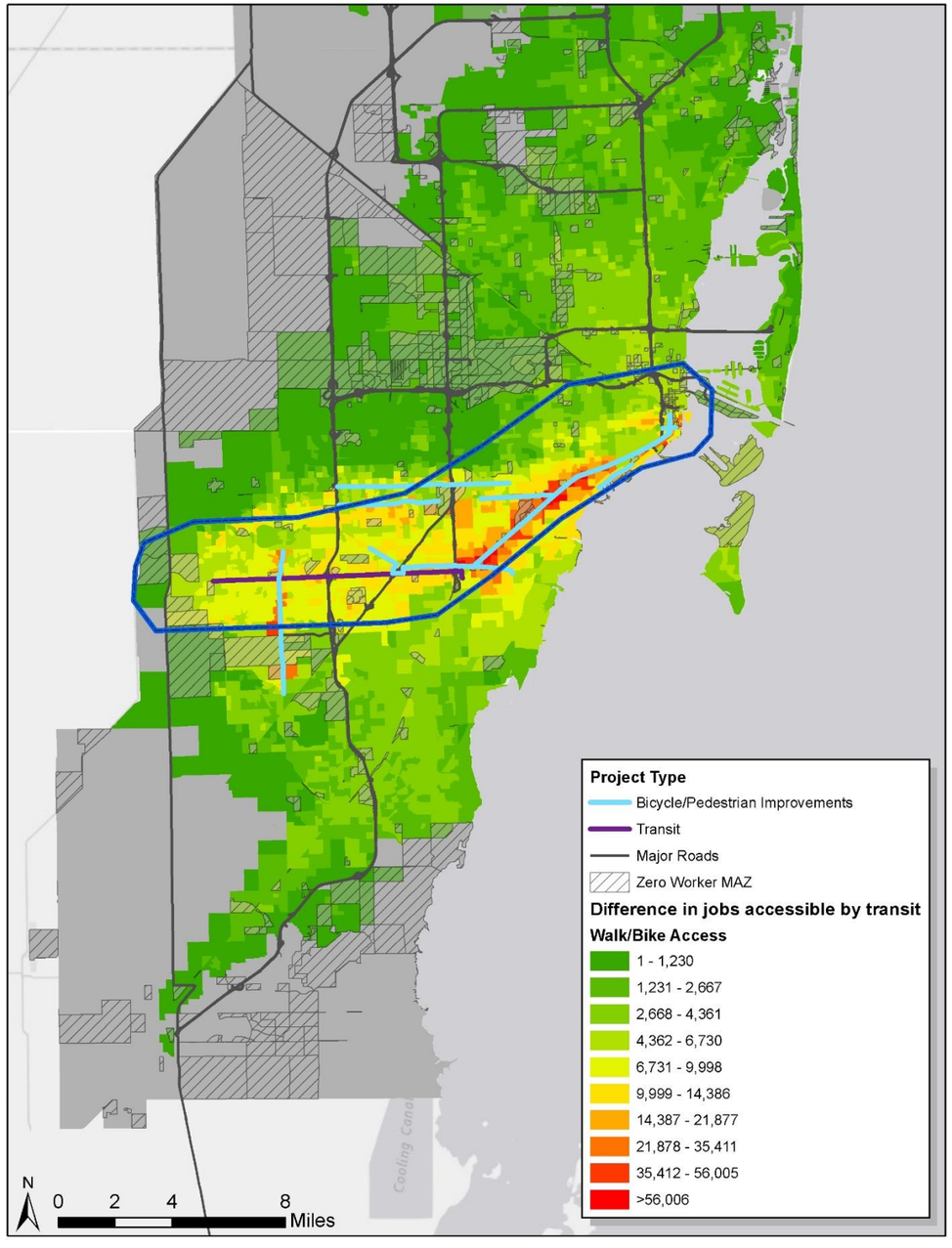
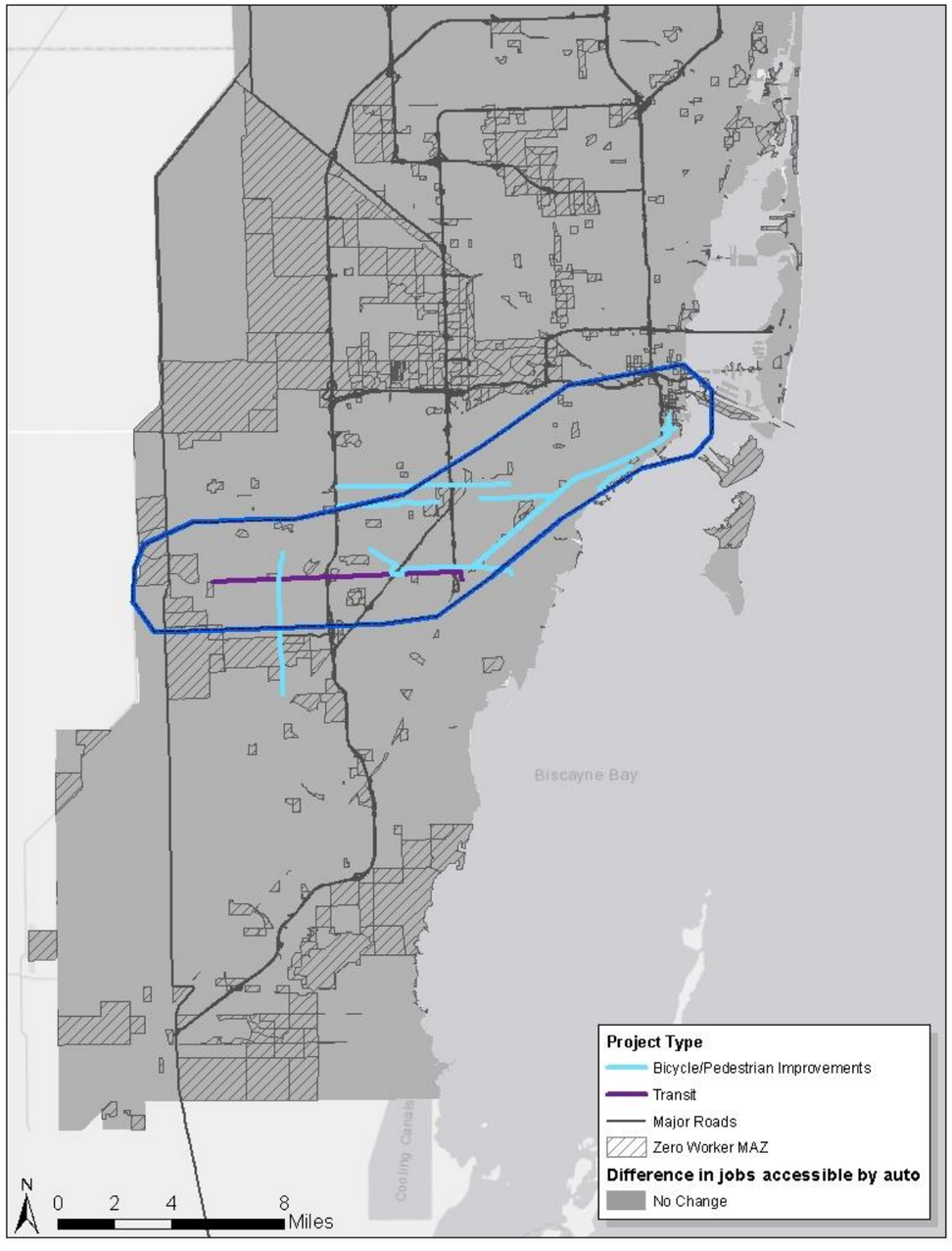
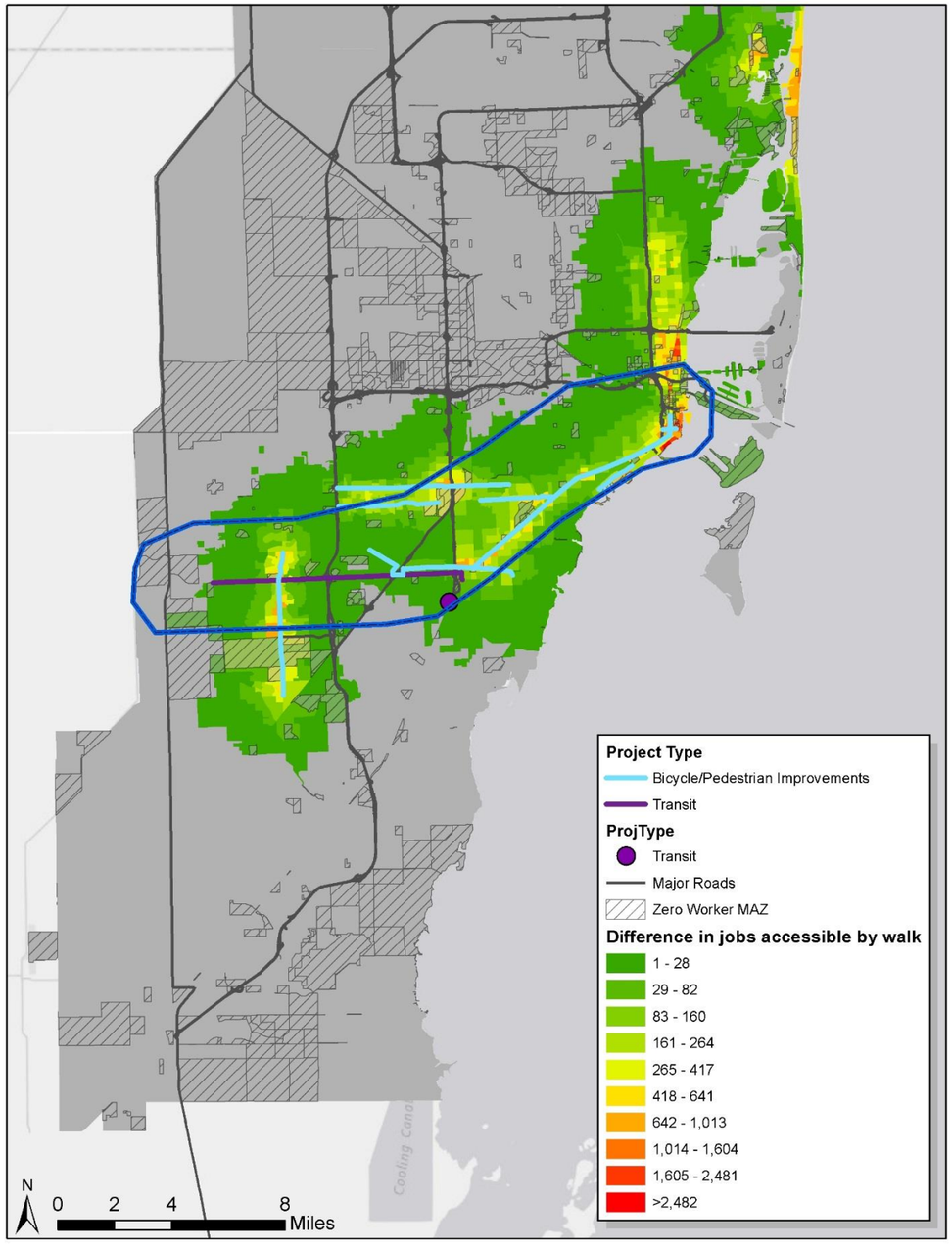


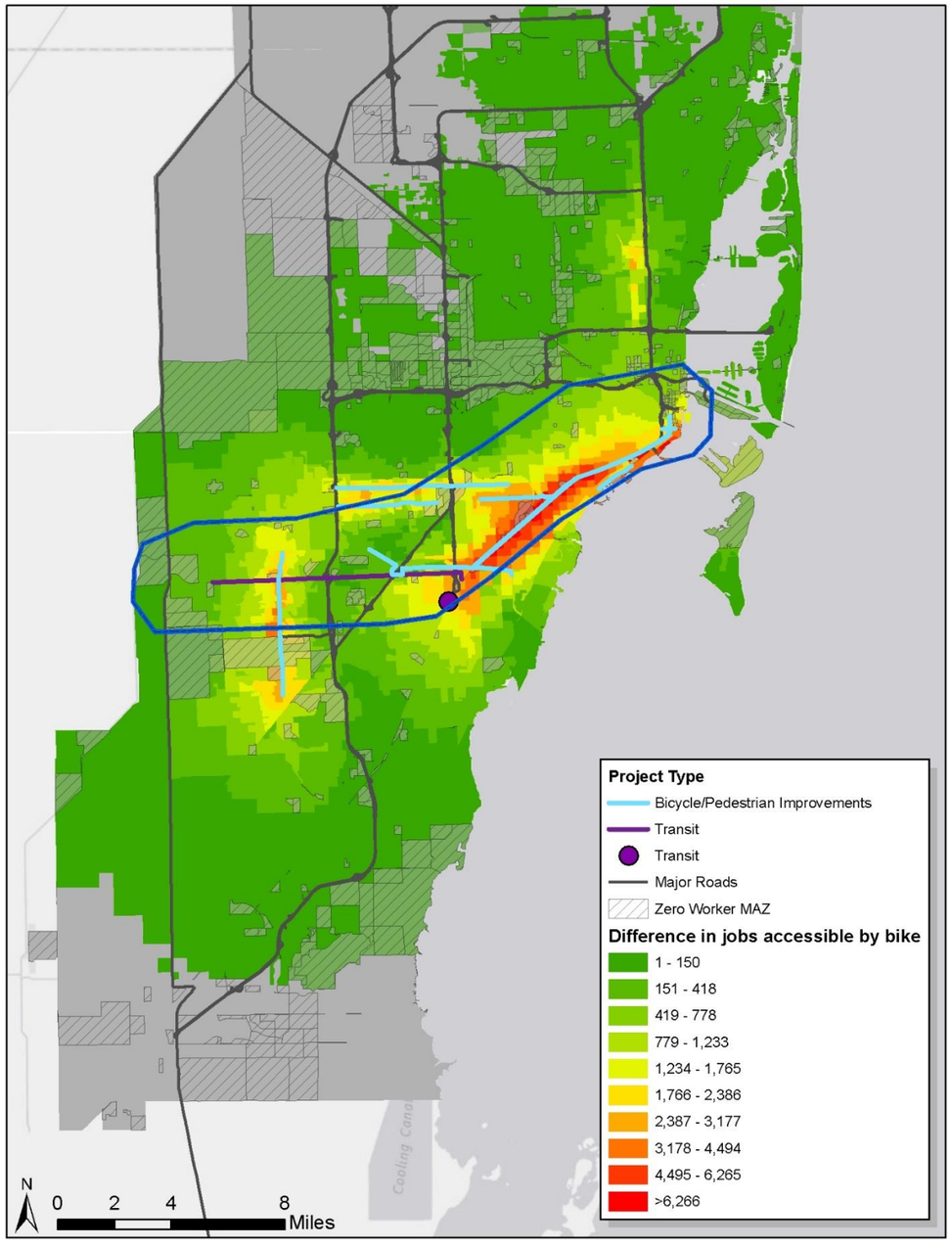
Corridor 2. Scenario 1. Auto Accessibility Delta



Corridor 2. Scenario 2. Walk Accessibility Delta



Corridor 2. Scenario 2. Bike Accessibility Delta



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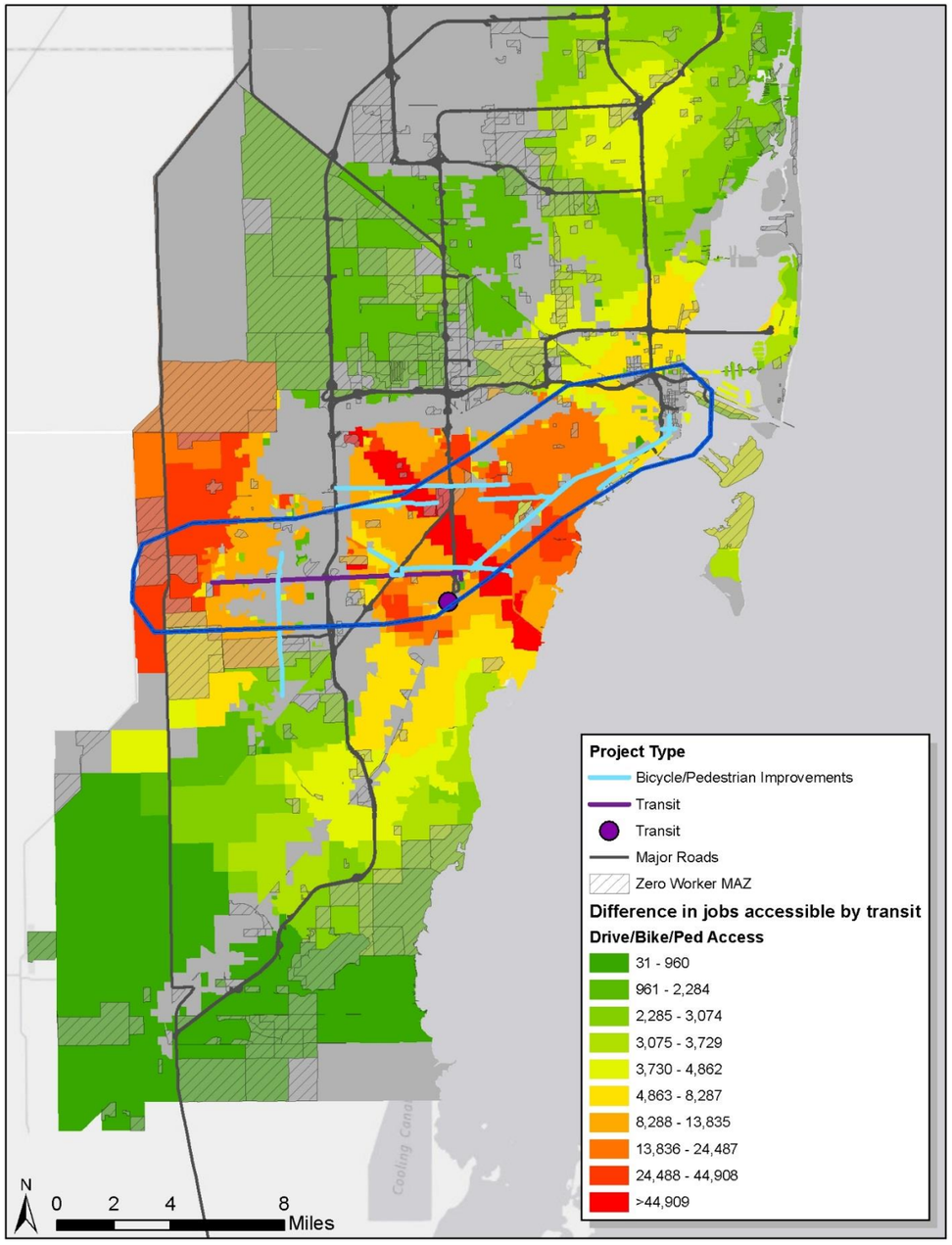

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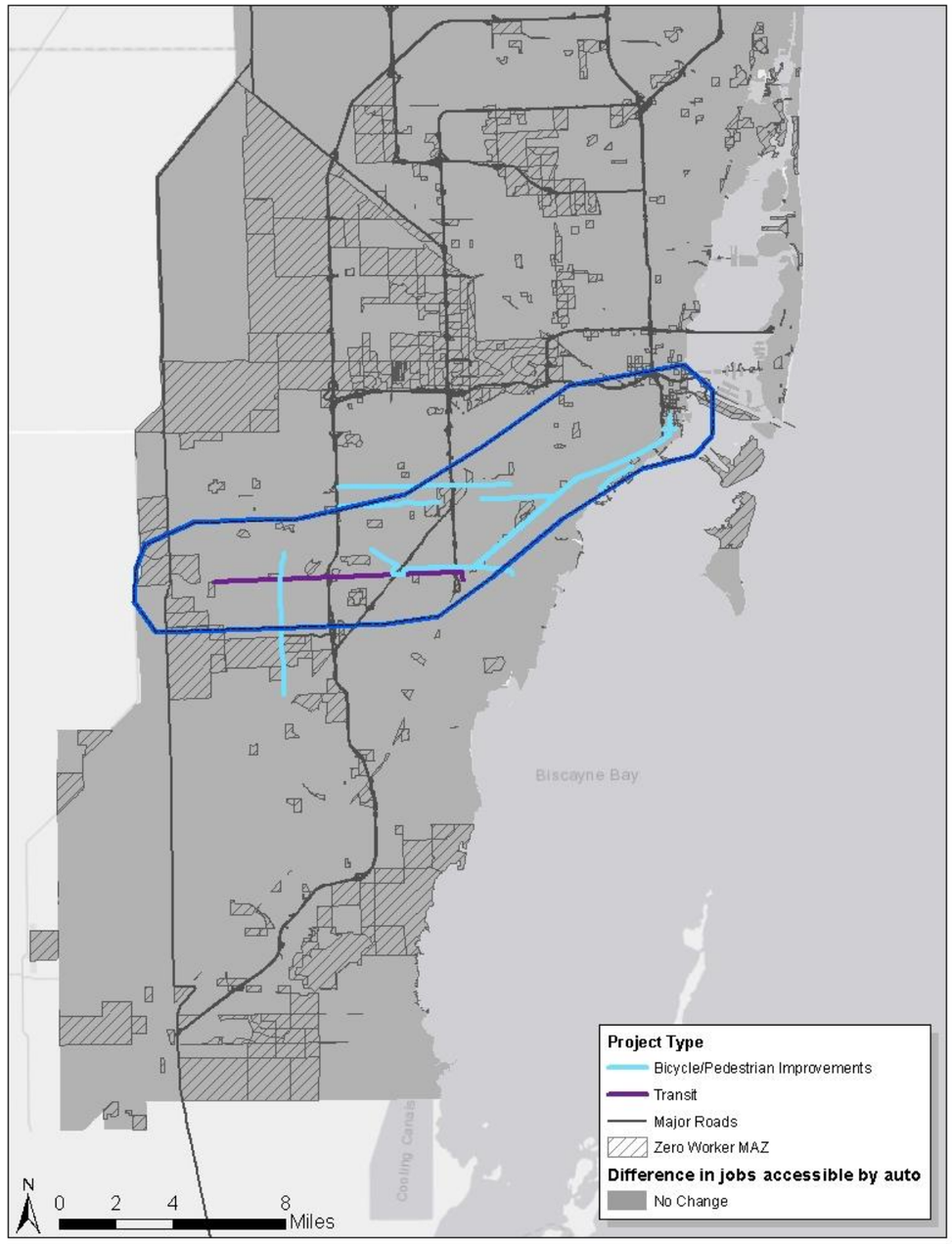
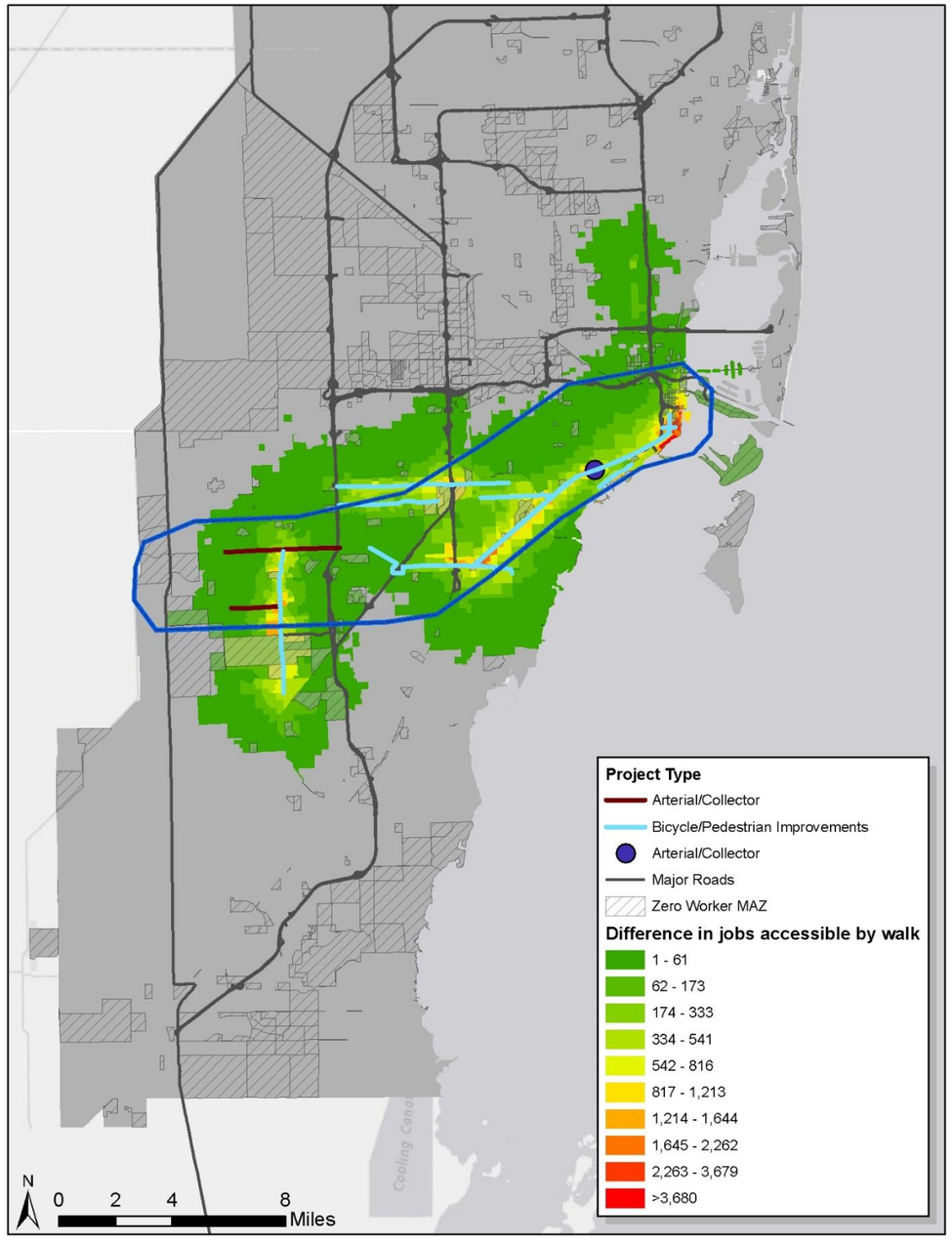
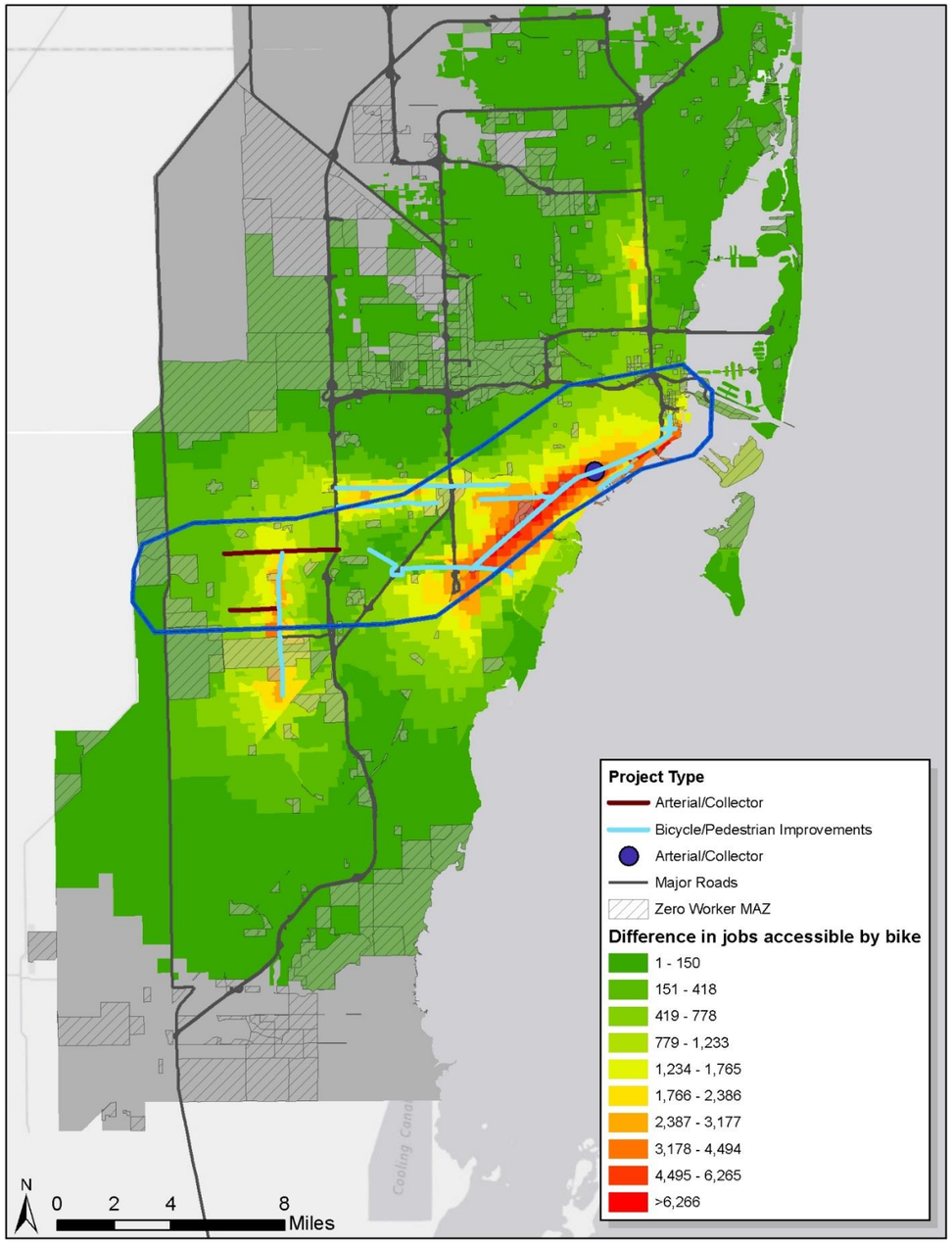


Corridor 2. Scenario 4. Walk Accessibility Delta



Corridor 2. Scenario 4. Bike Accessibility Delta



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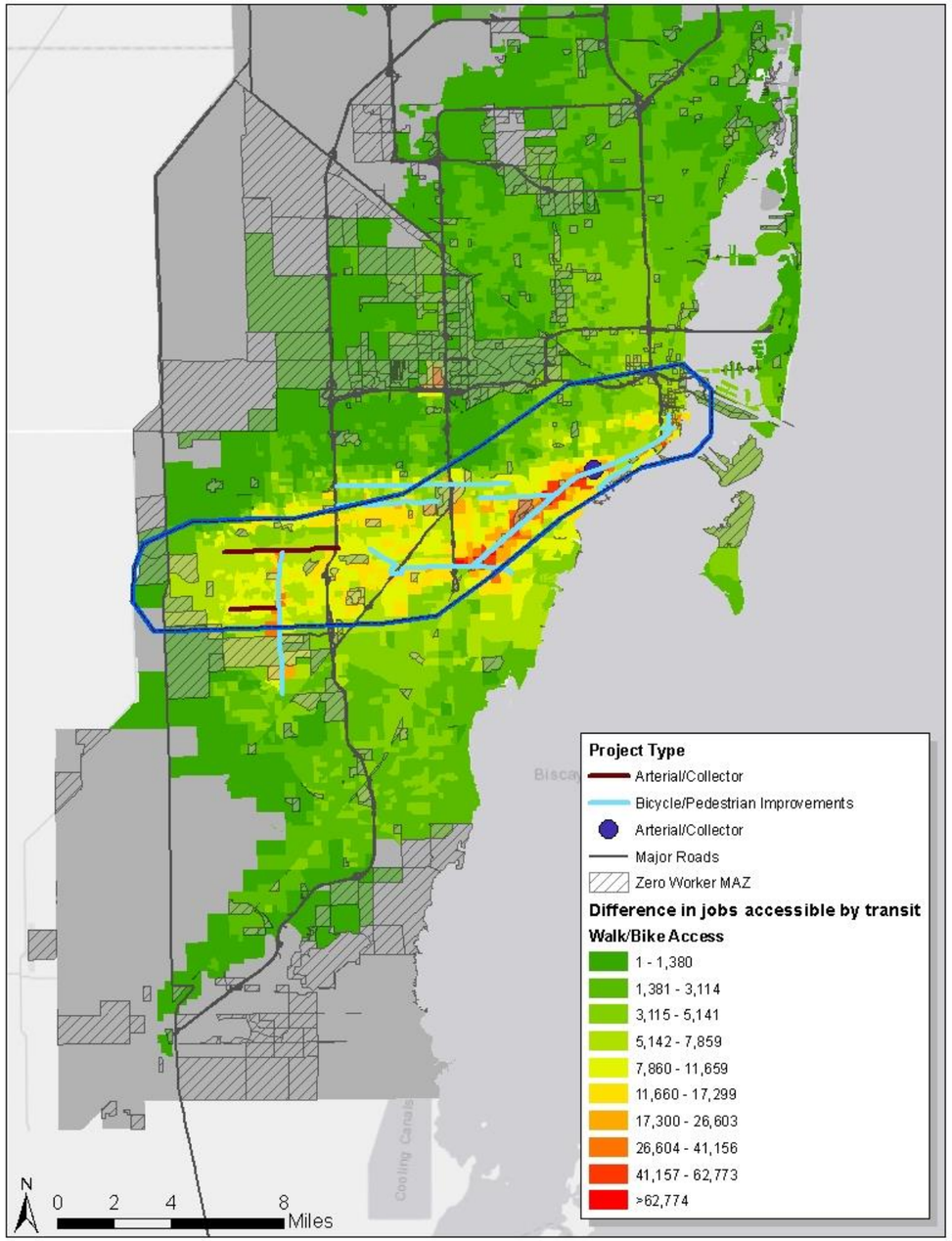

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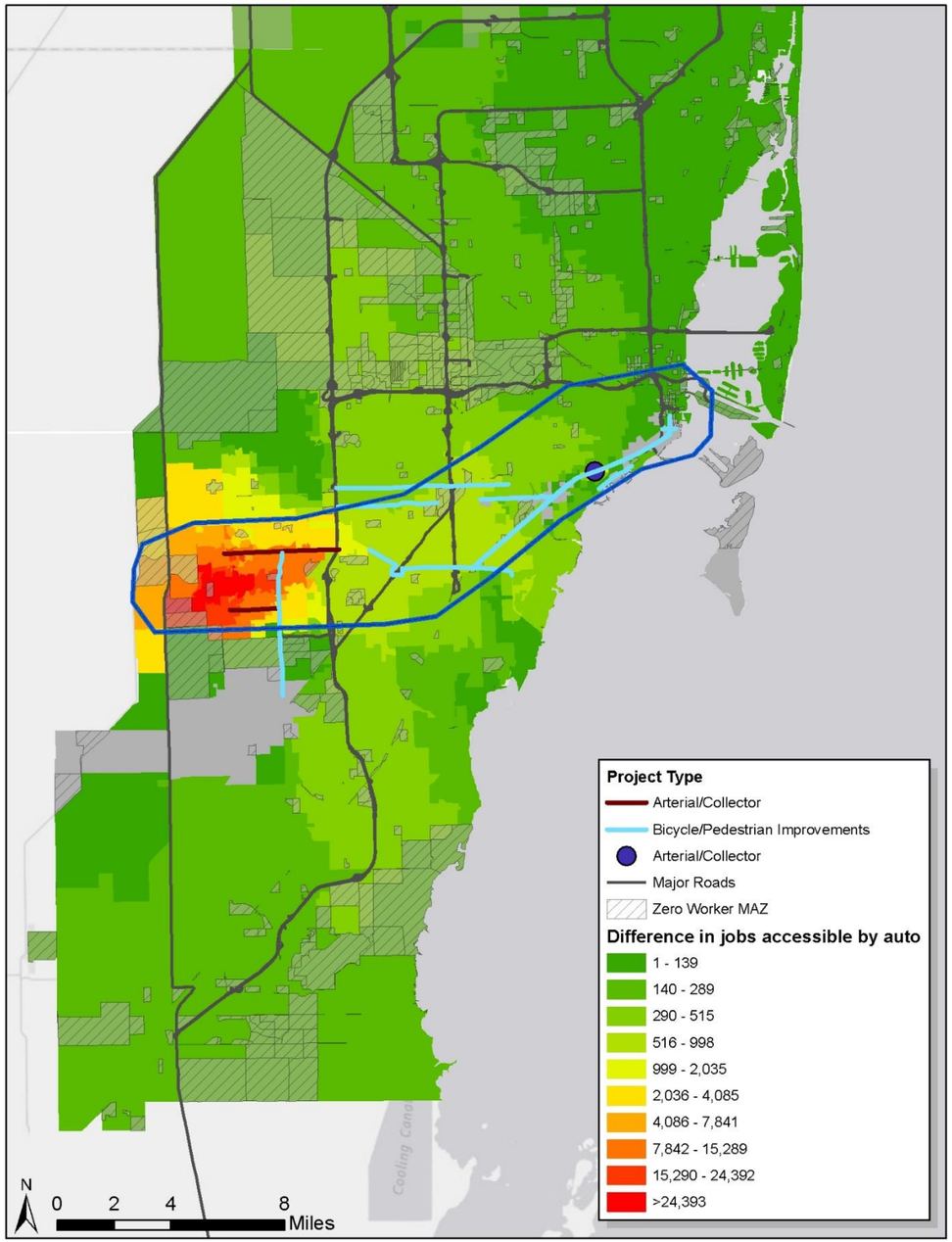
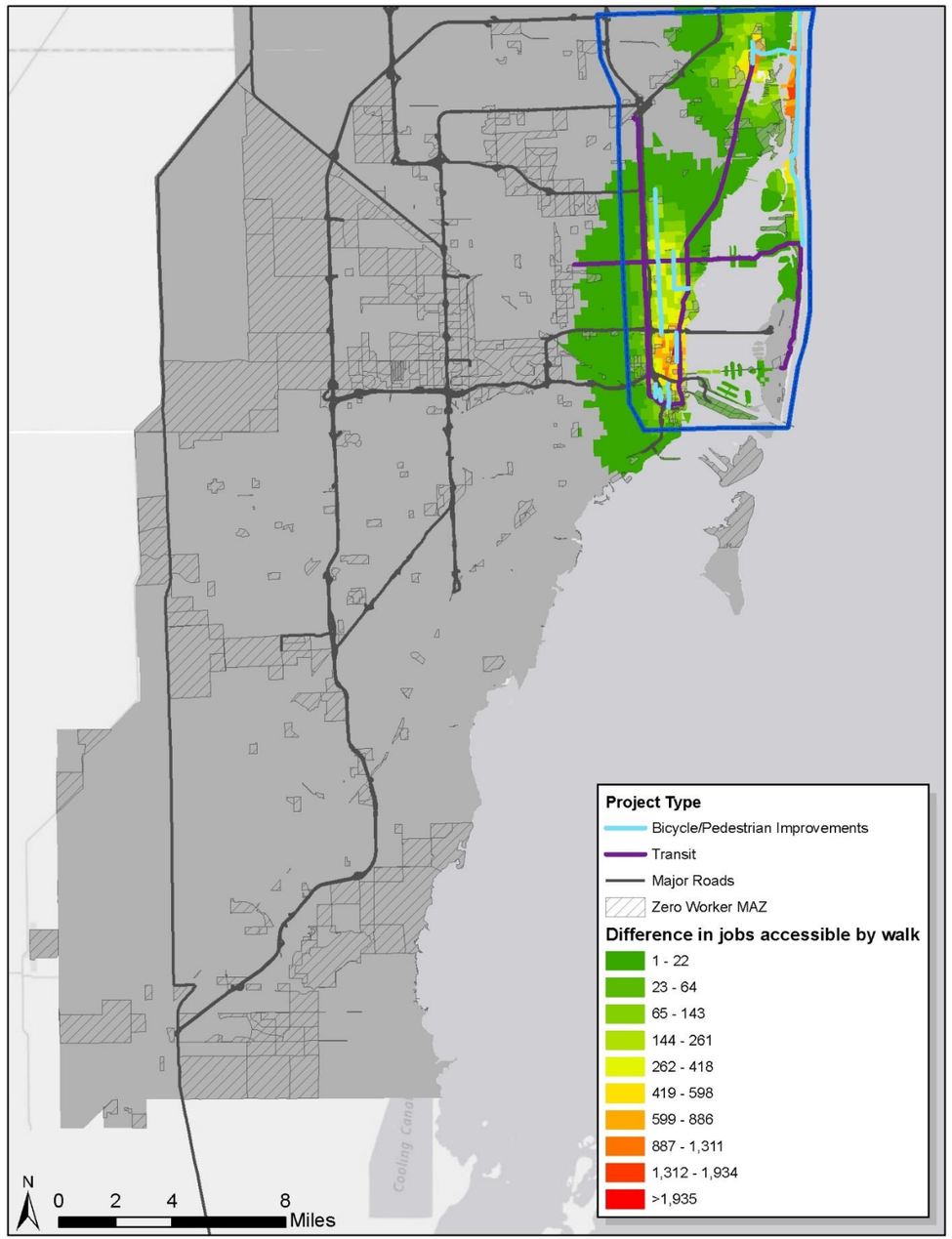


Corridor 3. Scenario 1. Walk Accessibility Delta



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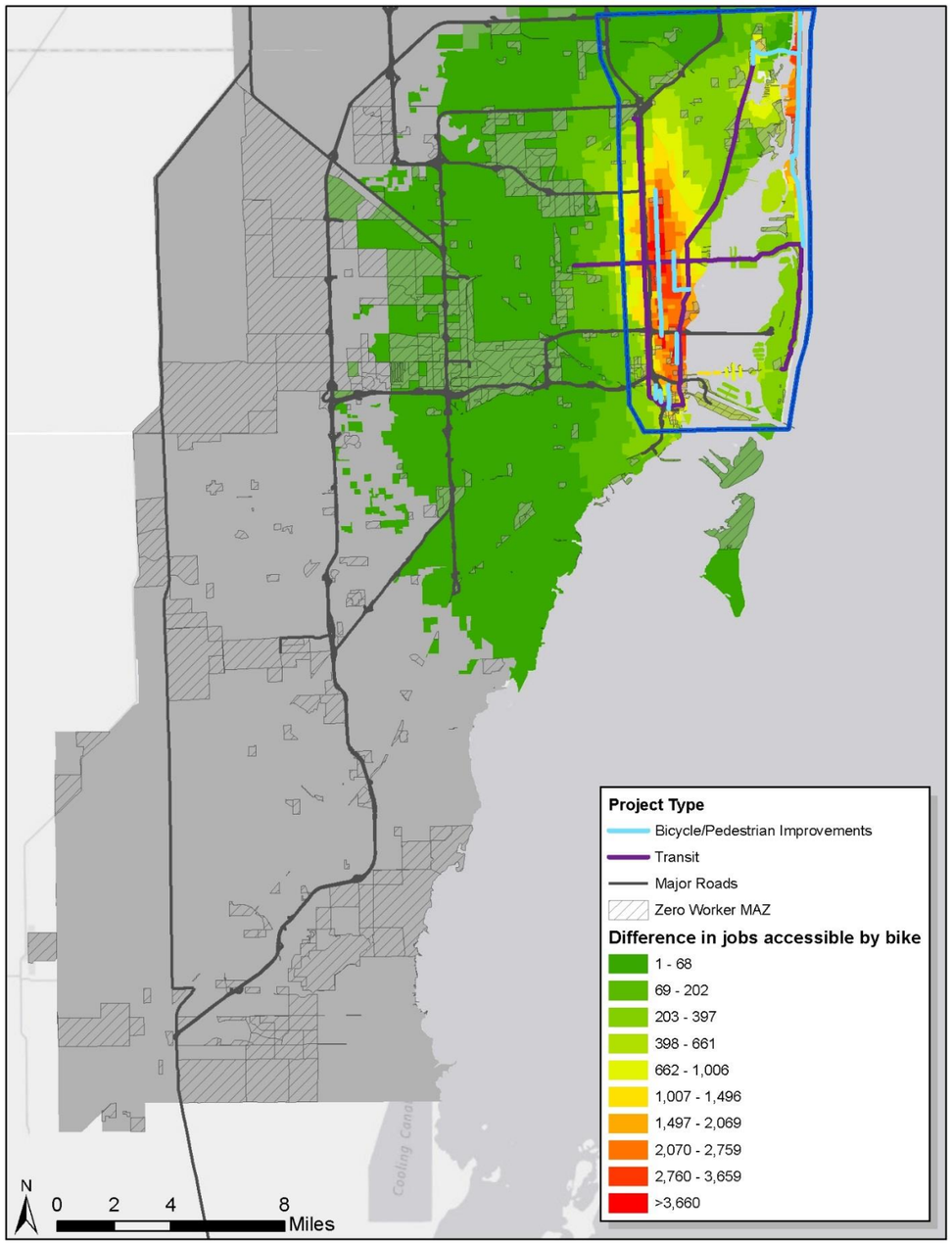

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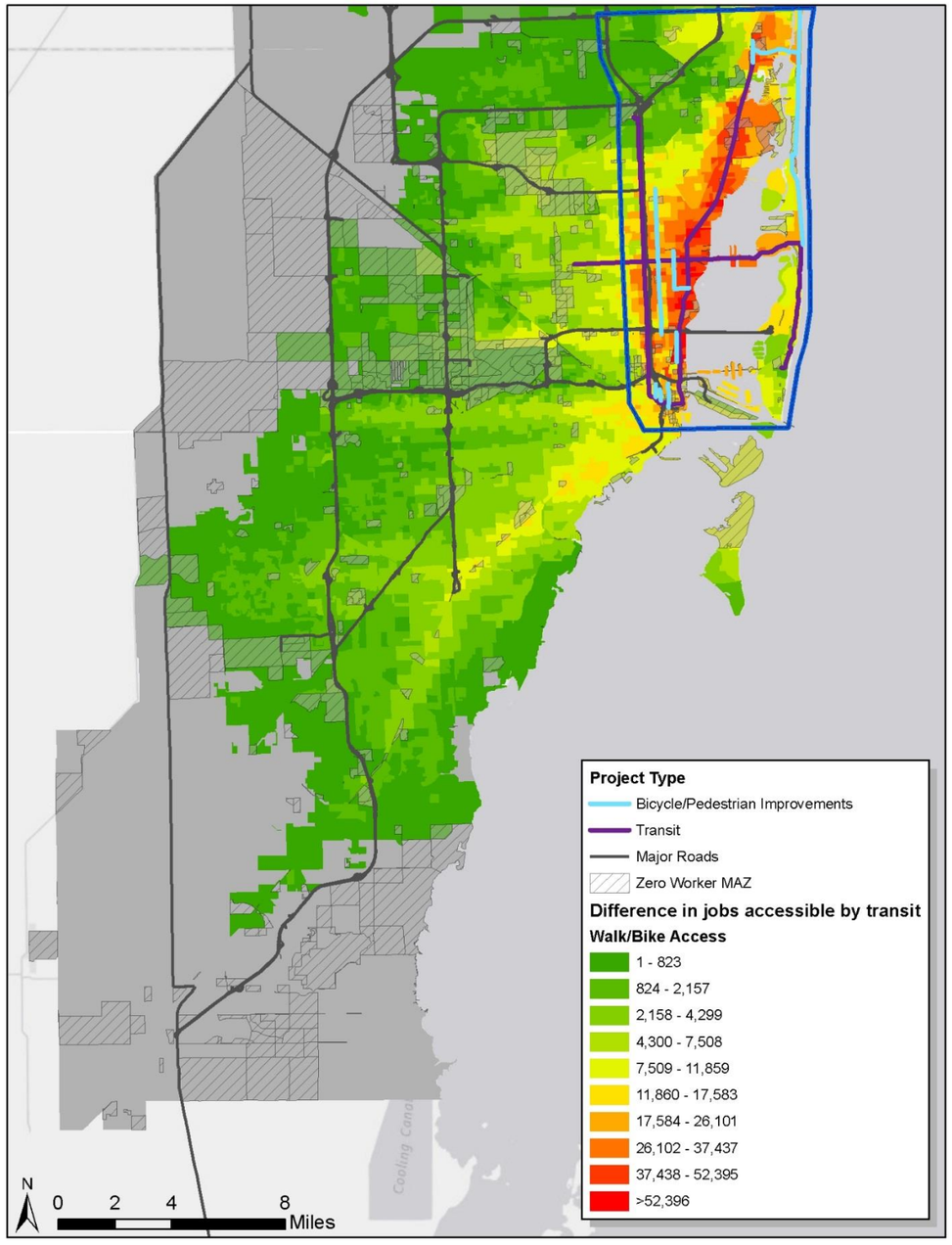
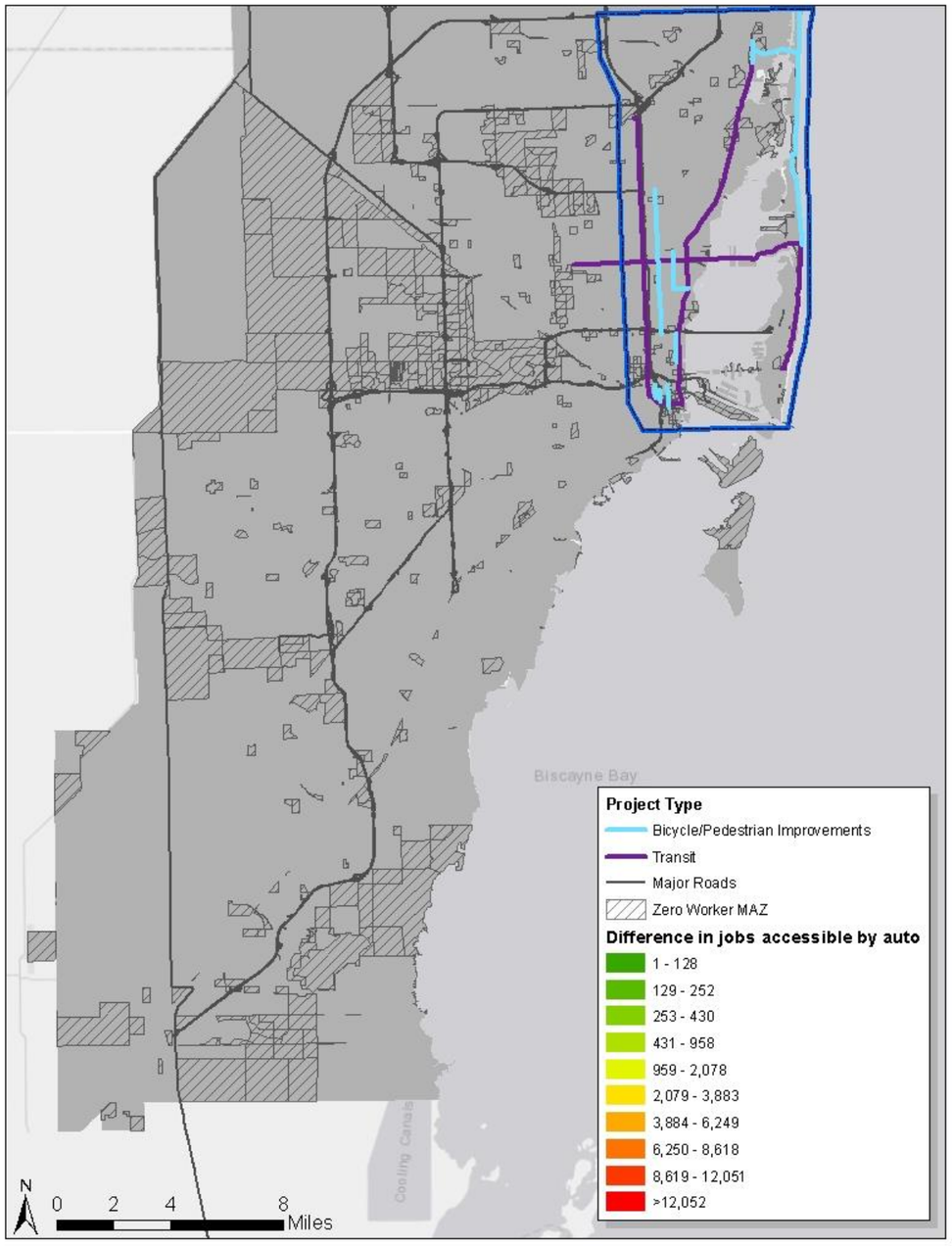


Corridor 3. Scenario 1. Auto Accessibility Delta



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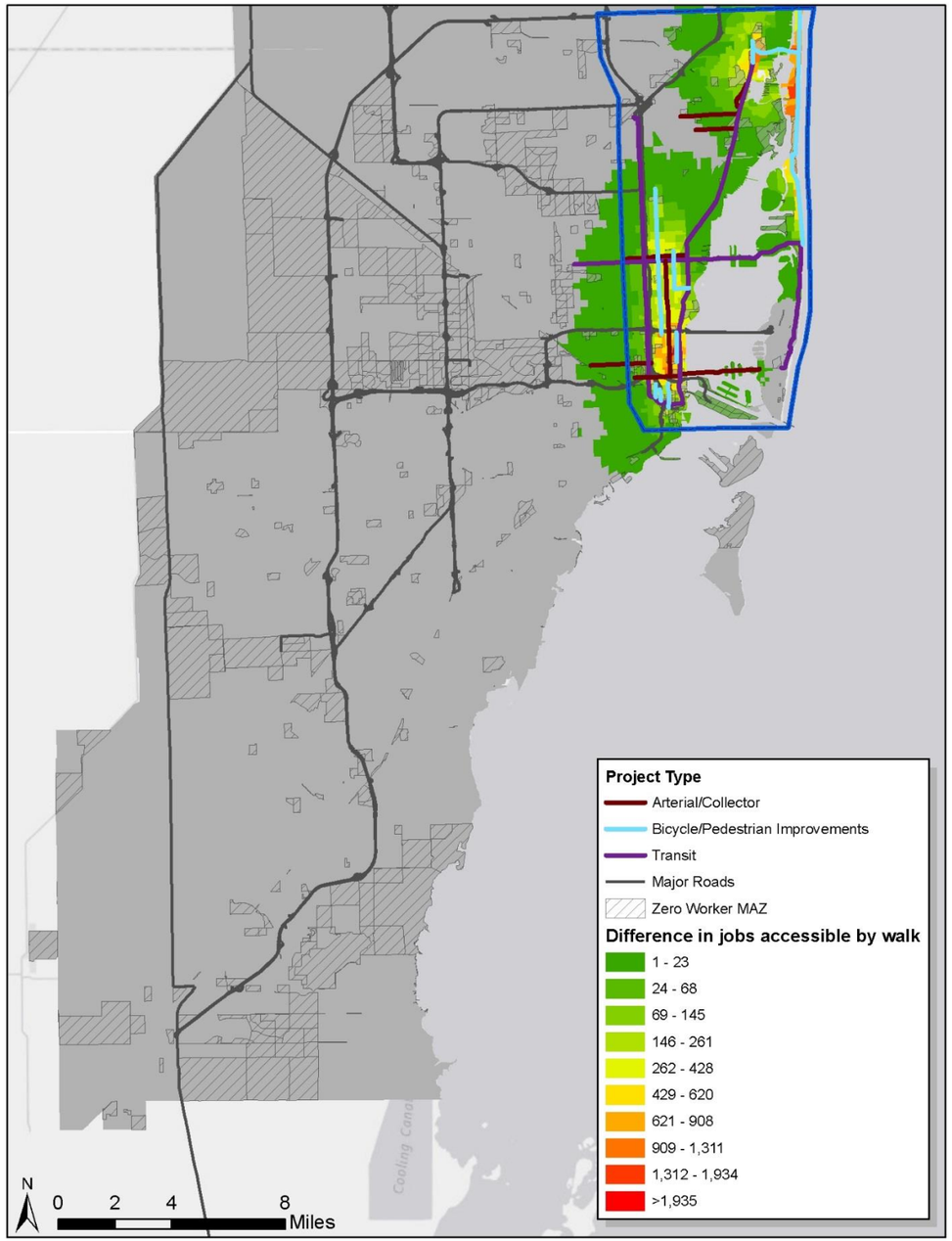

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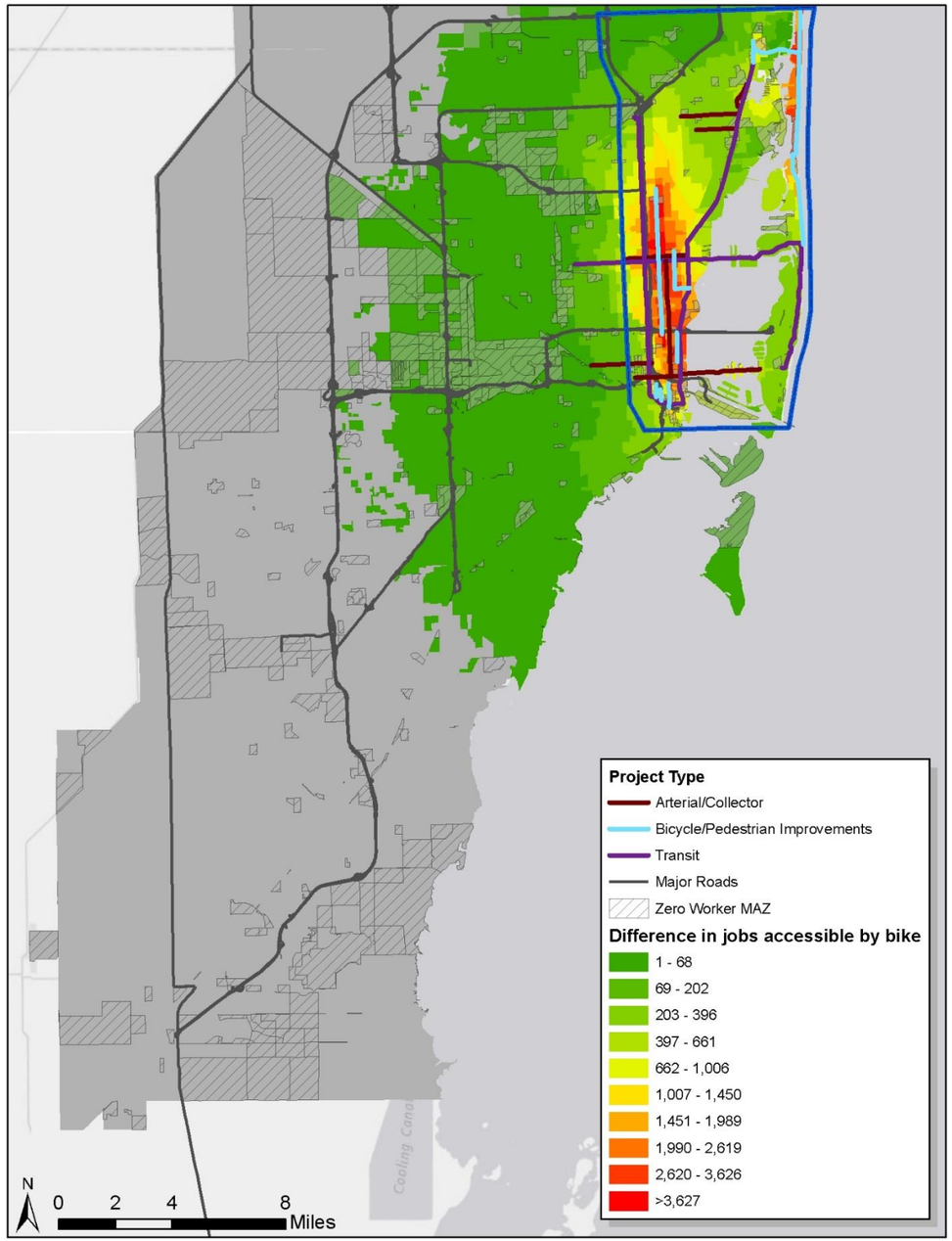
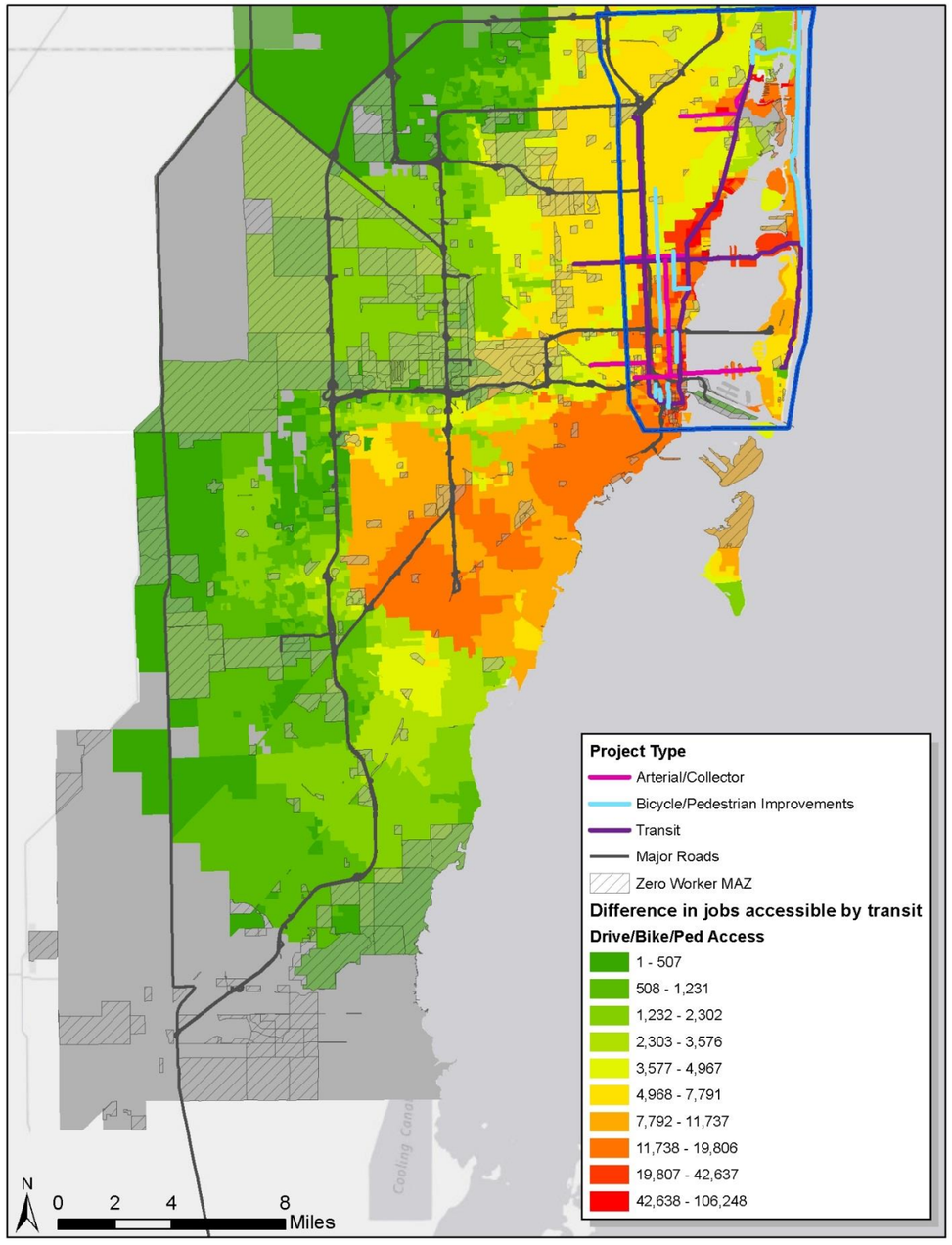
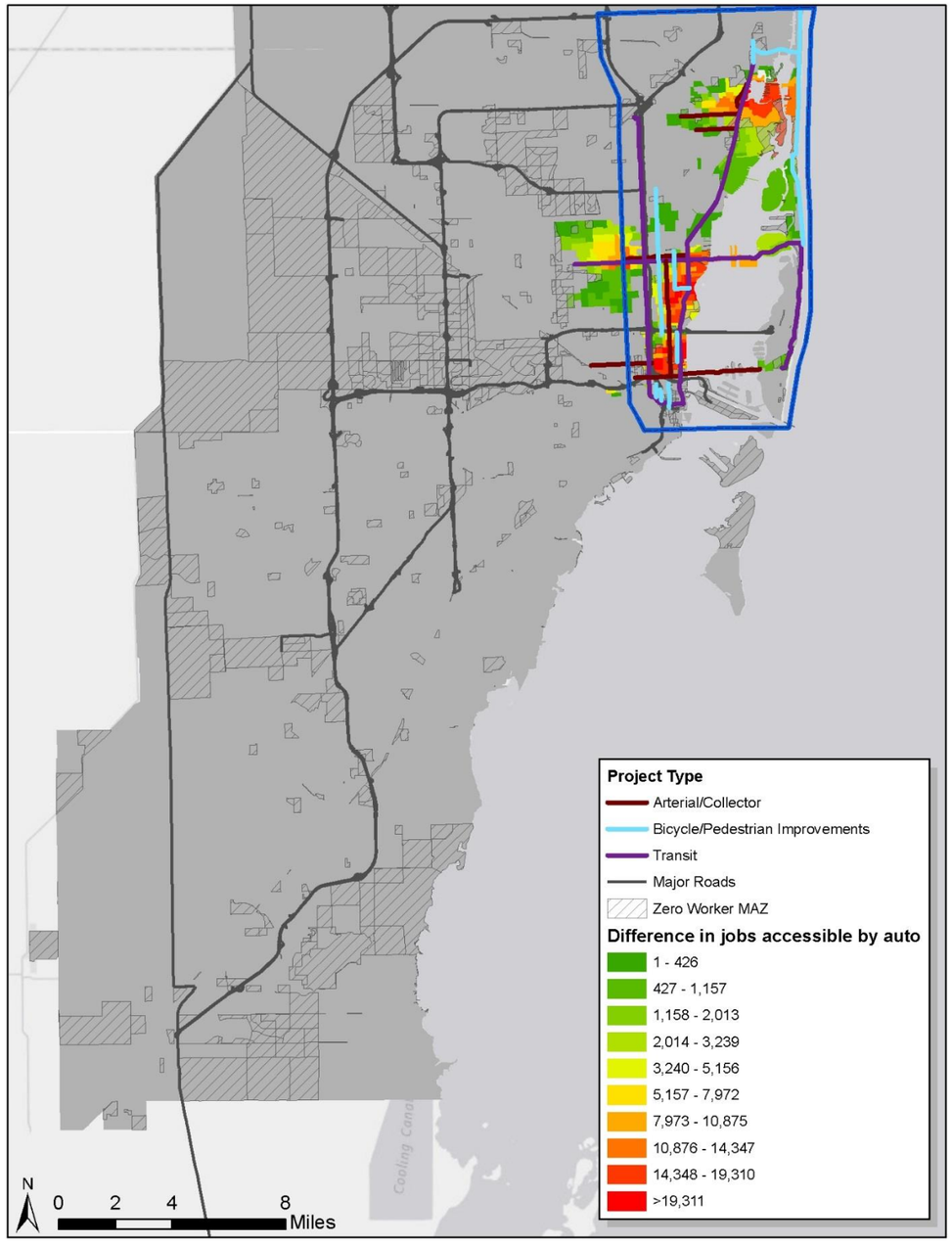


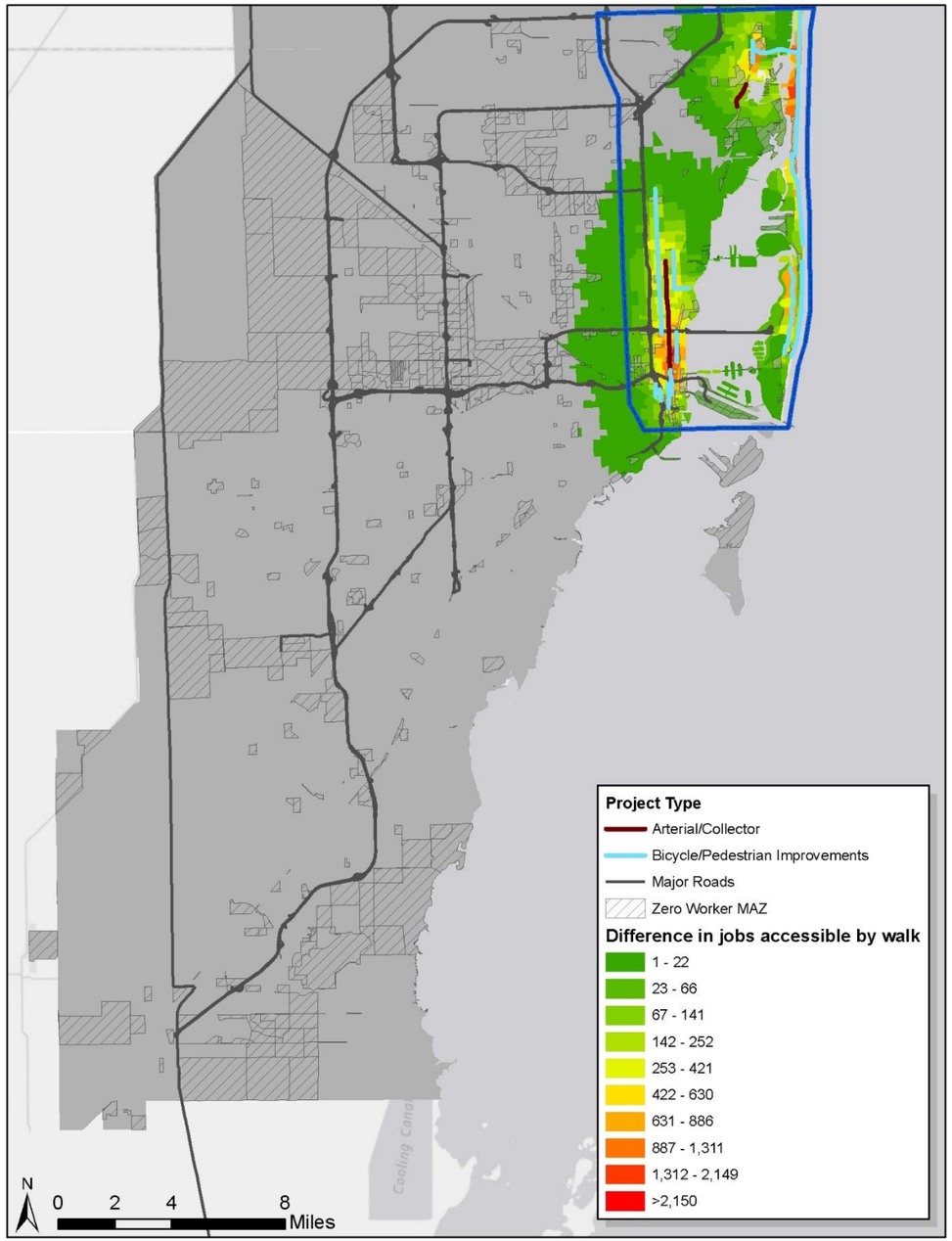
Corridor 3. Scenario 2. Transit Accessibility Delta



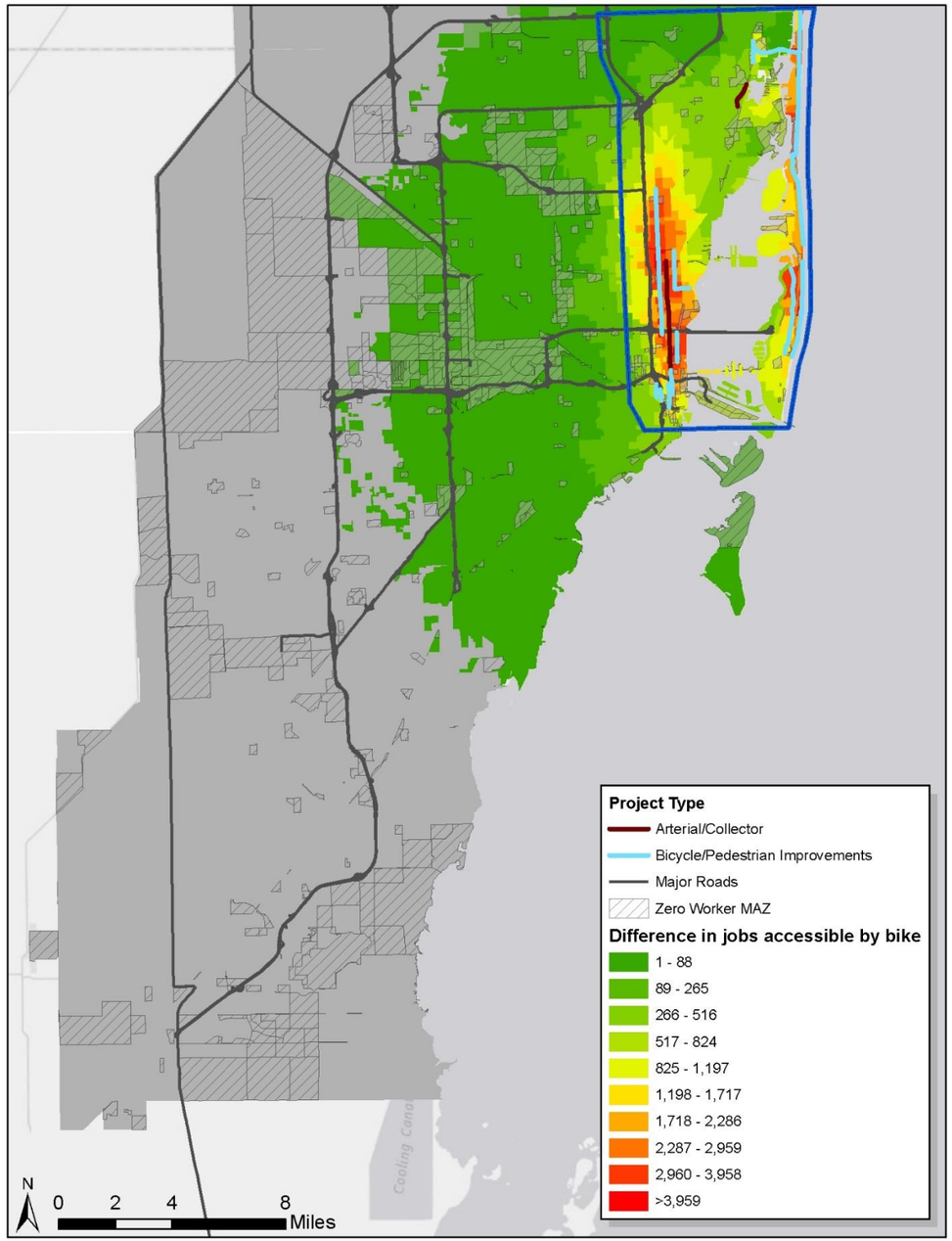
Corridor 3. Scenario 2. Auto Accessibility Delta



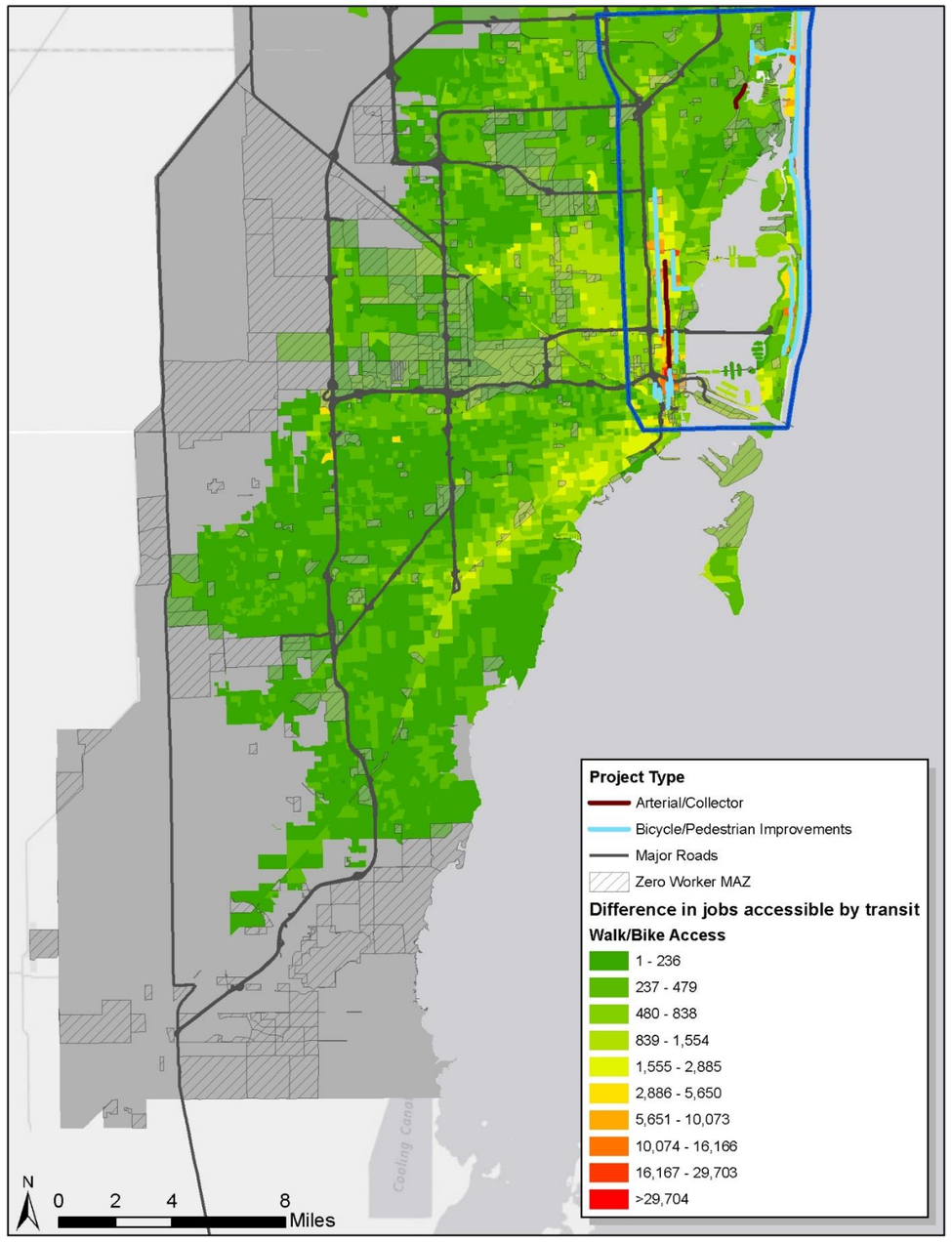
Corridor 3. Scenario 4. Walk Accessibility Delta



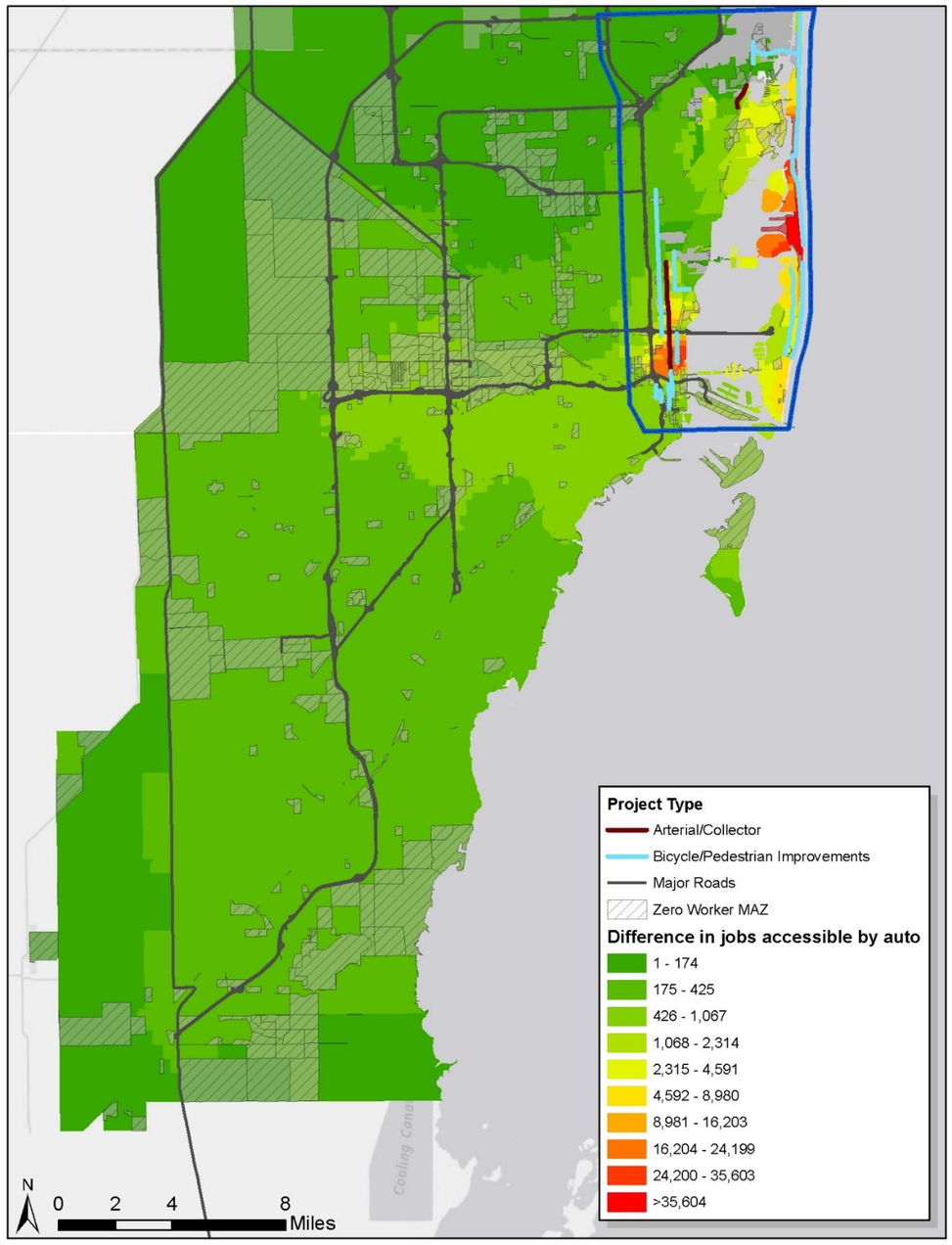
Corridor 3. Scenario 4. Bike Accessibility Delta



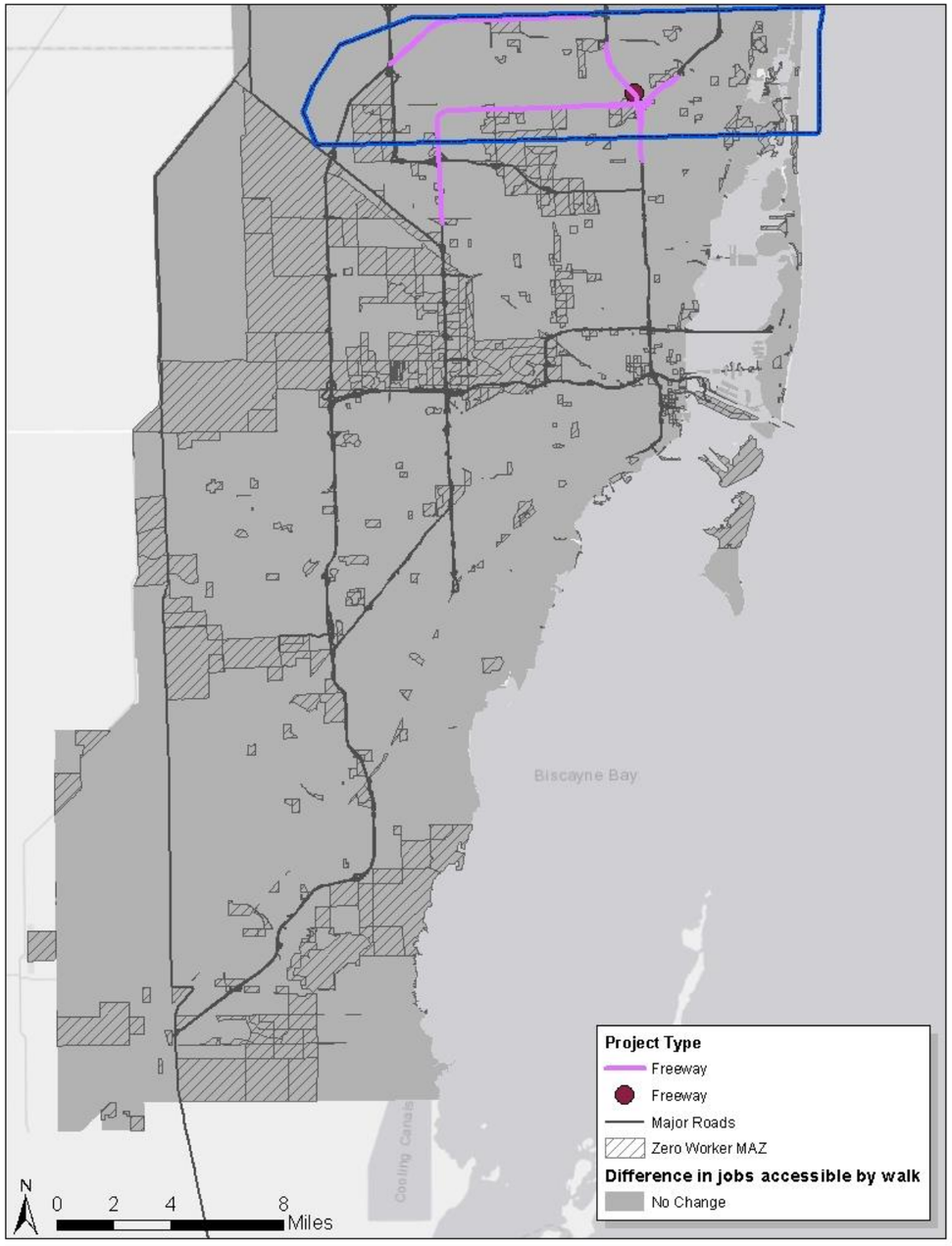
Corridor 3. Scenario 4. Transit Accessibility Delta



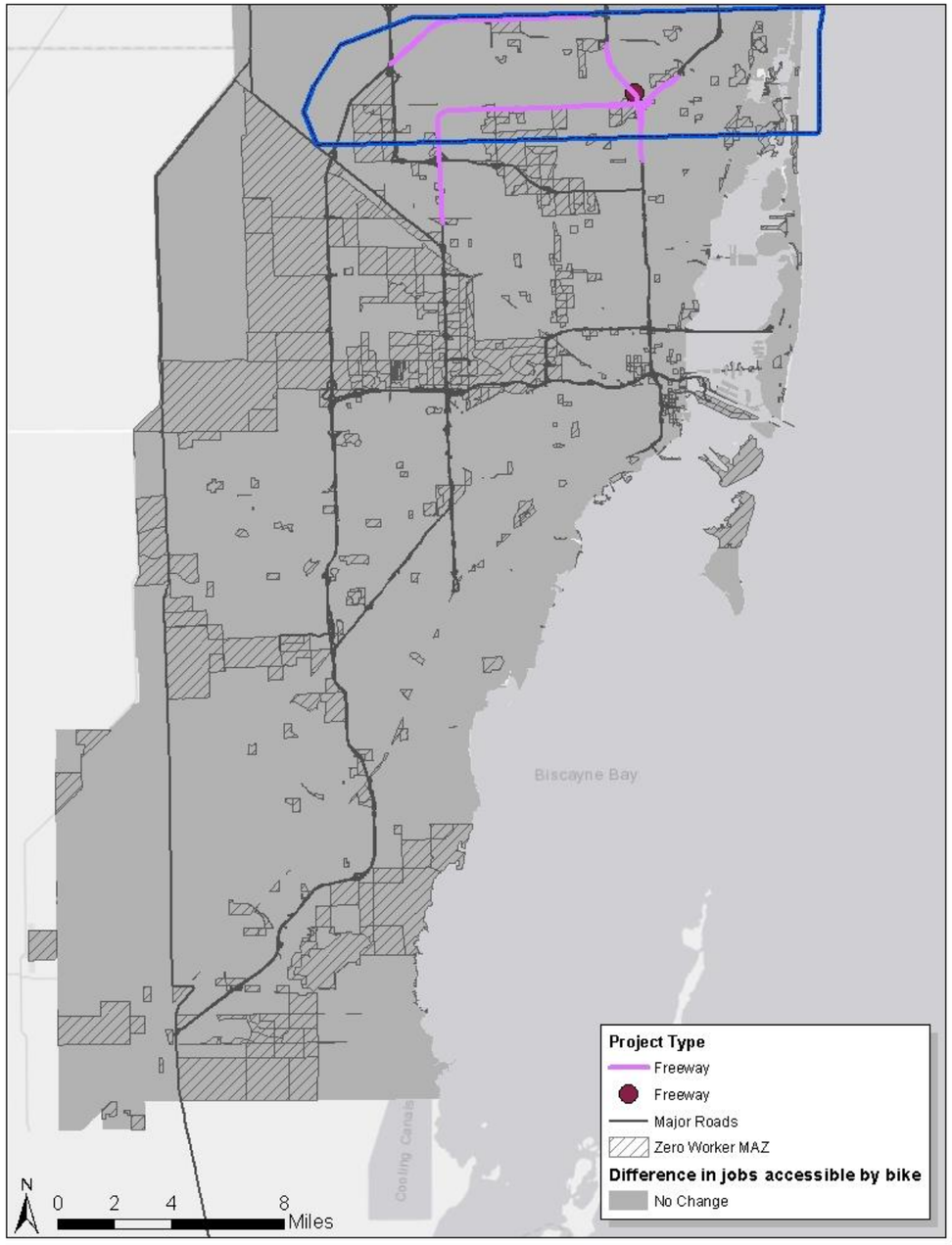
Corridor 3. Scenario 4. Auto Accessibility Delta



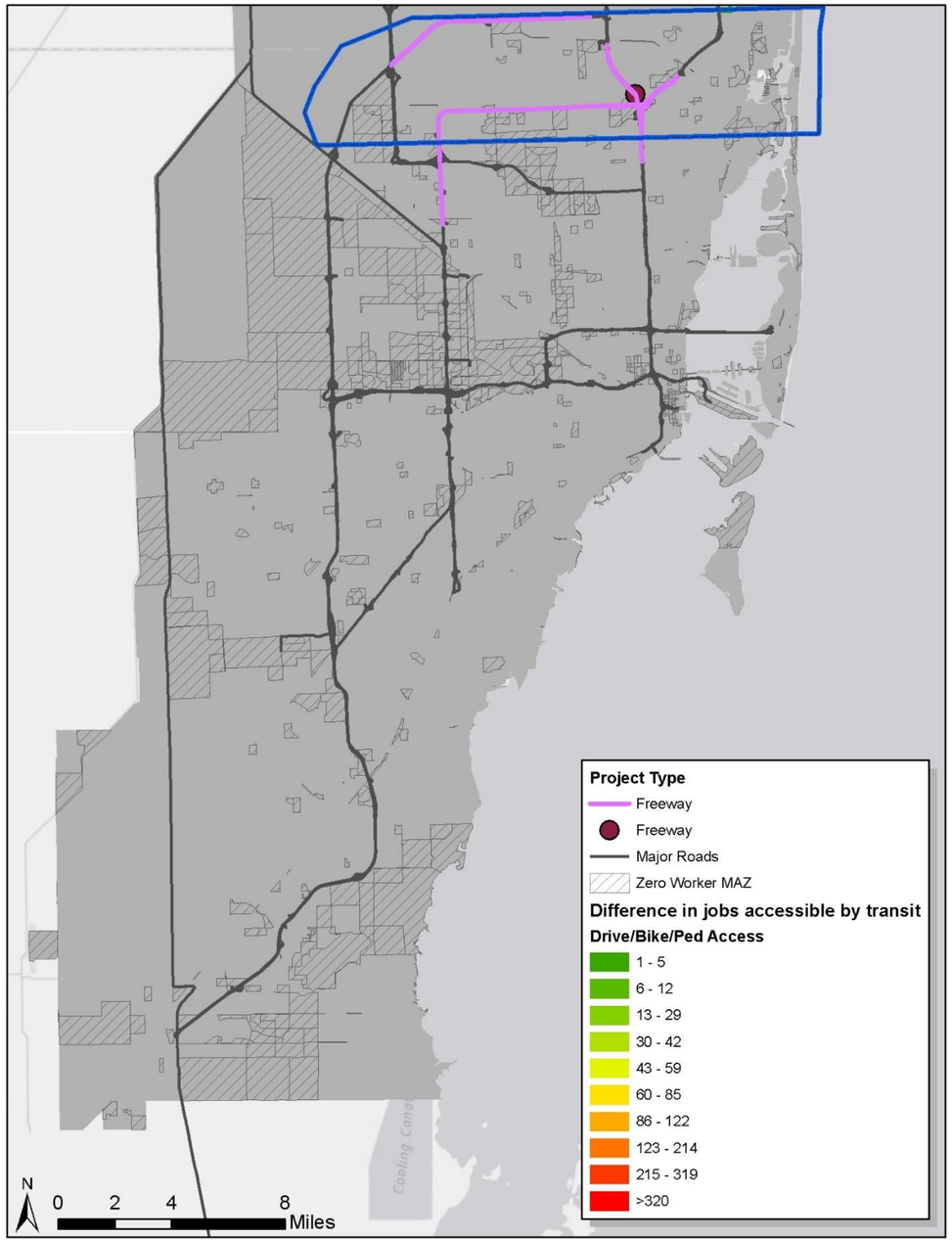
Corridor 4. Scenario 3. Walk Accessibility Delta



Corridor 4. Scenario 3. Bike Accessibility Delta



Corridor 4. Scenario 3. Transit Accessibility Delta



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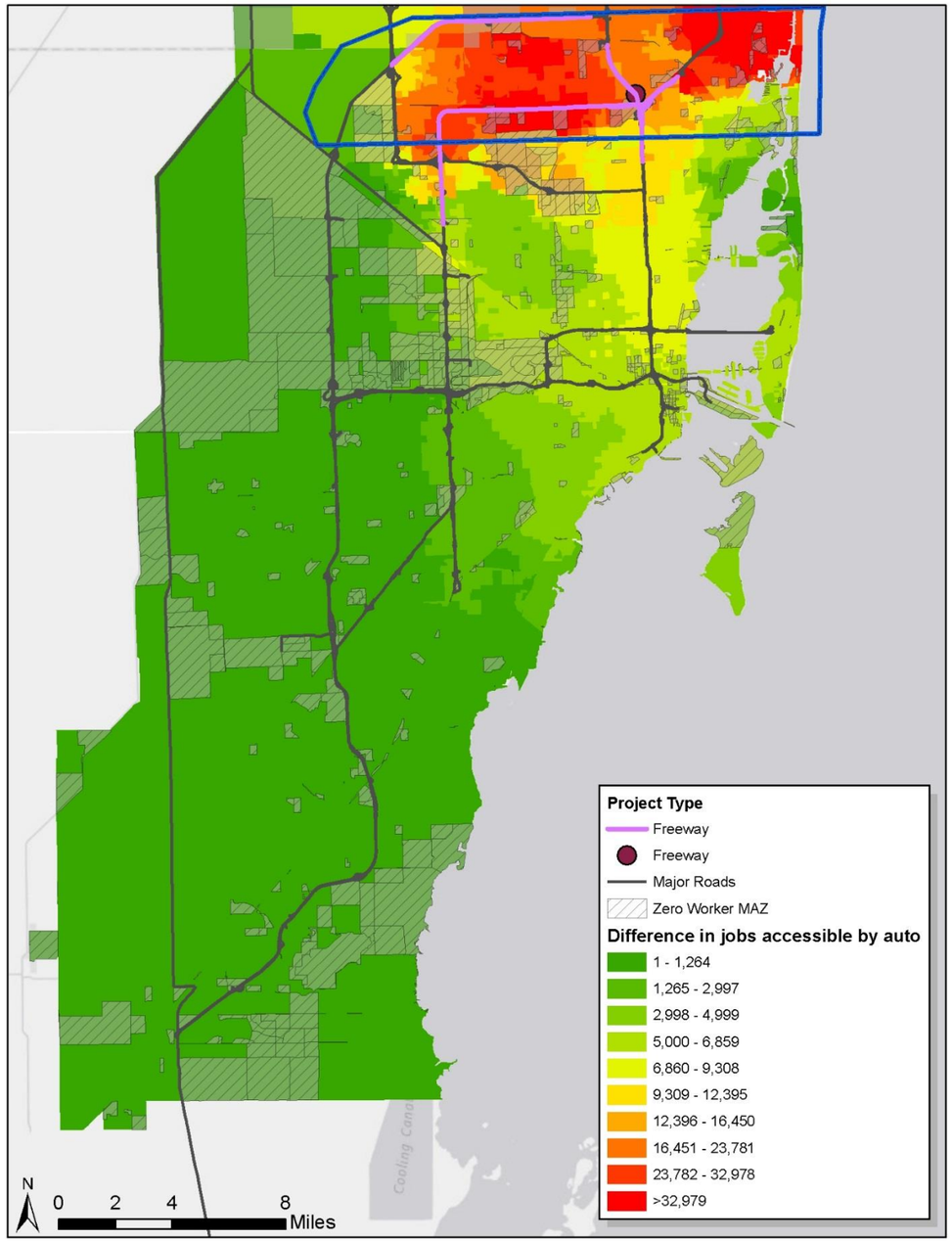
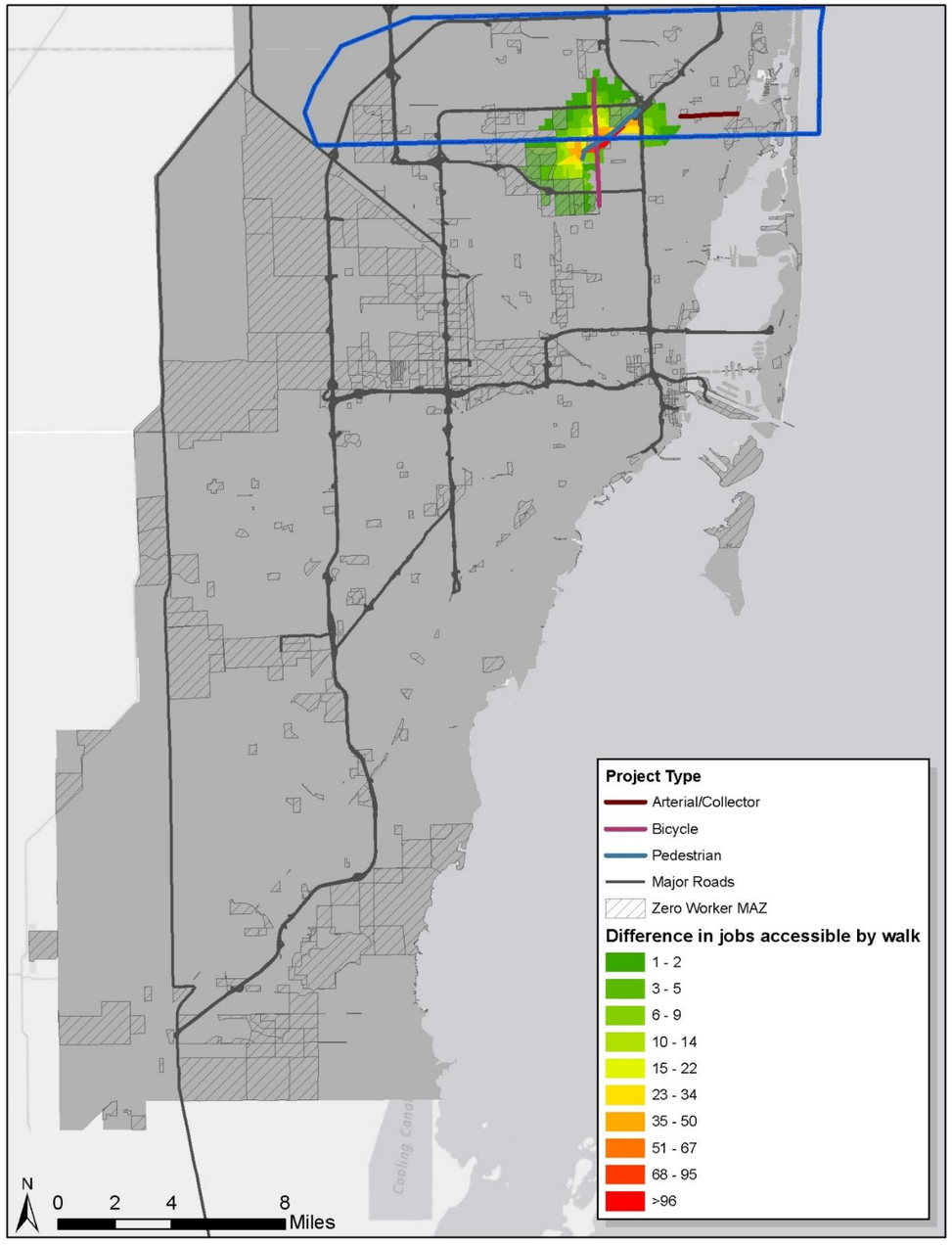


Corridor 4. Scenario 4. Walk Accessibility Delta



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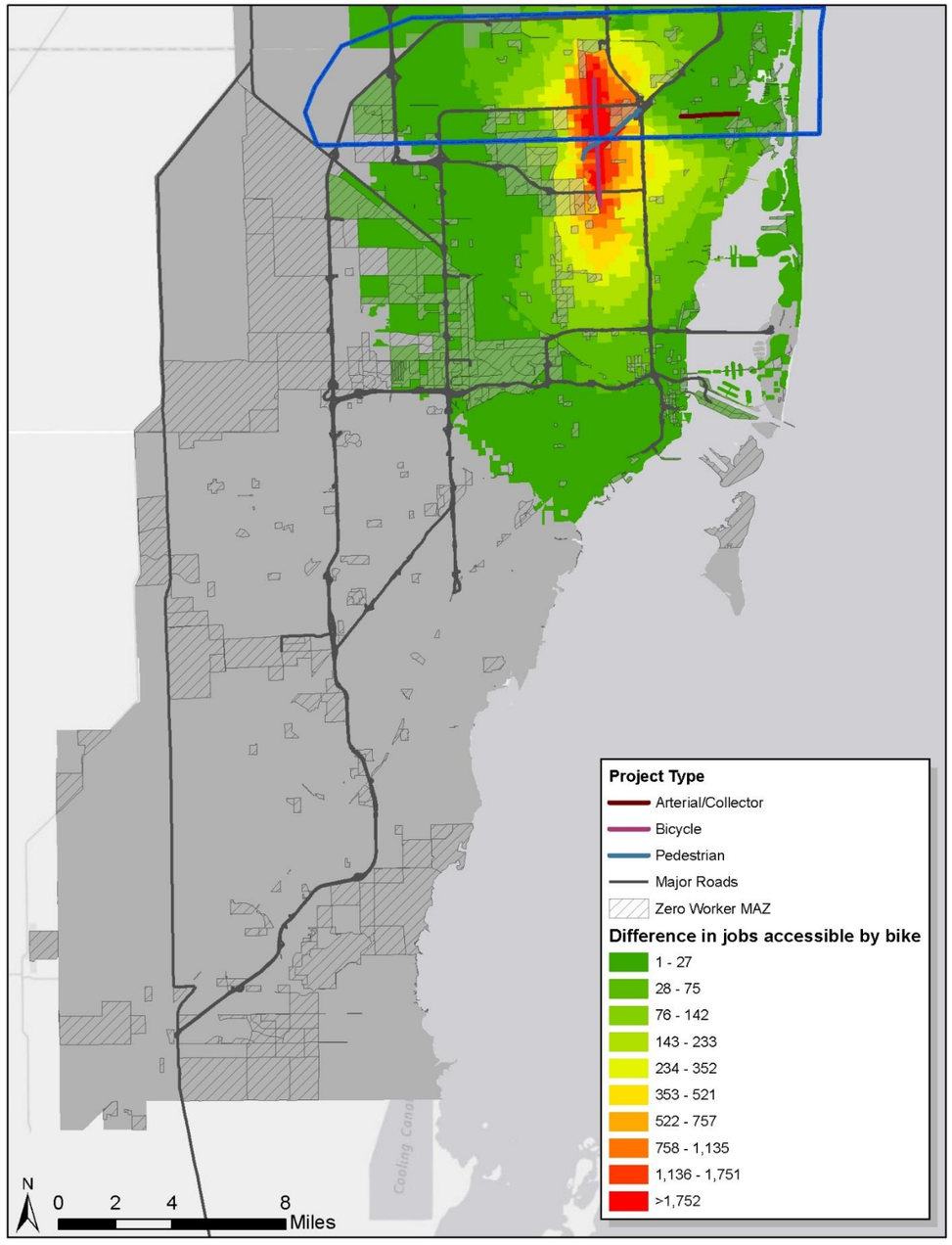
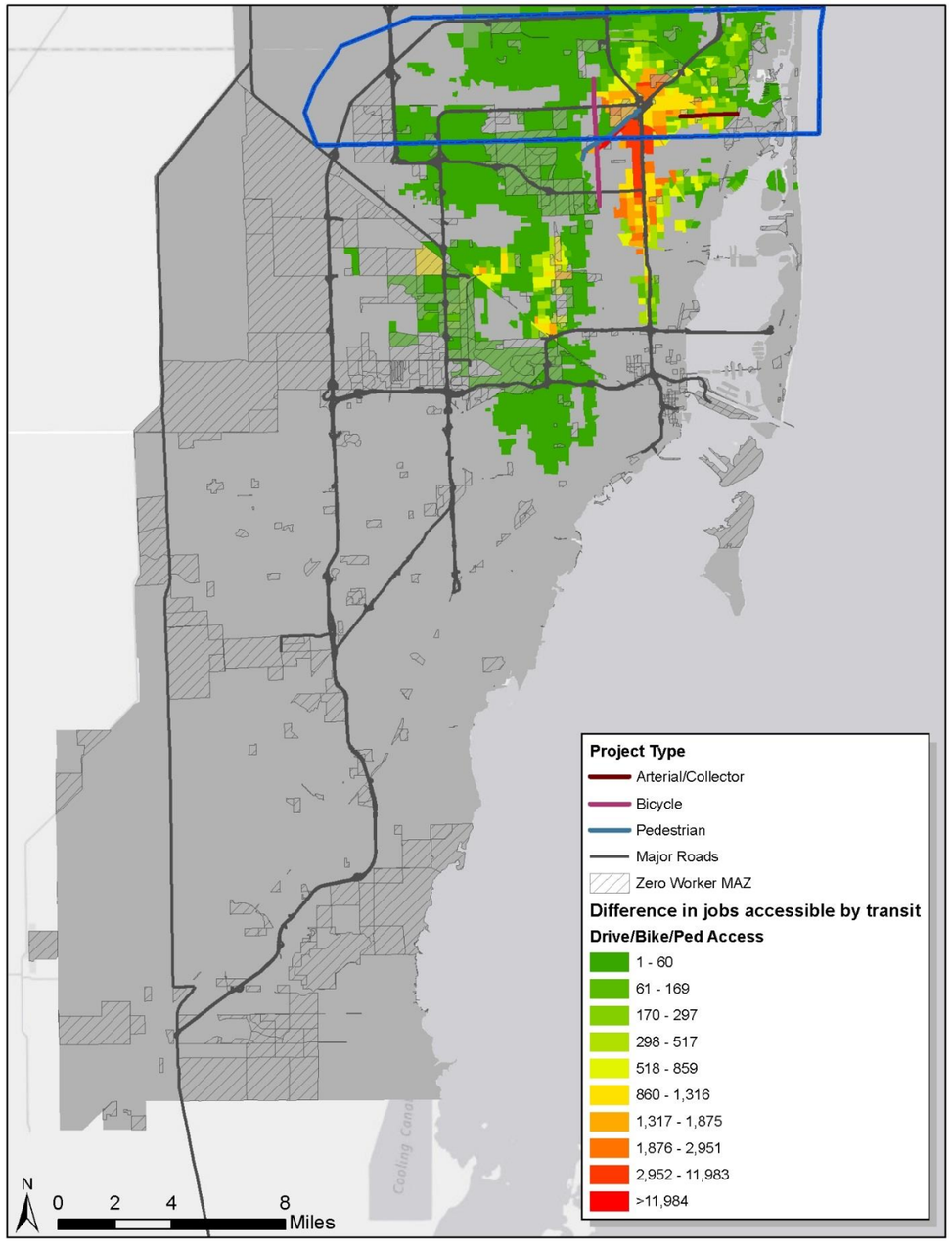
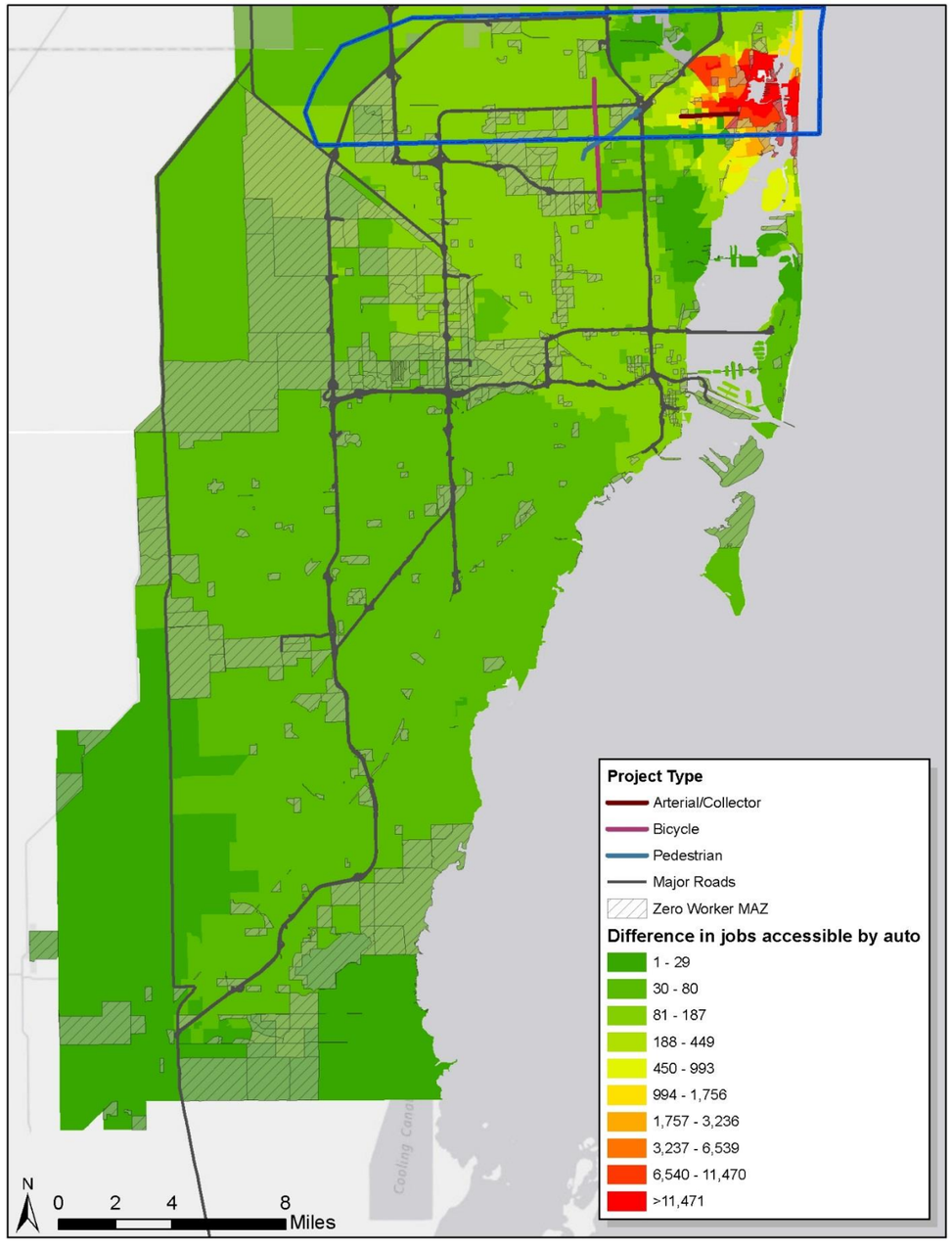


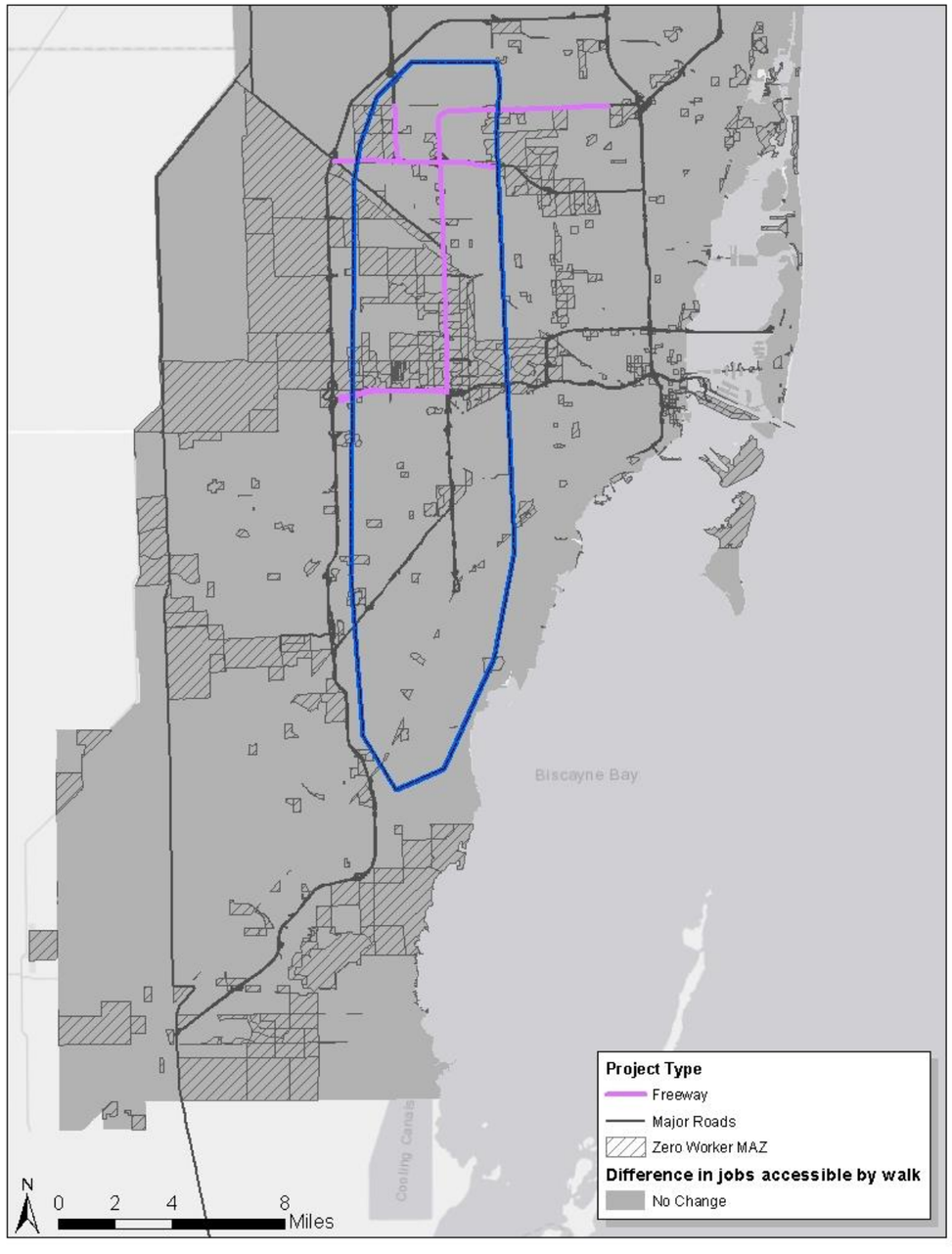
Corridor 4. Scenario 4. Transit Accessibility Delta



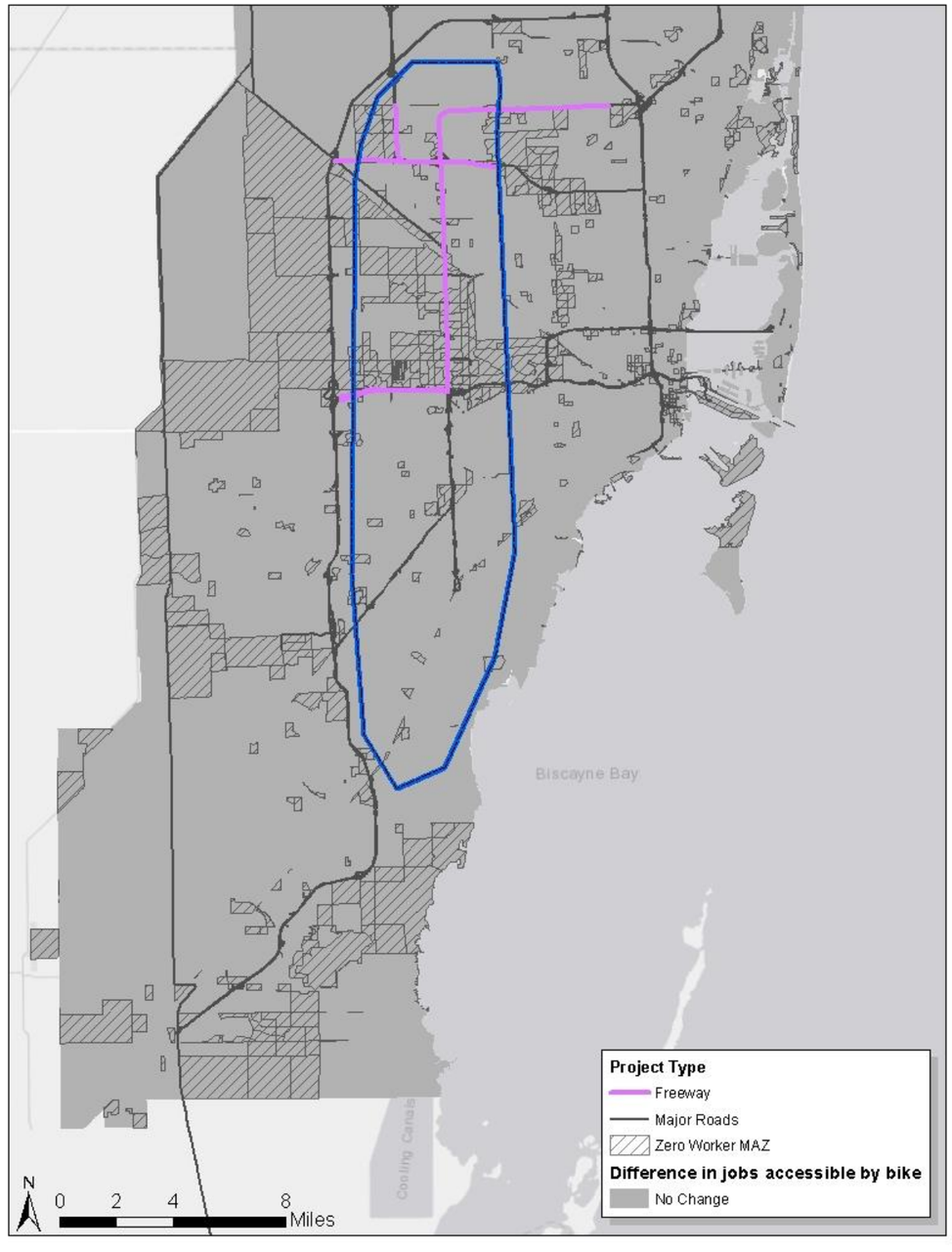
Corridor 4. Scenario 4. Auto Accessibility Delta



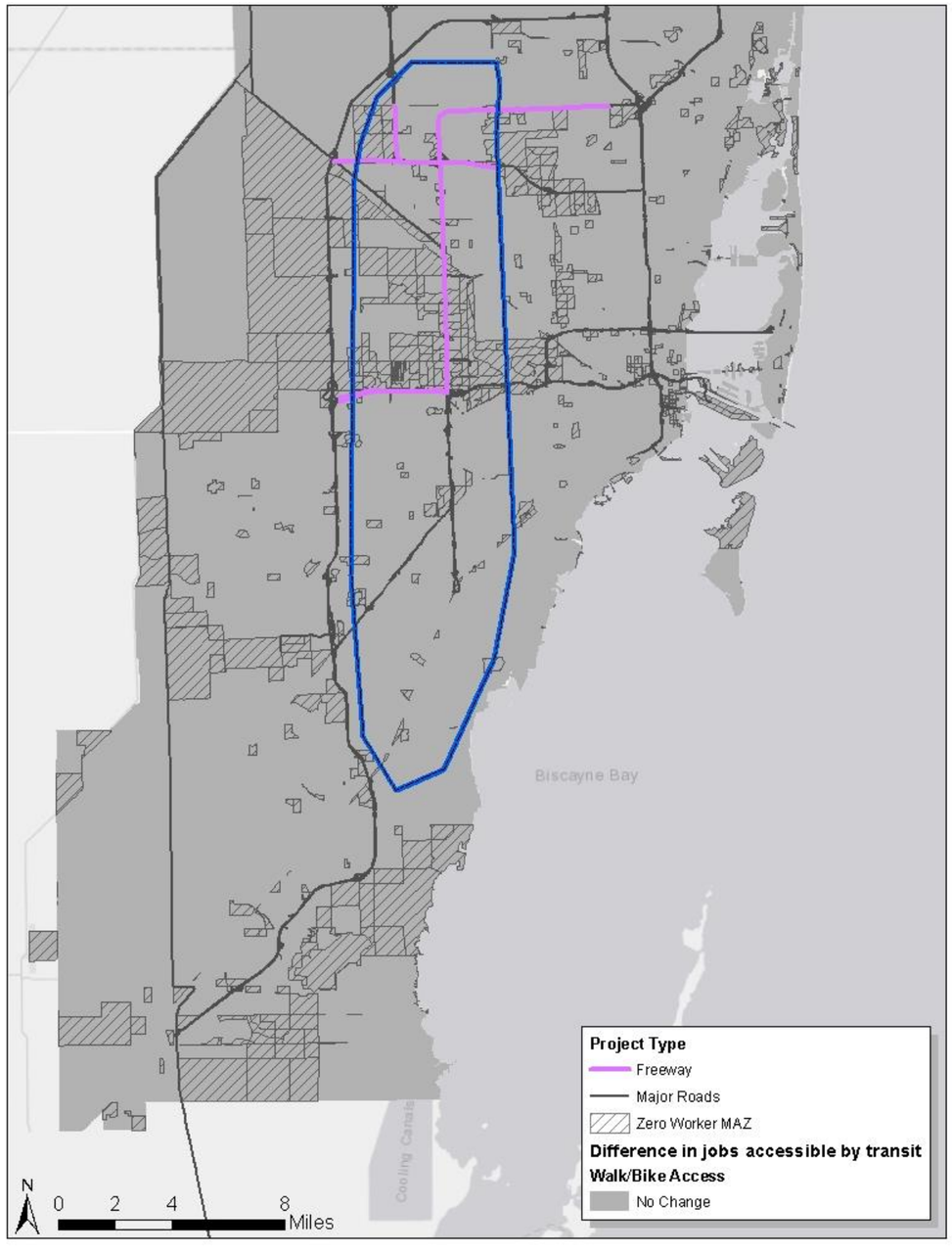
Corridor 5. Scenario 3. Walk Accessibility Delta



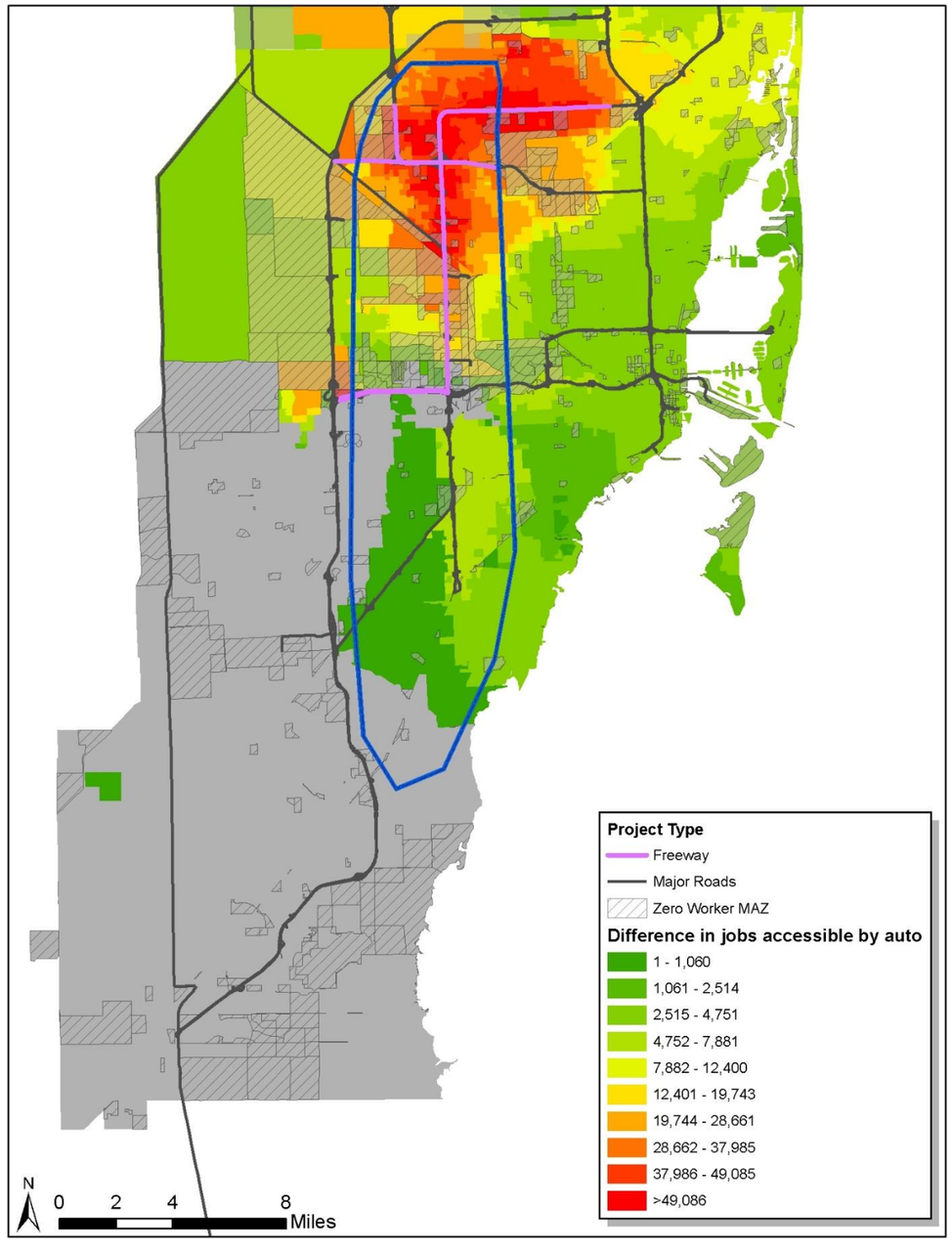
Corridor 5. Scenario 3. Bike Accessibility Delta



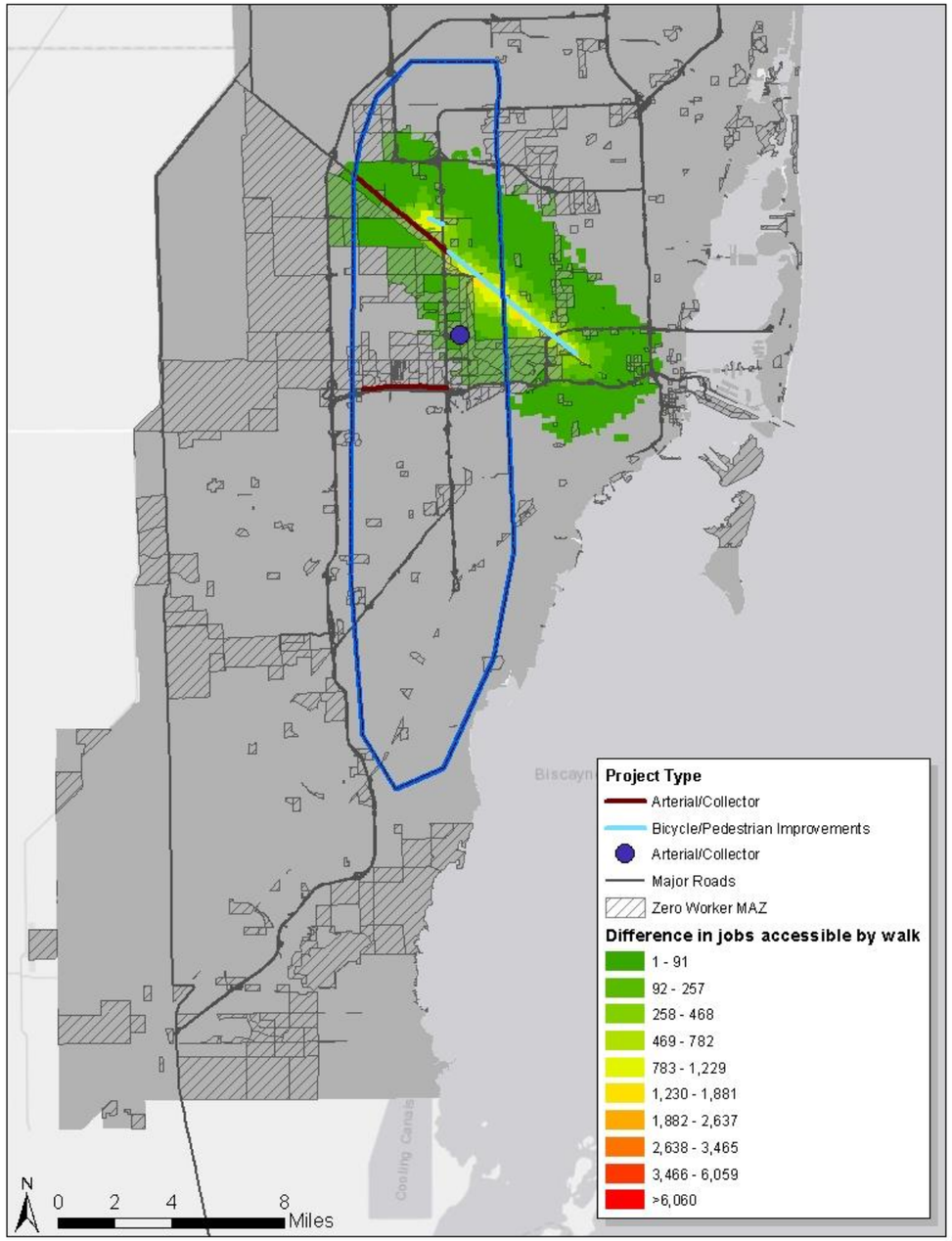
Corridor 5. Scenario 3. Transit Accessibility Delta



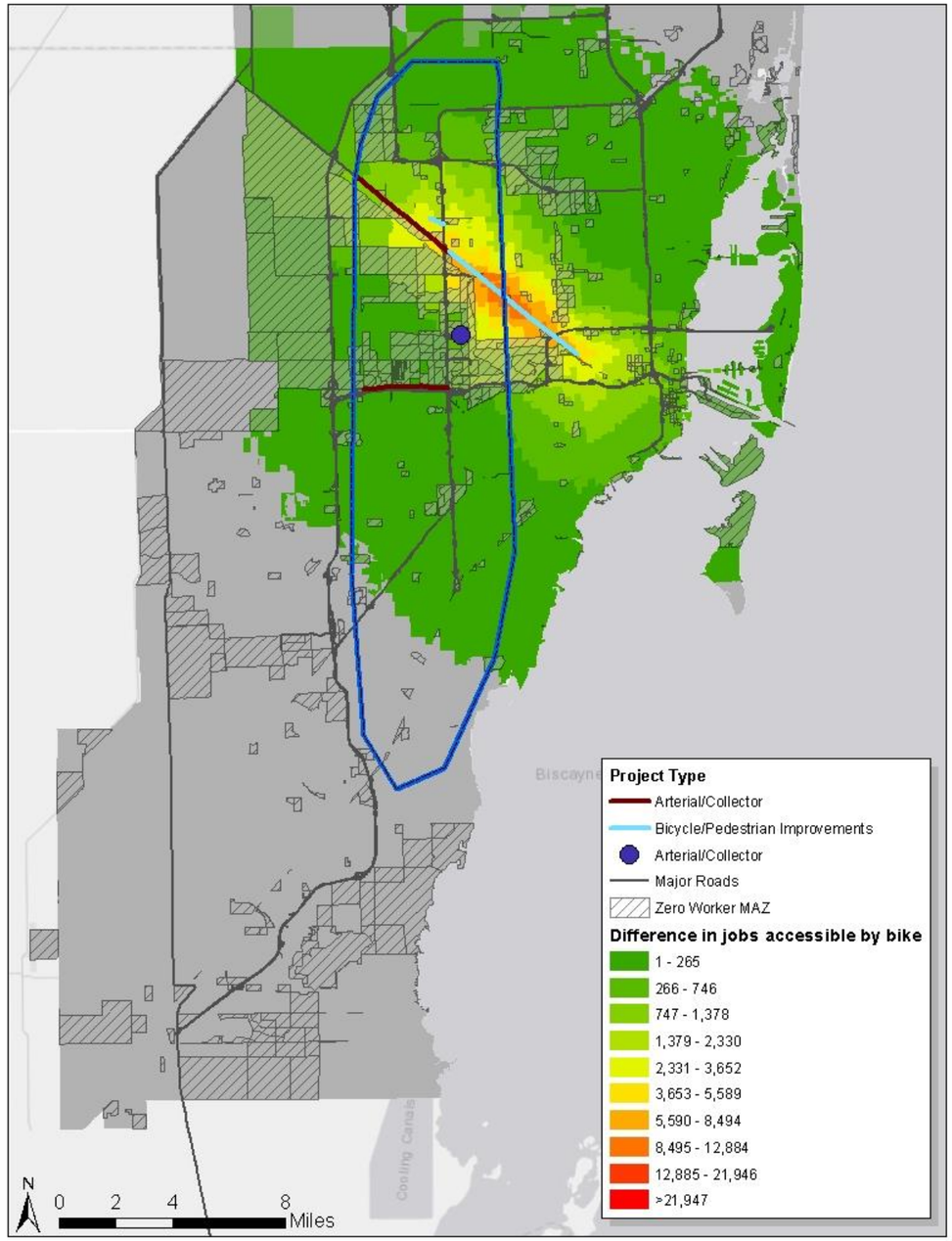
Corridor 5. Scenario 3. Auto Accessibility Delta



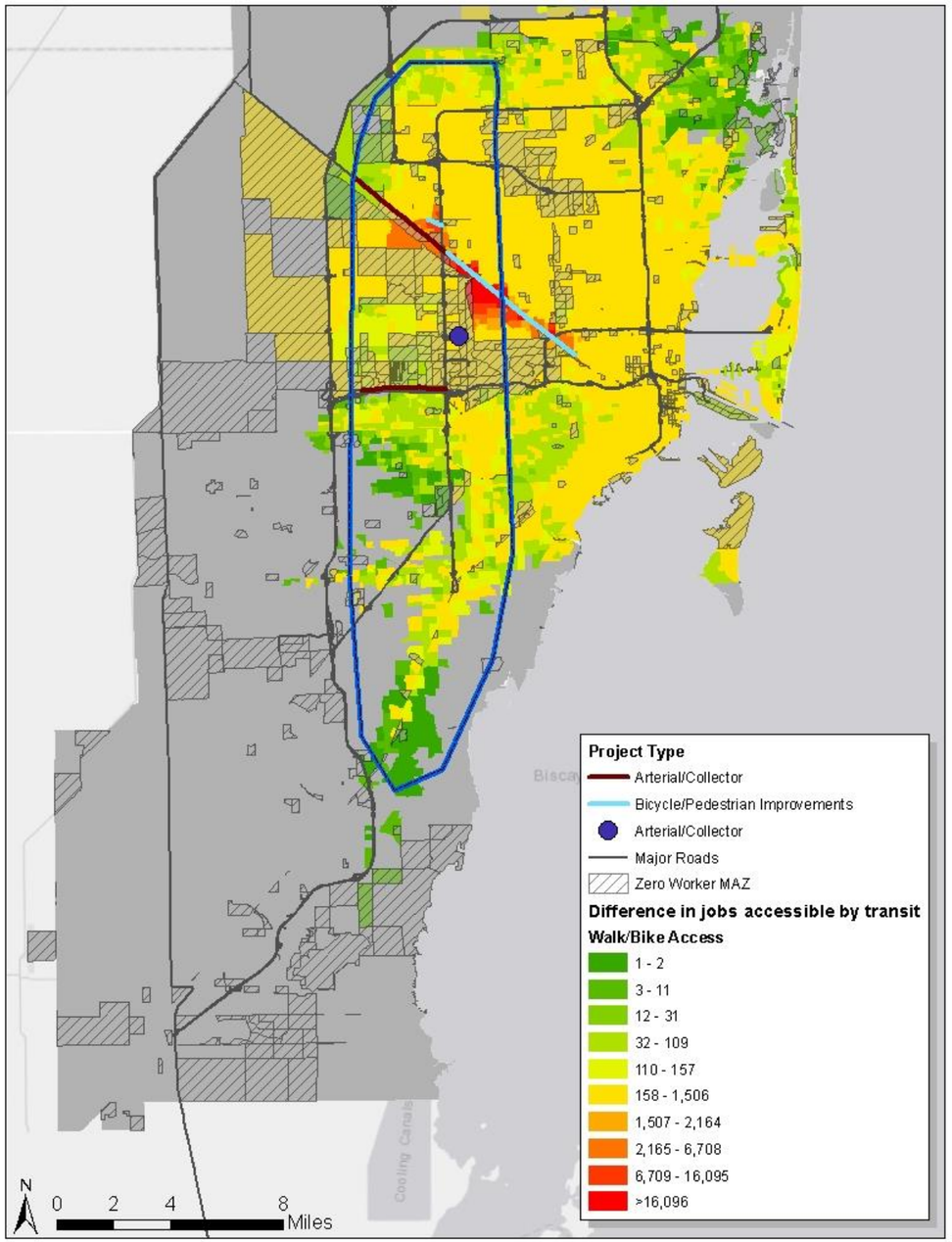
Corridor 5. Scenario 4. Walk Accessibility Delta



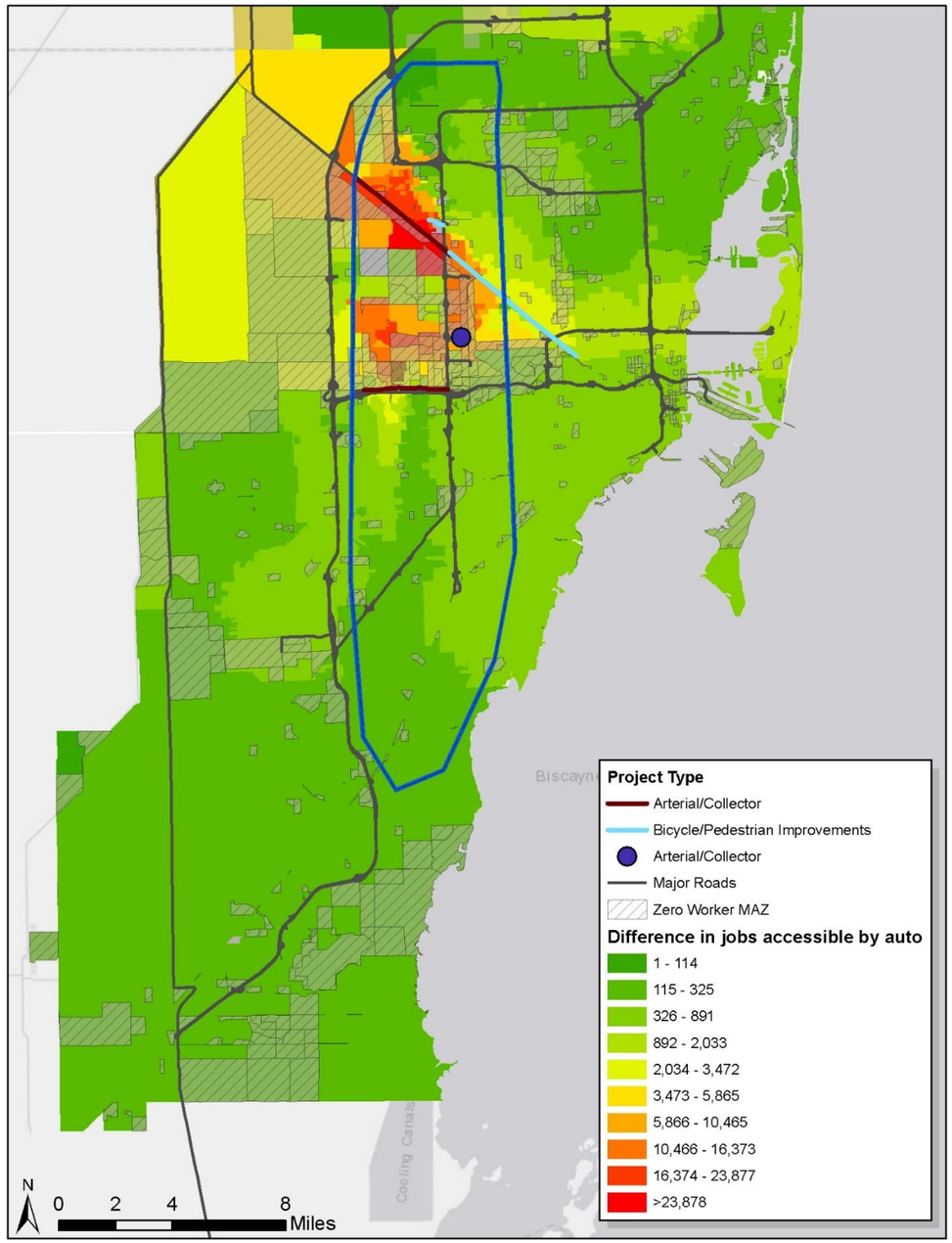
Corridor 5. Scenario 4. Bike Accessibility Delta



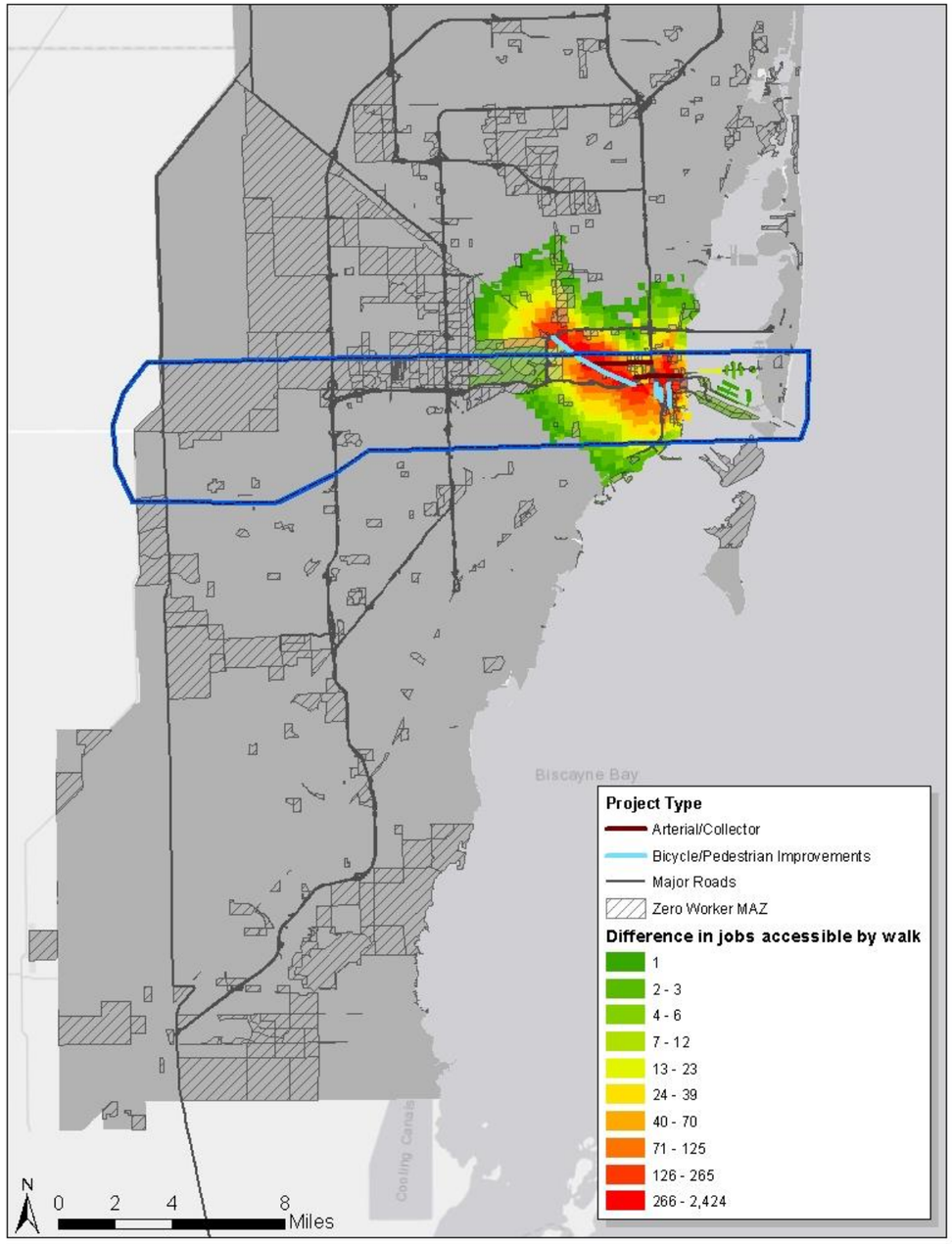
Corridor 5. Scenario 4. Transit Accessibility Delta



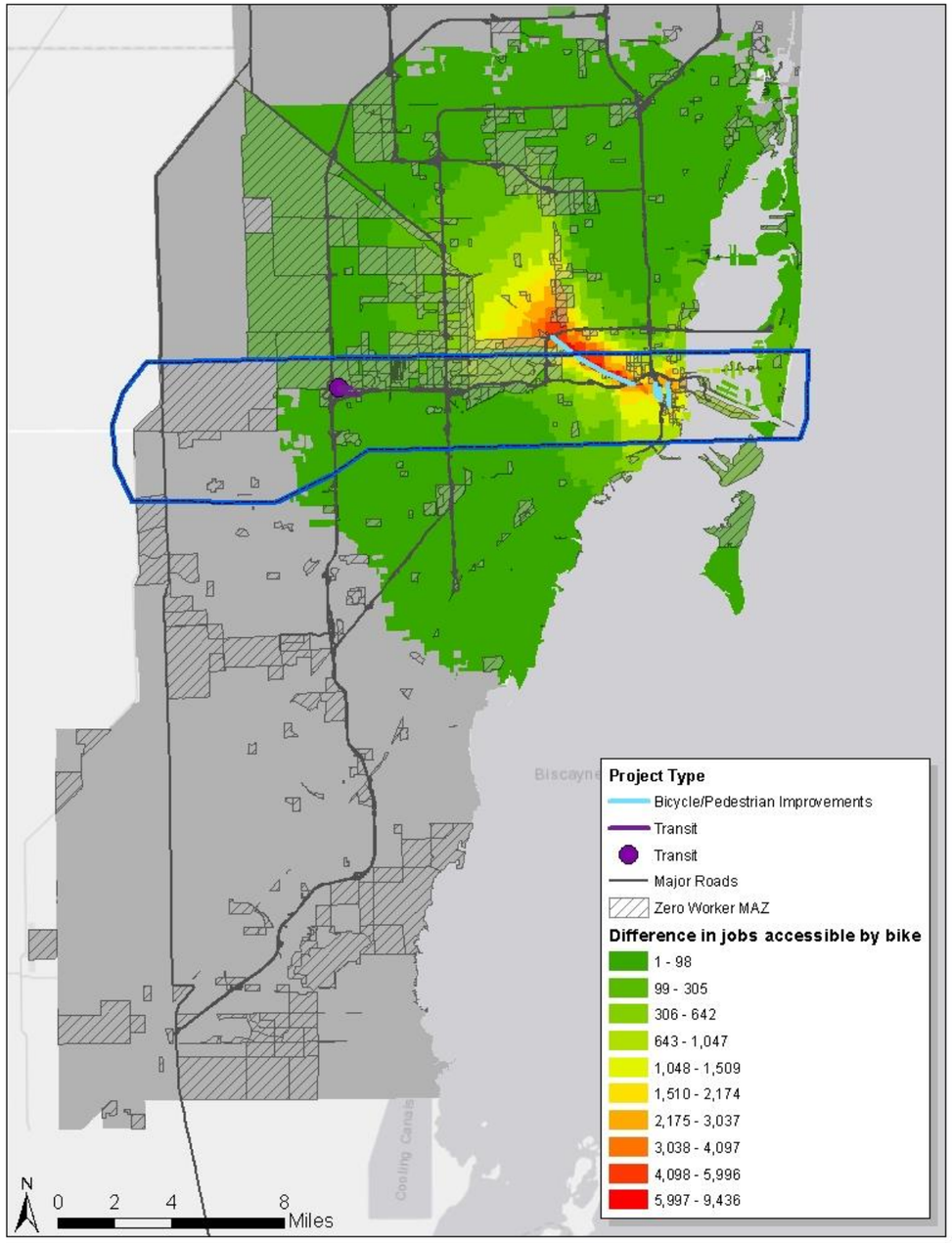
Corridor 5. Scenario 4. Auto Accessibility Delta



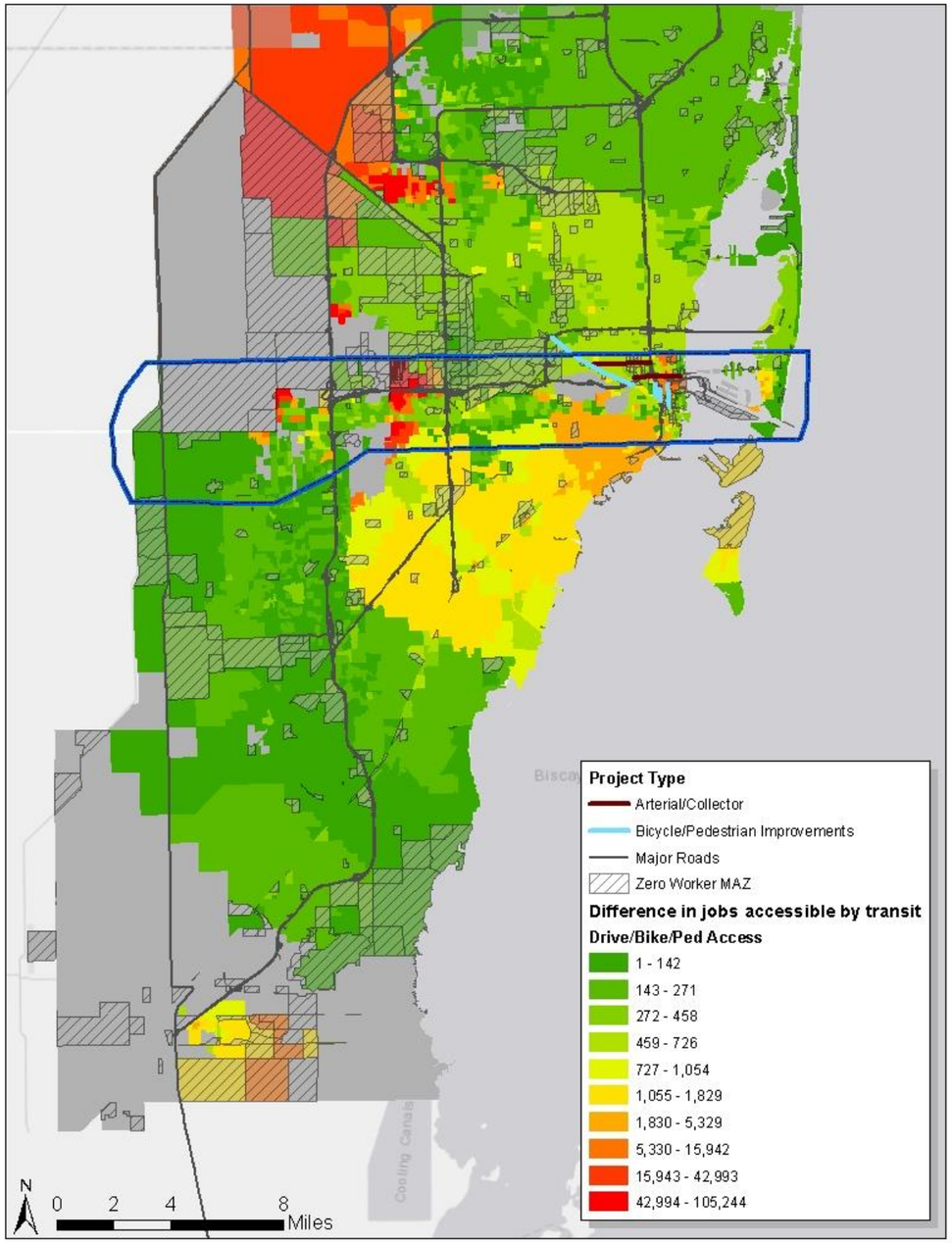
Corridor 8. Scenario 2. Walk Accessibility Delta



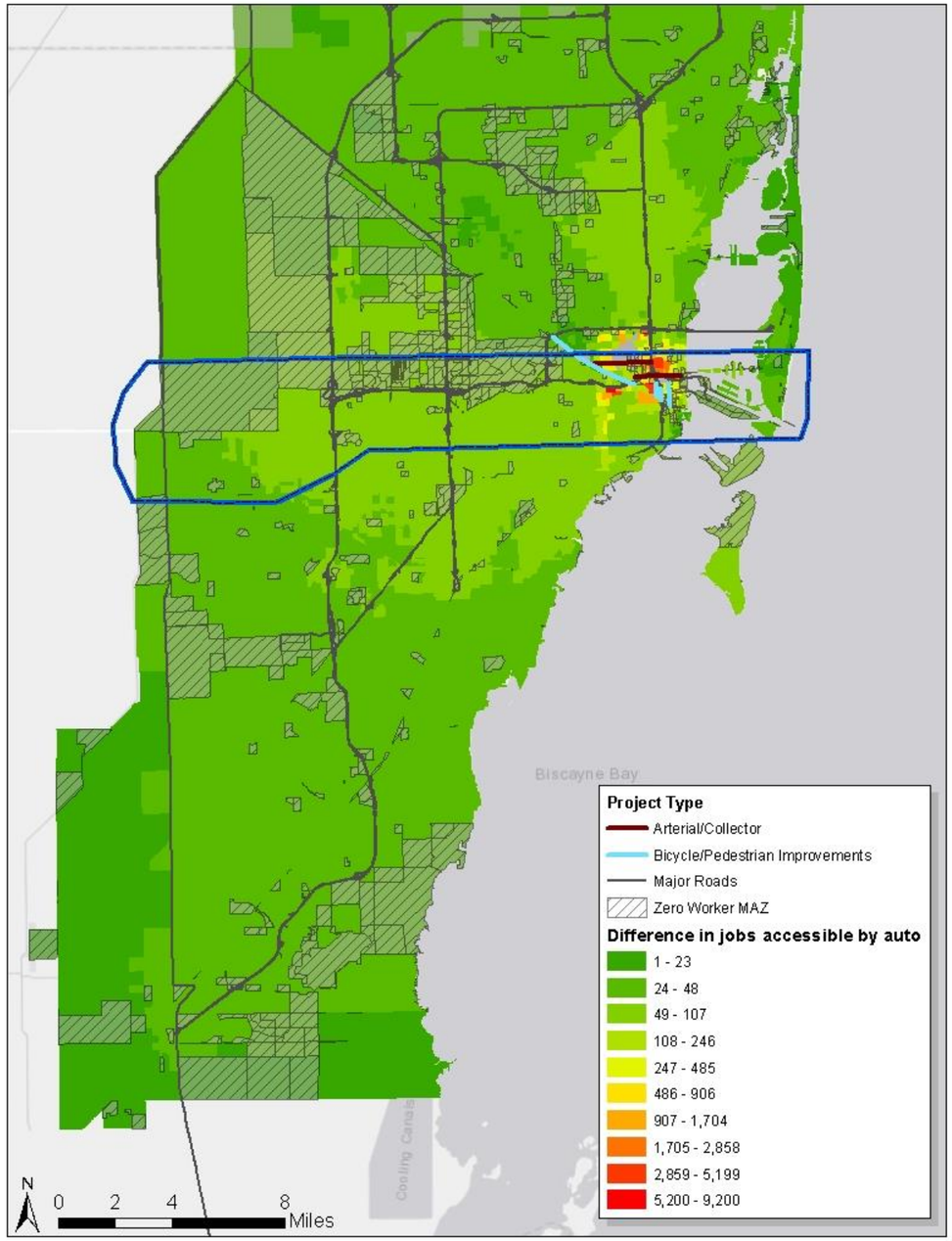
Corridor 8. Scenario 2. Bike Accessibility Delta



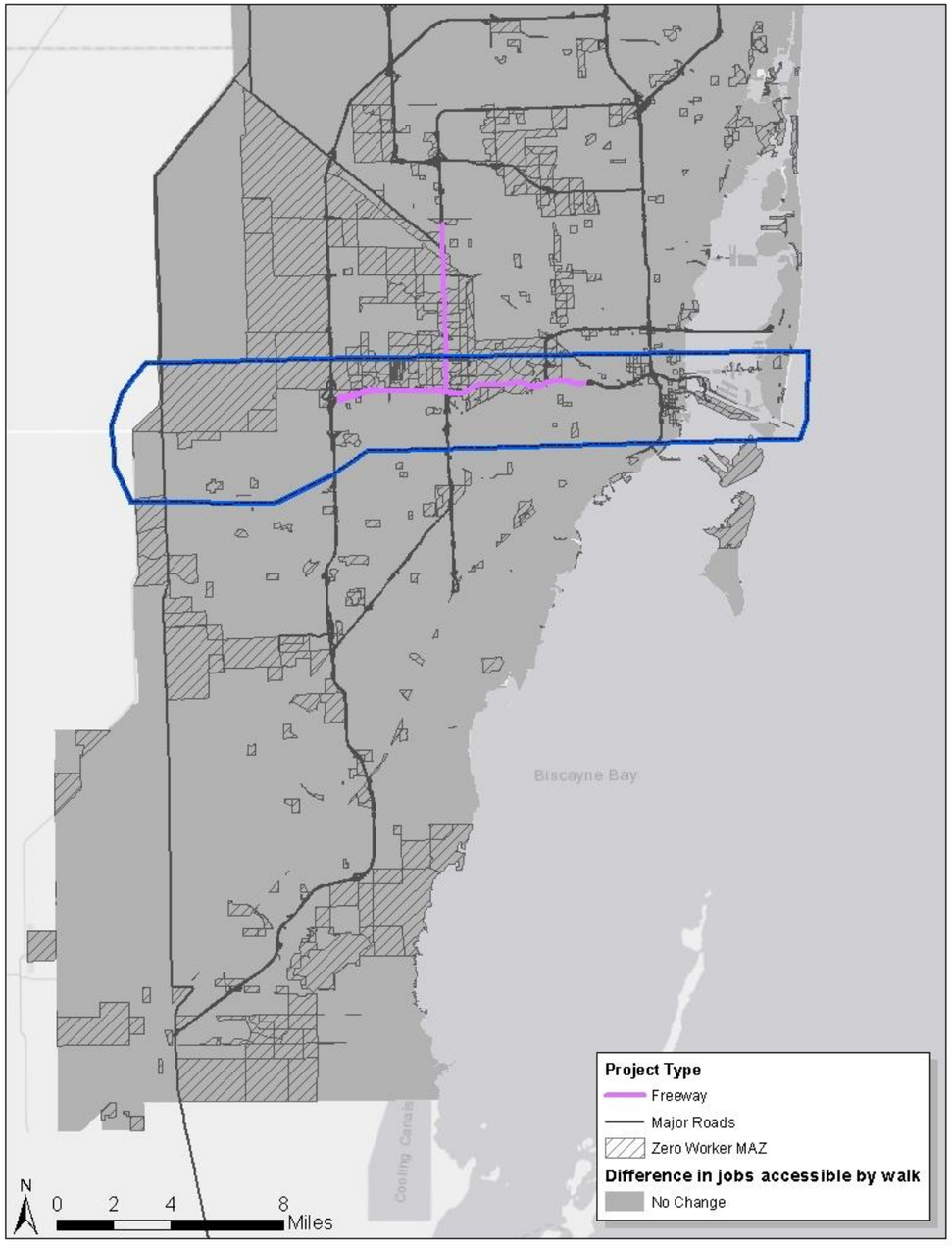
Corridor 8. Scenario 2. Transit Accessibility Delta



Corridor 8. Scenario 2. Auto Accessibility Delta



Corridor 8. Scenario 3. Walk Accessibility Delta



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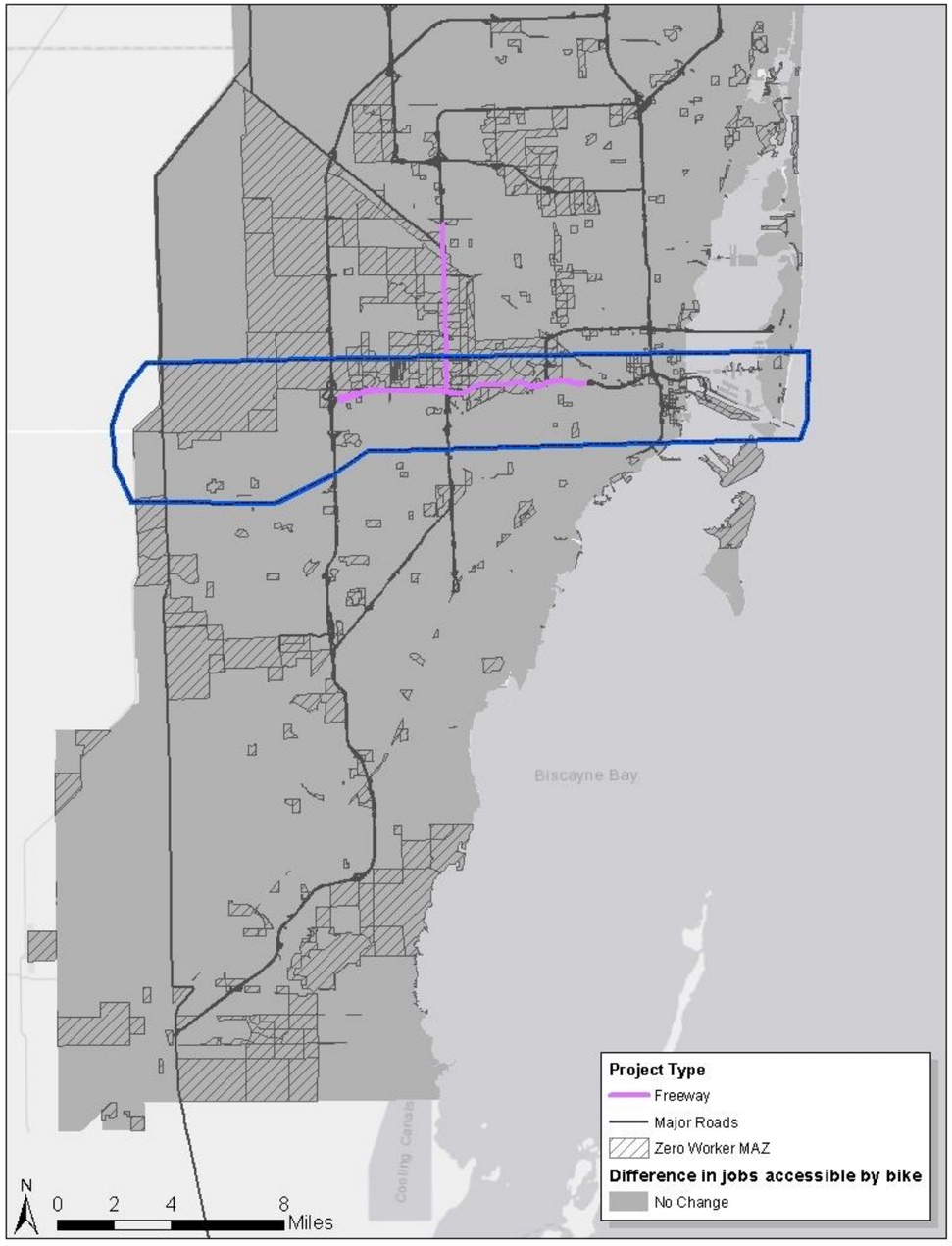
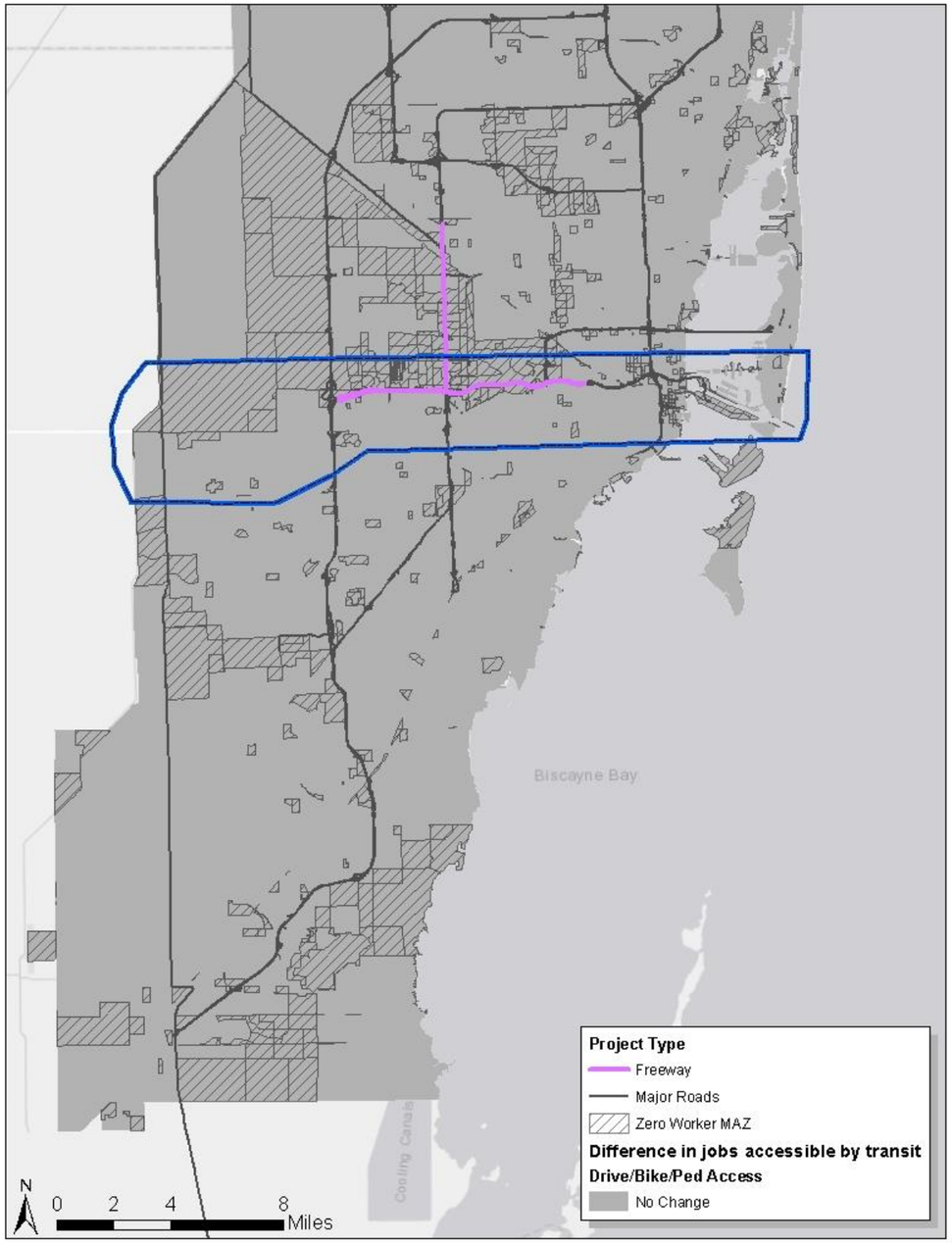
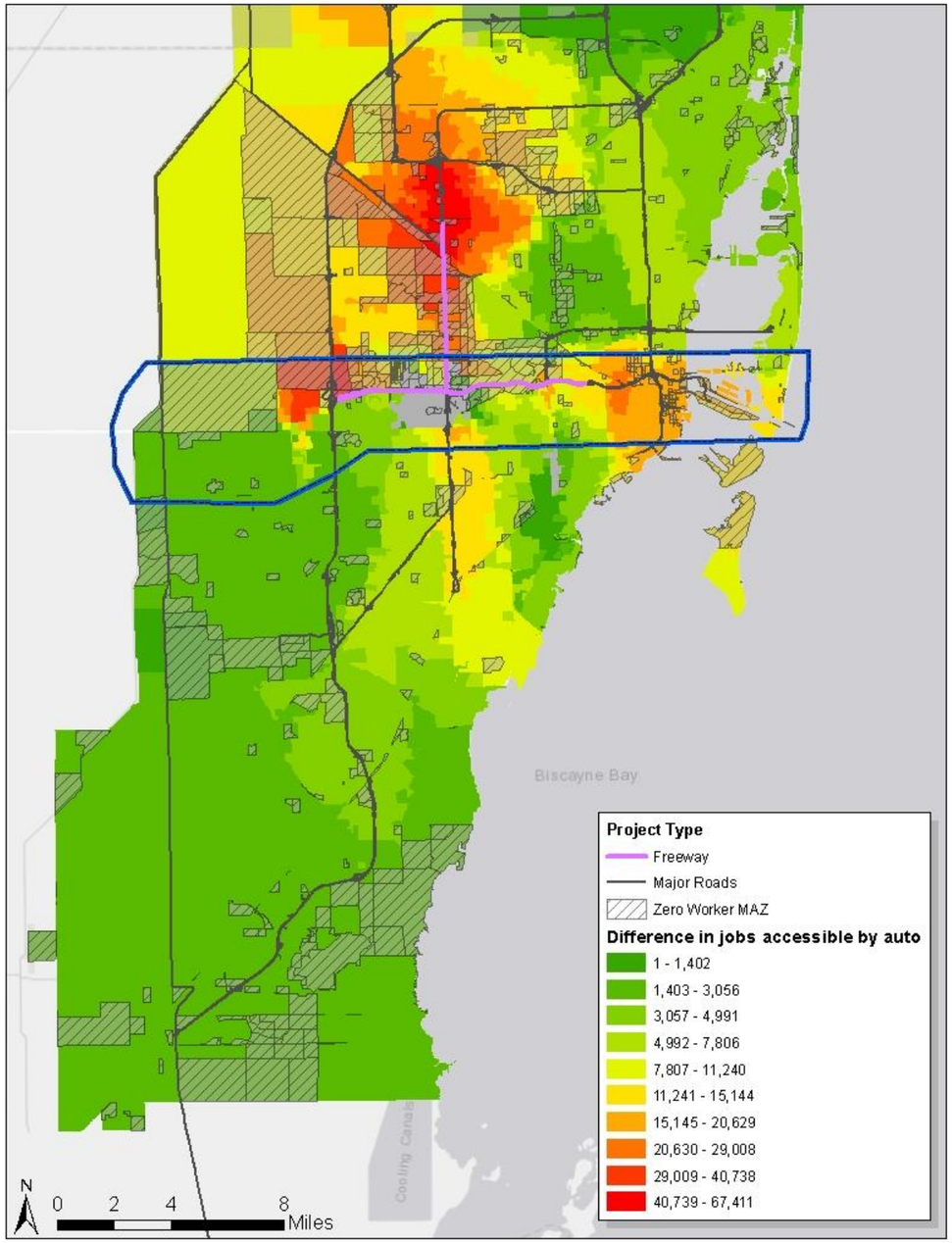


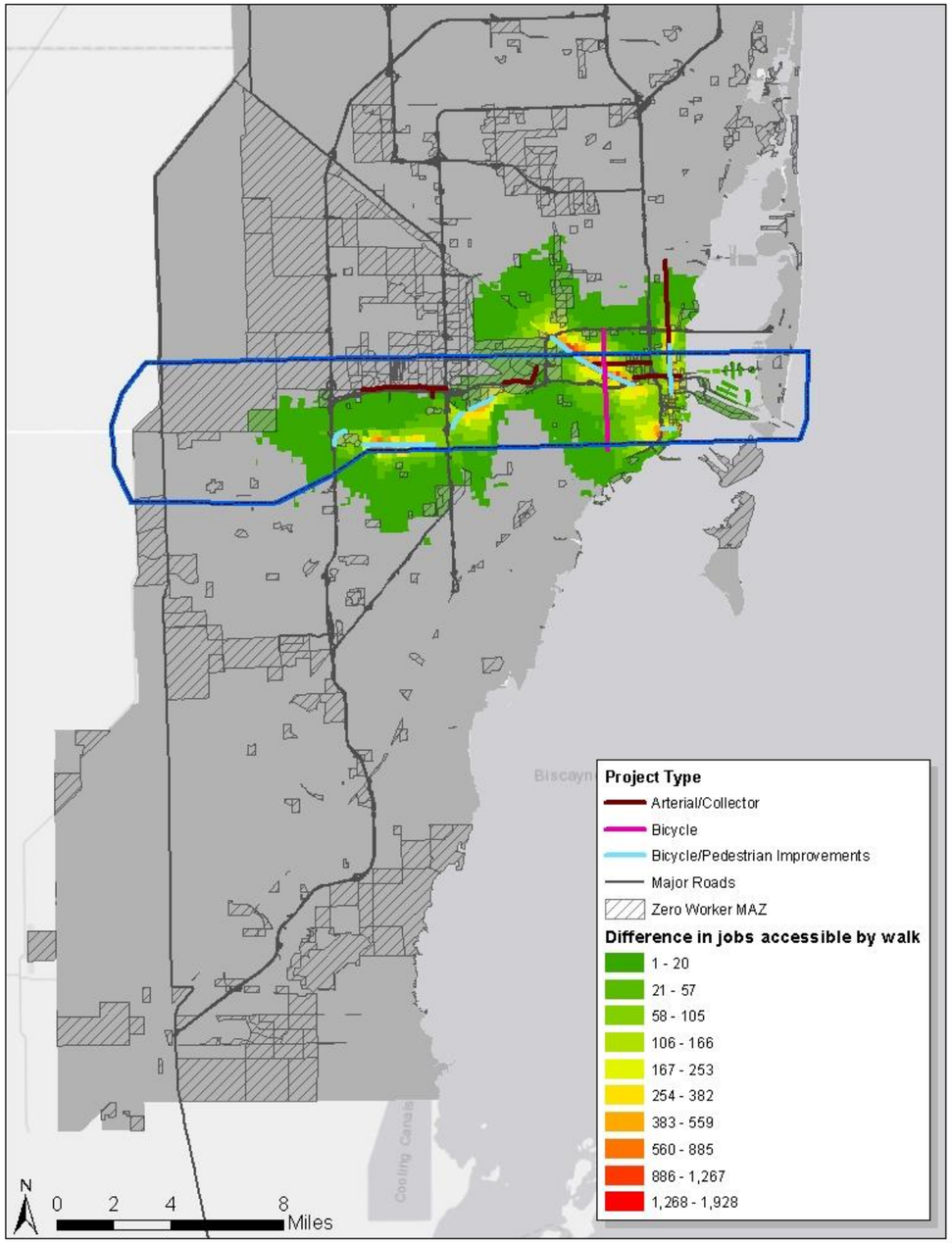
Corridor 8. Scenario 3. Transit Accessibility Delta



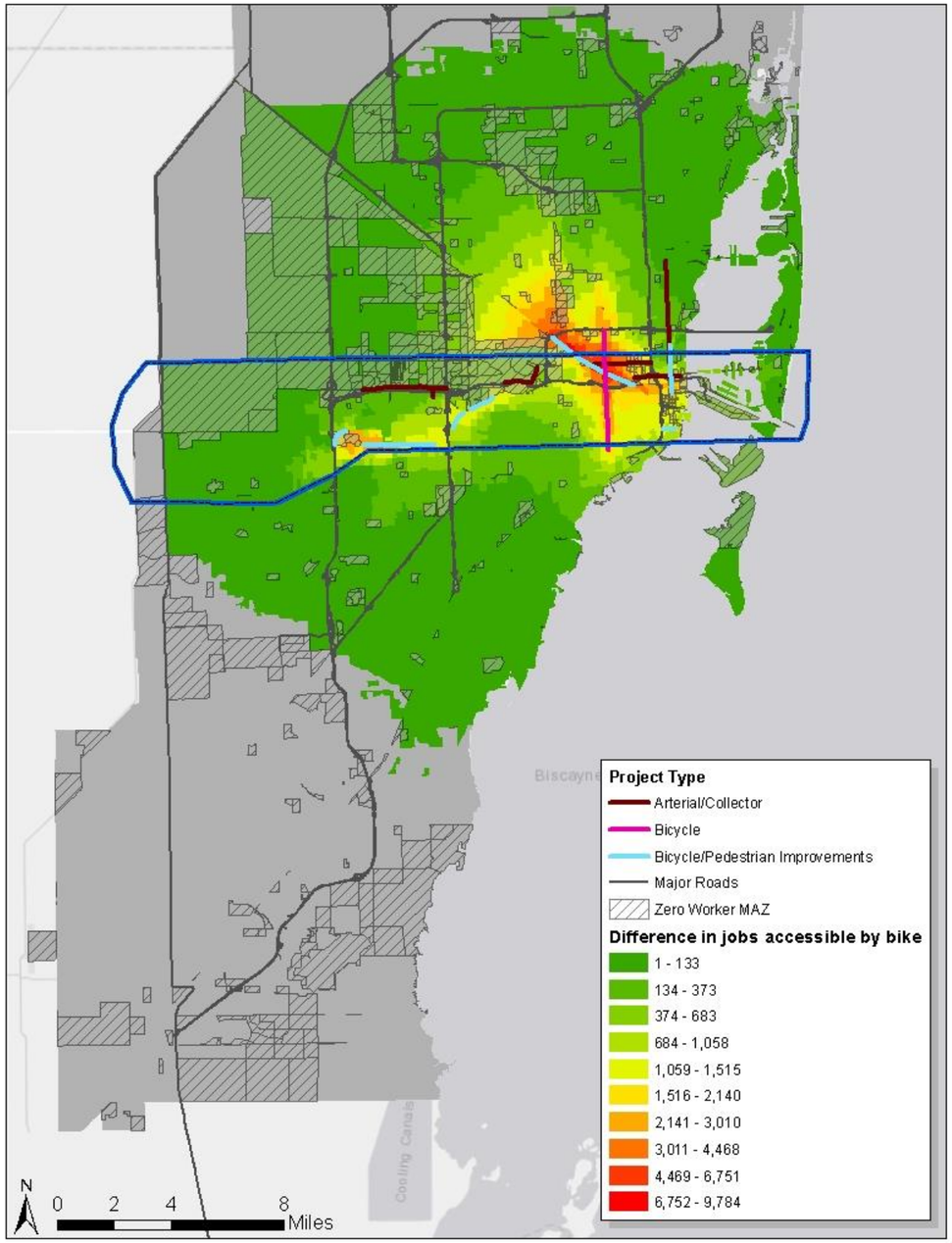
Corridor 8. Scenario 3. Auto Accessibility Delta



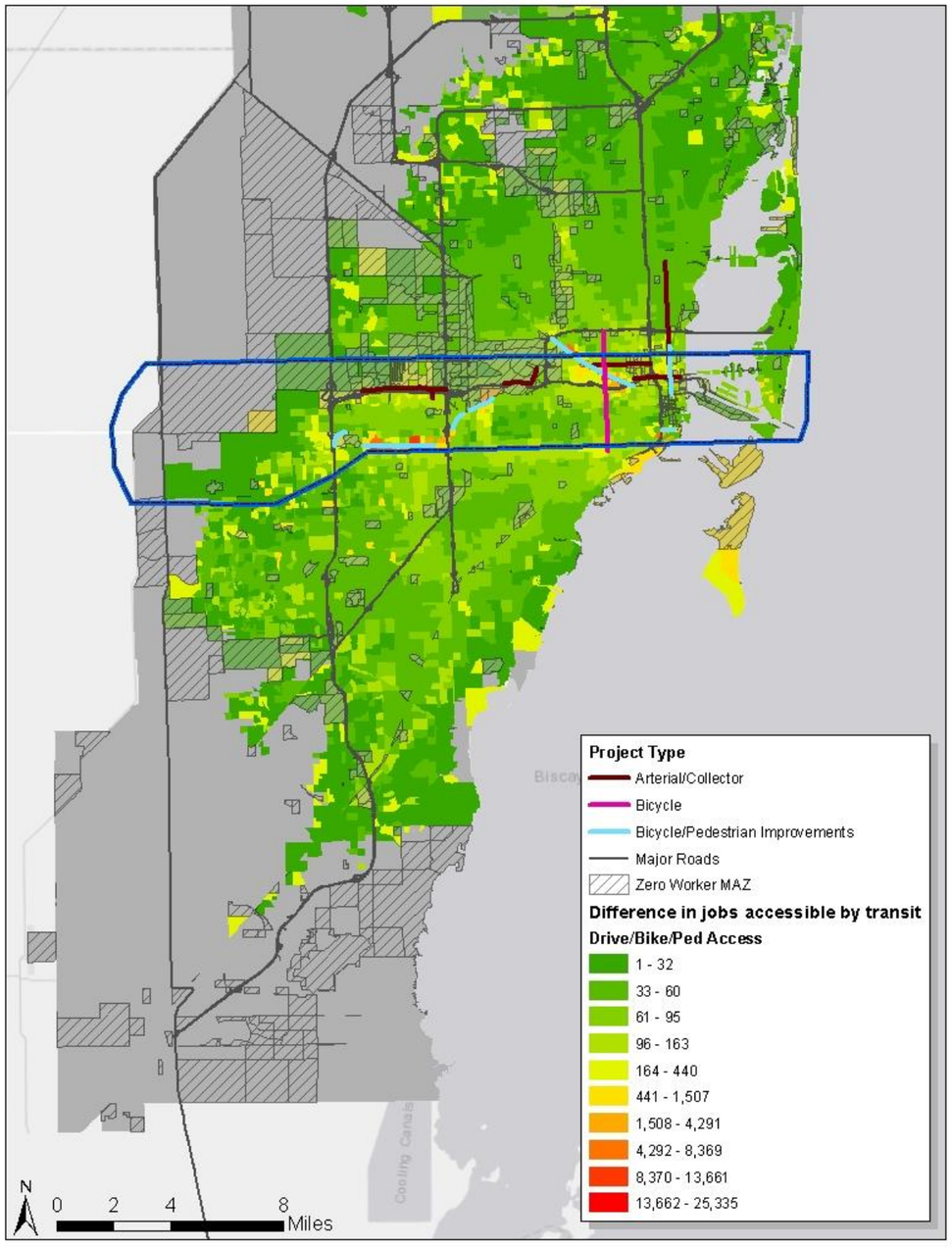
Corridor 8. Scenario 4. Walk Accessibility Delta



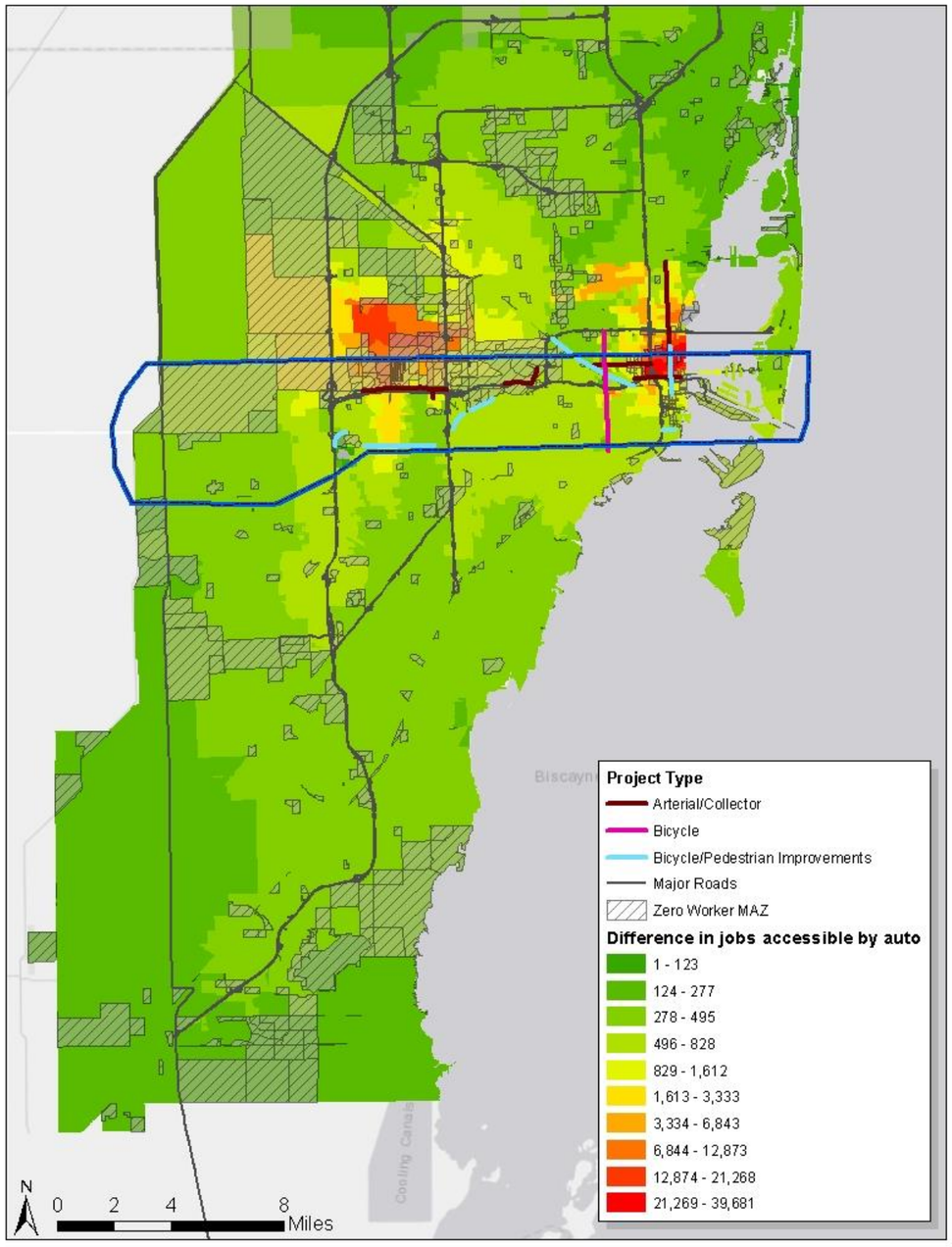
Corridor 8. Scenario 4. Bike Accessibility Delta



Corridor 8. Scenario 4. Transit Accessibility Delta



Corridor 8. Scenario 4. Auto Accessibility Delta



Appendix C. Corridor Connectivity and Mobility Charts

Transit Connectivity Ratio by Corridor

Downtown Miami average

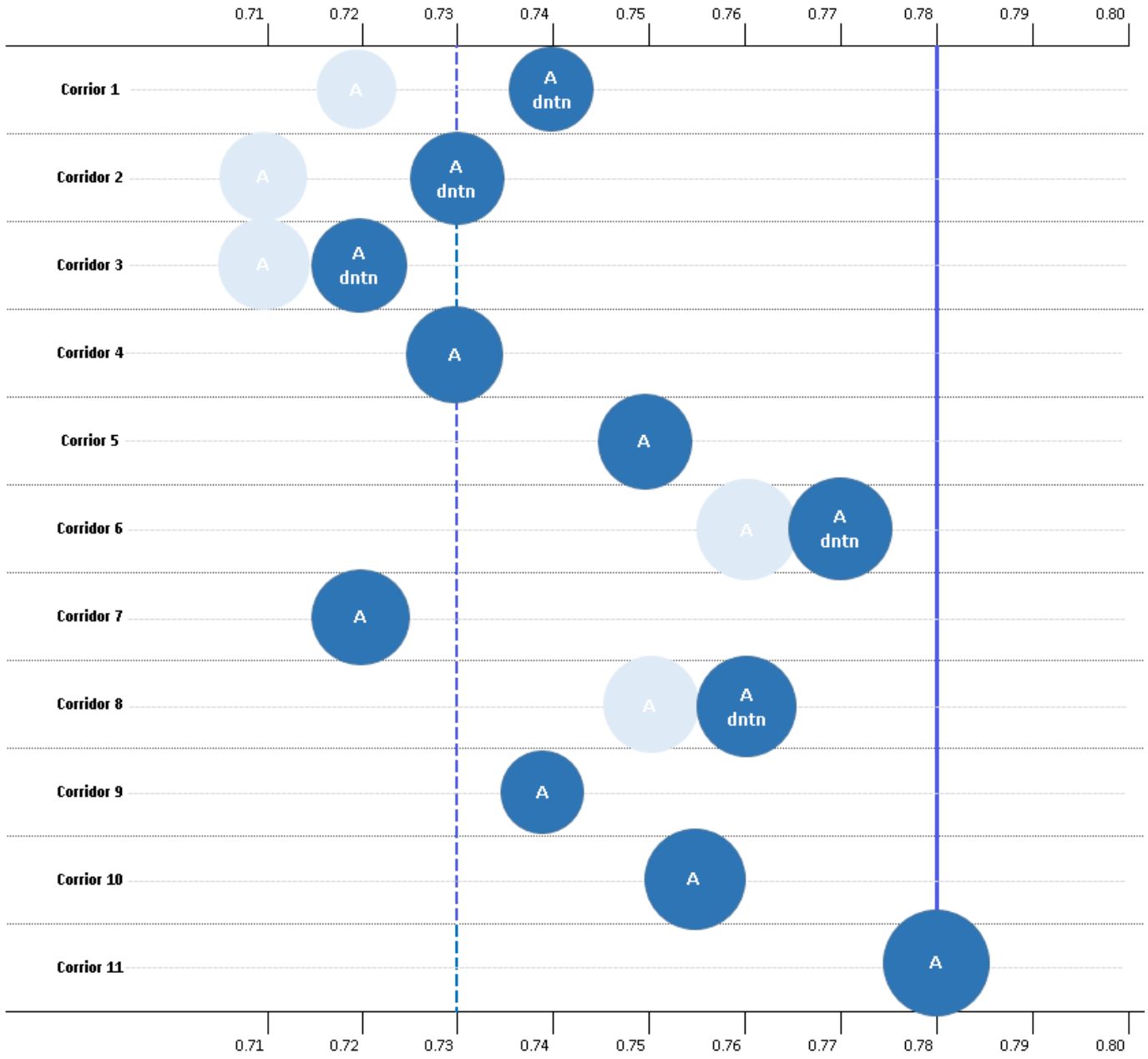
Countywide average

T — Corridor Transit Access to Jobs score

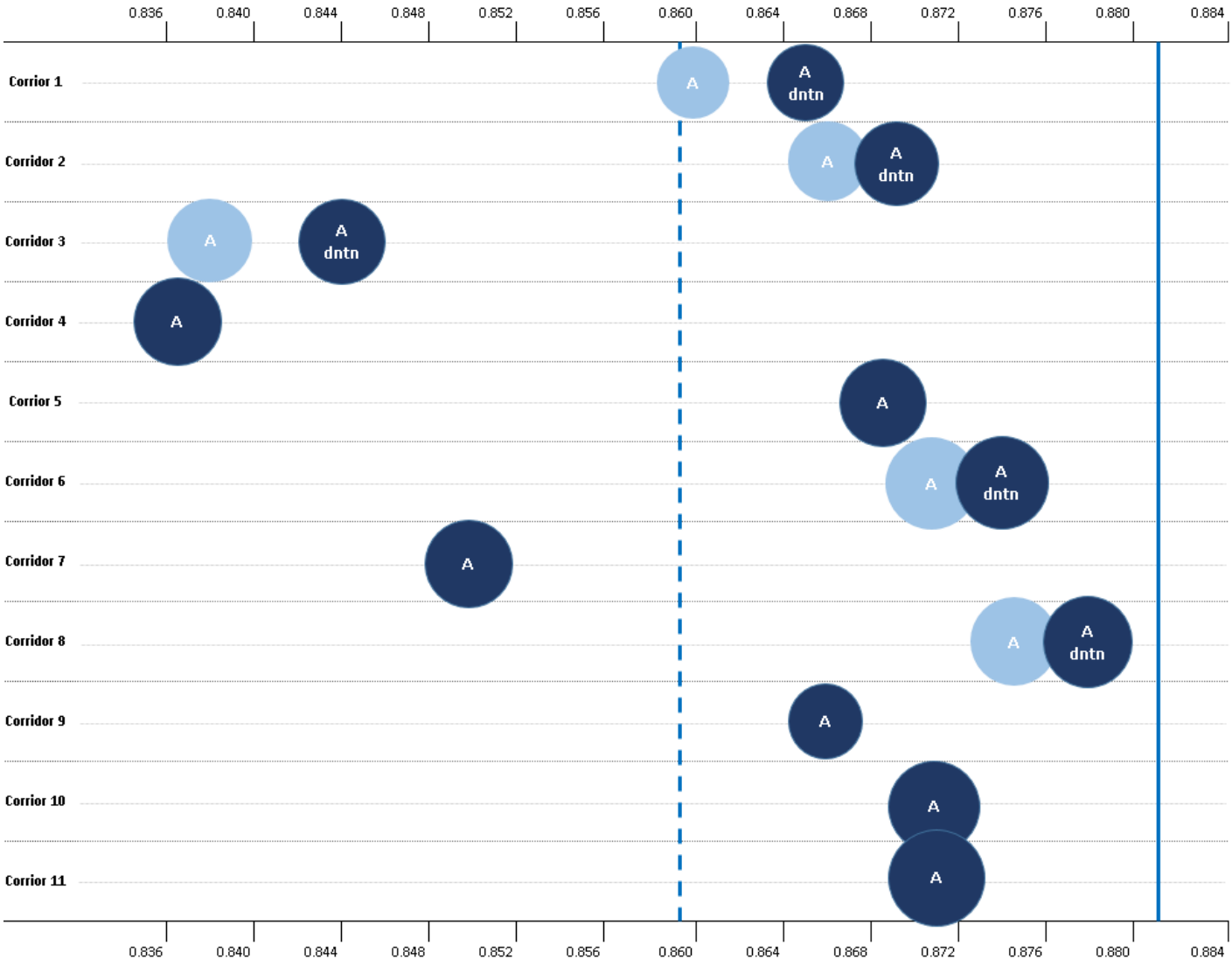
"X" Cong. **:** Uncong. ratio

"Y" Defined Corridors

Auto Connectivity Ratio by Corridor



Auto Mobility Ratio by Corridor



Downtown Miami average

Countywide average

A — Corridor Auto Access to Jobs score

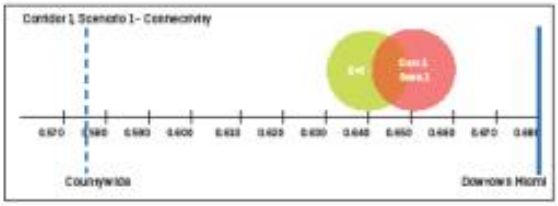
"X" Cong. : Uncong. ratio

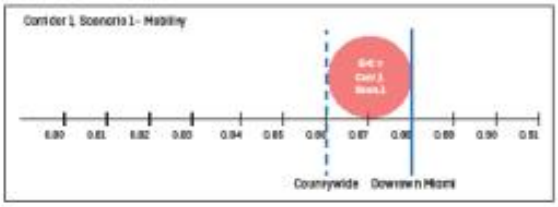
"Y" Defined Corridors

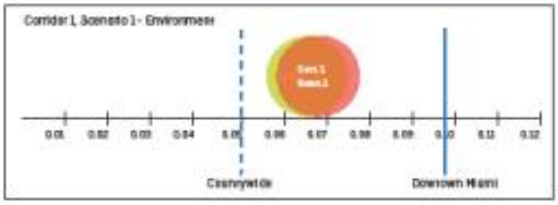
Appendix D. Corridor Summary Sheet Samples

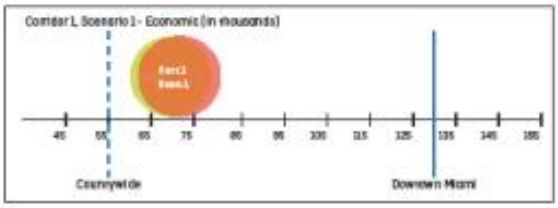
CORRIDOR 1 / SCENARIO 1

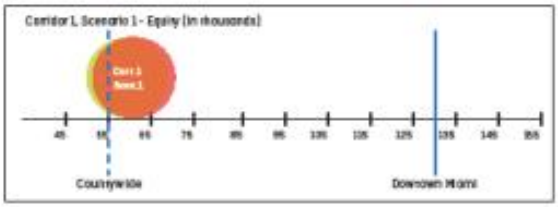
WALK ACCESSIBILITY







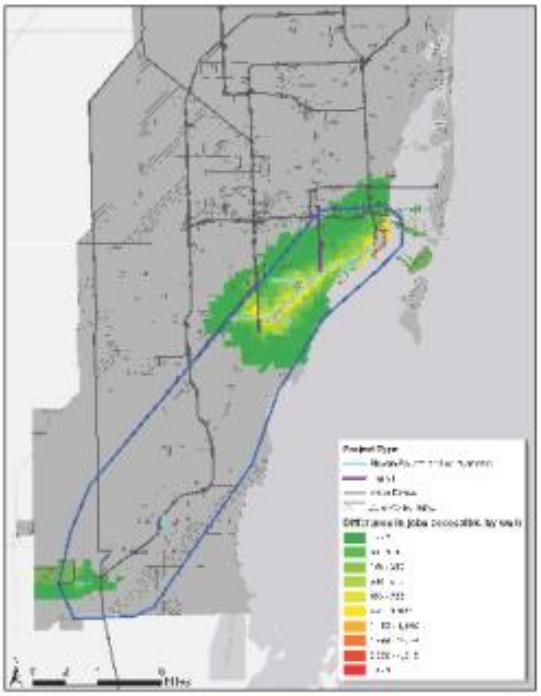




LEGEND

Existing + Committed Corridor 1 / Scenario 1

Bubble size represents raw walk/bike score



NOTES:

- Raw scores represent corridor changes in respective metrics.
- Normalized scores represent raw scores relative to other scenarios/corridors.
- Bubble diagrams represent corridor margin of change for WALK & BIKE accessibility for Economic & Equity metrics, and change in respective ratio for the Connectivity, Mobility, and Environment metrics

CORR 1 / SCEN 1 BIKE / PED	CONNECT.	MOBILITY	ENVIRON.	ECON.	EQUITY
RAW DELTA	0.013	0.0000	0.0011	1,200	300
NORMALIZED	76%	0%	100%	100%	43%

IMPROVEMENTS INCLUDED IN CORRIDOR 1 / SCENARIO 1:

PEDESTRIAN

- M-Path GreenLink Trail Improvements from SW 67 Avenue to Miami River Greenway
- Commodore Trail Improvements from Darwin Street to Mercy Hospital
- Snapper Creek Trail "B" Trail Improvements from SW 94 Avenue/K-Land Park to SW 57 Avenue

BICYCLE

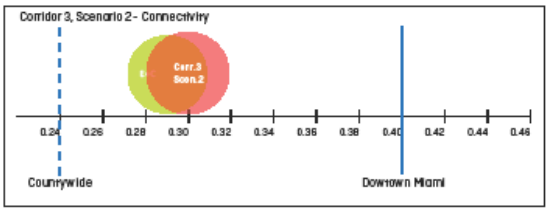
- SW 137 Avenue Bicycle Facility Improvements from SW 288 Street to SR-821 (HEFT)
- SW 25 Road Bicycle Facility Improvements from Brickell Avenue to Coral Way
- NW 344 Street Bicycle Facility Improvements from SW 192 Avenue to NW 6 Avenue
- Blue Road Bicycle Facility Improvements from SW 67 Avenue to SW 42 Avenue
- S 13 Street/Coral Way Bicycle Facility Improvements from SW 3 Avenue to Brickell Avenue

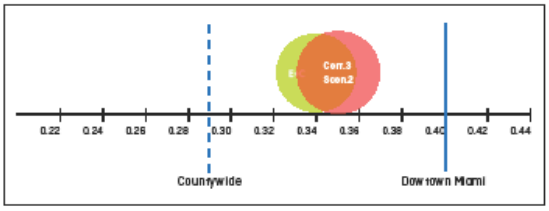
TRANSIT

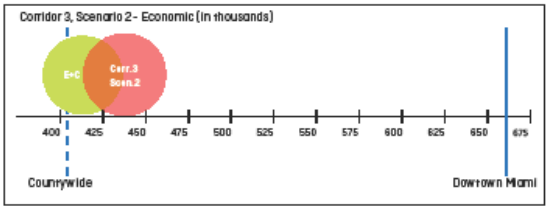
- Douglas Road Corridor (SW 37 Avenue) Enhanced Bus – Incremental improvement on PTP corridor from US-1 to Miami Intermodal Center (MIC)

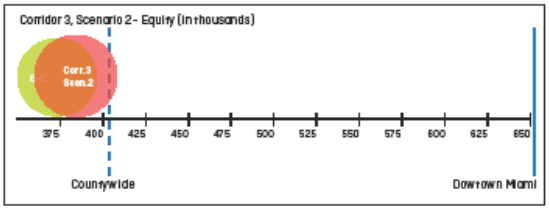
CORRIDOR 3 / SCENARIO 2

TRANSIT ACCESSIBILITY







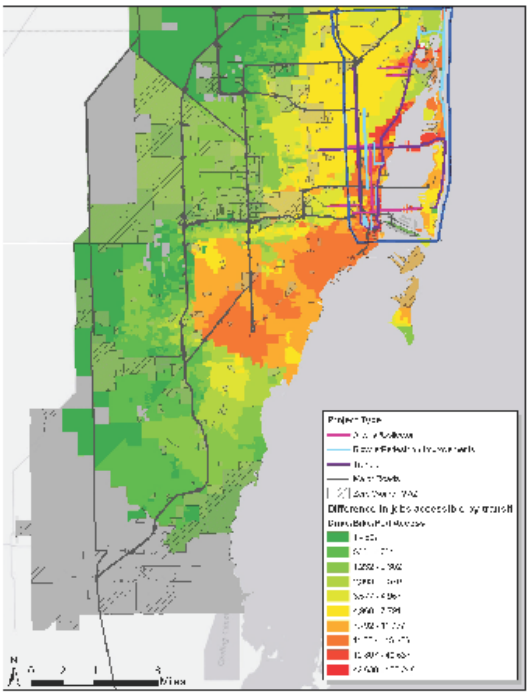


LEGEND

Existing + Commited

Corridor 3 / Scenario 2

Bubble size represents raw transit score



NOTES:

- Raw scores represent corridor changes in respective metrics.
- Normalized scores represent raw scores relative to other scenarios/corridors.
- Bubble diagrams represent corridor margin of change for TRANSIT accessibility for Economic & Equity metrics, and change in respective ratio for the Connectivity, Mobility, and Environment metrics

CORR 3 / SCEN 2 TRANSIT	CONNECT.	MOBILITY	ENVIRON.	ECON.	EQUITY
RAW DELTA	0.013	–	0.022	17,000	7,500
NORMALIZED	100%	–	100%	100%	100%

IMPROVEMENTS INCLUDED IN CORRIDOR 3 / SCENARIO 2:

PEDESTRIAN

- Atlantic Trail Improvements from North Shore Park to Broward County Line
- Biscayne Road Pedestrian Facility Improvements from NE 187 Street to NE 191 Street

BICYCLE

- NE 62 Street Bicycle Facility Improvements from Biscayne Boulevard to NE 2 Avenue
- NW 5 Avenue Bicycle Facility Improvements from NW 4 Street to NW 11 Street
- SW/NW 1 Avenue Bicycle Facility Improvements from SW 2 Street to NW 11 Street
- NE 2 Avenue Bicycle Facility Improvements from NE 20 Street to NE 36 Street
- NE 2 Avenue Bicycle Facility Improvements from NE 62 Street to West Little River Canal/NE 84 Street
- NW 2 Avenue Bicycle Facility Improvements from NW 20 Street to NW 79 Street

TRANSIT

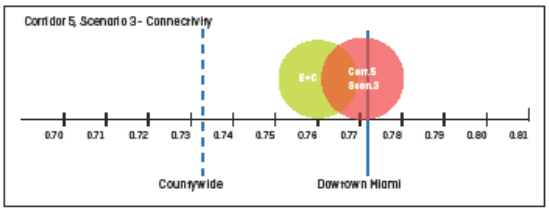
- 79 Street Causeway Enhanced Bus from Northside Metrorail Station to Miami Beach Convention Center
- NW 7 Avenue Enhanced Bus from Downtown Miami to Golden Glades Interchange
- North Corridor (Biscayne) Enhanced Bus from Miami Downtown Terminal to Aventura Terminal

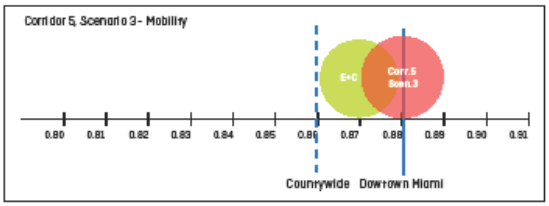
ROADWAY

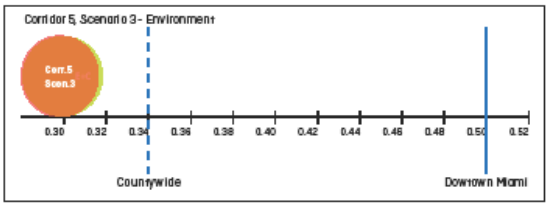
- NW 79 Street/NW 81 Street/NW 82 Street Capacity Improvements from NW 13 Court to Biscayne Bay
- W Dixie Highway Widen to 4 Lanes from NE 163 Street to NE 175 Street
- NE 151 Street Add 2 Lanes and Reconstruct from NE 10 Avenue to West Dixie Highway
- NE 159 Street Add 2 Lanes and Reconstruct from NE 6 Avenue to West Dixie Highway
- NW 14 Street Widen to 3 Lanes and Resurface from Civic Center to US-1

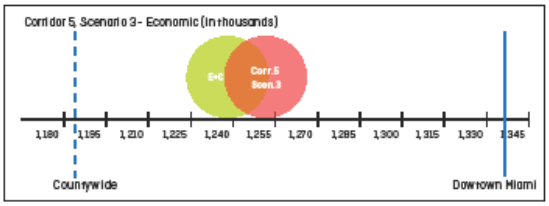
CORRIDOR 5 / SCENARIO 3

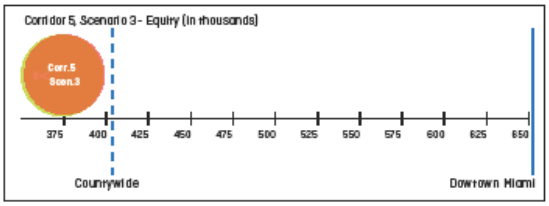
AUTO ACCESSIBILITY







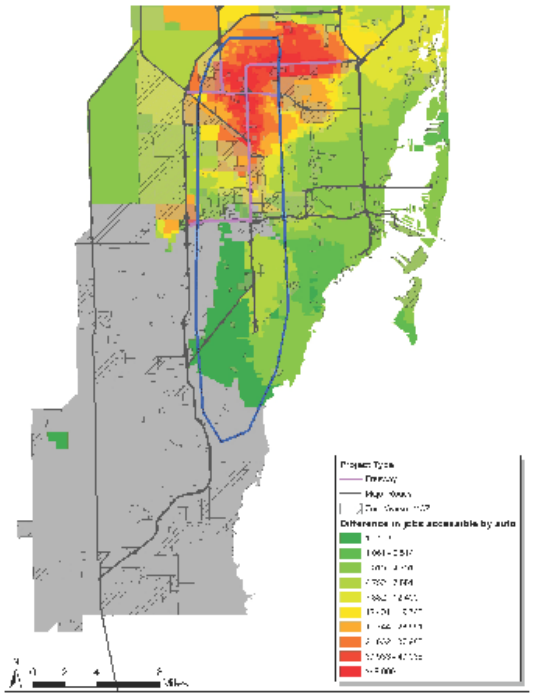




LEGEND

Existing + Commited Corridor 5 / Scenario 3

Bubble size represents raw auto score



NOTES:

- Raw scores represent corridor changes in respective metrics.
- Normalized scores represent raw scores relative to other scenarios/corridors.
- Bubble diagrams represent corridor margin of change for AUTO accessibility for Economic & Equity metrics, and change in respective ratio for the Connectivity, Mobility, and Environment metrics

CORR 5 / SCEN 3 AUTO	CONNECT.	MOBILITY	ENVIRON.	ECON.	EQUITY
RAW DELTA	0.010	0.0115	-0.0026	15,400	600
NORMALIZED	71%	72%	-59%	64%	8%

IMPROVEMENTS INCLUDED IN CORRIDOR 5 / SCENARIO 3:

ROADWAY

- SR 836 Managed Lanes from SR 821 (HEFT) to SR 826 / SR 836 Interchange
- SR 826 Managed Lanes from NW 154 Street to NW 17 Avenue
- SR 826 Widen with Express Lanes from NW 103 Street to NW 154 Street
- SR 826 Add 4 Special Use Lanes from SR 836 to NW 103 Street
- SR 924 Gratigny West Extension from SR 826/I-75 to SR 821 (HEFT)
- I-75 Widen with Express Lanes from SR 826 to NW 170 Street
- I-75 Off Ramp from SB I-75 to SB W 28 Avenue/NW 87 Avenue

MIAMI-DADE

MULTIMODAL ACCESSIBILITY-BASED NEEDS ASSESSMENT

FEBRUARY 2018

PEPARED FOR:

Miami-Dade Transportation Planning Organization

TPO Miami-Dade Transportation Planning Organization

PEPARED BY:

ATKINS

RENAISSANCE PLANNING

CALTRAN ENGINEERING GROUP