APPENDIX E

Accessibility Analysis

MetroPlan 2045 Regional Transportation Plan

Equity and Accessibility Analysis

Contract No.: 2021-0001
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Prepared by:

BURGESS & NIPLE

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1.0 Introduction

MetroPlan (formerly Flagstaff Metropolitan Planning Organization) is updating its regional transportation plan (RTP) for a 25-year planning horizon. The 2017 Update to the RTP identified $250 Million in projects and resulted in 3 ballot initiatives being sent to voters: Prop 419 for general transportation, Prop 420 for a Lone Tree railroad overpass, and Prop 421 for transit service improvements. Two of those initiatives passed, but the transit funding was not approved by voters. As a result of these 2018 ballot box decisions, the 2022 RTP update is more focused on "how" than "what." In other words, the region is clear on the projects that need to be completed and has a commitment to voters to deliver. However, the design, relative modal emphasis of the projects, and program schedule needs further exploration in light of recent policy developments.

In addition to the passage of funding propositions in 2018, the City of Flagstaff recently declared a climate emergency and seeks to achieve carbon neutrality by 2030. MetroPlan is positioned to support this effort through the RTP. One way MetroPlan can provide support is to clearly communicate to decision makers and the public the effectiveness of various transportation design strategies in meeting mobility, accessibility, and climate action goals.

1.1. Project and Accessibility Analysis Purpose

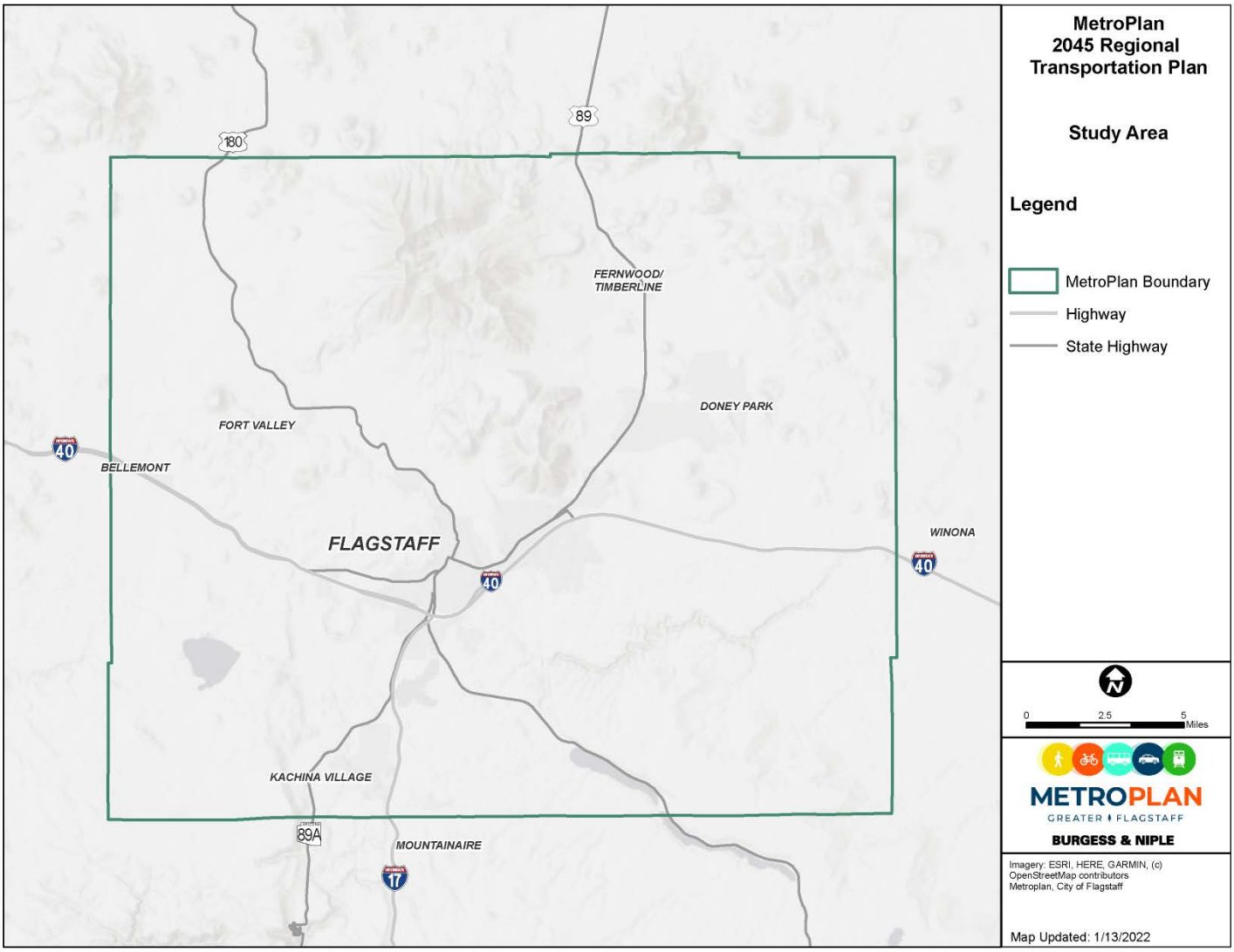
This RTP will serve as a policy document and vet what is needed and would be accepted by the public to achieve Flagstaff climate goals. The RTP will also satisfy all federal requirements.

The purpose of the accessibility analysis is to inform equitable programming of resources within the purview of the Prop 419 tax, and potentially inform transit needs for a future tax.

1.2. Study Area

The study area includes the greater Flagstaff region, which consists of a 525 square-mile study area including the City of Flagstaff, Bellemont, Fort Valley, Kachina Village, Mountainaire, Doney Park, and the surrounding area. ***Figure 1*** illustrates the MetroPlan planning boundary.

Figure 1 – Study Area



2.0 Methodology Overview

Accessibility analyses were conducted at the Traffic Analysis Zone (TAZ) level to determine travel times from points of interest by mode (walk, bike, transit, vehicle). For purposes of this analysis, travel times were run in five-minute increments for walk, bike, and automobile and in 15-minute increments for transit. The analyses leveraged GIS and the MetroPlan travel demand model (TDM). These platforms were run with the following assumptions:

- Travel times assumed travel to the TAZ centroid.
- Travel pathways used appropriate existing infrastructure (e.g., walk on paths/sidewalks, drive on roads, etc.)
- Transit travel times include time to/from a stop as well as wait times.
- The TDM offers mode choice; when walking or biking is faster than transit, users choose one of these modes instead of transit, creating larger travel time bandwidths.
- As in past RTP analyses, this accessibility effort focuses on TAZs with population over 10 residents.

Scores by mode were generated for each point of interest. This was achieved by determining how many locations by point of interest category were accessible to a TAZ within the maximum time interval (30 minutes walk/bike, 45 transit, 15 minutes vehicle). Scores were weighted by the total number of points of interest.

For example, park was one of the five categories of points of interest. Thirty parks were considered in this analysis. If someone could walk to 10 of the 30 parks within 30 minutes from a particular TAZ, that TAZ score would be 10/30 = 0.33. This would be weighted by the number of points of interest to reach up to 100 points (5 categories of points of interest, each category is weighted 20 points). The weighted walk score for parks for the TAZ would be 0.33x20 = 6.6. This would be added with the other categories of points of interest for a composite score, again up to 100 points.

Typically, accessibility scores are calculated based on a regional average and compared to TAZs with an overrepresentation of Title VI populations. Based on the Socioeconomic Profile conducted in conjunction with this RTP, over 95% of TAZs with population over 10 residents include at least one Title VI population that overrepresents the regional average by at least 15%. Therefore, accessibility scores for TAZs with 3 or more Title VI populations were calculated and compared to the regional accessibility scores for each mode to provide striation (virtually all TAZs are Title VI, therefore, the regional average is very nearly the Title VI average). This also allows insights into the performance of the likely more disadvantaged TAZs. TAZs were identified spatially by mode and general recommendations for equitable transportation programming, as well as programmatic considerations, were made to help address potential inequities. Context (urban vs. rural) was considered in the recommendations process.

3.0 Categories of Points of Interest

Accessibility analyses were conducted for grocery stores, medical facilities, schools (specifically charter schools), publicly accessible parks, and employment centers. These five categories provide a general context of equitable access for the people of the MetroPlan area and how persons from each area of the region can get to these points of interest within a reasonable walking, bicycle, transit, and automobile travel time. The points of interest were selected based on specific criteria to each category (documented below) and together create a picture of necessary resources for the MetroPlan population. Points of interest were based on publicly available information from July 2022.

The first step in conducting the accessibility analysis was to identify the points of interest for each category (grocery stores etc.) and digitize or plot those points into the ArcMap (GIS) software. Accessibility analysis is run based on the x,y coordinates of a point of interest so it is necessary to get the data set compiled as an initial step. The analysis is conducted by measuring the travel time from a point of interest outward towards the desired location, in this instance a TAZ centroid location along a path traversable by the mode being analyzed. It was also necessary to define the TAZ centroid locations prior to the analysis. These centroid locations were generated from the MetroPlan TDM.

3.1. Education

A review of public-school locations from the Flagstaff Unified School District (FUSD) (K-12) in the MetroPlan area and their respective bus routes and stops provided context that access to these locations from the TAZs within the MetroPlan boundary is sufficient. Access to charter schools (which are viewed as a public resource) via public school district bussing is not available and was therefore selected for further analyses. This analysis included 11 points of interest. Private and religious schools were excluded from this list because tuition is required, which in turn makes these locations unavailable as a public resource, since tuition is a barrier to access. Based on a limited literature review, other agencies employed this same practice.

3.2. Employment Centers

Generalized employment center locations were selected as points of interest from a review of the Maricopa Association of Governments (MAG) larger employment dataset. This data set included individual employment locations (well over eight hundred data points) that created an excess of data unsuitable for a generalized accessibility analysis. Further, granular review would also require assessment of employment options and consideration of employment population base. Centers of employment, where a larger number of jobs are more densely located provide a more reasonable dataset from which to conduct the analysis and represents a large cross-section of employment opportunities. Nine centers of employment were selected for this analysis; these are generalized locations of concentrated employment and do not represent any one employer.

3.3. Grocery Store

Twelve grocery store locations were identified through a generalized search of data within the MetroPlan boundary and excluded convenience stores, farmers markets, ethnic and specialty stores, dollar stores, and membership-based stores such as Costco and Sam's Club.

3.4. Parks/Recreation Services

Park locations included all public park and recreation facilities within the MetroPlan boundary as well as elementary school parks that are publicly available outside of school hours. A total of 30 locations were included in the analysis.

3.5. Medical Facilities

Medical facility locations included hospitals, community health centers, and urgent care facilities. These locations make up the publicly available options to MetroPlan residents and included a total of ten locations. VA hospitals and other care facilities were excluded from the analysis because their services are not available to the public as a whole and only to members of the U.S Military.

4.0 Modal Analysis

Travel times were informed by a review of the Flagstaff Trip Diary Survey of Community Travel Patterns 2018 Report of Results. The Trip Diary listed the following distance traveled by mode, indicating the typical distance someone is willing to travel per trip. When a trip distance exceeds the mode preferred threshold, travelers are more likely to select a different mode.

- Walking: 1.0 mile
- Bicycle: 1.7 miles
- Transit: 2.0 miles
- Private Vehicle: 4.0 miles

These distances were based on average speeds reported. This informed the thirty minute maximum trip length assumed for walk and bike analyses.

The analysis tool was run by mode based on two inputs: points of interest and the TAZ centroid data set. Input parameters are set prior to running the analysis and these include time interval, selecting analysis towards or away from the points of interest, and a processing method (in the case of this analysis a "dissolve" method was chosen). Once the parameters are set and the data is input into the analysis tool, it can be run. The output for any point of interest dataset will function as a travel time band that either demonstrates travel time away from the point of interest or travel time towards the point of interest. For the purposes of this analysis the time interval parameters were set for 0-30 minutes range in 5-minute intervals. The output from this analysis includes bands (polygons) with 5-minute interval values for each point of interest location. These bands are then cross referenced (joined) utilizing a software tool that identify TAZ centroid locations intersecting with each individual band. A travel band value (i.e., 5 minutes, 10 minutes, etc.) is assigned to the TAZ centroid (if the spatial relationship is present). This process is replicated for each point of interest within any category. The presence of a spatial relationship between a TAZ centroid and a travel band or multiple travel bands suggests that there is reasonable access to this particular resource from any given TAZ location.

This analysis assumed that safe paths are chosen based on user type to reach the points of interest. The following sections provide nuanced analysis information by mode.

4.1. Walk

The walk analysis was performed using the web-based ArcGIS Online platform using ESRI Network Walk Analysis, which falls under the Network Analyst umbrella of tools. Network Analyst does not account for crossing time in the walk analysis tool. ESRI Network Analyst utilizes the road network with physical sidewalks and multiuse paths as the network for its walk analysis tool. A function within the ArcGIS online platform that originates from the "Drive Time" analysis function was utilized to run the walk analysis for all five accessibility categories. A subset of this "Drive Time" known as "Walk Time" was utilized as the method of analyses. ***Figure 2*** through ***Figure 6*** display the walk analysis for each category of points of interest.

Figure 2 – Walk Analysis: Charter Schools

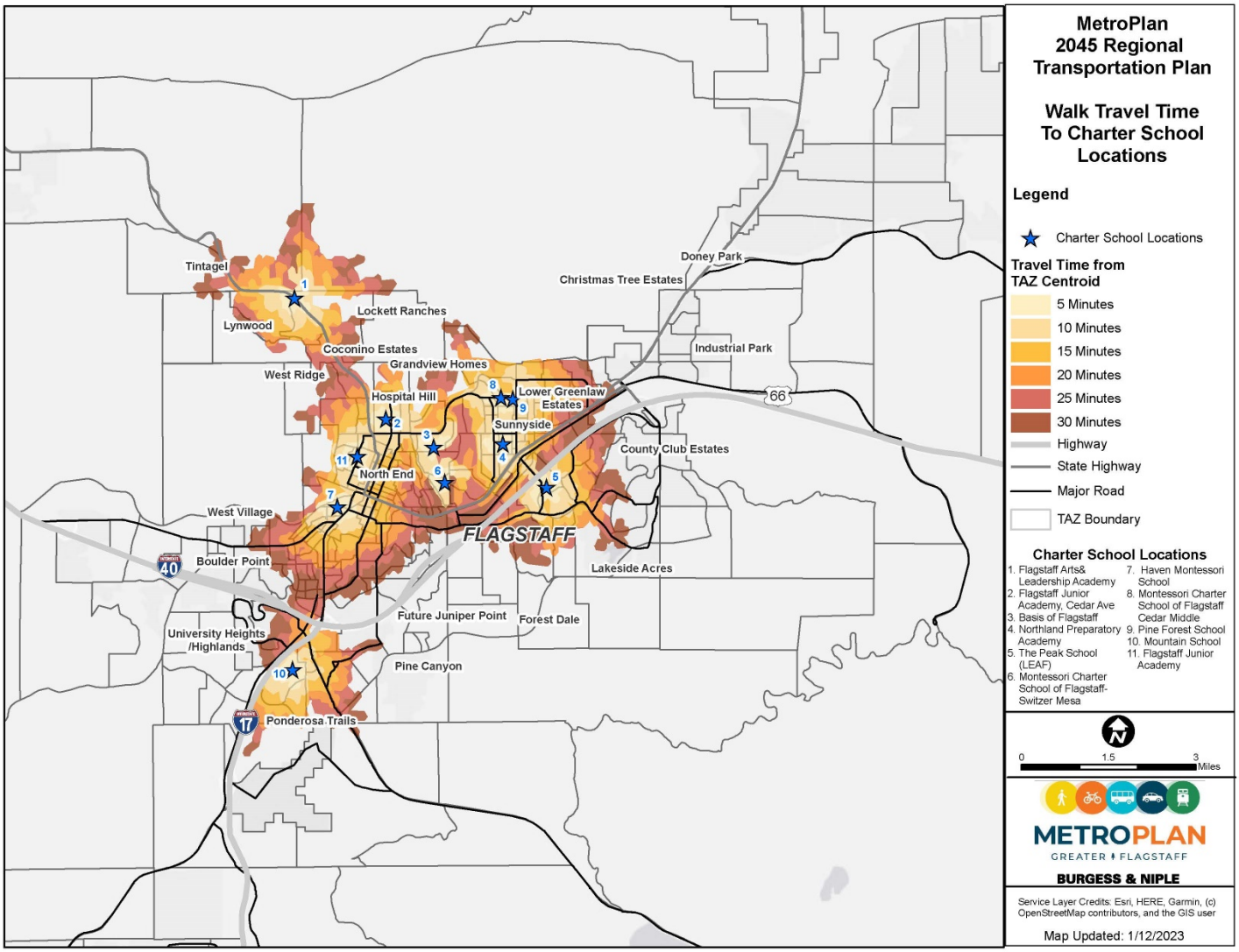


Figure 3 – Walk Analysis: Employment Centers

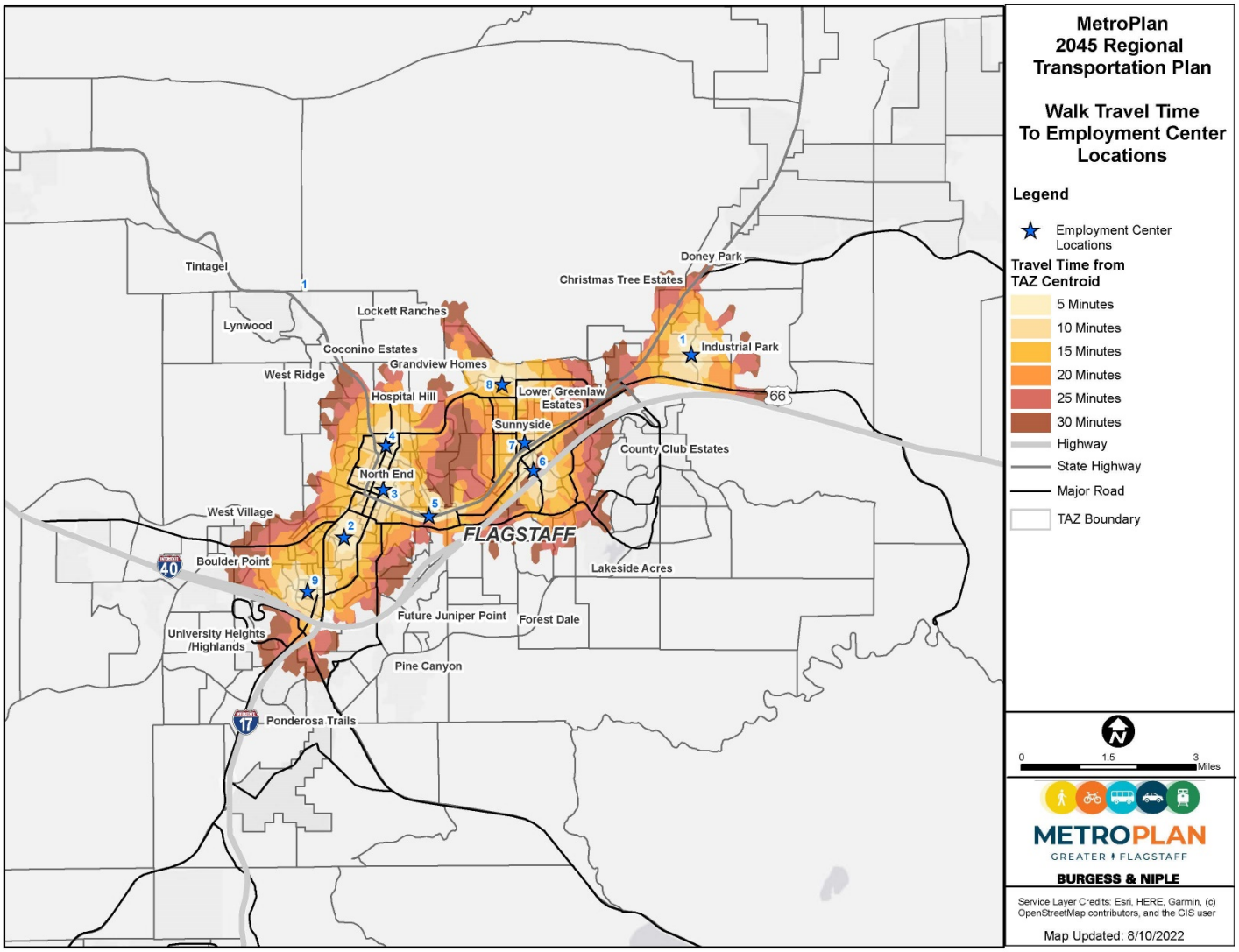


Figure 4 – Walk Analysis: Grocery Stores

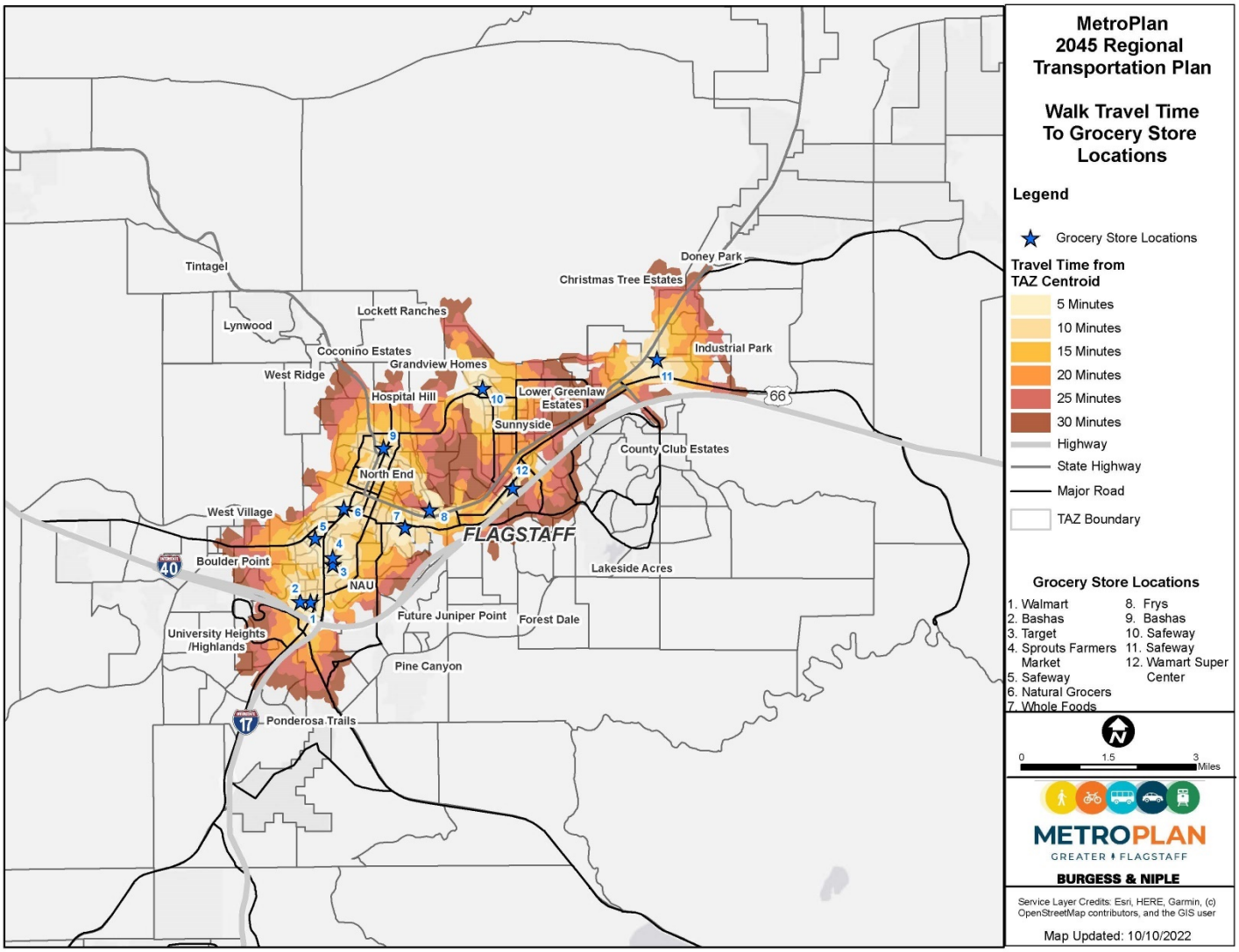


Figure 5 – Walk Analysis: Parks

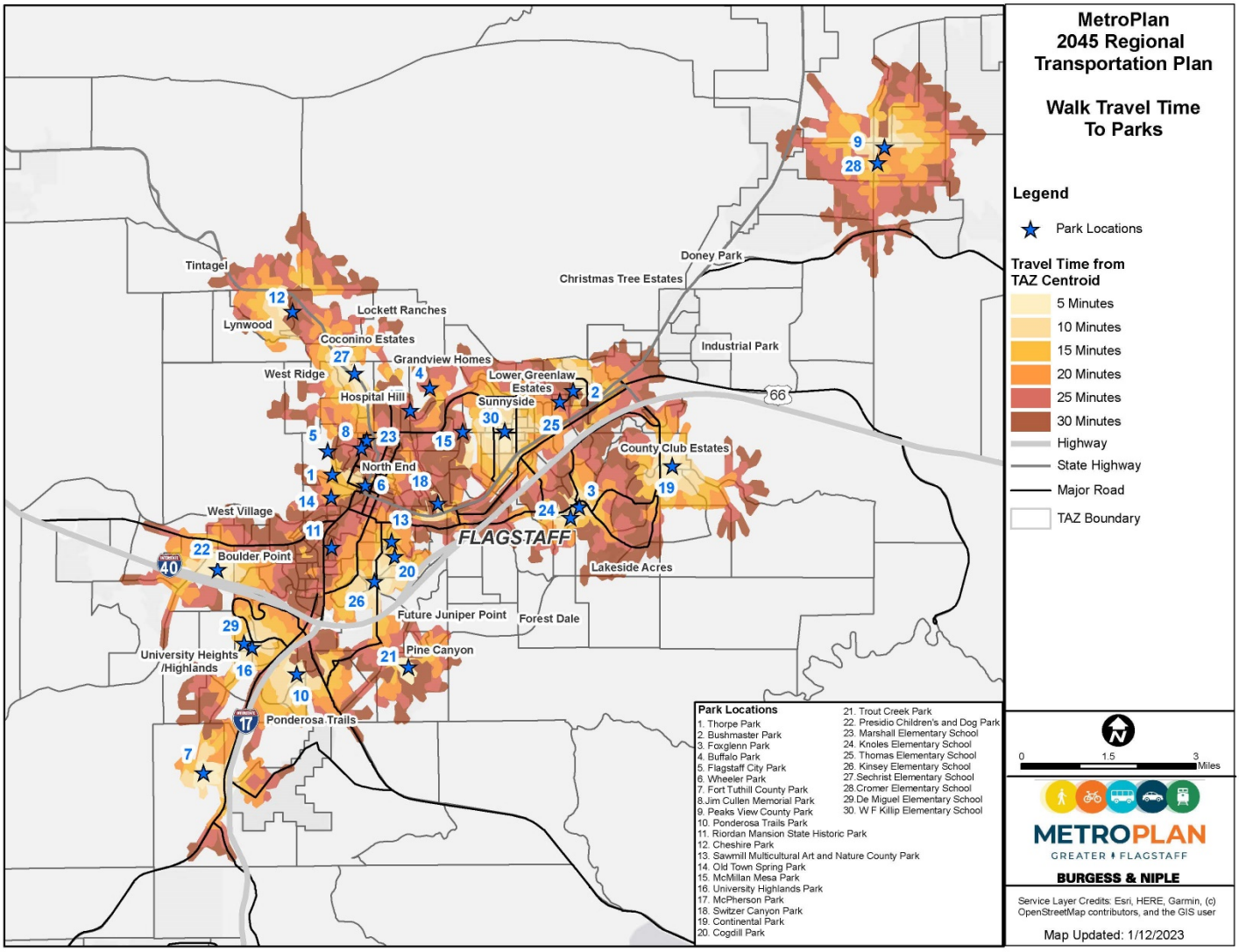
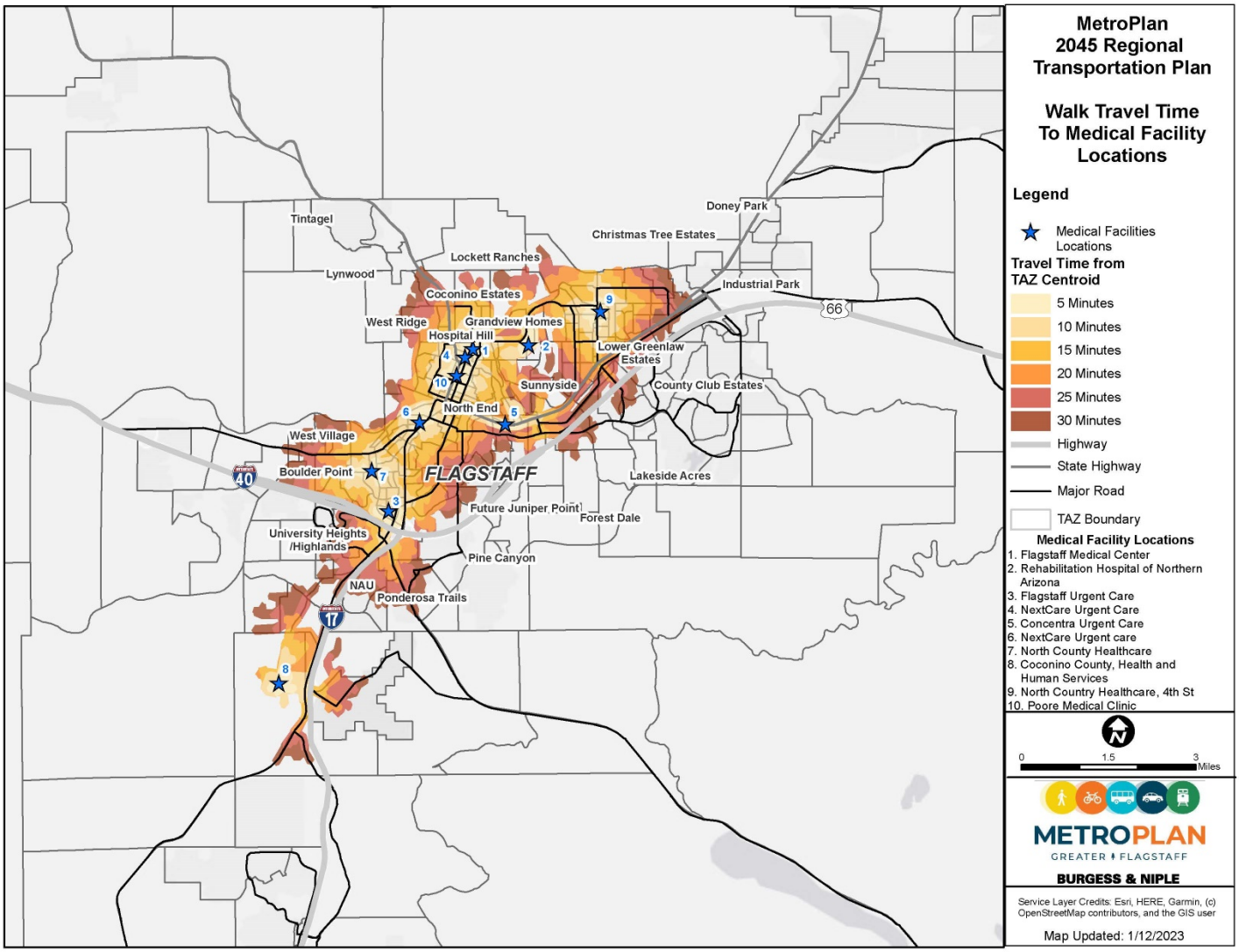


Figure 6 – Walk Analysis: Medical Facilities



4.2. Bike

The bike analysis leveraged the MetroPlan travel demand model (TDM). Travel times are computed using the average speed of bicyclists adjusting for grade. The model will increase the assumed speed for a down grade and decrease the assumed speed for an upward grade. The model computes total travel time by adding the total travel times of all the links used to reach its destination. Within the model, bicycles are able to use all roadways except for freeways as well as any bike enabled urban trail. Bike travel times are related to the network geometry only and are not impacted by roadway congestion. Bike travel times are shown in ***Figure 7*** through ***Figure 11***.

Figure 7 – Bike Analysis: Charter Schools

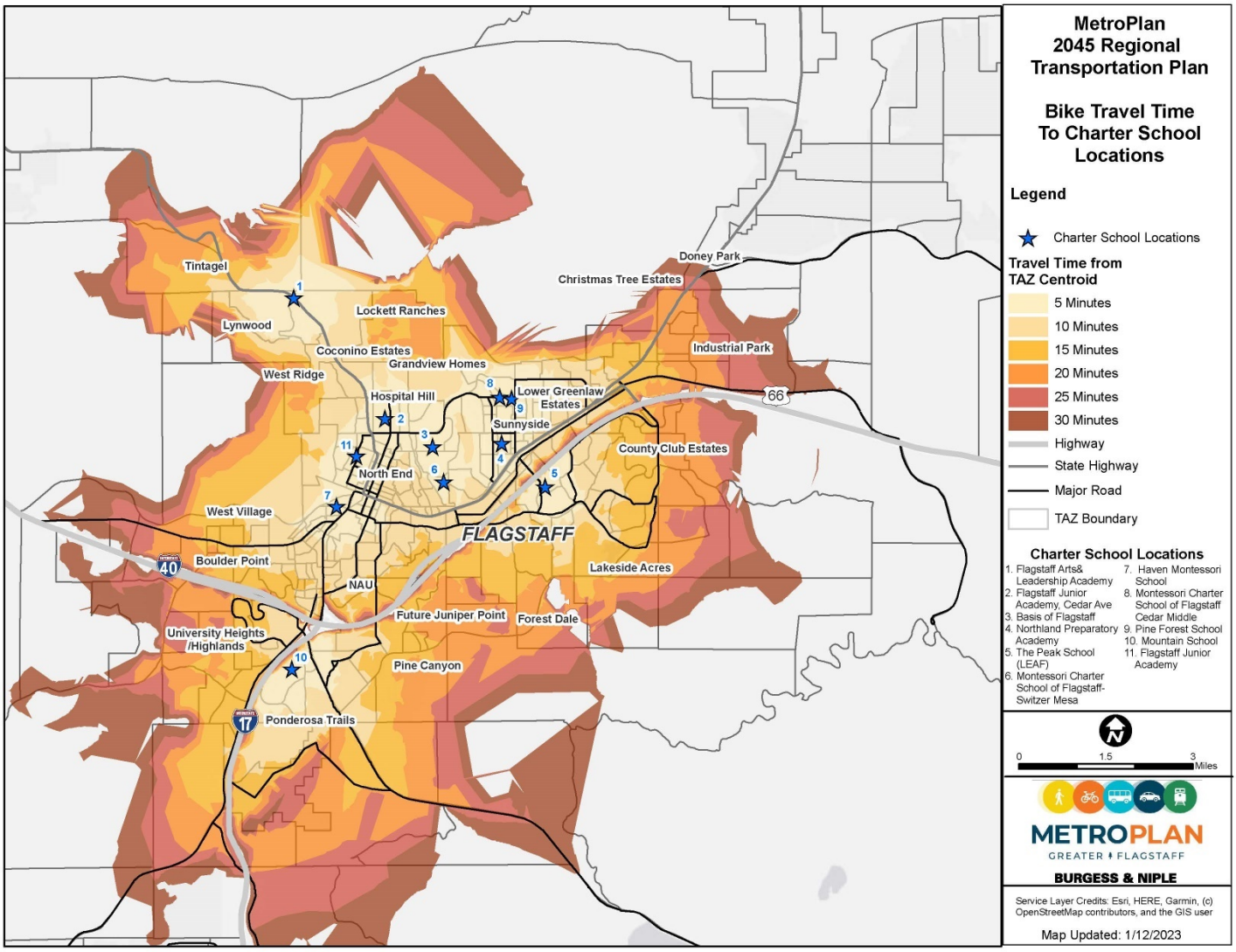


Figure 8 – Bike Analysis: Employment Centers

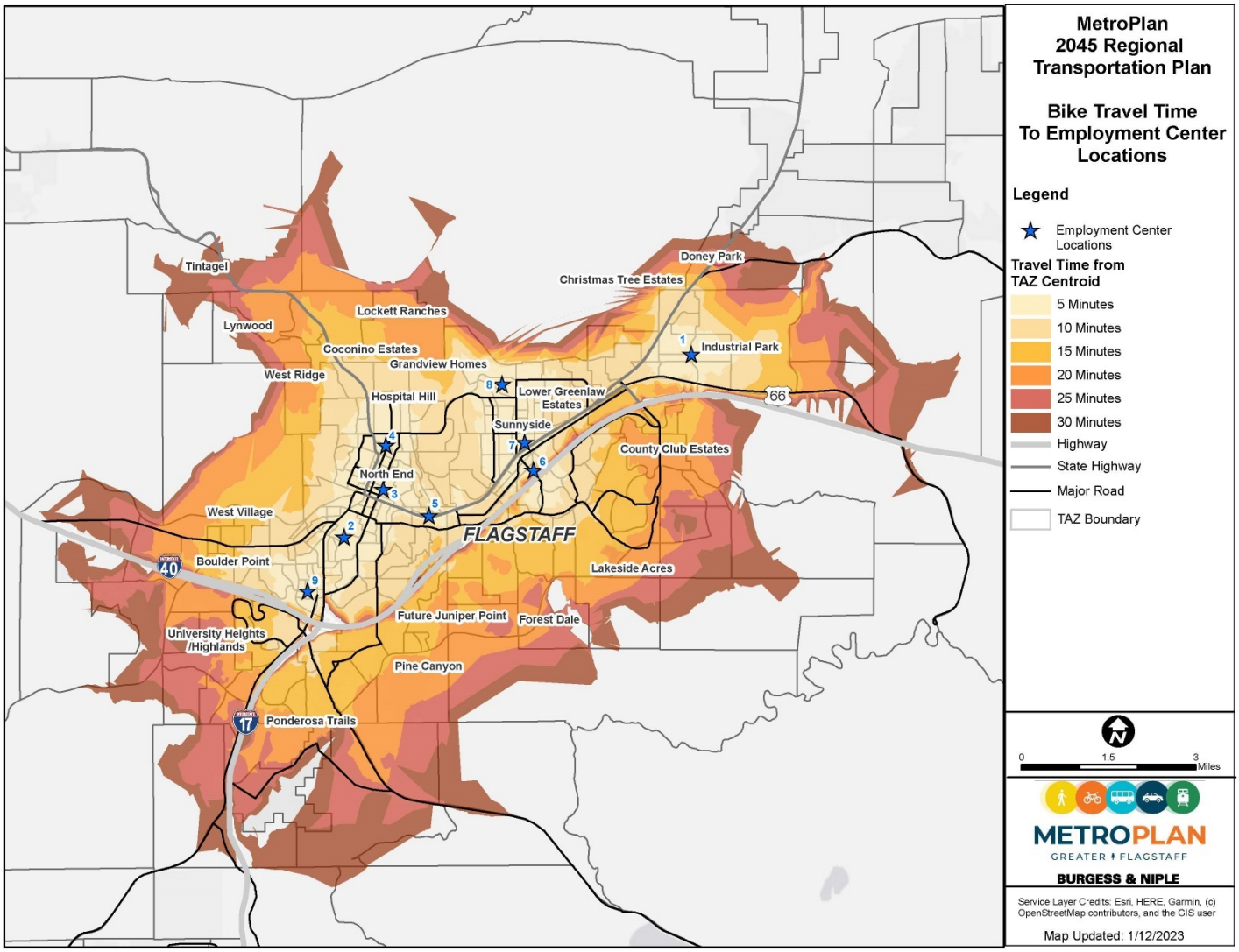


Figure 9 – Bike Analysis: Grocery Stores

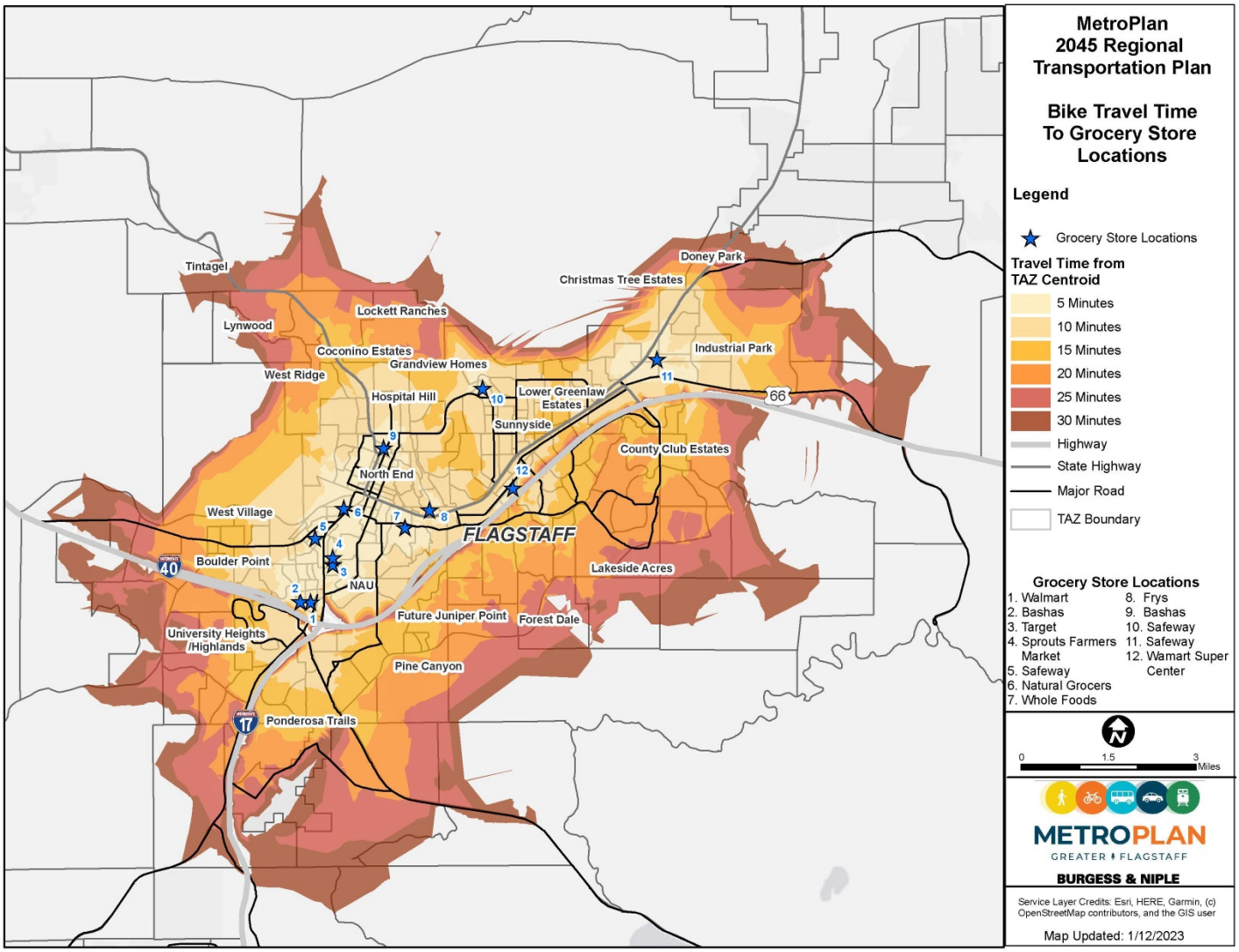


Figure 10 – Bike Analysis: Parks

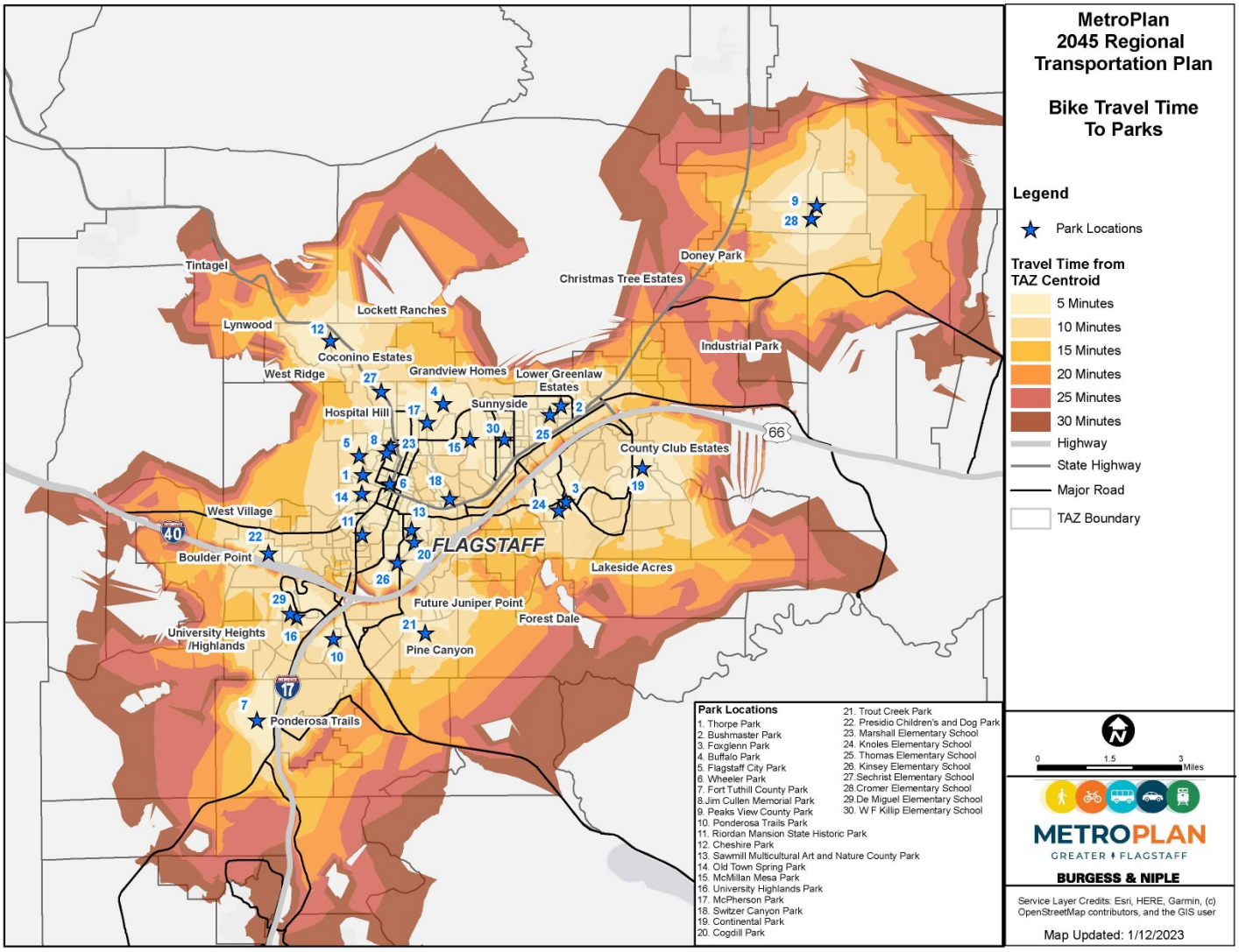
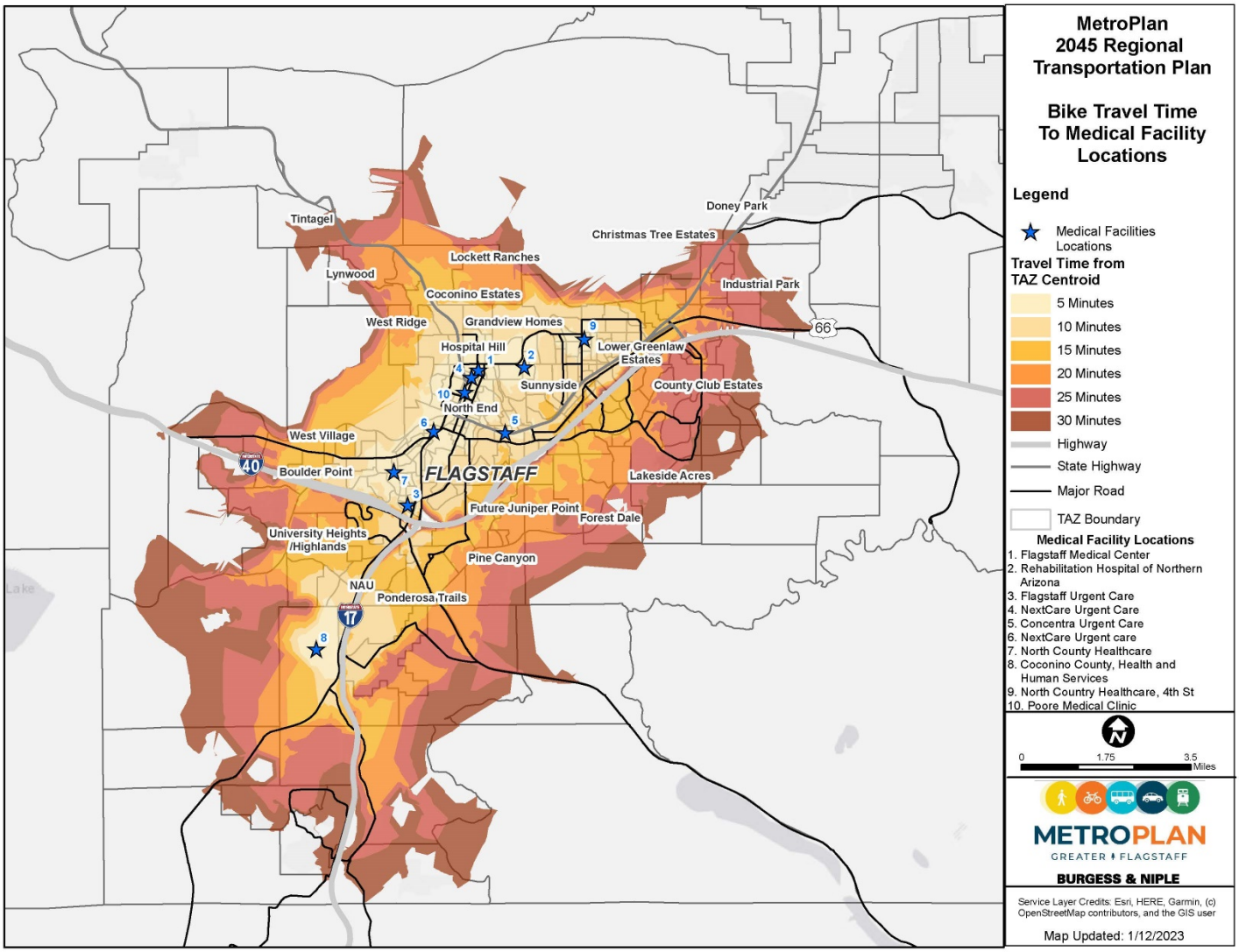


Figure 11 – Bike Analysis: Medical Facilities



4.3. Transit

The transit analysis leveraged the MetroPlan TDM. Transit travel bands are computed using the transit travel time output matrix. This matrix sums the total amount of time to complete a trip from one origin to its destination. This includes the time to walk to the transit stop, time spent waiting for the bus, the time spent on the bus, any time spent walking to a transfer, any time spent waiting for the transfer bus, and the time to walk from the final transit stop to the ultimate destination. The travel band maps may not seem intuitive at first glance as some points of interest are very close to transit stops yet are not highlighted by any bands. This is because these sites are located in such a way that trips are faster walking to these locations than using transit. Many of these areas are close to routes with 20-minute or more headway times. Transit travel times are shown in ***Figure 12*** through ***Figure 16***.

Figure 12 – Transit Analysis: Charter Schools

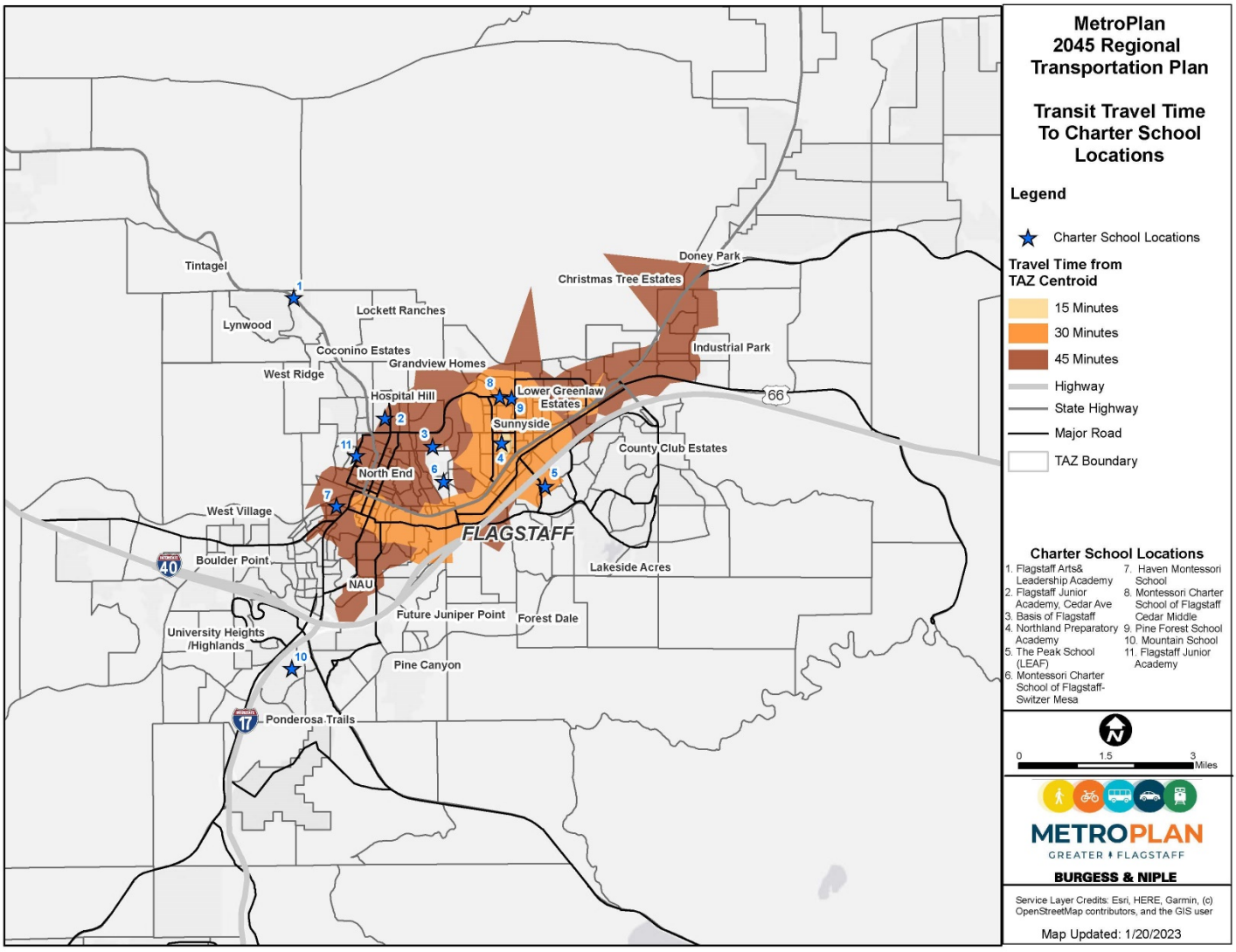


Figure 13 – Transit Analysis: Employment Centers

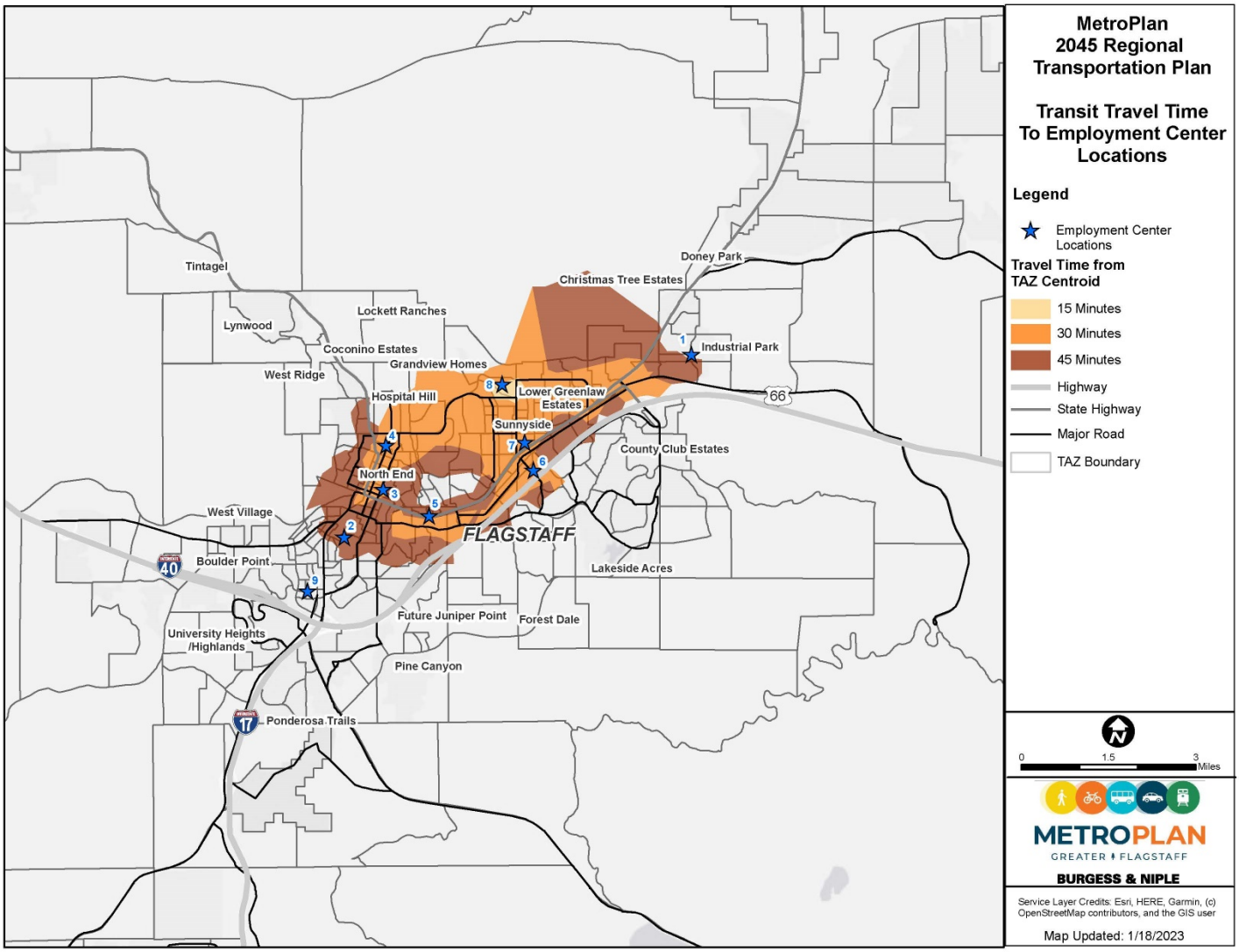


Figure 14 – Transit Analysis: Grocery Stores

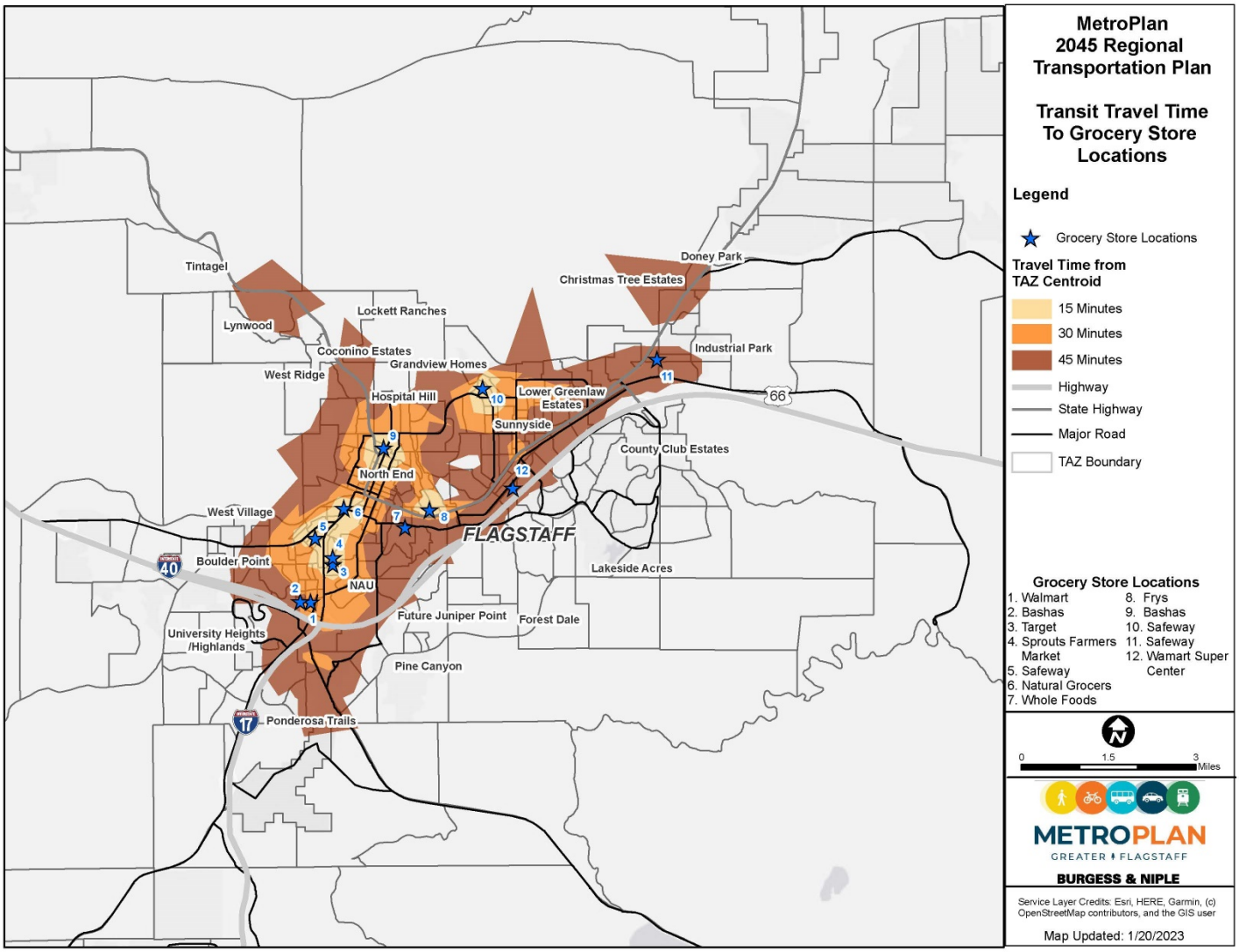


Figure 15 – Transit Analysis: Parks

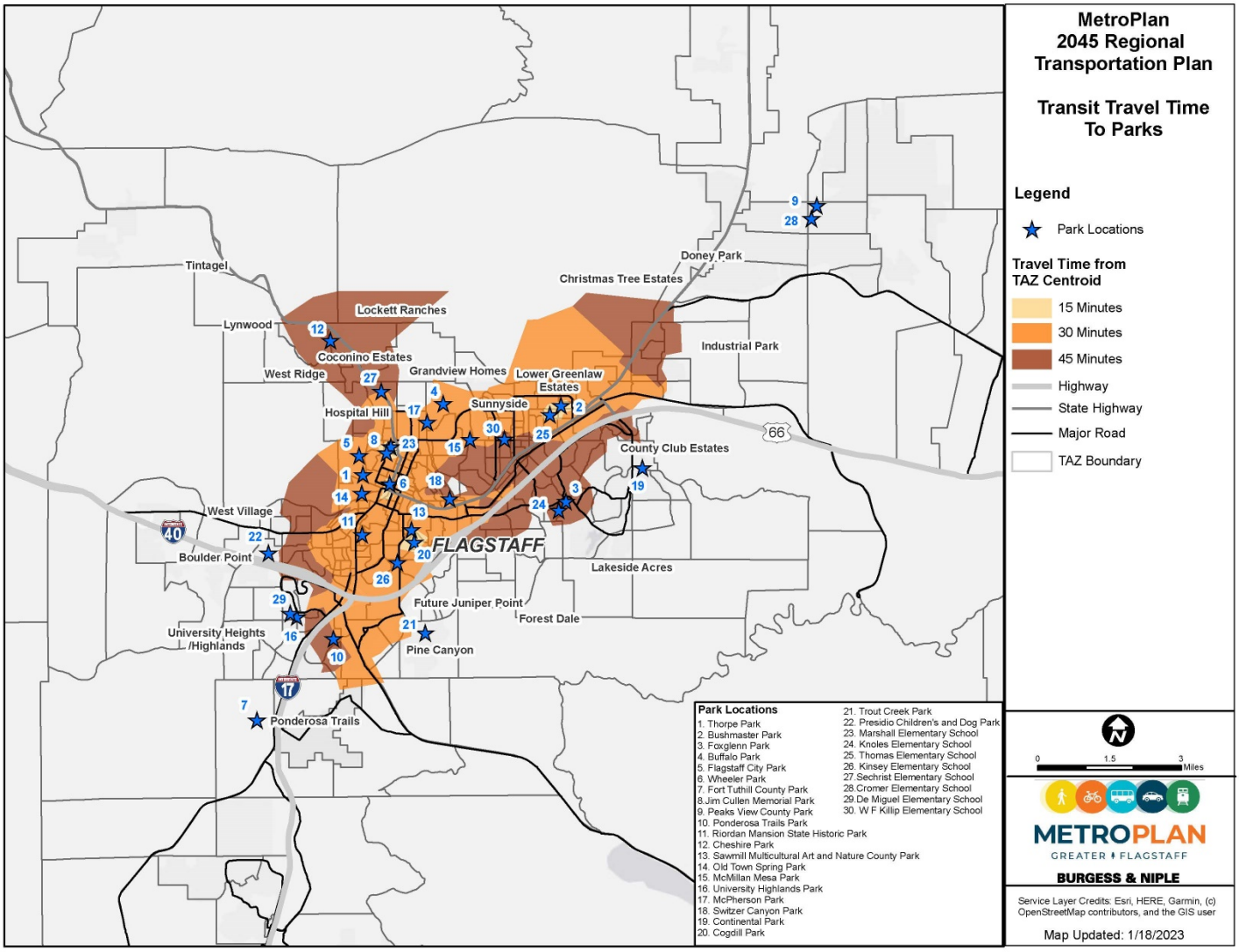
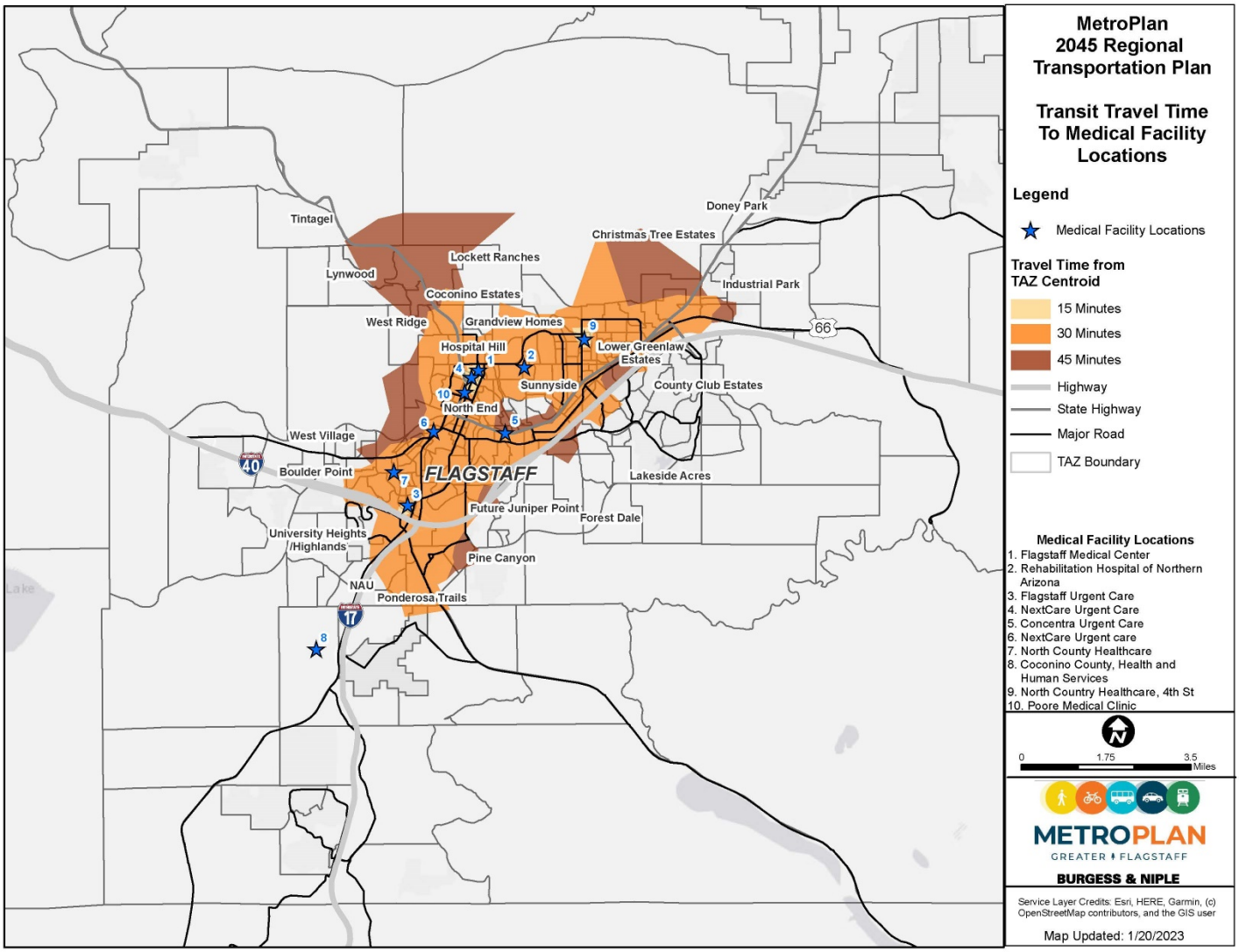


Figure 16 – Transit Analysis: Medical Facilities



4.4. Automobile

The automobile analysis leveraged the MetroPlan TDM. Automobile travel time takes into consideration the amount of traffic on each link. Based on the amount of congestion the model uses a volume delay function to estimate the congested travel time on that link. Vehicles also assume a time penalty at each signalized intersection. The travel bands of the vehicles are then related not only to the network geometry, but to the traffic conditions as well. Travel bands are displayed in ***Figure 17*** through ***Figure 21***.

Figure 17 – Automobile Analysis: Charter Schools

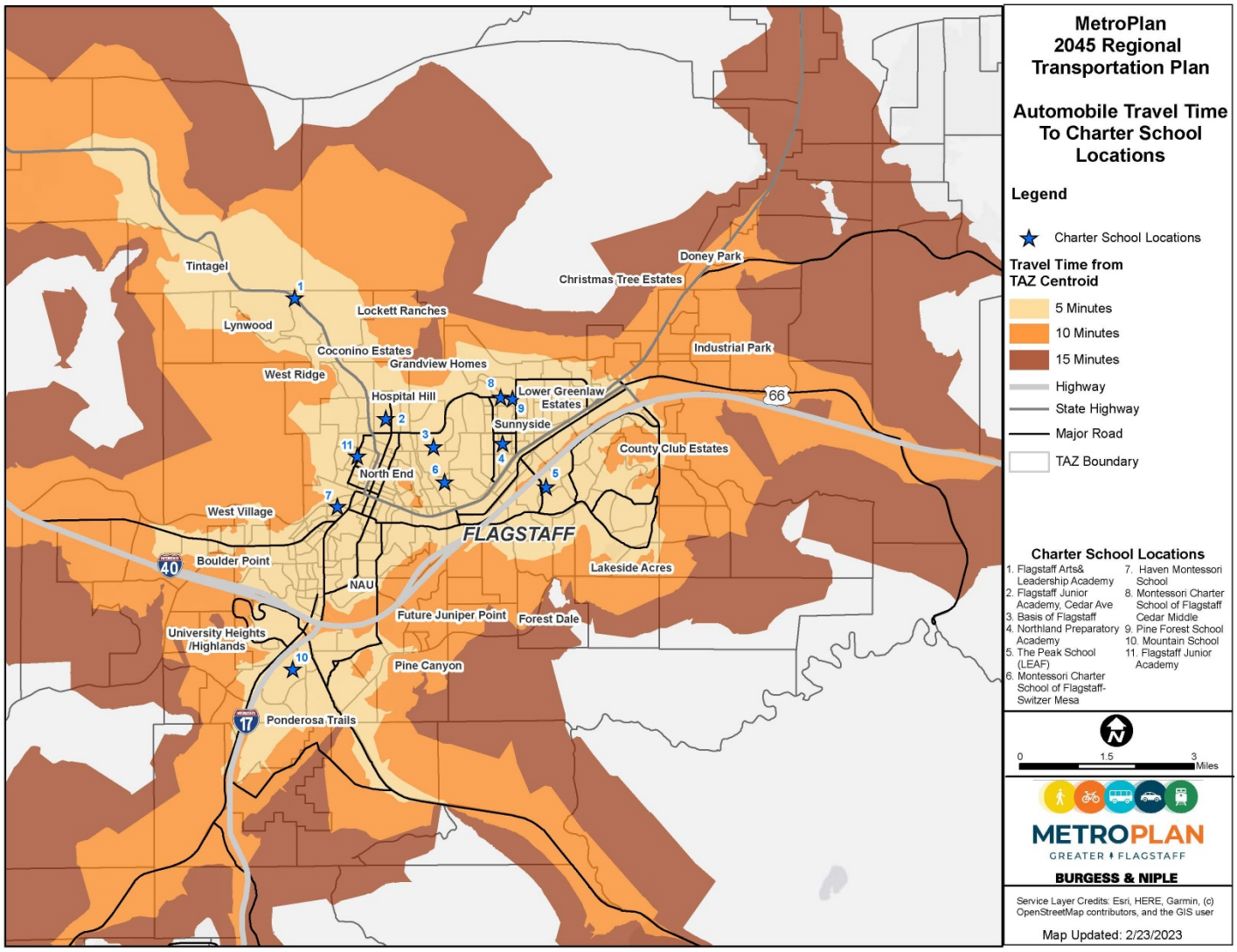


Figure 18 – Automobile Analysis: Employment Centers

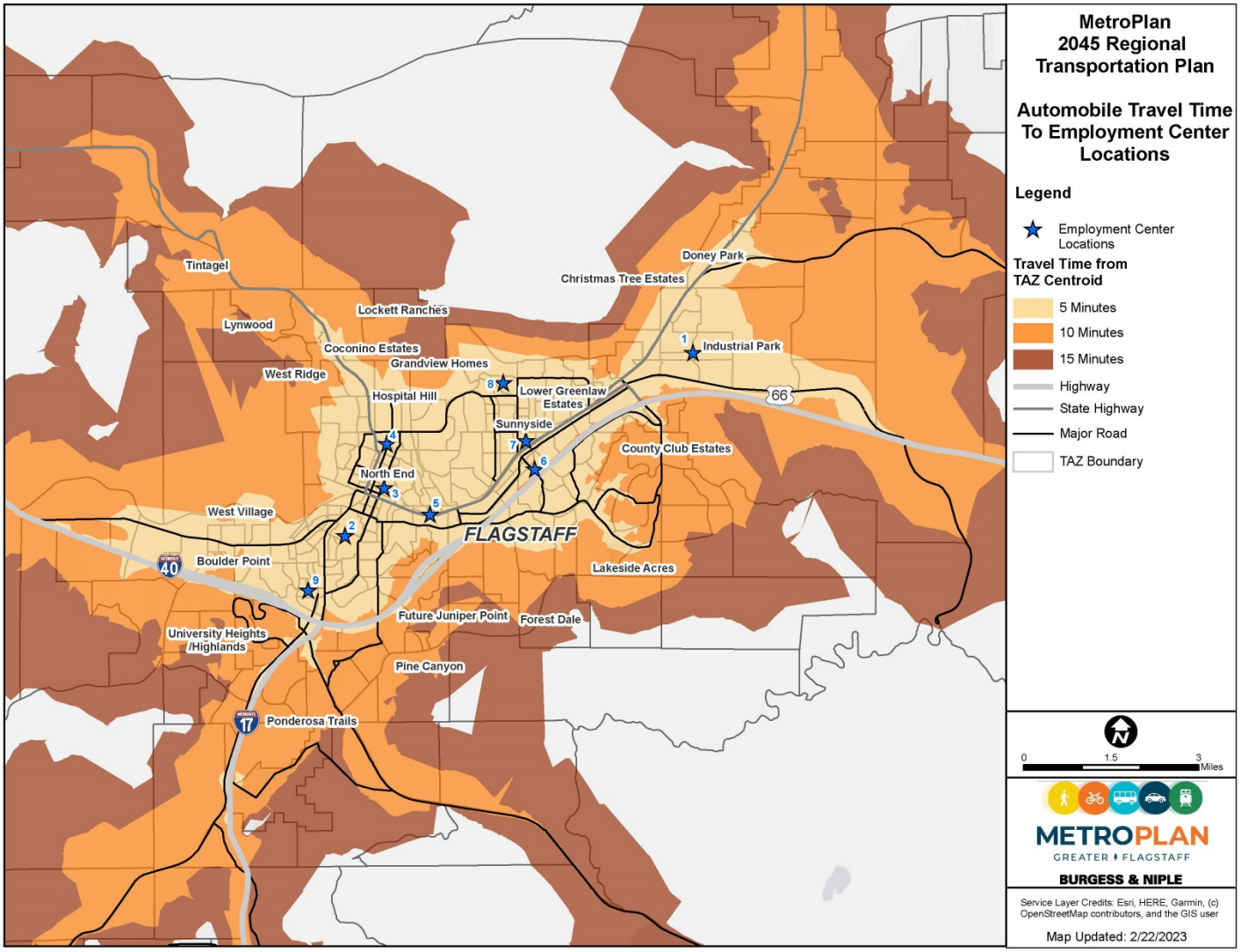


Figure 19 – Automobile Analysis: Grocery Stores

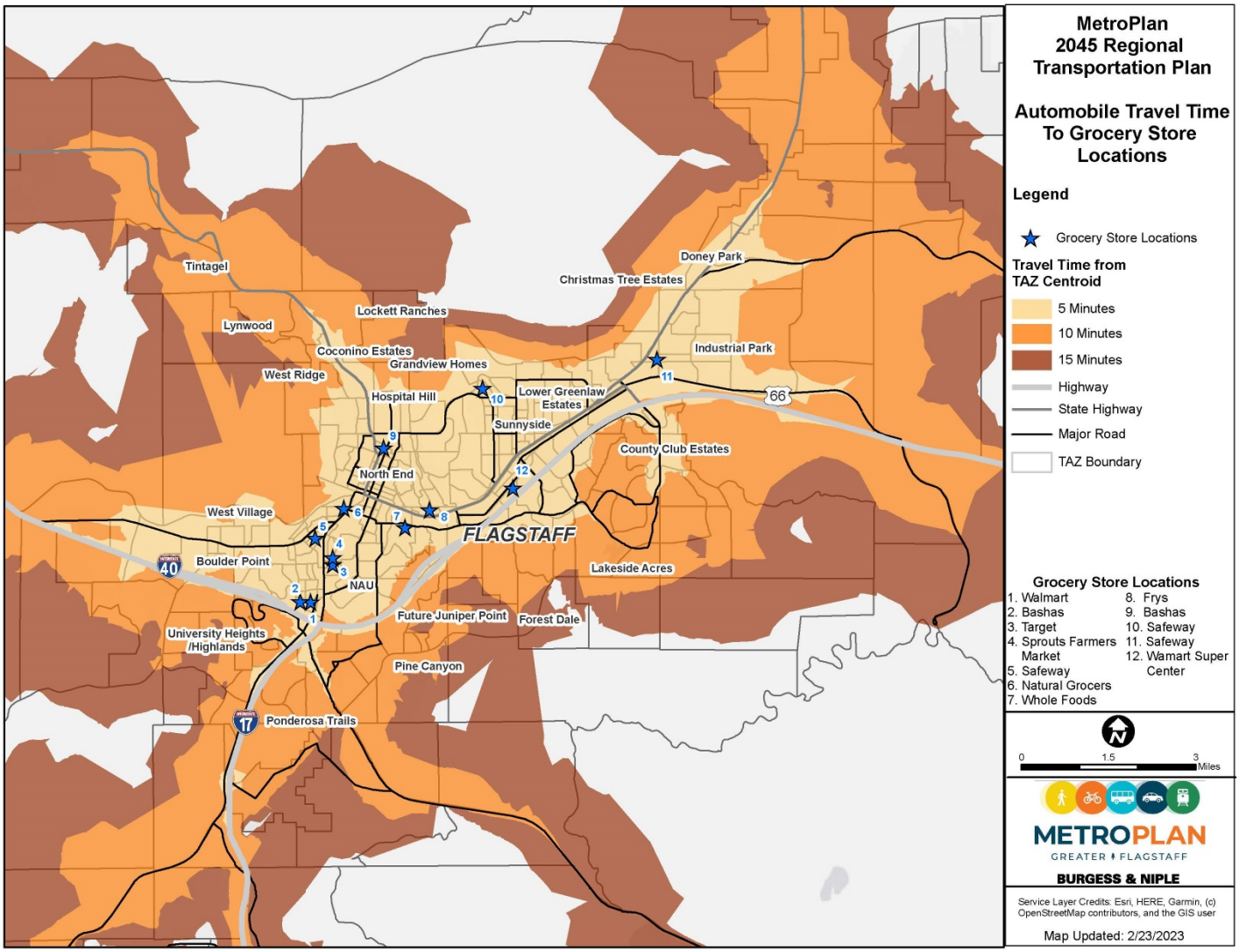


Figure 20 – Automobile Analysis: Parks

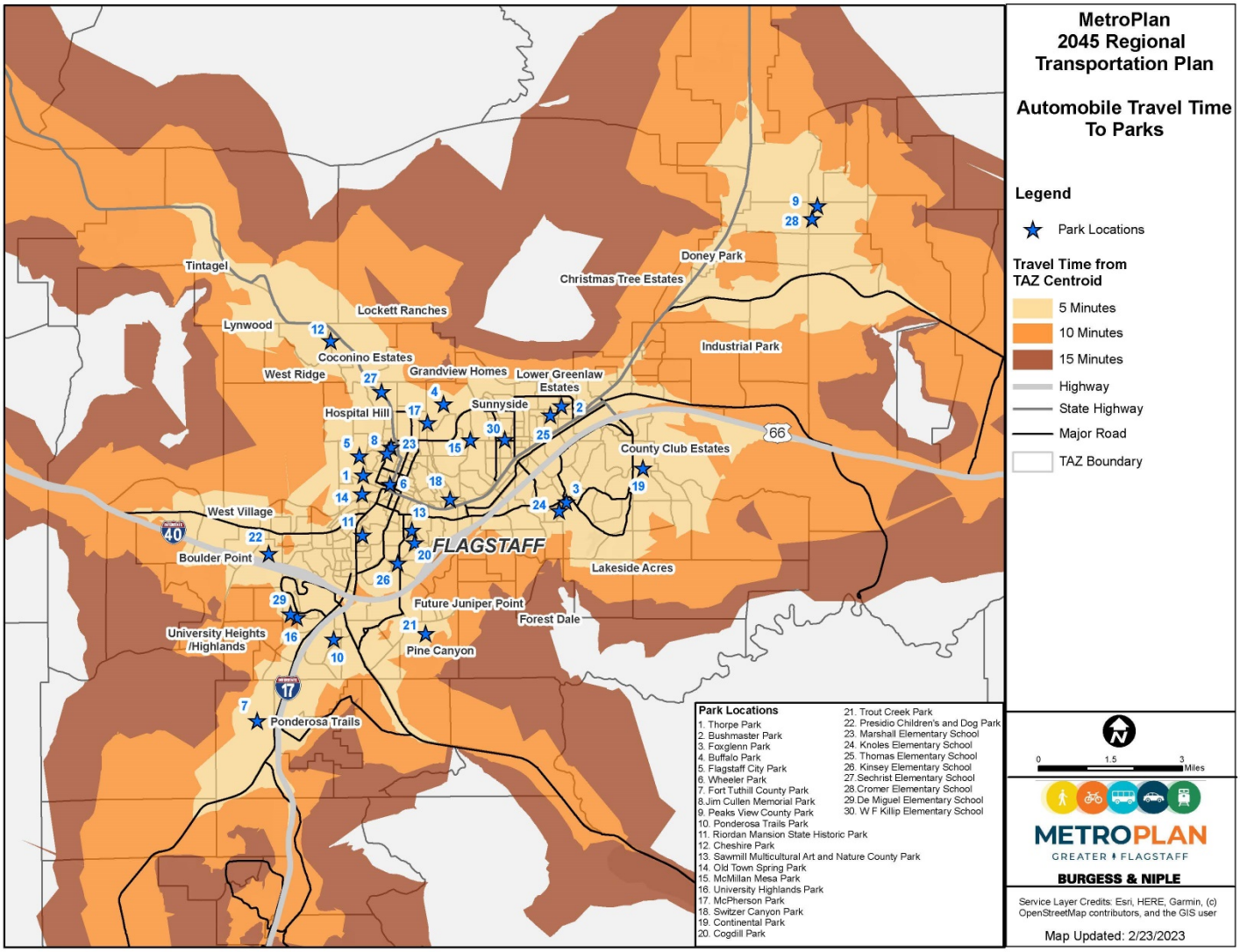
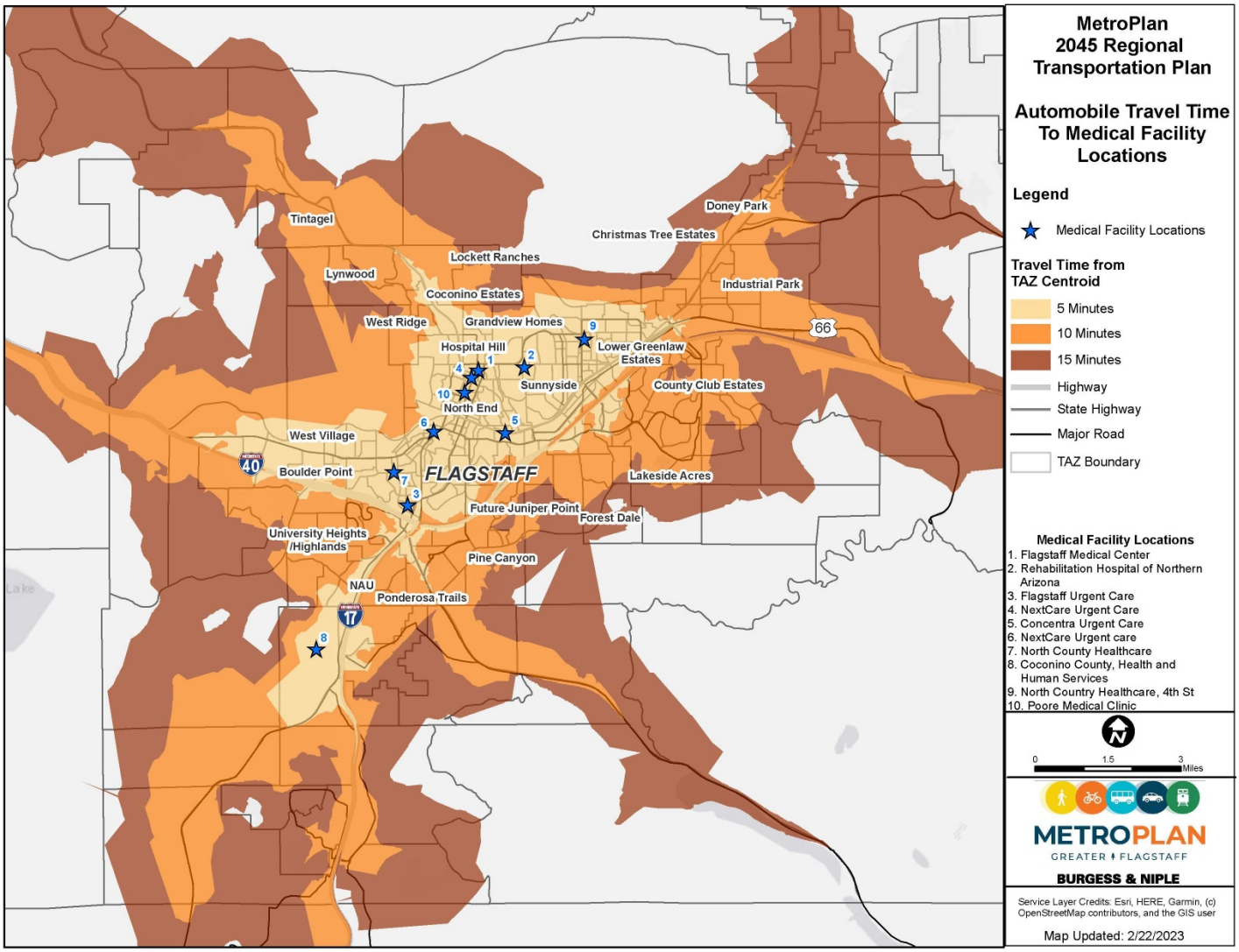


Figure 21 – Automobile Analysis: Medical Facilities



5.0 Title VI Accessibility

The accessibility analysis scoring was conducted as described in ***Section 2.0***. Underserved Title VI TAZs and the 2010 Urban Boundary were mapped jointly to highlight the location of underserved populations and proximity to city center. Different solutions may be needed to address inequities within and beyond the urban boundary. TAZs closer to town are more likely to be able to utilize modes of transportation other than private vehicle but may be lacking in the resources or facilities (i.e., transit stops/ bike paths etc.) to use them. Conversely, programmatic solutions, such as Meals on Wheels and taxi vouchers, may be necessary to address needs in areas that are further removed.

Figure 22 – Walk Analysis: Title VI Underserved TAZs

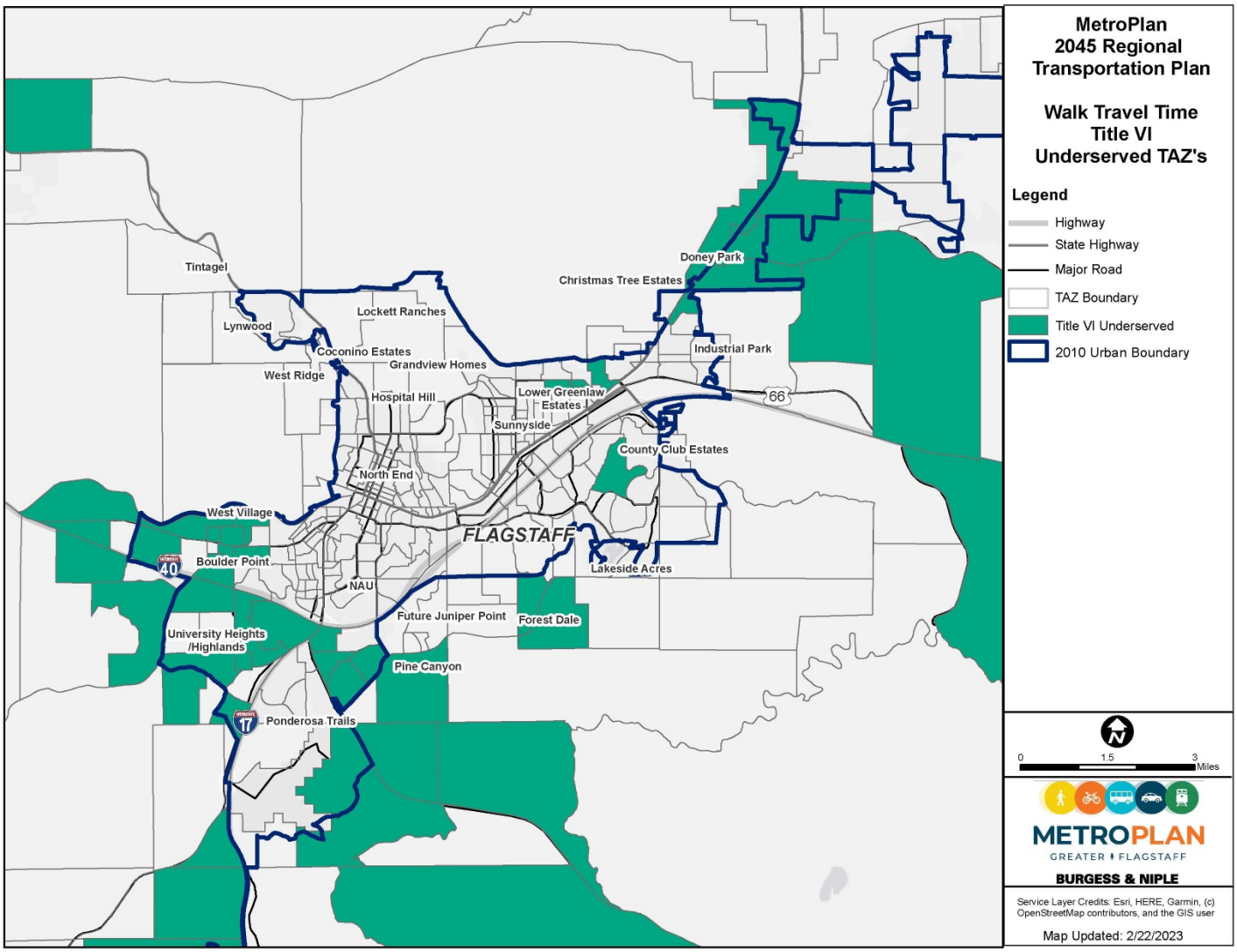


Figure 23 – Bike Analysis: Title VI Underserved TAZs

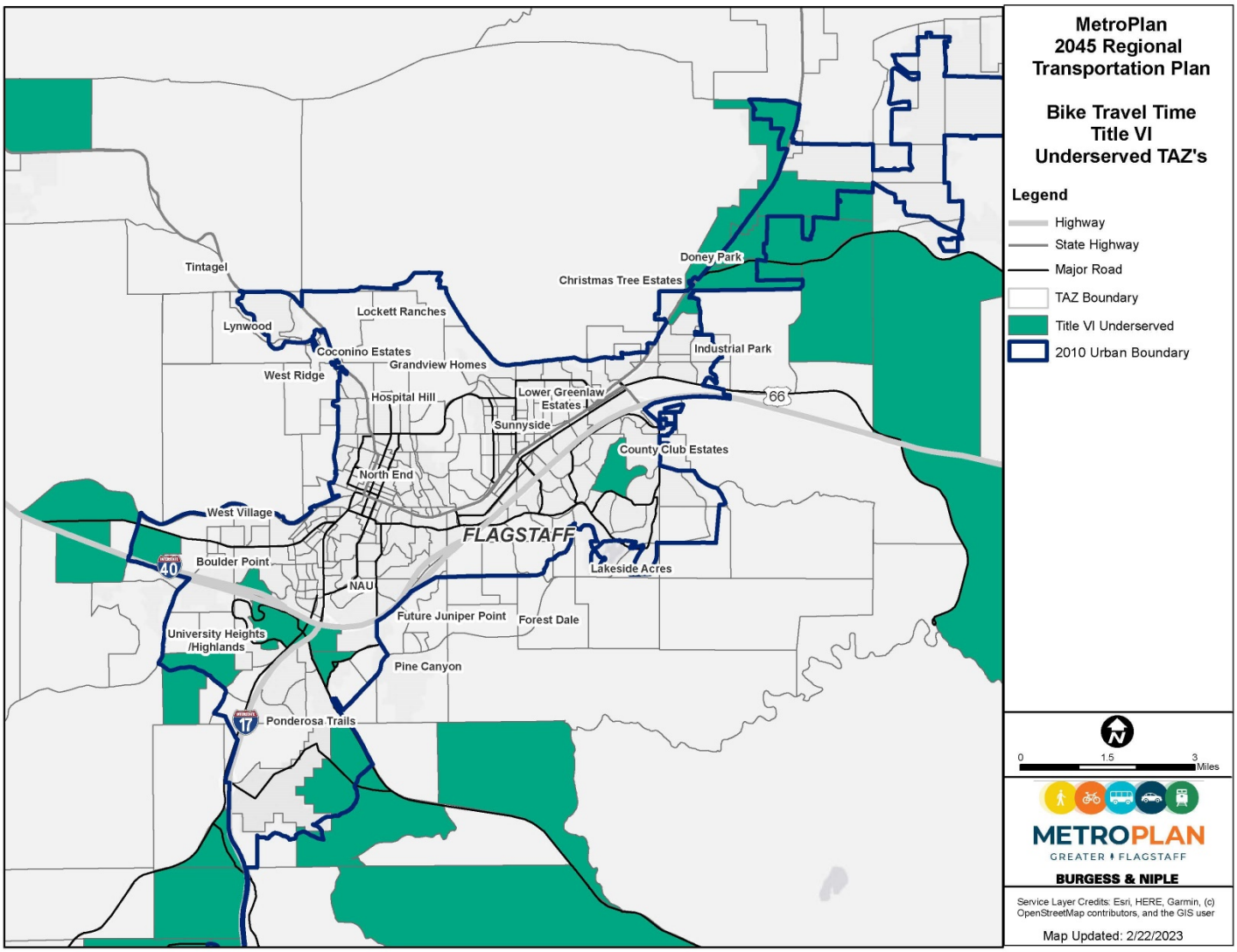


Figure 24 – Transit Analysis: Title VI Underserved TAZs

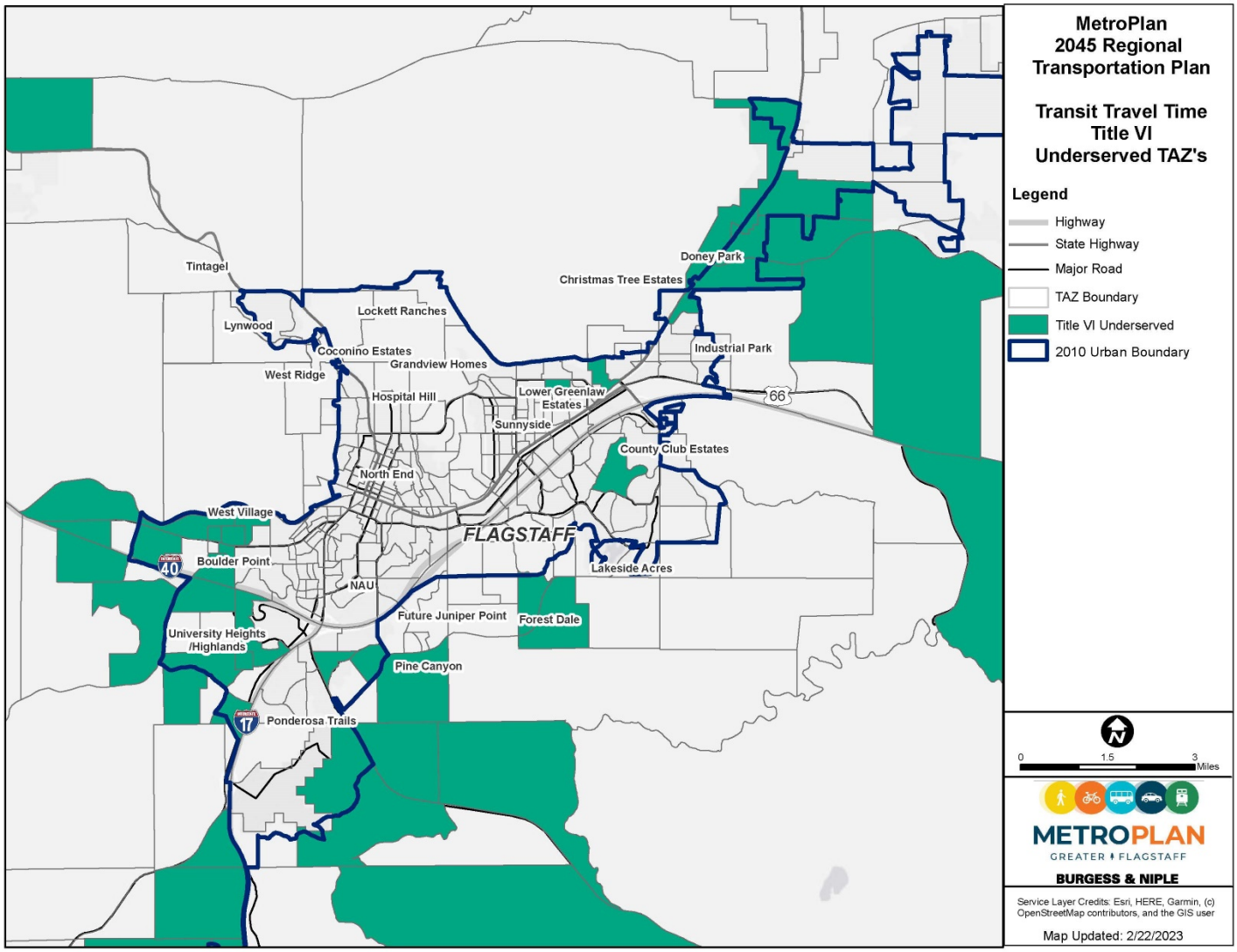
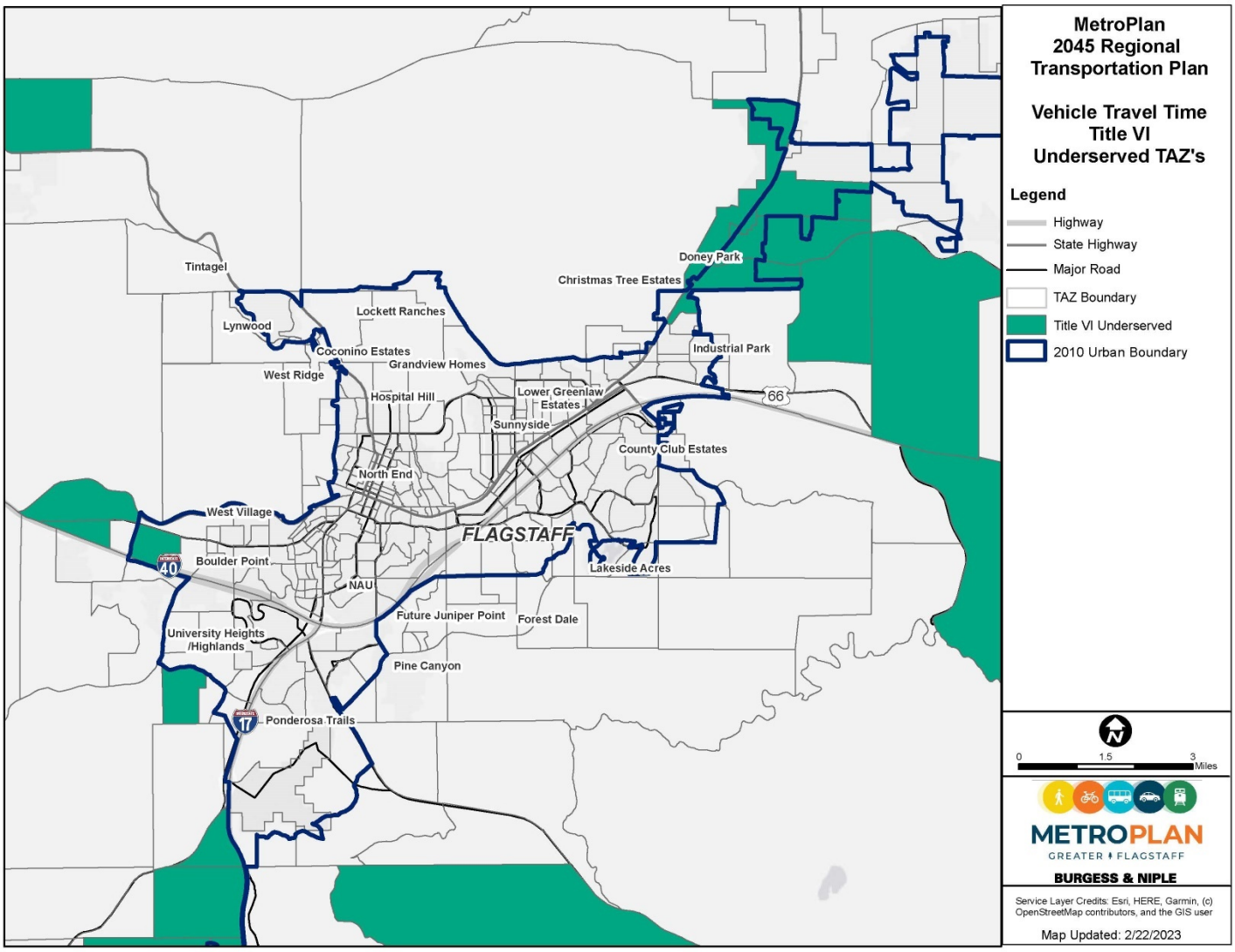


Figure 25 – Vehicle Analysis: Title VI Underserved TAZs



6.0 Conclusions

The accessibility analysis suggests there are areas within the urban boundary that could be better served by all modes to provide more equitable access. In particular, areas with a lower degree of connectivity appear to fare worse across modes. Results should be reviewed within the context of the TAZ structure and socioeconomic data. Due to partial overlaps between TAZs, travel bands and Title VI populations, discretion is advised on using these results at face value.

With this new approach for MetroPlan to assess equitable access policy guidance is recommended to refine the thresholds used in the methodology. Along with policy, additional context and site review should be considered prior to developing specific solutions. Future programming and prioritization of planned active transportation improvements should consult this analysis. A cursory review suggests that Proposition 419 projects – including the pedestrian and bicycle improvements – will not address accessibility for most of these affected areas. Areas beyond the urban boundary may benefit from a programmatic approach in lieu of an infrastructure-based approach.