MARICOPA ASSOCIATION OF GOVERNMENTS

RIO SALADO NORTH FREIGHT STUDY

Draft Final Report
Existing Conditions Assessment

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Prepared for:

MARICOPA ASSOCIATION of GOVERNMENTS

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1 INTRODUCTION

The Rio Salado North Freight Study is one of several freight subarea project assessments being conducted by the Maricopa Association of Governments (MAG) to recommend projects and policies that will move goods more efficiently and safely through existing industrial clusters of the MAG region, thereby fostering the development of a diverse and economically thriving place to work and live.

The study focus is on commercial truck freight operations and how freight interacts with other modes of transportation such as passenger cars, freight rail, transit, bicycles, and pedestrians. This report details the existing conditions and improvement recommendations for the major intersections and roadways within the study area.

1.1 Background and Need

The study area streets are congested with high levels of commercial vehicles and traffic from workers commuting to and from industrial facilities. A common trend in the study area is for commercial vehicles to leave their specific facility and take the shortest path to the closest major freeways, which are Interstate 10 (I-10) and Loop 202 South Mountain. It is not uncommon to see significant traffic levels at traffic interchanges and portions of the surrounding roadway network.

In addition, connectivity gaps in the pedestrian and bicycle network may result in potential conflicts between commercial vehicles and pedestrians/bicycles.

This report documents existing conditions and needs, development of improvement recommendations to address identified needs, and refinement and prioritization of recommendations.

1.2 Study Objectives

The objectives of this study are:

1. Observe and document existing conditions, including freight distribution mobility patterns of local distribution centers and warehousing facilities;
2. Develop an inventory of corridor needs, including intersection and movement needs, to reduce congestion and improve safety; and
3. Recommend phased solutions to reduce congestion and improve safety for all modes (vehicles, trucks, bicycles, pedestrians, transit) through innovative and traditional methods.

1.3 Study Area

The study area for the Rio Salado North Freight Study consists of major mile-grid streets and their intersections, along with I-10 and Loop 202 interchanges within the following limits: approximately 0.25 miles west of 59th Avenue on the west, McDowell Road on the north, Lower Buckeye Road on the south, and 35th Avenue on the east.

The I-10 and the new Loop 202 South Mountain freeway mainline are not specifically analyzed as part of this study. However, many of the freeway on-ramps and off-ramps are. **Figure 1** shows the vicinity of the study area.

Figure 2 displays the 24 major intersections included in the study area along with major roadways.

The study area is comprised of land within the jurisdictions of the City of Phoenix and unincorporated Maricopa County as shown in **Figure 3**.

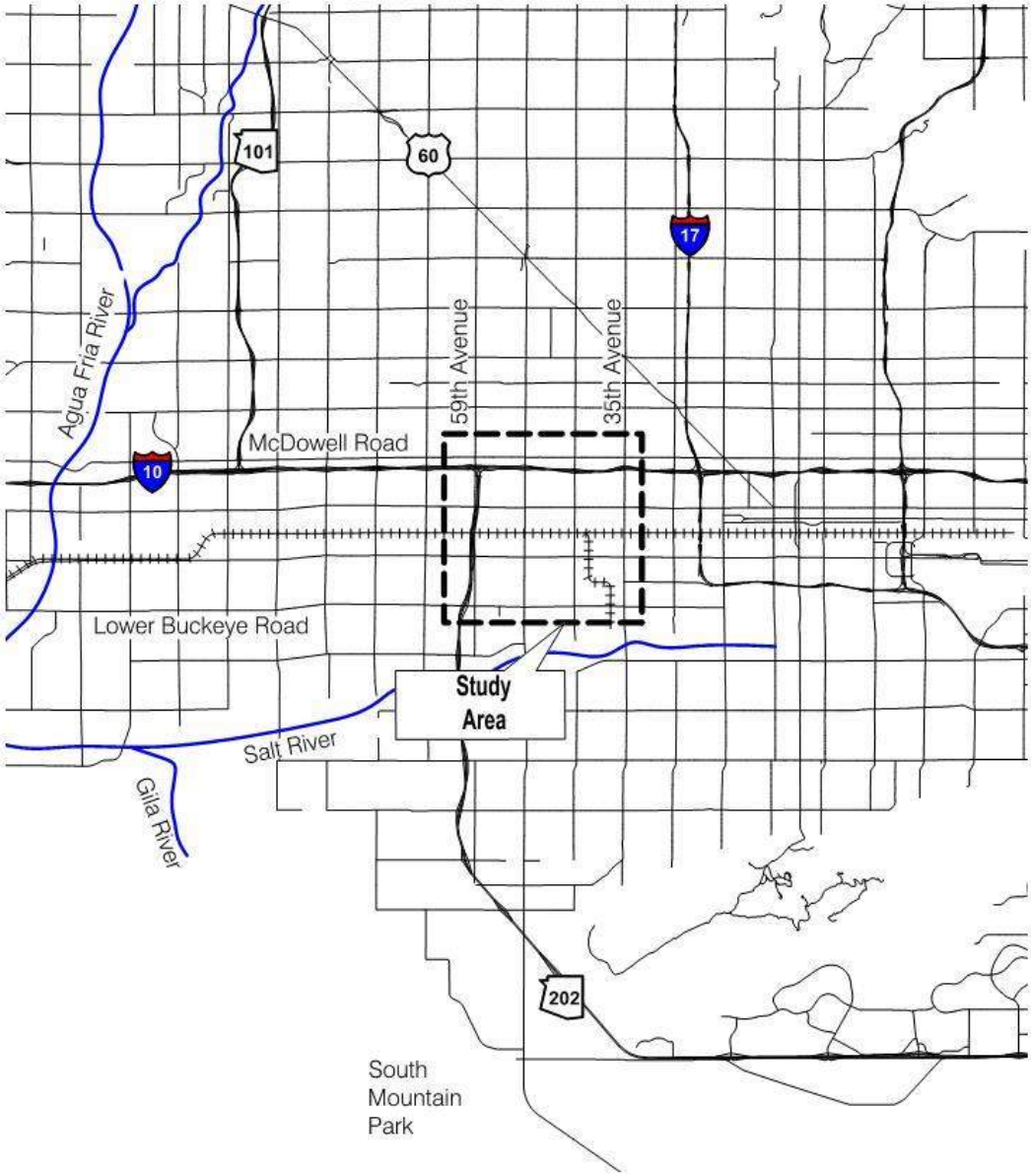

Figure 1 – Vicinity Map

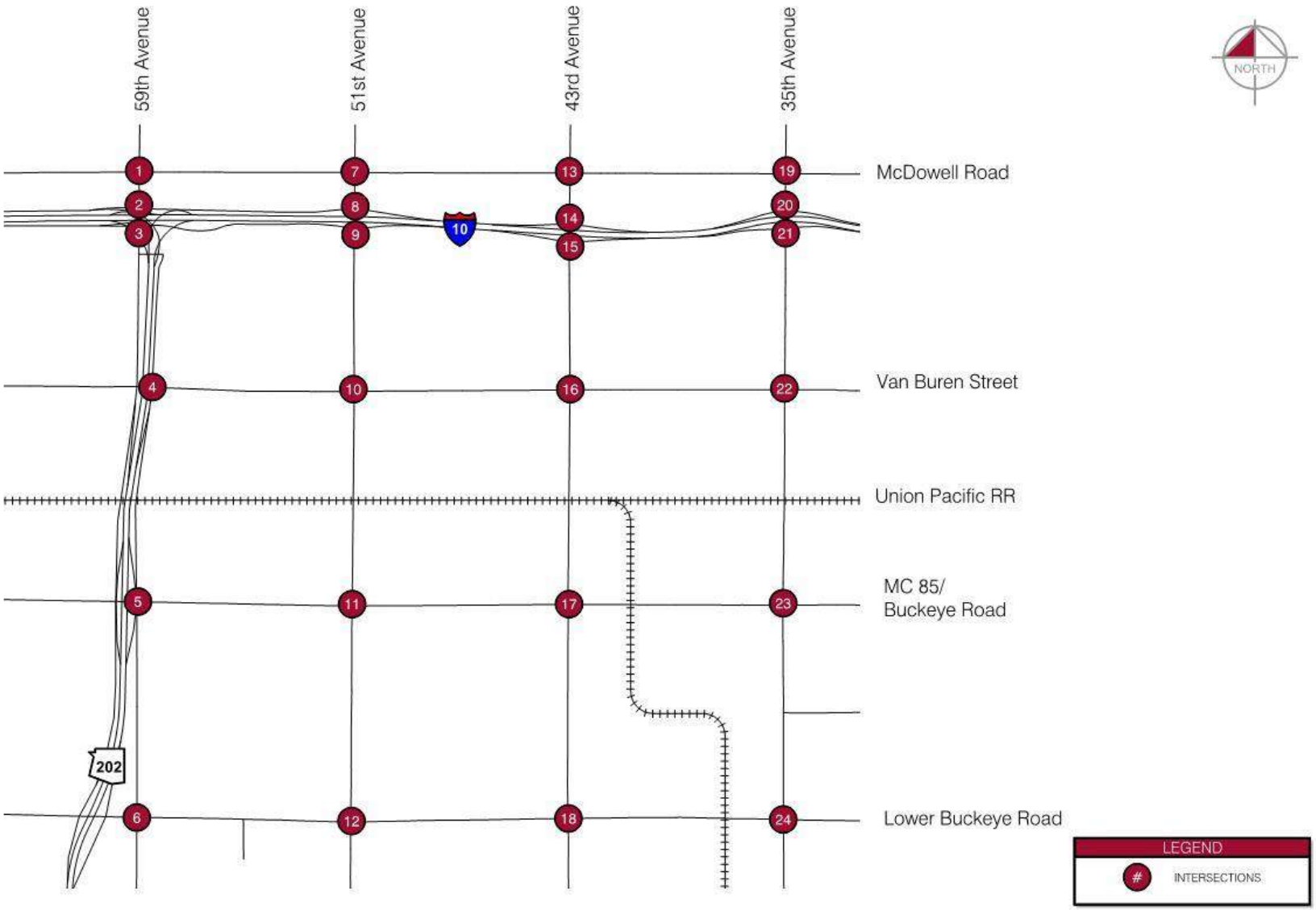

Figure 2 – Study Area

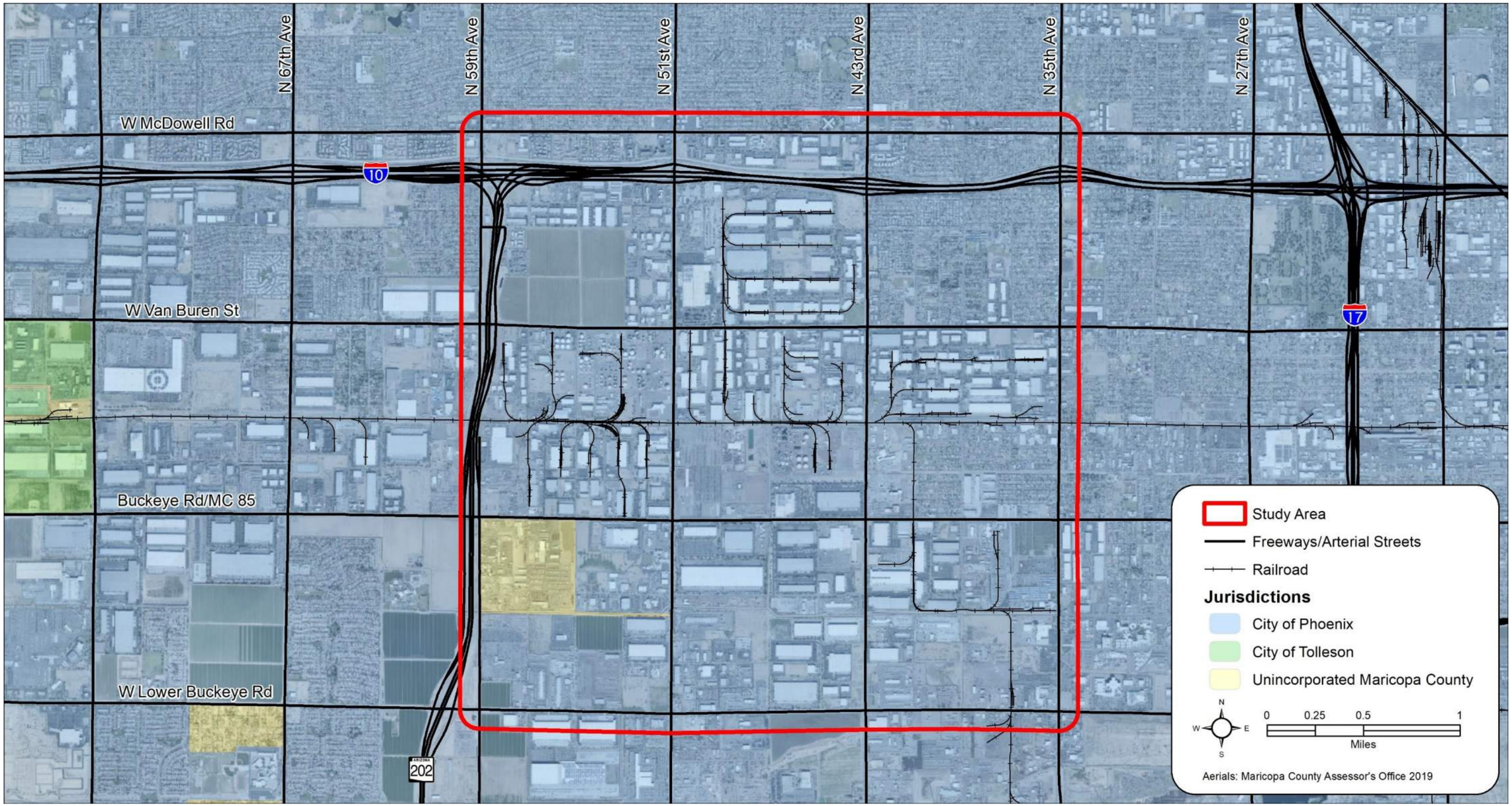

Figure 3 – Study Area Jurisdictions

2 EXISTING CONDITIONS

This section summarizes information regarding existing study area land use, employment, utilities, the transportation network, and traffic volumes as well as the findings of a traffic capacity analysis, crash analysis, and field assessment.

2.1 Data Collection and Review

Relevant information on existing corridor characteristics was obtained from the following available studies, reports, documents, and data sets (with the year of the data shown in parentheses):

- American Transportation Research Institute (ATRI) data (2017);
- Arizona 811 utility information (2020);
- Arizona Department of Transportation (ADOT) crash data (2015-2019);
- ADOT and City of Phoenix traffic signal timing plans (2020);
- ADOT *I-10 Multimodal Corridor Study* (2013);
- City of Phoenix *Comprehensive Bicycle Master Plan* (2014);
- City of Phoenix *General Plan* (2015);
- City of Phoenix *Mobility Studies* for Golden Gate and Kuban Park Neighborhoods (2019);
- MAG, Maricopa County Department of Transportation (MCDOT), and City of Phoenix Geographical Information Systems (GIS) data (2020);
- MAG *2040 Regional Transportation Plan Update* (2020);
- MAG *Active Transportation Plan* (2020);
- MAG bikeways data (2020);
- MAG *Regional Freight Transportation Plan* (2017);
- MAG regional travel demand model data (2020);
- MAG travel time (HERE) data (2017 and 2019); and
- Valley Metro bus route data (2020).

2.2 Existing Land Use and Employment

Existing land uses within the study area, as provided by MAG, are shown in **Figure 4**. South of I-10, land uses in the study area are largely industrial, with smaller amounts of agriculture, residential, and commercial. The residential land use lies directly adjacent to I-10 in most cases, primarily between 43rd Avenue and 35th Avenue. Existing land uses are consistent with the type of travel activity observed in the study area, in that high percentages of heavy vehicle traffic were noted. Industrial and agricultural land uses generate a high volume of heavy vehicles that are used to service the land and to transport products.

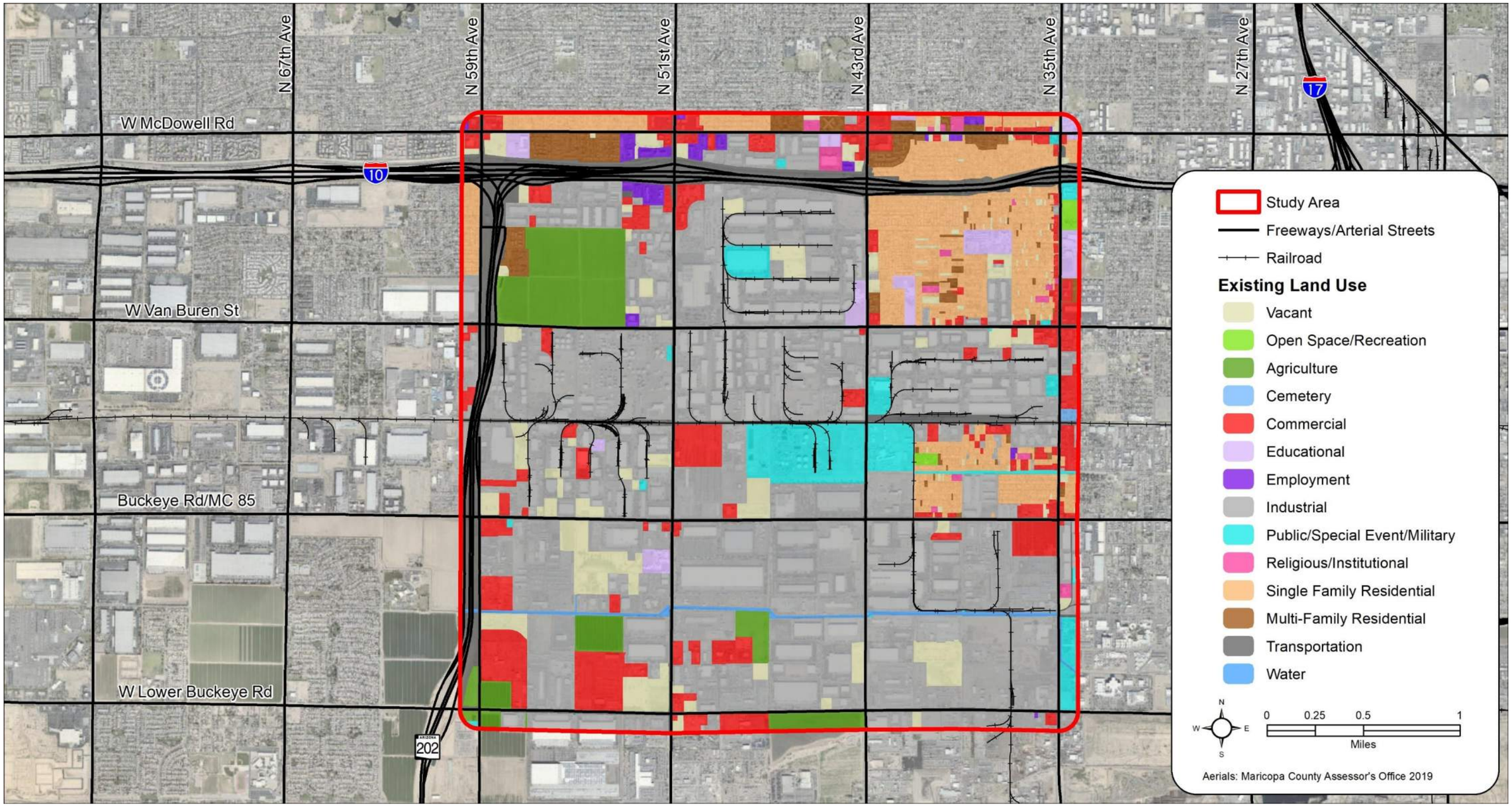

Figure 4 – Existing Land Use

Some adjacent land uses have the potential to conflict with each other due to characteristics such as traffic type, noise, or visual form. Examples of potentially conflicting adjacent land uses are residential or educational land uses with industrial uses. Within the study area, the largest areas of potentially conflicting land uses include:

- Van Buren Street between 43rd Avenue and 35th Avenue;
- 43rd Avenue between I-10 and Van Buren Street; and
- Buckeye Road/MC-85 between 43rd Avenue and 35th Avenue.

These locations include significant amounts of residential, educational, and industrial land uses.

Figure 5 shows the relative proportions of the existing types of employment in the study area within each MAG travel demand model traffic analysis zone (TAZ), along with the quantity of industrial employment within each TAZ as freight traffic is often generated by industrial employment. **Figure 6** shows the likely high generators of heavy vehicle trips, derived from the locations of employers in the study area with more than 25 employees Both employment data and TAZ boundaries were provided by MAG. The land use and employment maps correlate with the commercial/retail employment near I-10 and Loop 202 and the industrial employment south of I-10 and east of Loop 202 in the study area.

2.3 Utilities

Utilities present constraints that should be considered during future solution development. Resolution of these constraints may require partnership with the relevant utility providers/owners. For example, irrigation and drainage channels that parallel the roadways may constrain the ability for the roadway to be widened without incurring the cost of moving or enclosing the channels. Arizona 811e was contacted to identify the utility stakeholders within the study area. The following utility providers and their services were identified as being within the study area:

- ADOT – culverts, electric, fiber, gas, irrigation, sewer, storm drain, telephone, traffic signals, water;
- Arizona Public Service (APS) – electric;
- American Telephone and Telegraph (AT&T) – coaxial, fiber;
- City of Phoenix Information Technology Services – coaxial, fiber;
- City of Phoenix Public Transit – electric;
- City of Phoenix Traffic Signals – fiber, traffic signals;
- City of Phoenix Water Services Department – reclaimed water, sewer, water;
- CenturyLink – coaxial, fiber;
- Cox Communications – CATV, fiber;
- CS Construction – fiber;
- Fluor Industrial Services – culverts, electric, fiber, irrigation, storm drain, traffic signals, water;
- Kinder Morgan Energy – gas;
- El Paso Natural Gas – gas;
- MCI – fiber;

- Pauley Construction – communications, fiber;
- Redflex – electric;
- Roosevelt Irrigation District – irrigation;
- Salt River Project (SRP) – communications, electric, fiber, irrigation;
- Southwest Gas – gas;
- Sprint – fiber; and
- US Department of Energy – CATV, coaxial, electric, fiber.

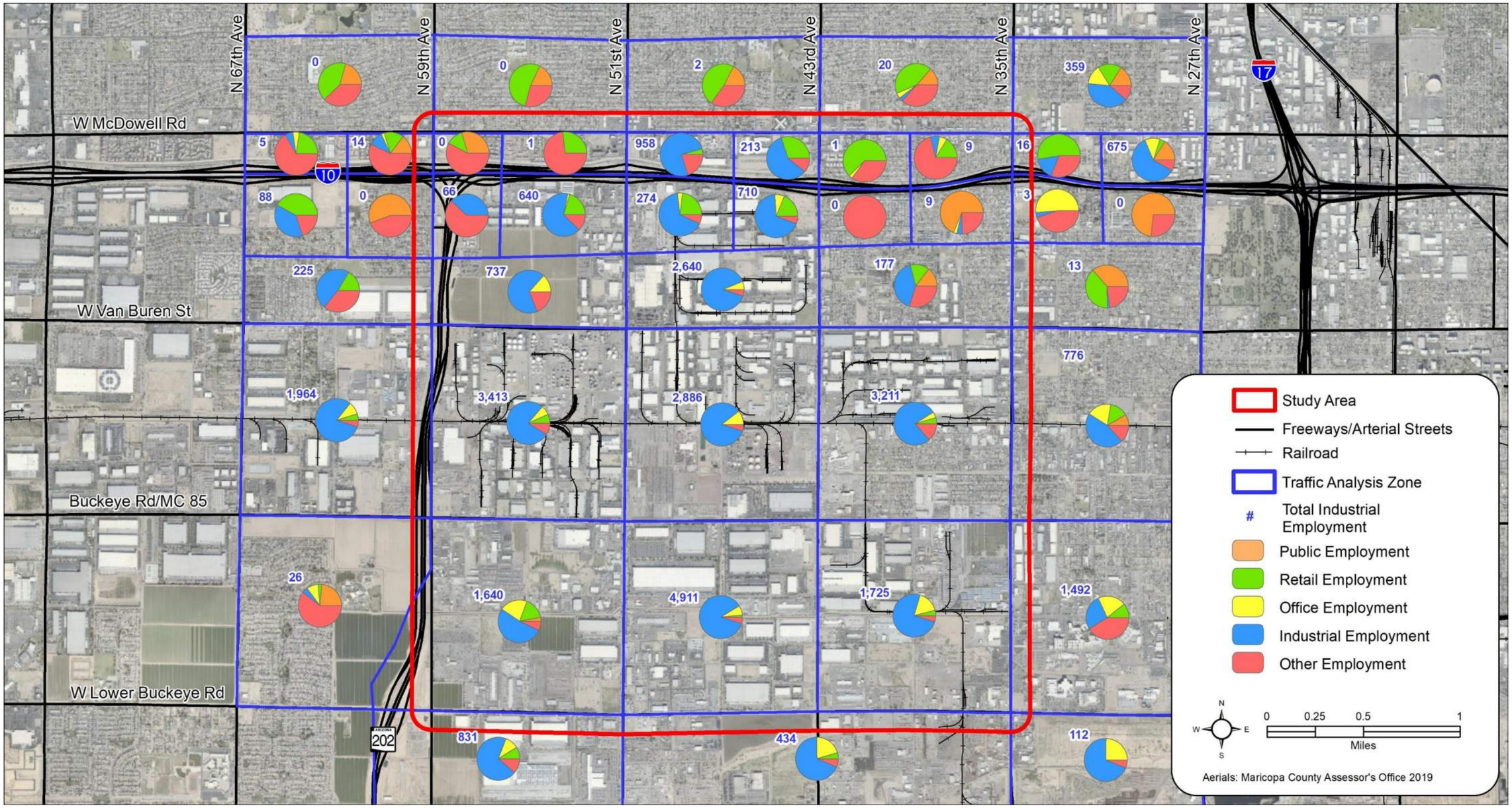

Figure 5 – Existing Employment Types

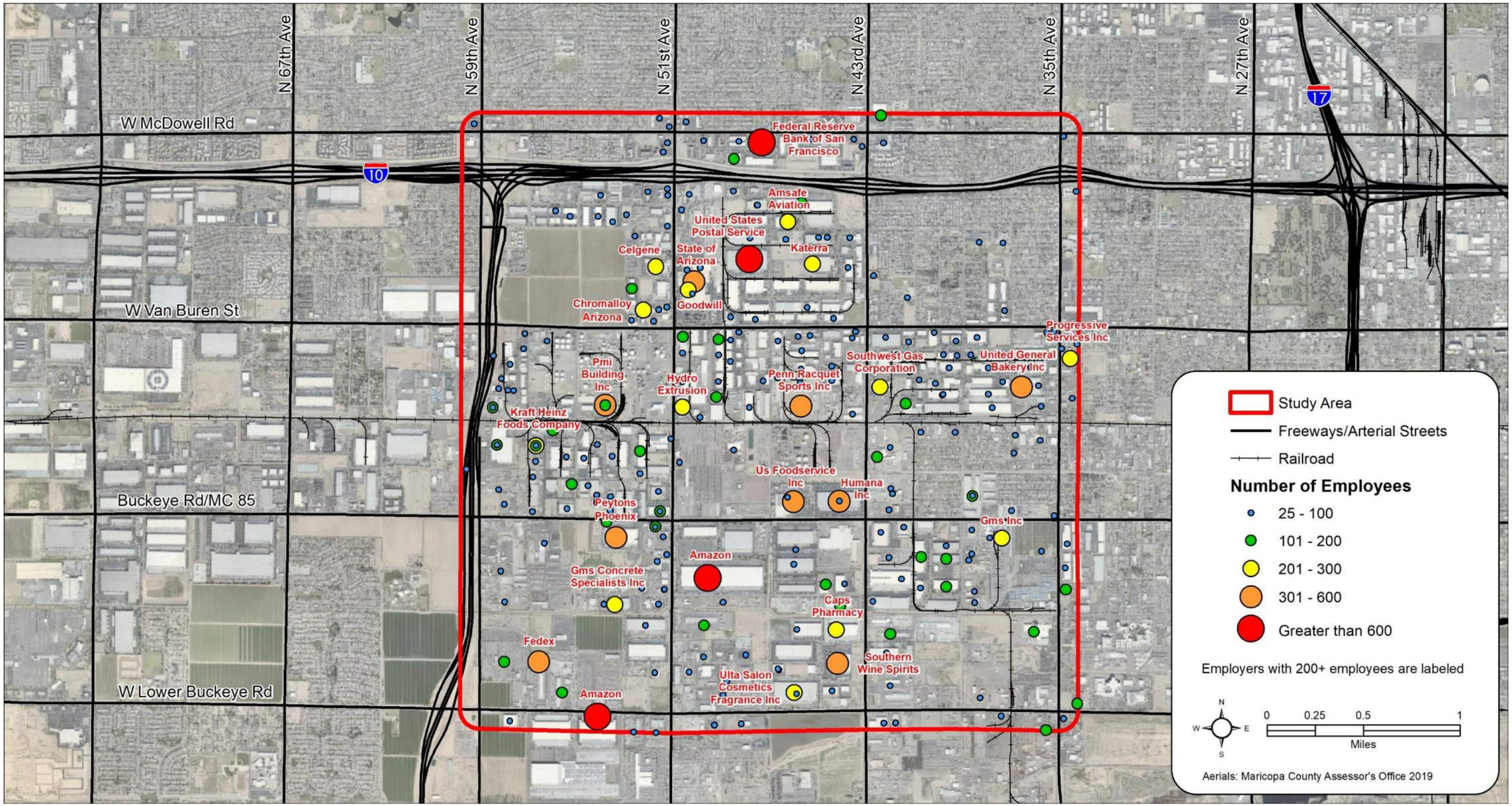

Figure 6 – Major Employers

2.4 Existing Transportation Network

The existing transportation network within the study area includes the major arterial roadways, whose characteristics are listed in **Table 1**. I-10 and Loop 202 are also within the study area, but mainline operations along these freeways are not being analyzed as this study focuses on the arterial network.

The existing intersection lane geometry and control for each study area intersection are shown in **Figure 7a**, **Figure 7b**, **Figure 7c,** and **Figure 7d**. The existing number of through travel lanes and speed limits for each major segment of roadway in the study area are shown in **Figure 8a**, **Figure 8b**, **Figure 8c,** and **Figure 8d**.

The MAG Regional Freight Transportation Plan identified Critical Urban Freight Corridors and assigned priority to the segments identified. Segments within the study area have been identified as Critical Urban Freight Corridors. Additionally, several roadway segments included in the study area are identified in the Top 60 Lane Miles of Critical Urban Freight Corridors as designated by MAG, including the following:

- McDowell Road, 43rd Avenue to the eastern boundary of the study area (and further east);
- Van Buren Street, the entire study area, 59th Avenue to 35th Avenue (and further east and west);
- Buckeye Road, the entire study area, 59th Avenue to 35th Avenue (and further east and west);
- 51st Avenue, I-10 to Lower Buckeye Road; and
- 43rd Avenue, I-10 to MC 85/Buckeye Road.

Van Buren Street is considered a “highest priority” corridor according to the MAG Freight Network.

Appendix A contains maps showing the Critical Urban Freight Corridors per the MAG Regional Freight Transportation Plan.

Table 1 – Arterial Transportation Network Characteristics

Roadway	Alignment	Typical Through Lanes	Median	Part of Regional Freight Network?	Curb, Gutter, and Sidewalk	Bicycle Facilities	Railroad Crossing	Speed Limit (mph)
59th Avenue	North-South	2-3	TWLTL; raised median at I-10 ramp intersection approaches	Yes (I-10 to Lower Buckeye Rd.)	Yes (where adjacent parcels have been developed)	Bike lanes: Dealer Dr. to Tonto Ln.	Halfway between Van Buren St. and MC 85/Buckeye Rd.	35-40
51st Avenue	North-South	2-3	TWLTL; raised median at I-10 Eastbound (EB) ramp intersection and north	Yes	Yes	Bike lanes: Lower Buckeye Rd. to MC 85/Buckeye Rd.	Halfway between Van Buren St. and MC 85/Buckeye Rd.	40-45
43rd Avenue	North-South	1-3	TWLTL; raised median at I-10 ramp intersection approaches	Yes	Yes	None	Halfway between Van Buren St. and MC 85/Buckeye Rd.	35-45
35th Avenue	North-South	2-3	TWLTL; raised median at I-10 ramp intersection approaches	Yes	Yes	None	Halfway between Van Buren St. and MC 85/Buckeye Rd.	35-40
McDowell Road	East-West	3 WB 2 EB	TWLTL	No	Yes (sometimes north side sidewalk is along residential frontage road)	None	None	40-45
Van Buren Street	East-West	3 WB 2 EB	TWLTL	Yes	Yes	None	None	35-45
MC 85/ Buckeye Road	East-West	2	TWLTL; none west of 59th Ave	Yes	Yes, none west of 59th Ave.	None	East of 43rd Ave.	40-45
Lower Buckeye Road	East-West	1-2	TWLTL; none west of 59th Ave	Yes	Yes (where adjacent parcels have been developed)	Bike lanes: 51st Ave. to 35th Ave.	West of 35th Ave.	45

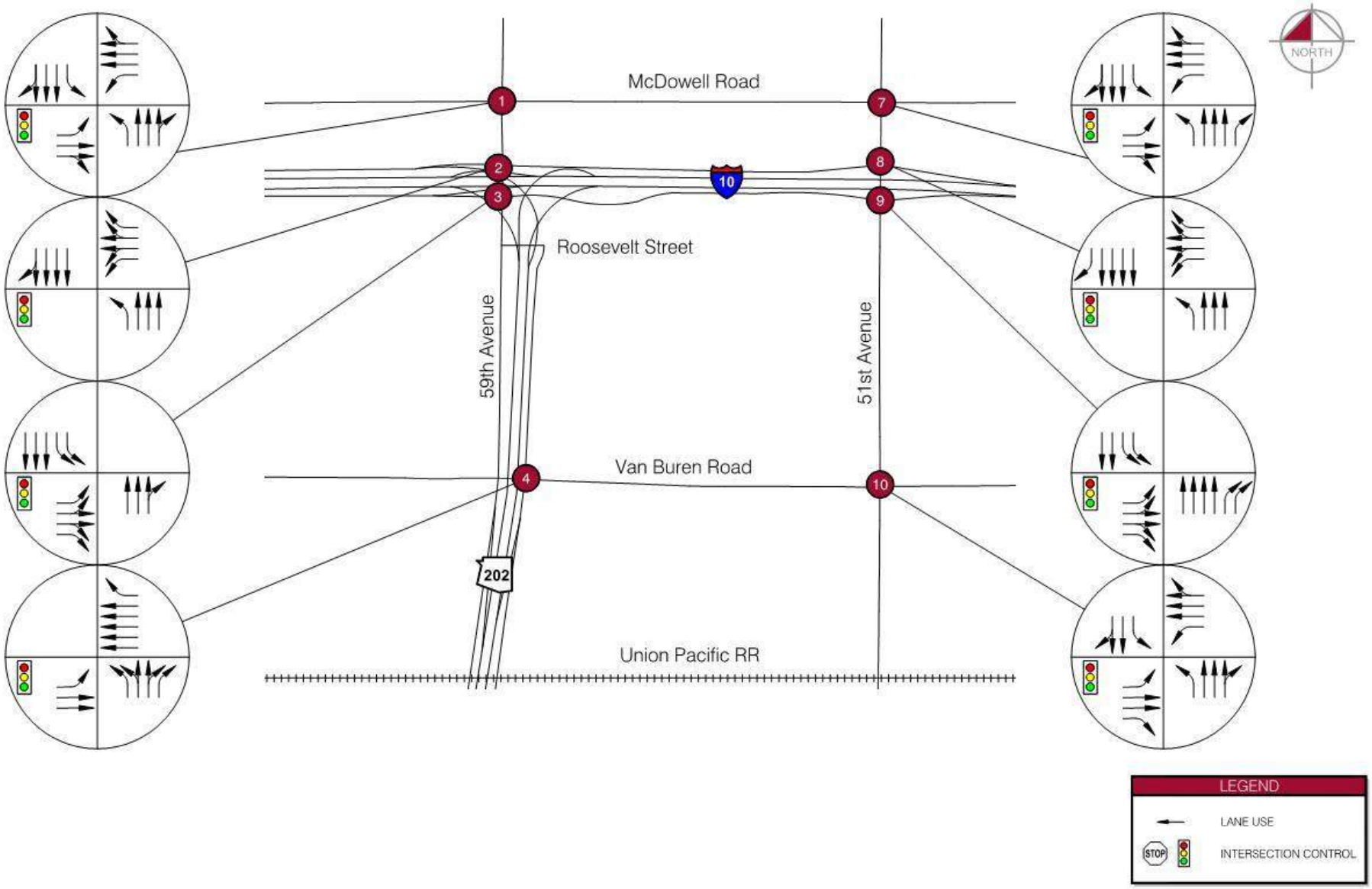

Figure 7a – Existing Intersection Layouts, Intersections 1-4 and 7-10

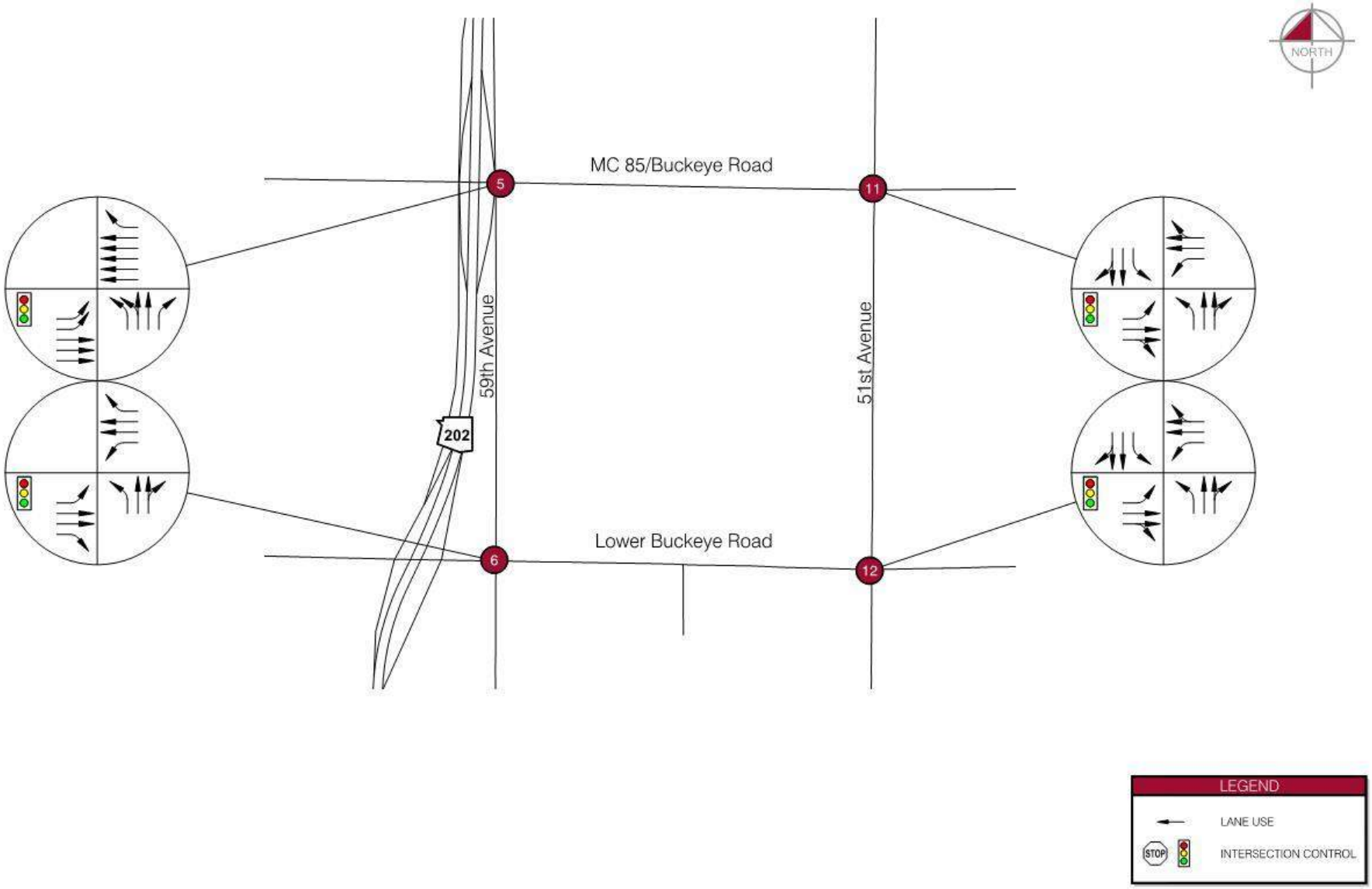

Figure 7b – Existing Intersection Layouts, Intersections 5, 6, 11, and 12

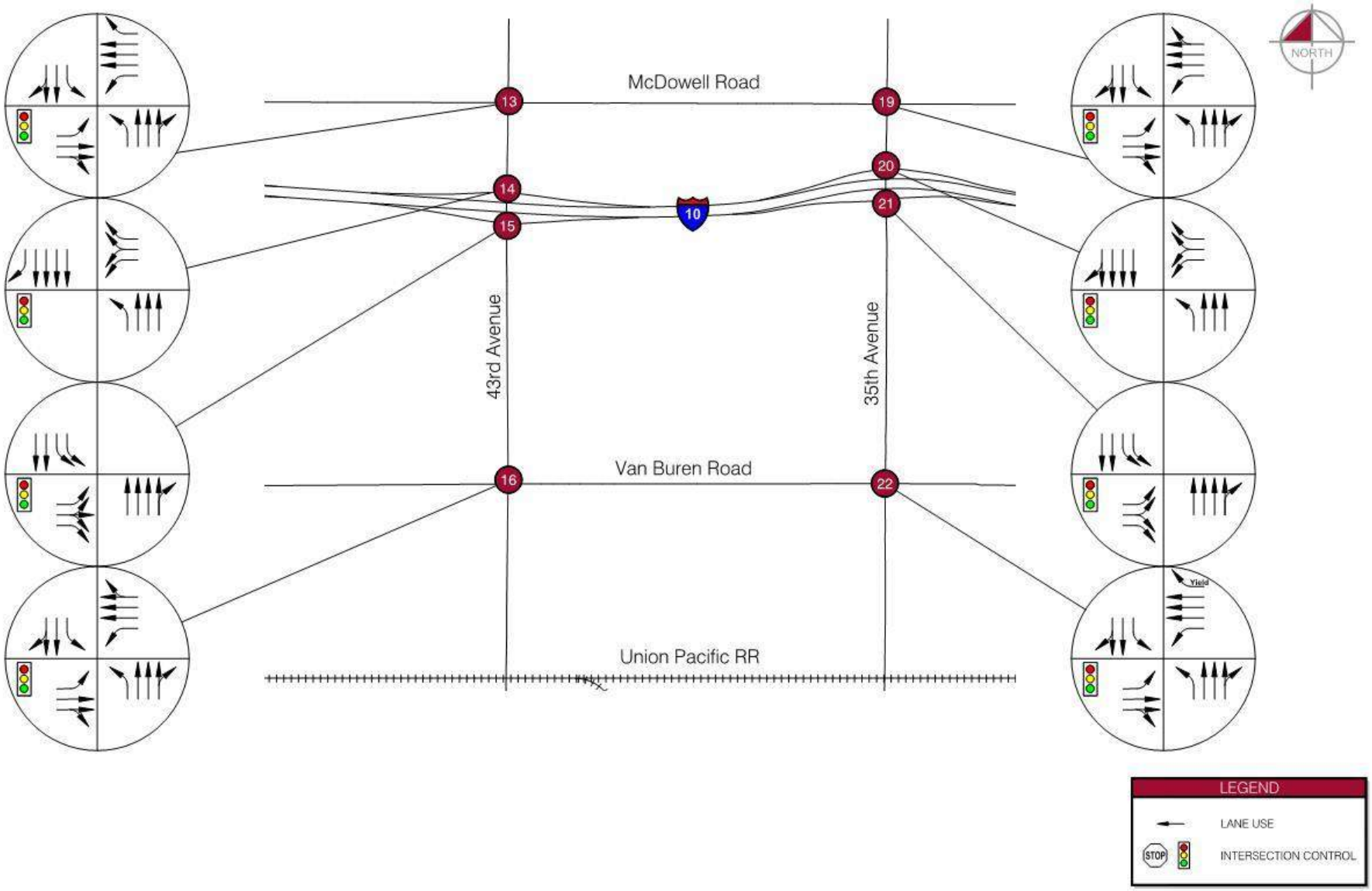

Figure 7c – Existing Intersection Layouts, Intersections 13-16 and 19-22

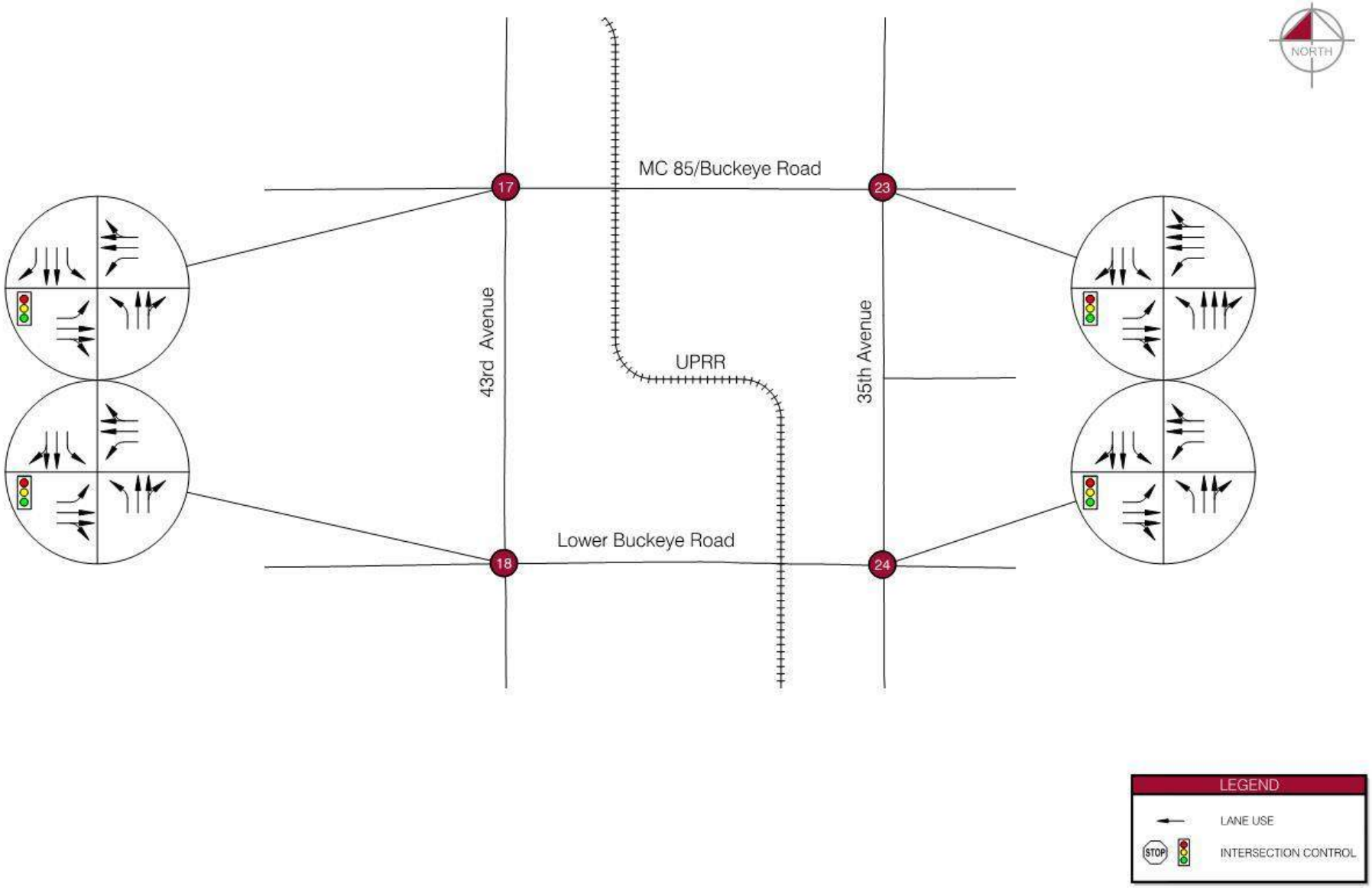

Figure 7d – Existing Intersection Layouts, Intersections 17, 18, 23, and 24

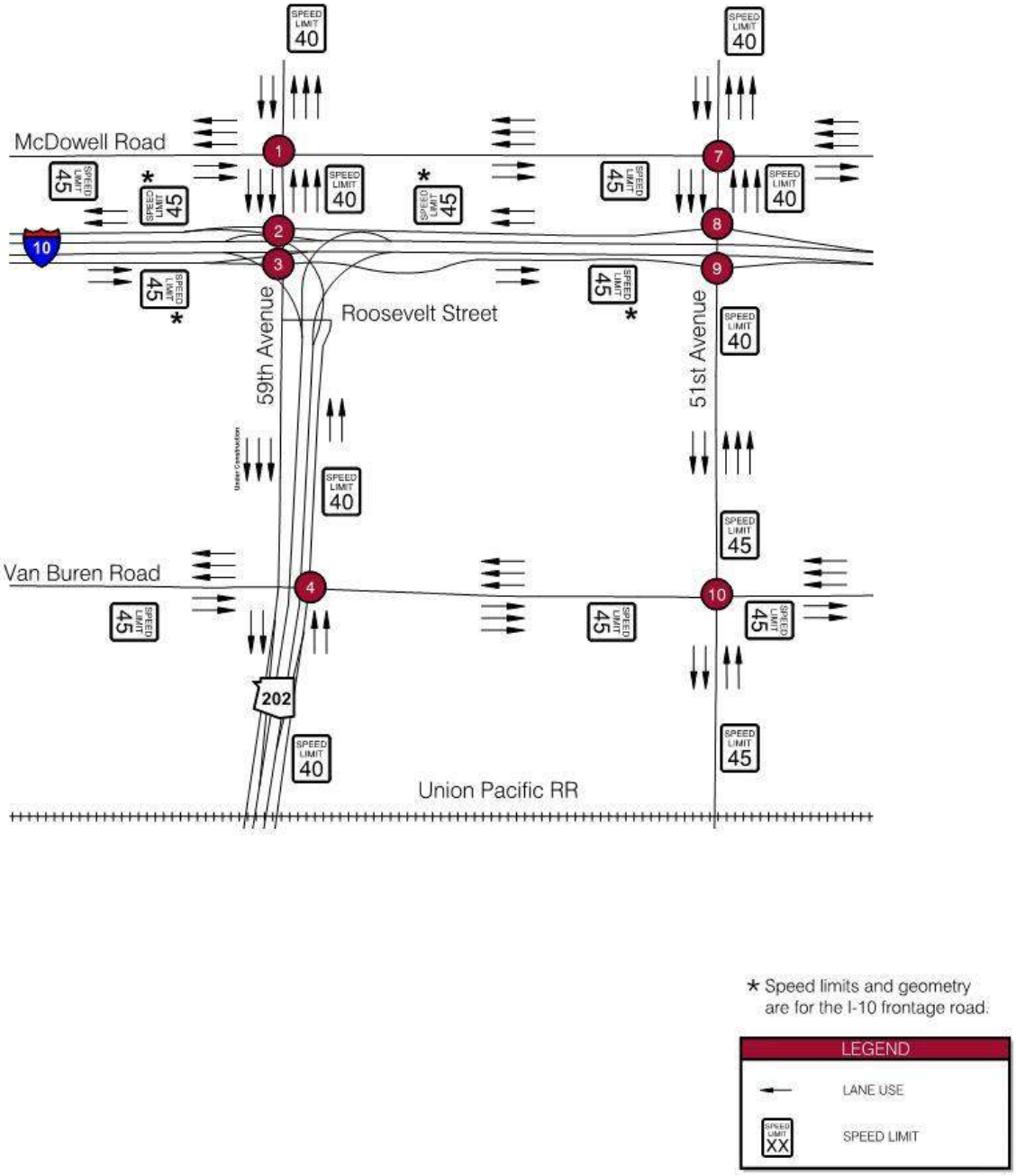

Figure 8a – Existing Through Lanes and Speed Limits, Intersections 1-4 and 7-10

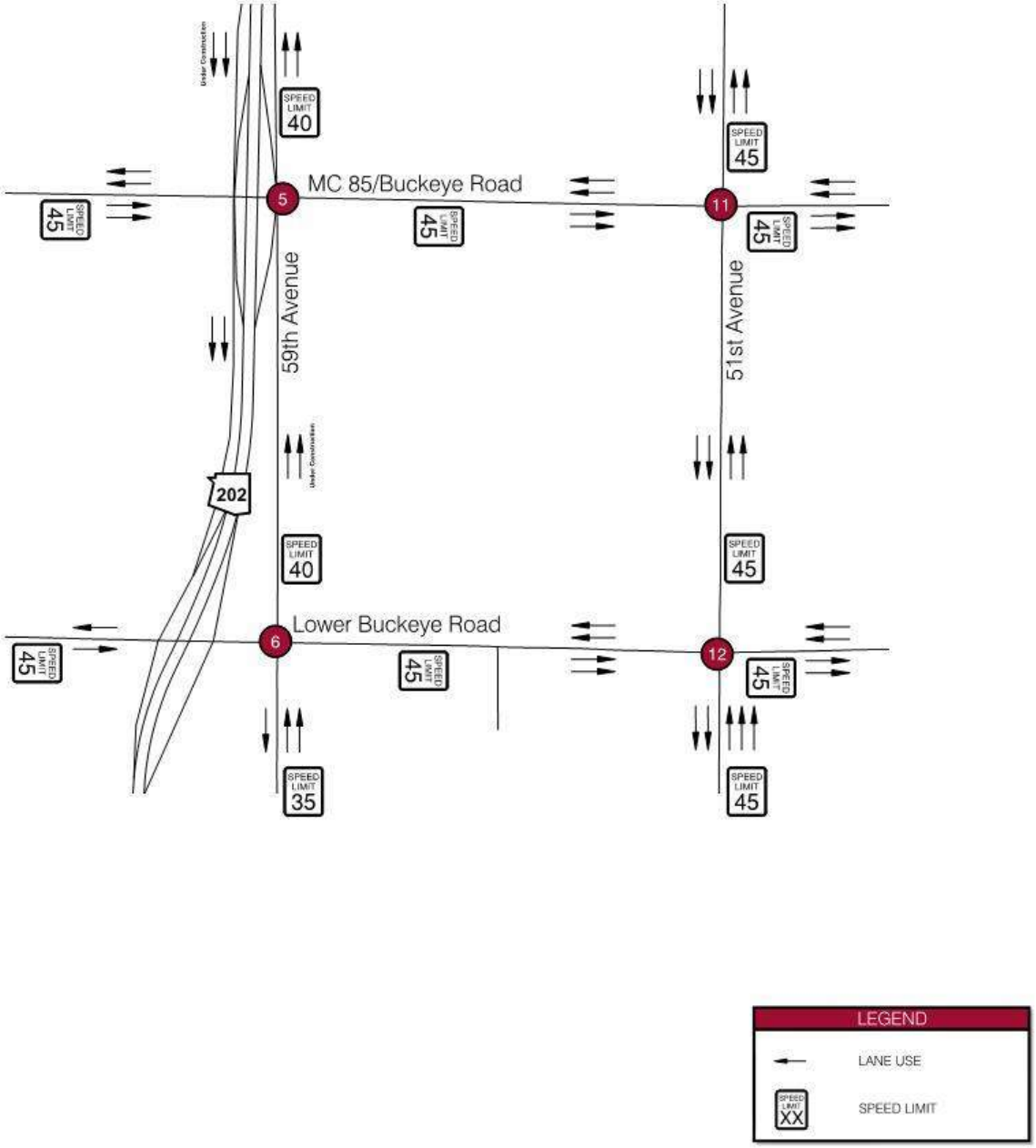

Figure 8b – Existing Through Lanes and Speed Limits, Intersections 5, 6, 11, and 12

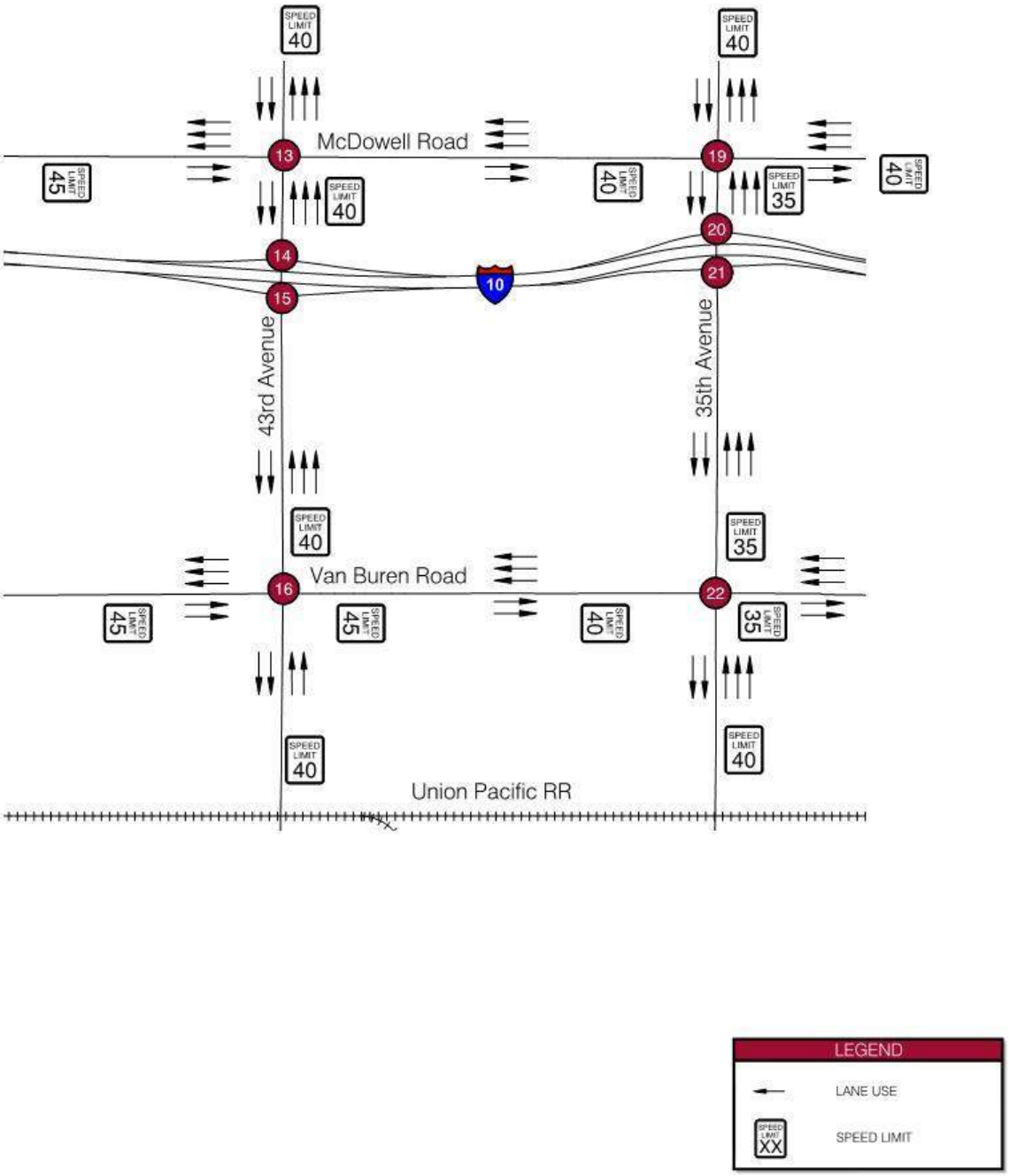

Figure 8c – Existing Through Lanes and Speed Limits, Intersections 13-16 and 19-22

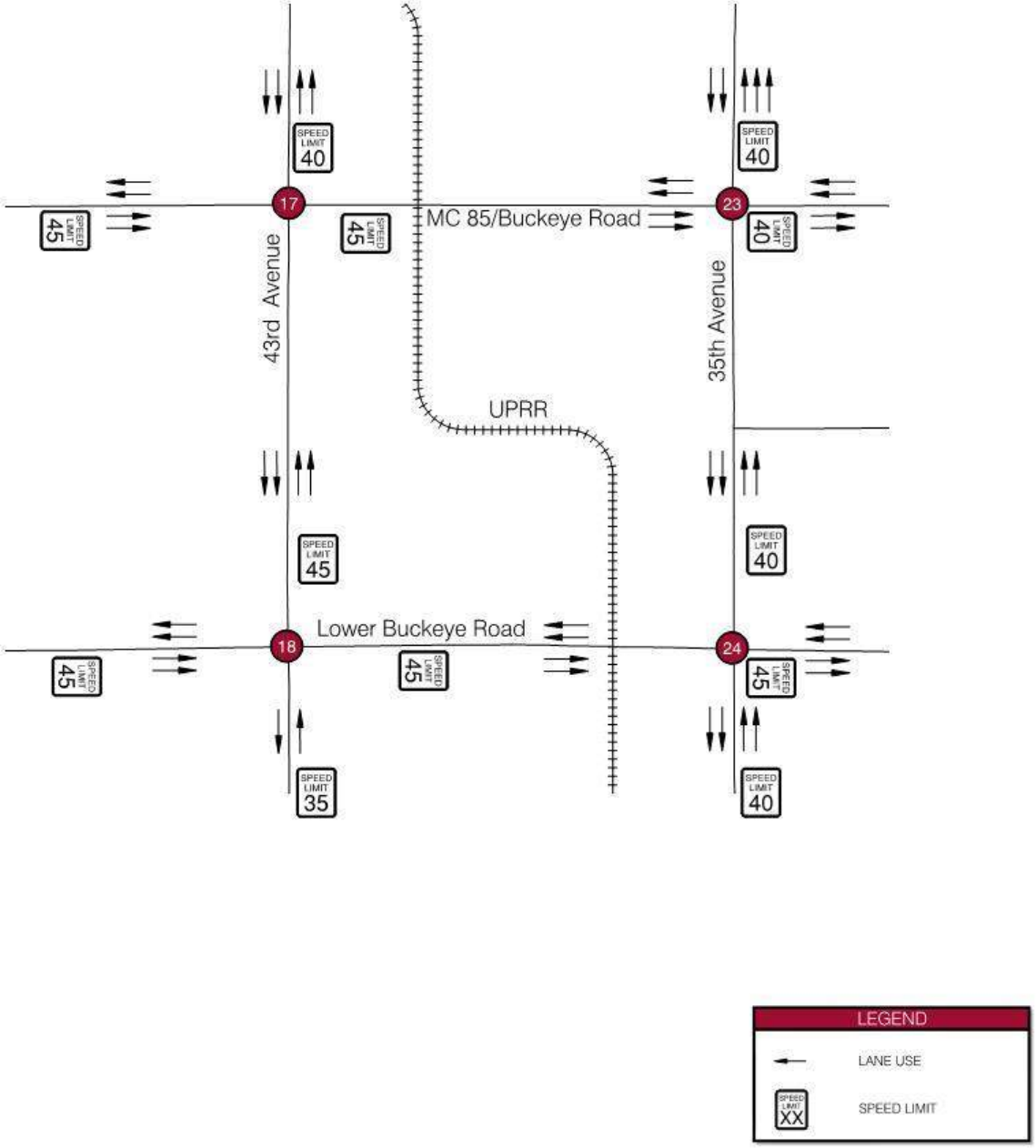

Figure 8d – Existing Through Lanes and Speed Limits, Intersections 17, 18, 23, and 24

2.4.1 Existing Transit Service and Stops

There are multiple transit service routes and stops within the study area. Transit services within the study area are shown in **Figure 9** and include:

- Two potential Bus Rapid Transit routes:
  - McDowell Road/44th Street [from McDowell Road and 35th Avenue to east of the study area at the Sky Train];
  - 35th Avenue/Van Buren Street [35th Avenue from the northern boundary of the study area (and further north) to Van Buren Street, and Van Buren Street from 35th Avenue to the eastern boundary of the study area (and further east)];
- Multiple Express Bus routes along I-10 including routes 562, 563, 571, and 573;
- Multiple local Valley Metro bus routes:
  - Route 3, Van Buren Street [throughout the entire study area];
  - Route 13, MC 85/Buckeye Road [throughout the entire study area];
  - Route 17, McDowell Road [throughout the entire study area];
  - Route 28, Lower Buckeye Road [throughout the entire study area];
  - Route 35, 35th Avenue [throughout the entire study area];
  - Route 43, 43rd Avenue [from MC 85/Buckeye Road to the northern boundary of the study area (and further north)];
  - Route 51, 51st Avenue [throughout the entire study area];
  - Route 59, 59th Avenue [from MC 85/Buckeye Road to the northern boundary of the study area (and further north)]; and
- Multiple bus stops with and without pull-out bays, typically found near major signalized intersections.

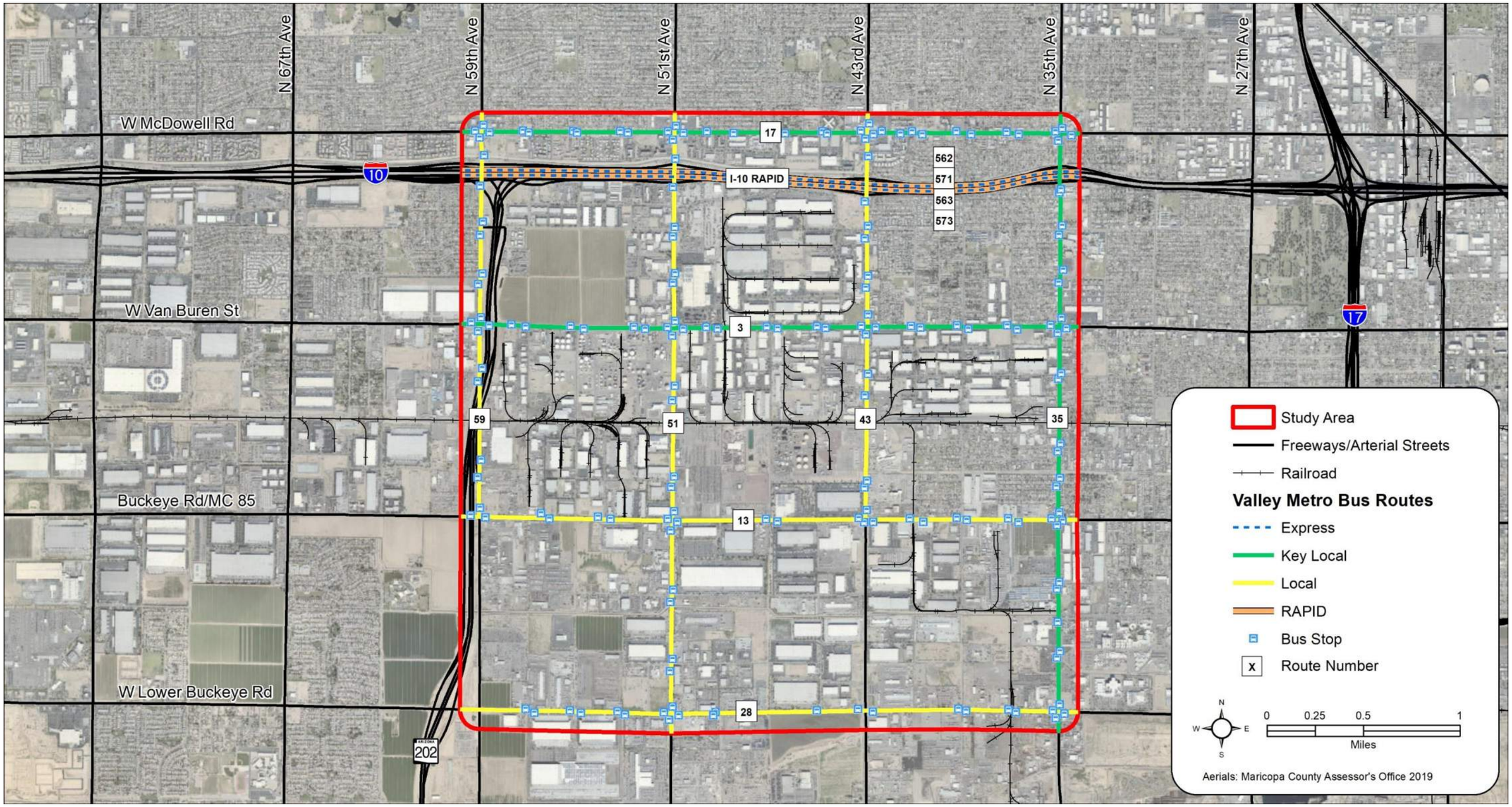

Figure 9 – Existing Transit Services and Facilities

2.4.2 Existing Pedestrian Network

Sidewalks are generally present on each side of the major roadways in the study area. **Figure 10** shows where there are gaps in the existing sidewalk network and where mid-block and designated school crossings are located within the study area. Pedestrian activity was high throughout the study area, with especially high pedestrian activity along McDowell Road and 35th Avenue.

2.4.3 Existing Bicycle Network

The study area contains limited bicycle facilities. There are designated bicycle lanes on the following segments of major roadway in the study area:

- 51st Avenue, Lower Buckeye Road to MC 85/Buckeye Road; and
- Lower Buckeye Road, 51st Avenue to 35th Avenue.

The previously referenced **Figure 10** also shows the existing bicycle network in the study area.

2.4.4 Existing Rail Facilities

A Union Pacific Railroad (UPRR) line runs east-west through the study area and is generally located approximately halfway between Van Buren Street and MC 85/Buckeye Road, creating at-grade railroad crossings on the major north-south study area roadways. Additionally, there is a branch line which diverts south from the main line in the study area just east of 43rd Avenue creating at-grade railroad crossings at MC 85/Buckeye Road and Lower Buckeye Road between 43rd Avenue and 35th Avenue. At-grade railroad crossings present a safety risk and introduce traffic delays as trains pass.

According to the Intermodal Association of North America (IANA) North American Intermodal Facilities Directory there is one Swift Transportation Inc. rail intermodal and support facility (depots and container yards (CY)) within the study area at 5601 W. Mohave, east of 59th Avenue and south of MC 85/Buckeye Road.

A CMI Phoenix CY/Depot is located at 710 South 67th Avenue (located just west of the study area).

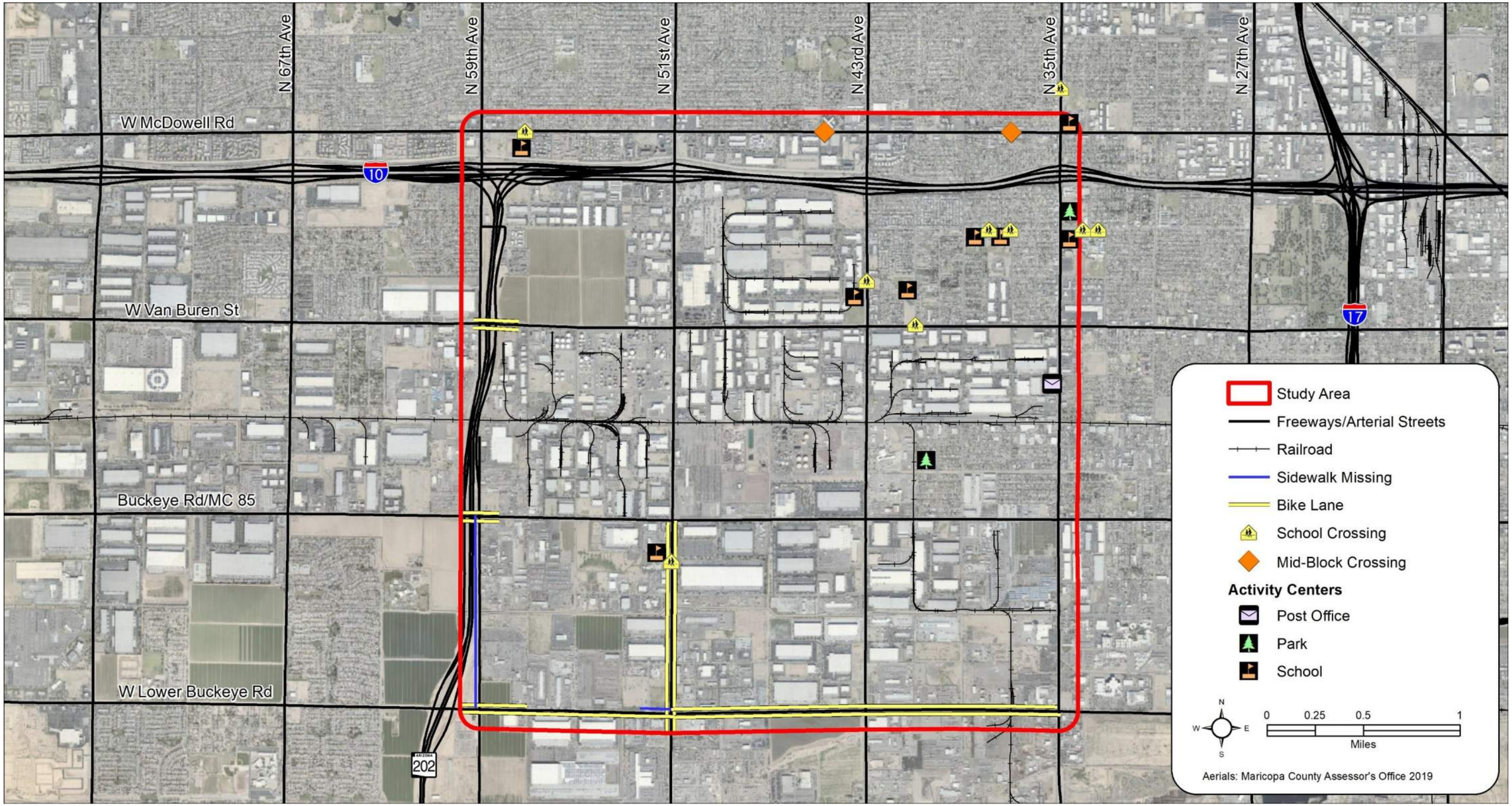

Figure 10 – Existing Bicycle and Pedestrian Networks

2.5 Existing Traffic Volumes

Weekday morning (AM) and afternoon (PM) peak period turning movement counts (TMCs) were collected at 24 study area intersections on Wednesday, February 19, Thursday, February 20, Tuesday, February 25, Wednesday, February 26, or Thursday, February 27, 2020. Counts were performed between 6:30 AM and 8:30 AM and between 3:45 PM and 5:45 PM. Volumes classified by vehicle type (cars and heavy vehicles [trucks]) were recorded for this study.

In addition to TMCs, weekday 24-hour bi-directional counts were performed at 32 locations in the study area. Volumes were classified by vehicle type using the Federal Highway Administration's (FHWA) classification scheme.

Peak hour volumes were identified for each intersection within each time period. Existing peak hour volumes are shown in **Figure 11a**, **Figure 11b**, **Figure 11c,** and **Figure 11d**. These figures also show the average daily traffic (ADT) volumes for all vehicles and for heavy vehicles only on segments within the study area. The raw peak period traffic count data is provided in **Appendix B**.

In general, daily volumes for all vehicles are 20,000- 35,000 vehicles per day (vpd), with 59th Avenue being a notable exception at 5,000-10,000 vpd along the one-way segments of the corridor between Lower Buckeye Road and Van Buren Street. Overall volumes generally decrease in the study area from north to south and from east to west. Daily heavy vehicle volumes are generally 4,000-13,000 vpd throughout the study area, with the one-way segments along 59th Avenue that were mentioned previously as notable exception. Heavy vehicle volumes are generally lowest on McDowell Road and 35th Avenue and highest on Lower Buckeye Road and 51st Avenue, south of I-10.

Figure 12a, **Figure 12b**, **Figure 12c,** and **Figure 12d** show the existing heavy vehicle percentages for each movement at intersections and for each arterial segment within the study area.

Daily heavy vehicle percentages are generally 15-25 percent north of I-10 and 30-60 percent south of I-10. Peak hour heavy vehicle percentages are generally 2-10 percent north of I-10 and 10-35 percent south of I-10. A comparison of AM and PM heavy vehicle volumes and percentages indicates that heavy vehicles often have different patterns than the typical commuter trend (towards Phoenix in the AM peak period, away from Phoenix in the PM peak period). The heavy vehicle patterns appear to relate more to shift schedules at industrial facilities and seem to correlate more towards California in the AM peak period and towards Phoenix in the PM peak period.

2.6 Travel Time Analysis

Travel speed data, collected by HERE and provided by MAG, was used to estimate daily travel time for the roadways throughout the study area. The HERE data provides a Travel Time Index (TTI) measure of effectiveness. In terms of overall mobility, the TTI is the relationship of the average peak period travel time in a specific section of the corridor to the free-flow travel time (based on the 85th-percentile speed) in the same location. The TTI recognizes the delay potential from recurring congestion during peak periods and displays results for annualized data. The HERE data also provides a Planning Time Index (PTI) measure of effectiveness. In terms of mobility, the PTI is the 95th percentile TTI and is a measure for reliability. The PTI recognizes the delay potential from non-recurring congestion during peak periods. The HERE data is provided in **Appendix C**.

Figure 13 through **Figure 15** show the 2017 TTI values for the AM, mid-day (MD), and PM peak periods. Higher values, shown as red-colored segments, indicate significant recurring congestion. **Figure 16** through **Figure 18** show the 2017 PTI values for the AM, mid-day (MD), and PM peak periods. Higher values, shown as red-colored segments, indicate significant non-recurring congestion.

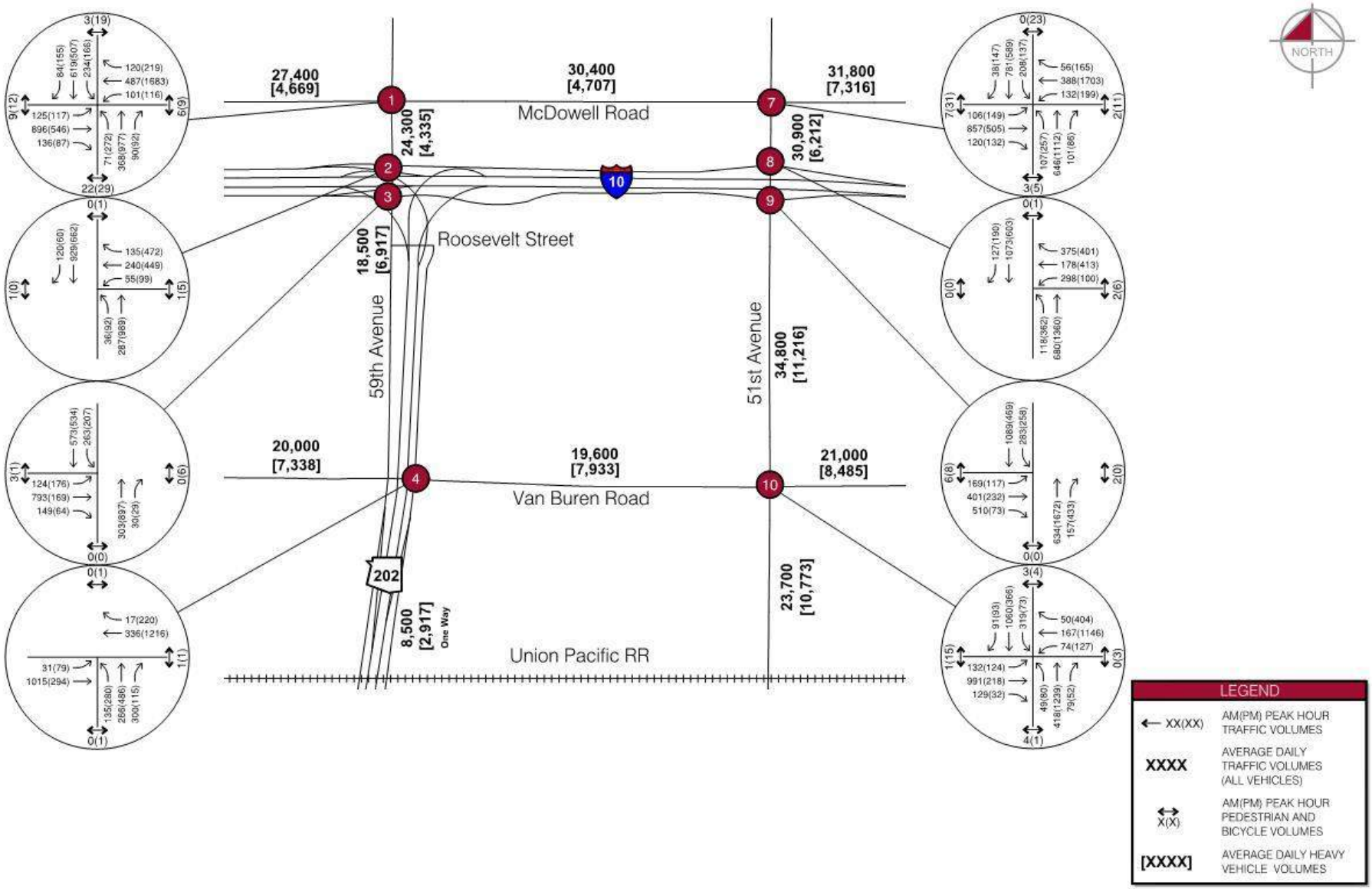

Figure 11a – Existing Volumes, Intersections 1-4 and 7-10

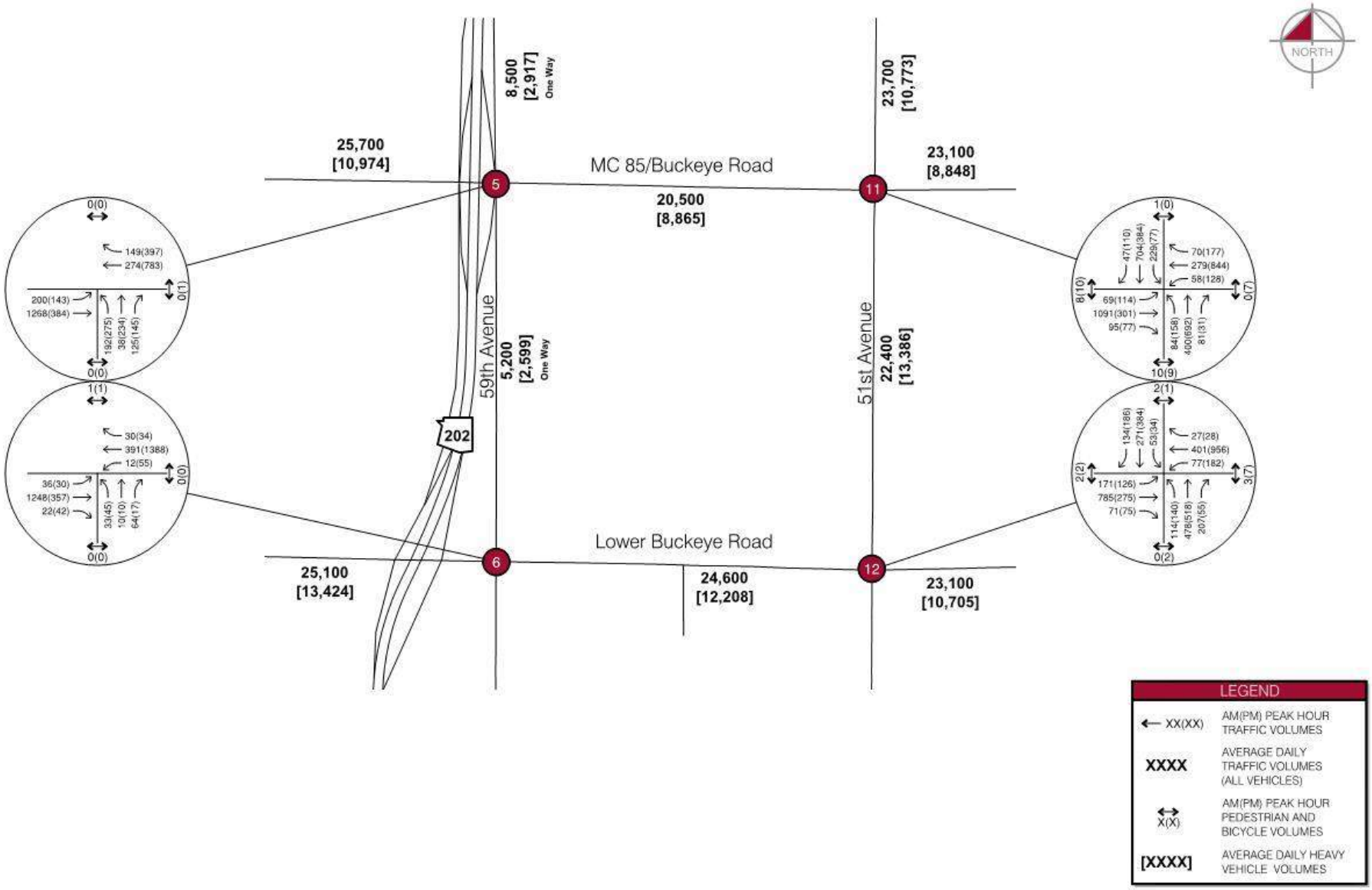

Figure 11b – Existing Volumes, Intersections 5, 6, 11, and 12

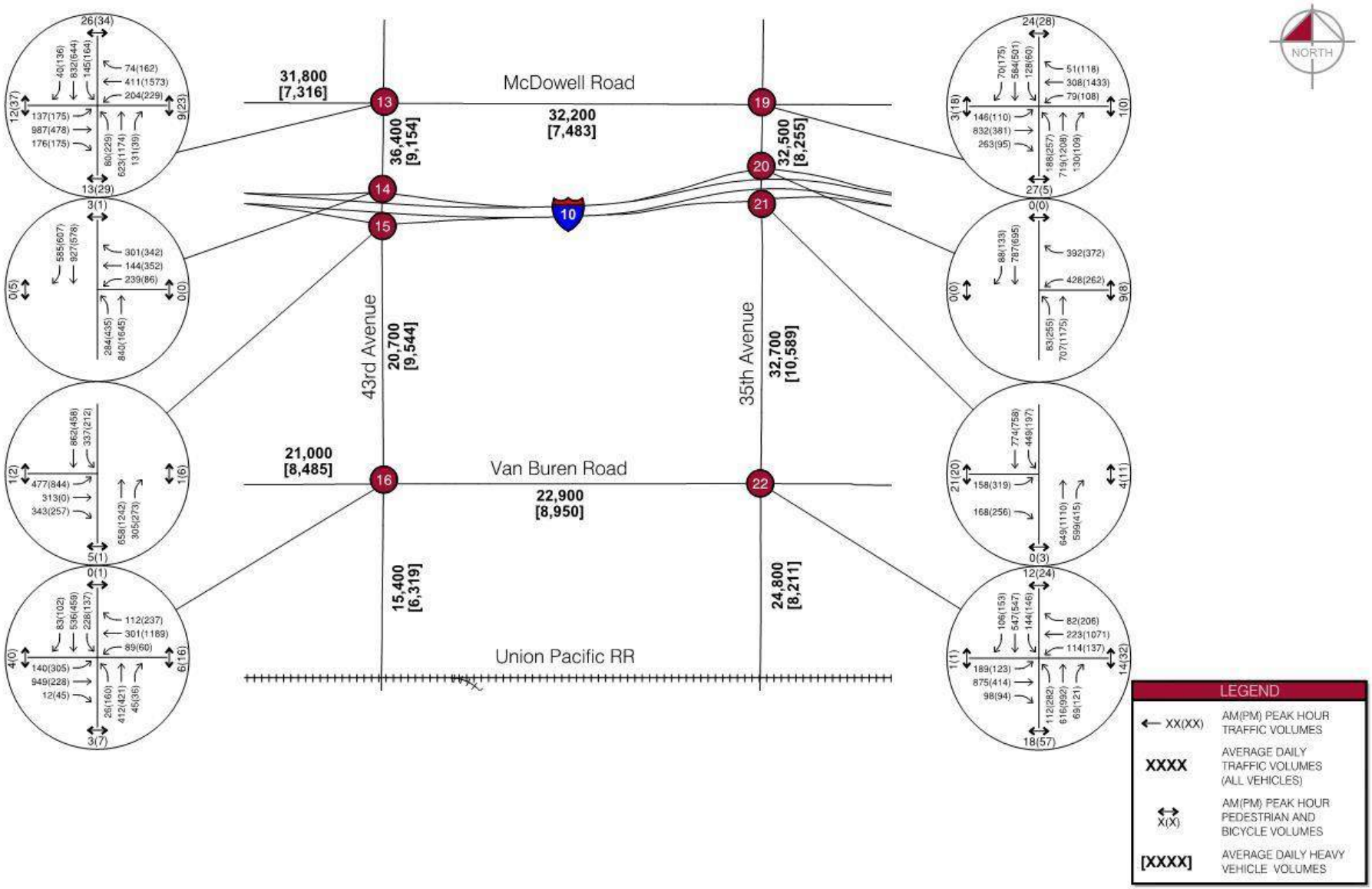

Figure 11c – Existing Volumes, Intersections 13-16 and 19-22

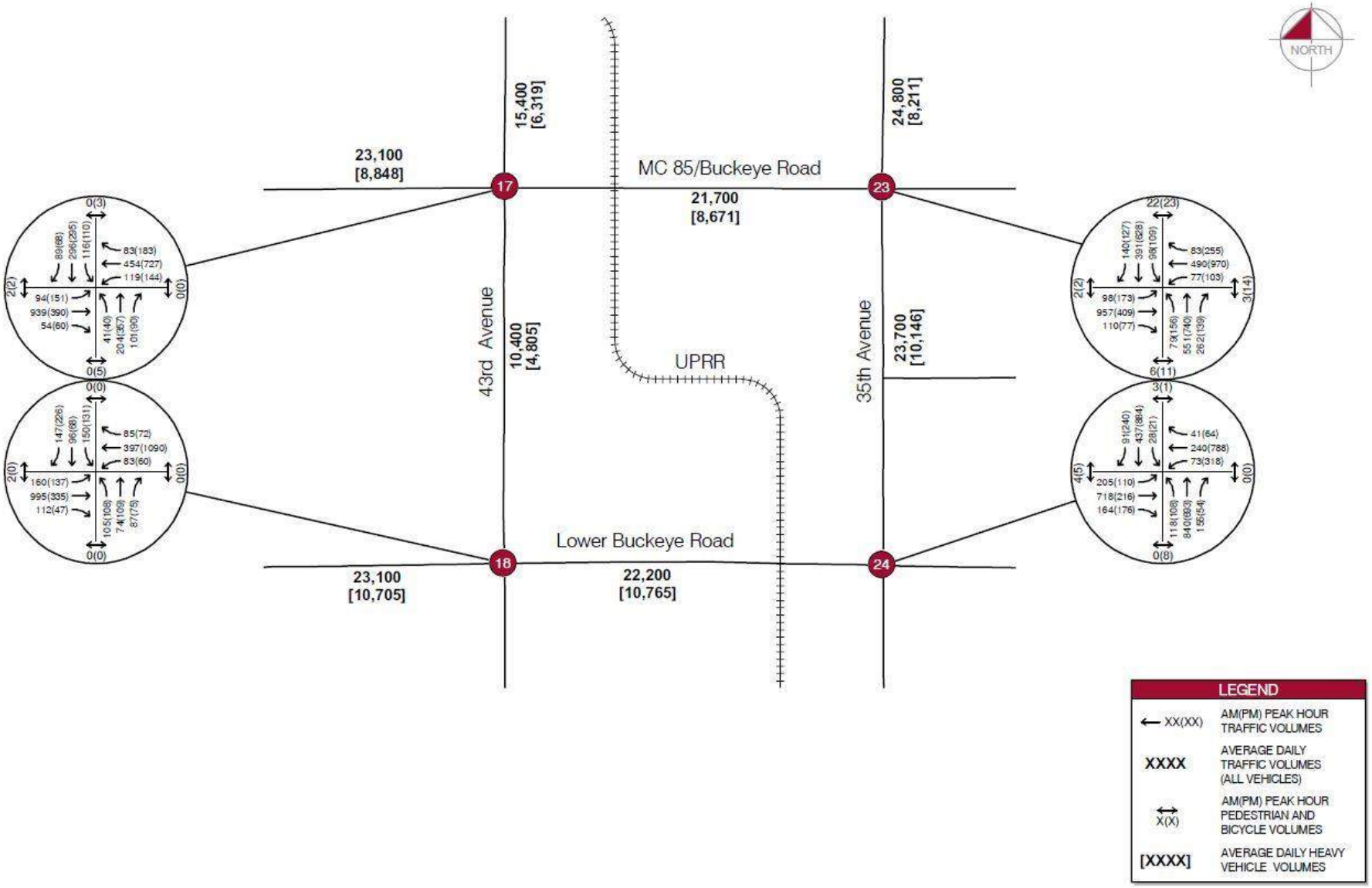

Figure 11d – Existing Volumes, Intersections 17, 18, 23, and 24

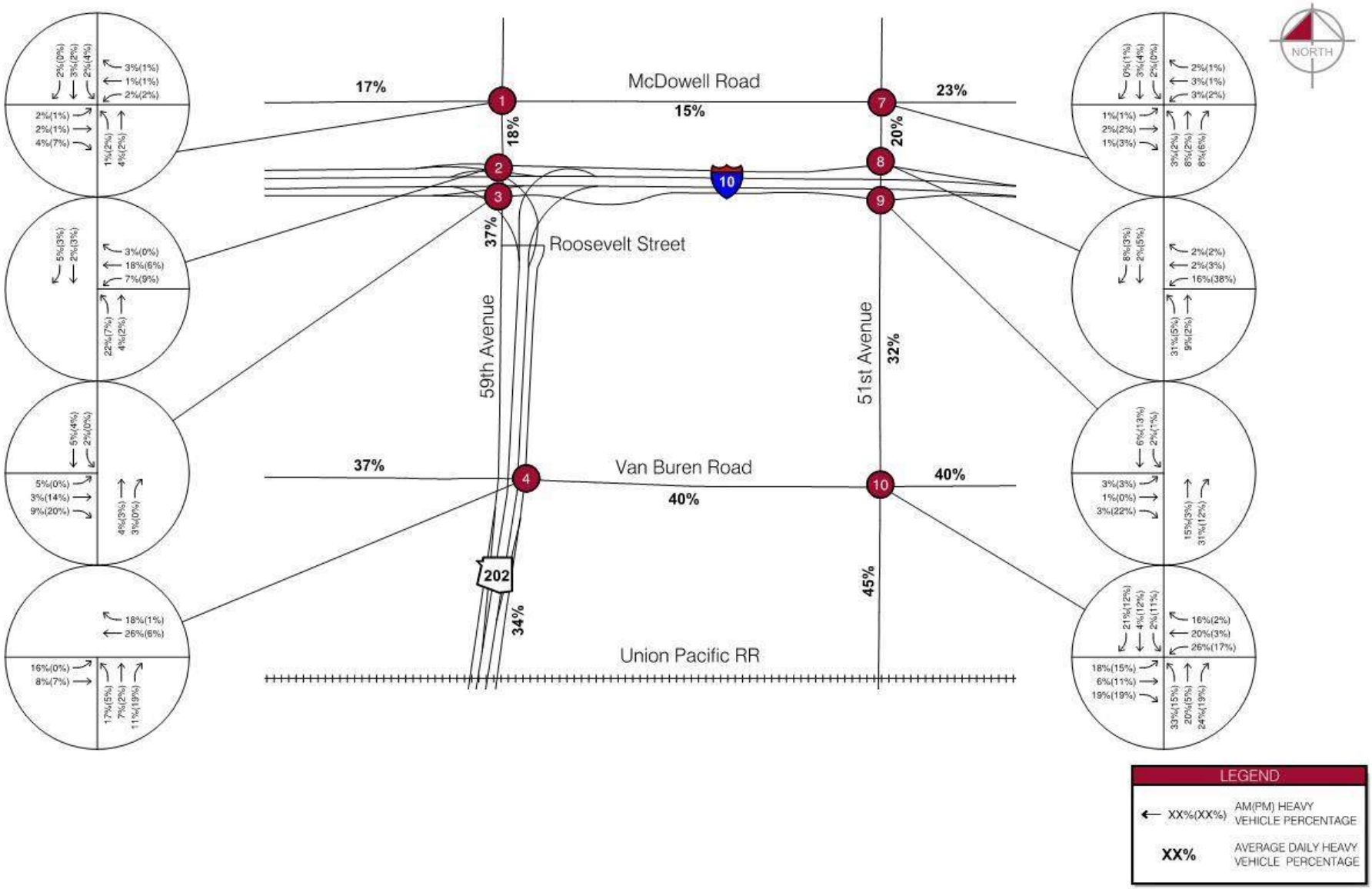

Figure 12a – Existing Heavy Vehicle Percentages, Intersections 1-4 and 7-10

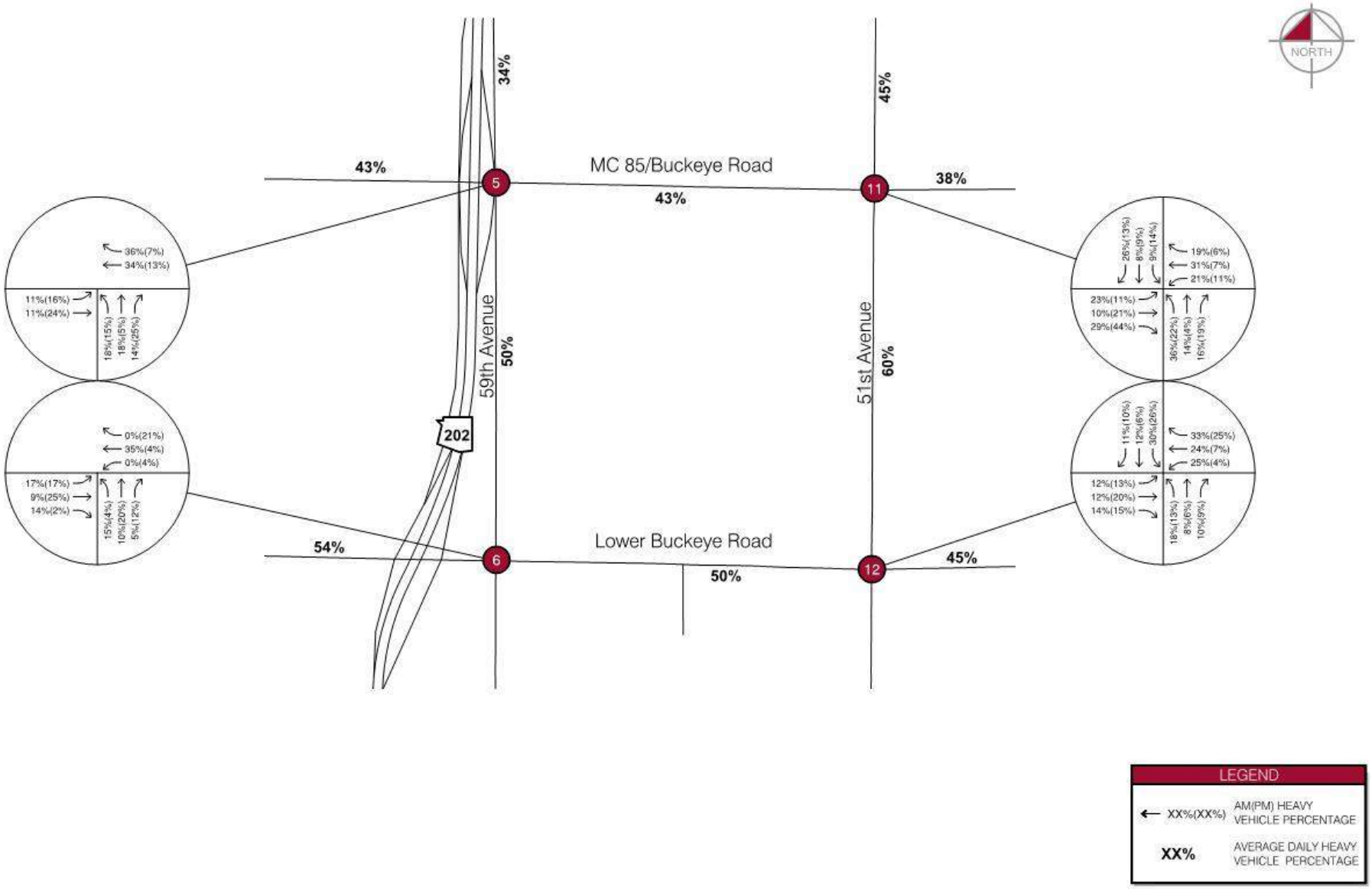

Figure 12b – Existing Heavy Vehicle Percentages, Intersections 5, 6, 11, and 12

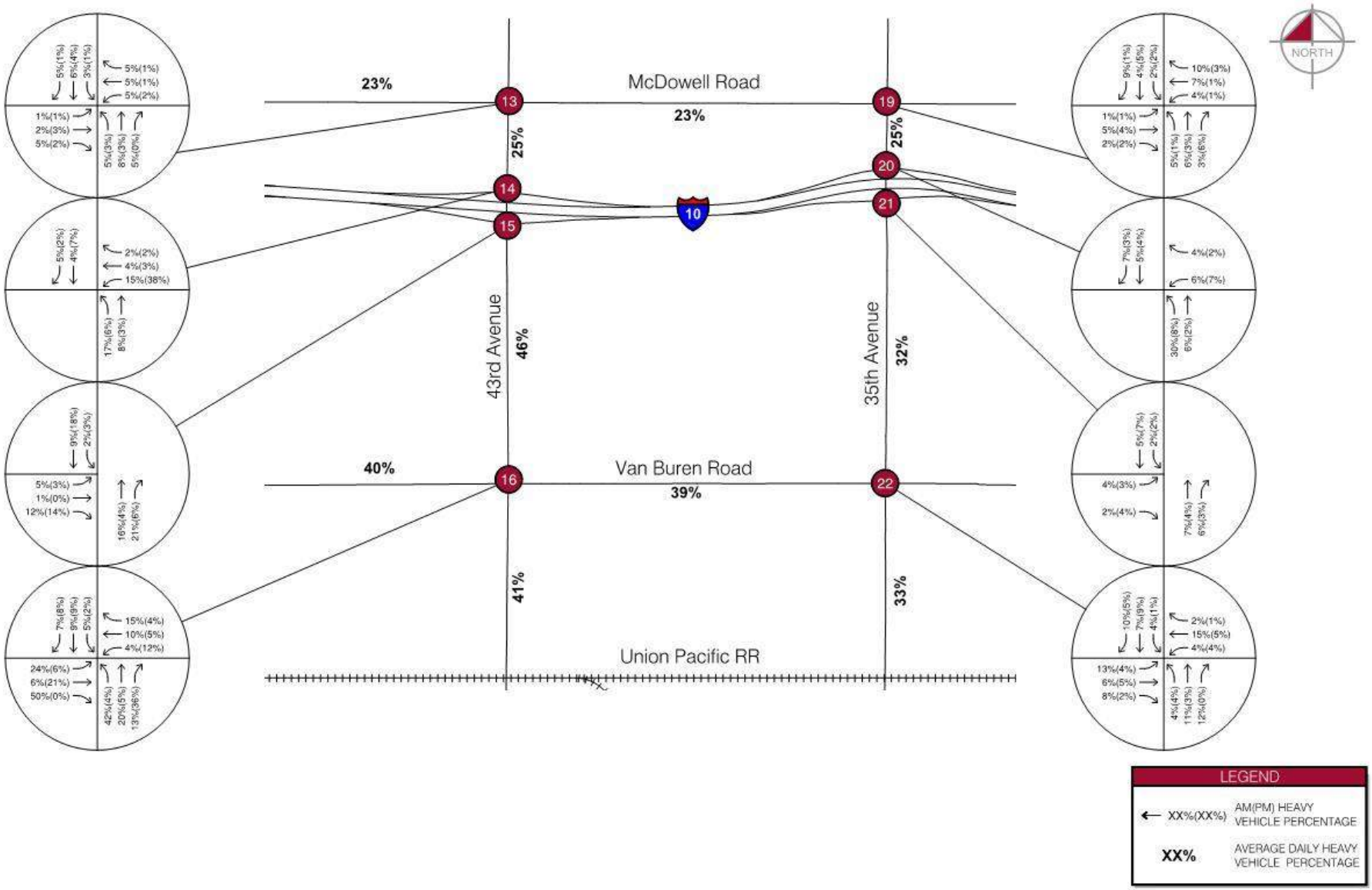

Figure 12c – Existing Heavy Vehicle Percentages, Intersections 13-16 and 19-22

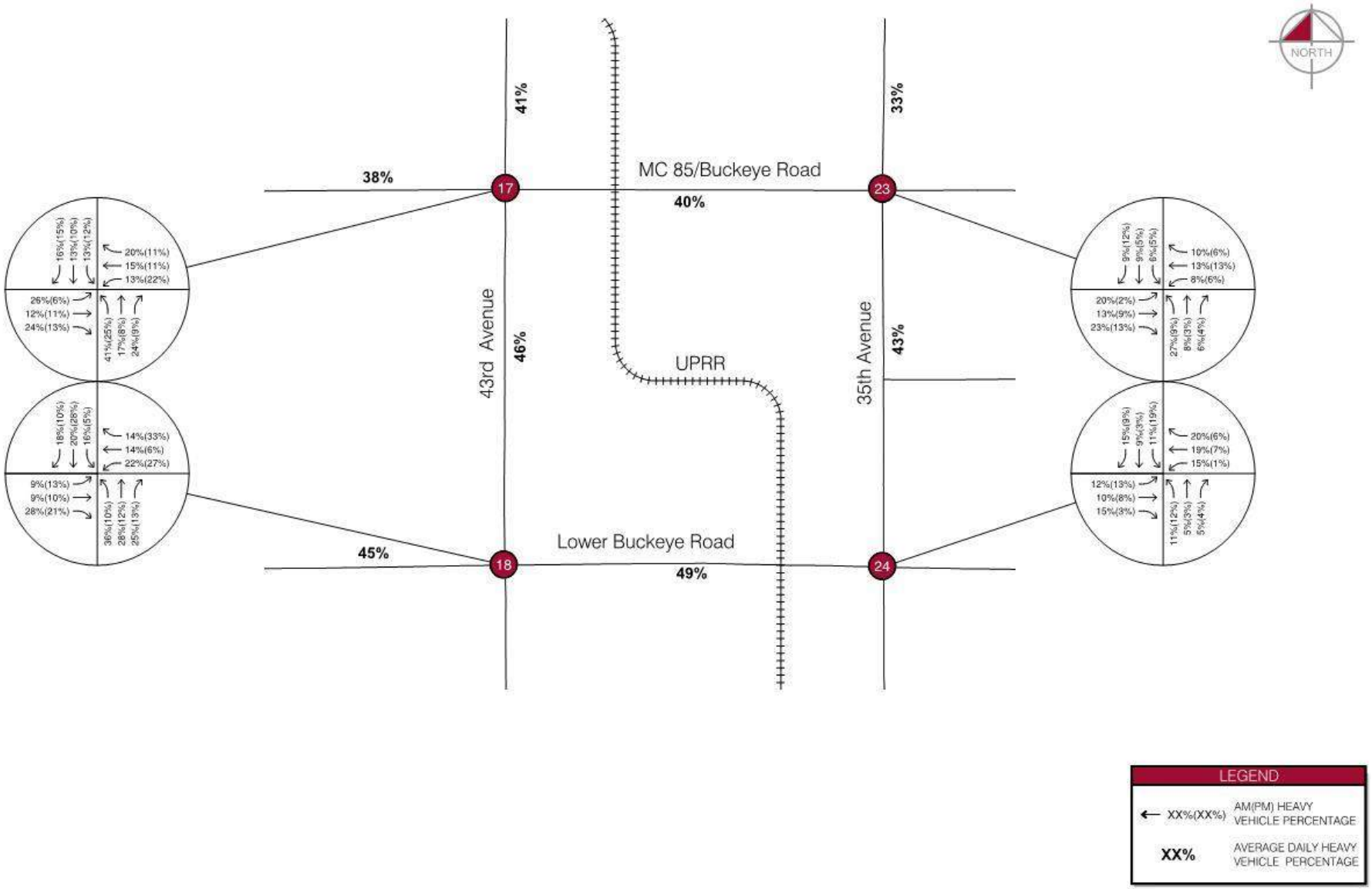

Figure 12d – Existing Heavy Vehicle Percentages, Intersections 17, 18, 23, and 24

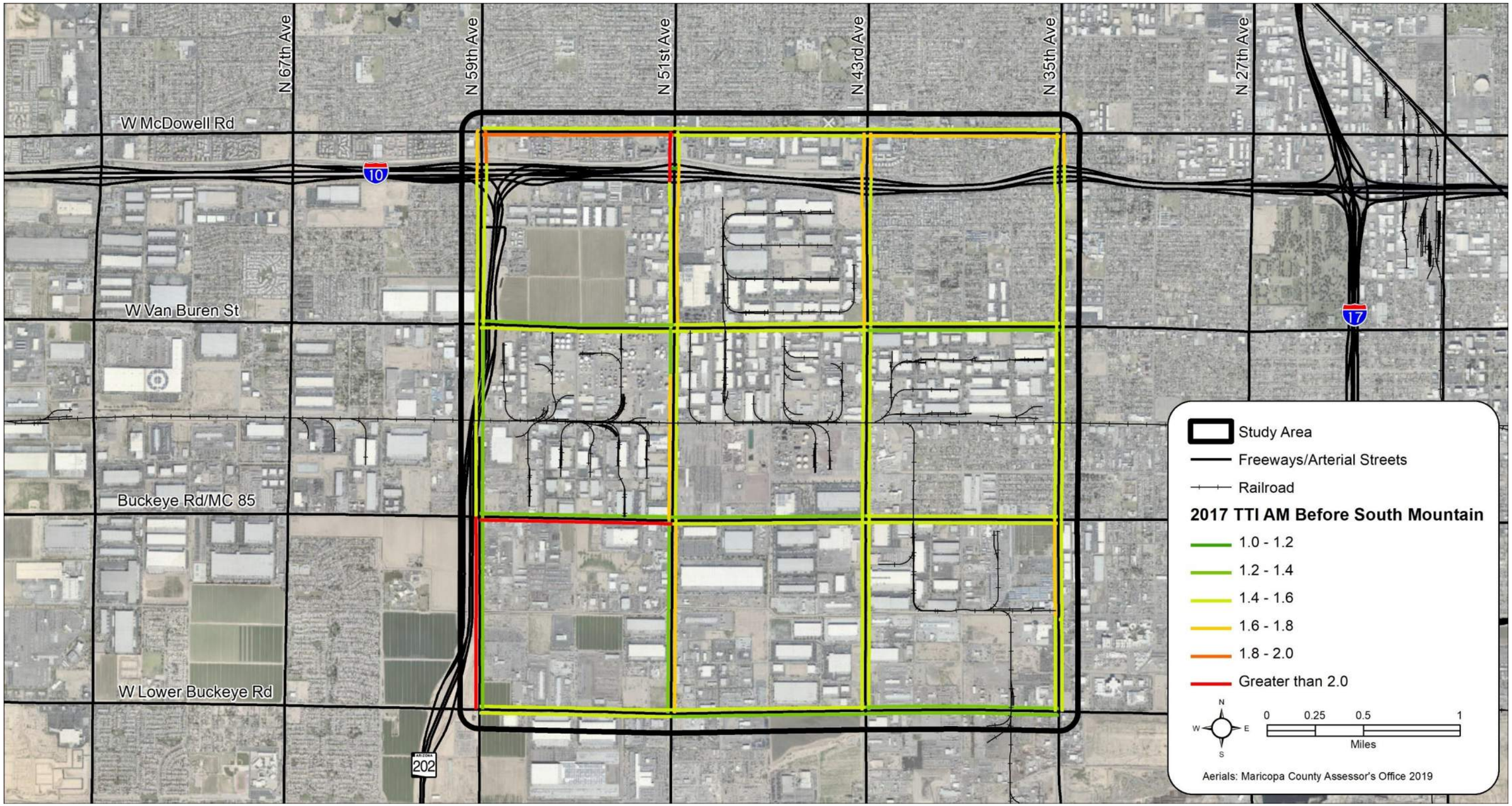

Figure 13 – 2017 AM TTI

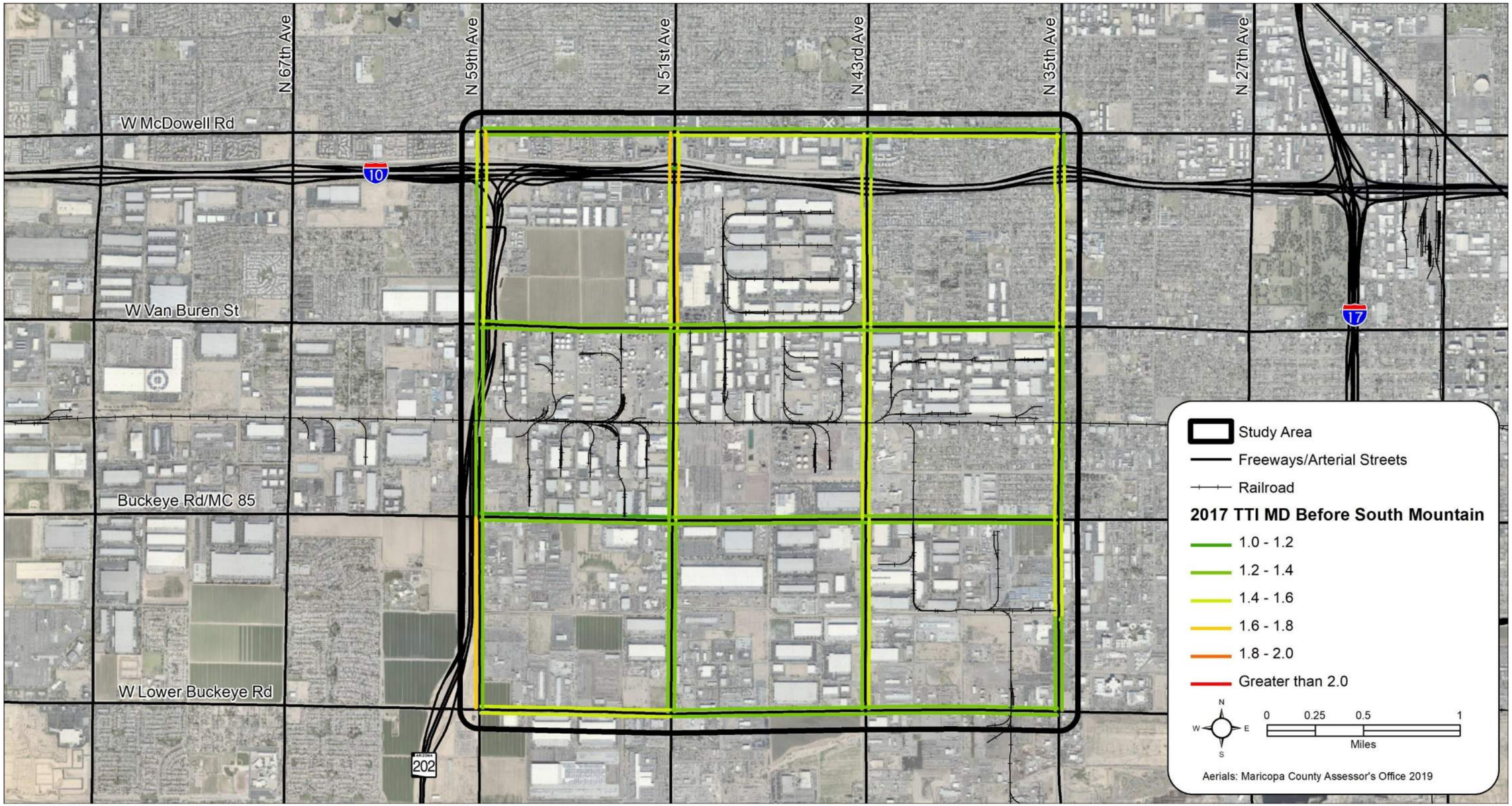

Figure 14 – 2017 MD TTI

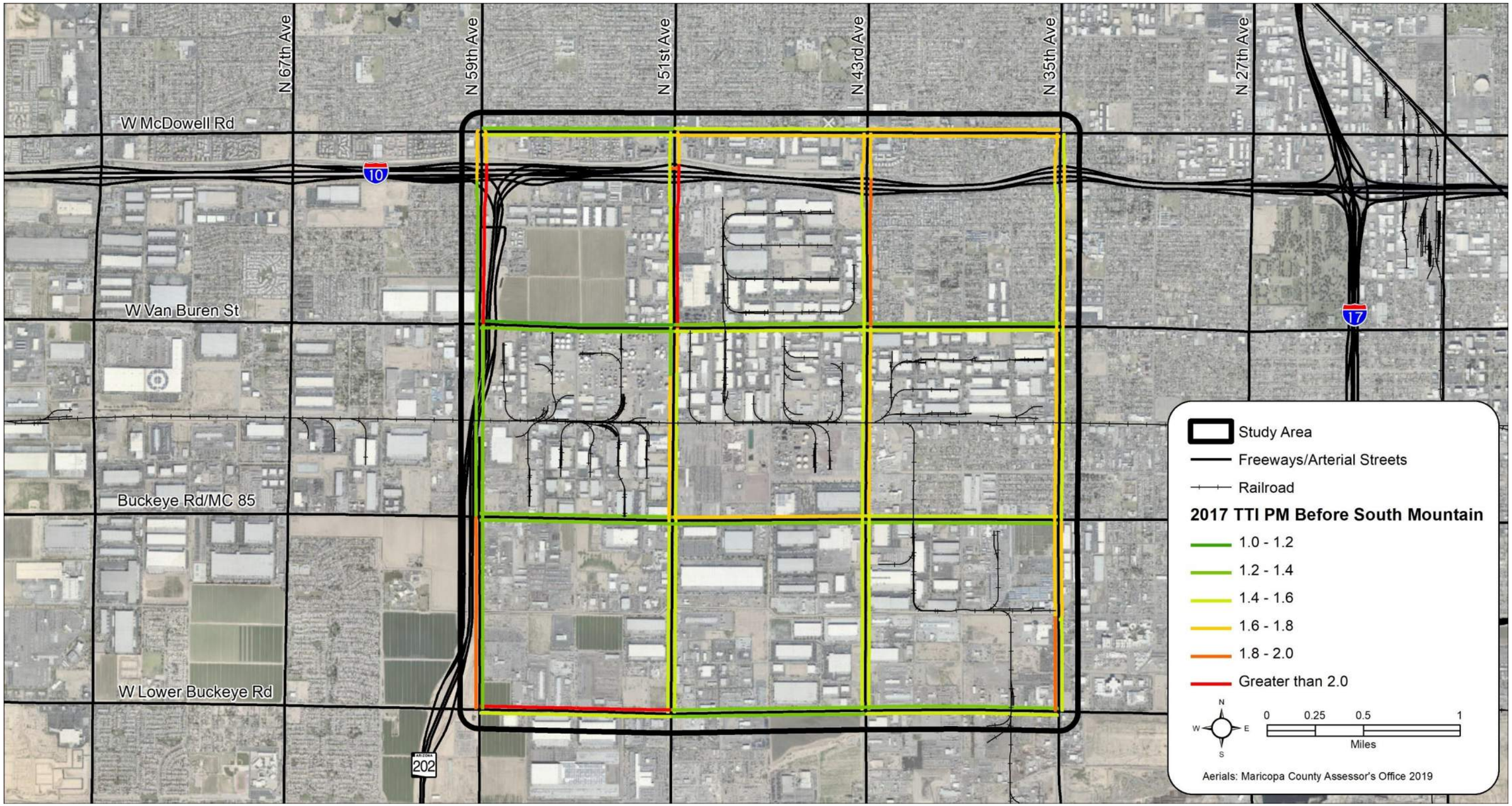

Figure 15 – 2017 PM TTI

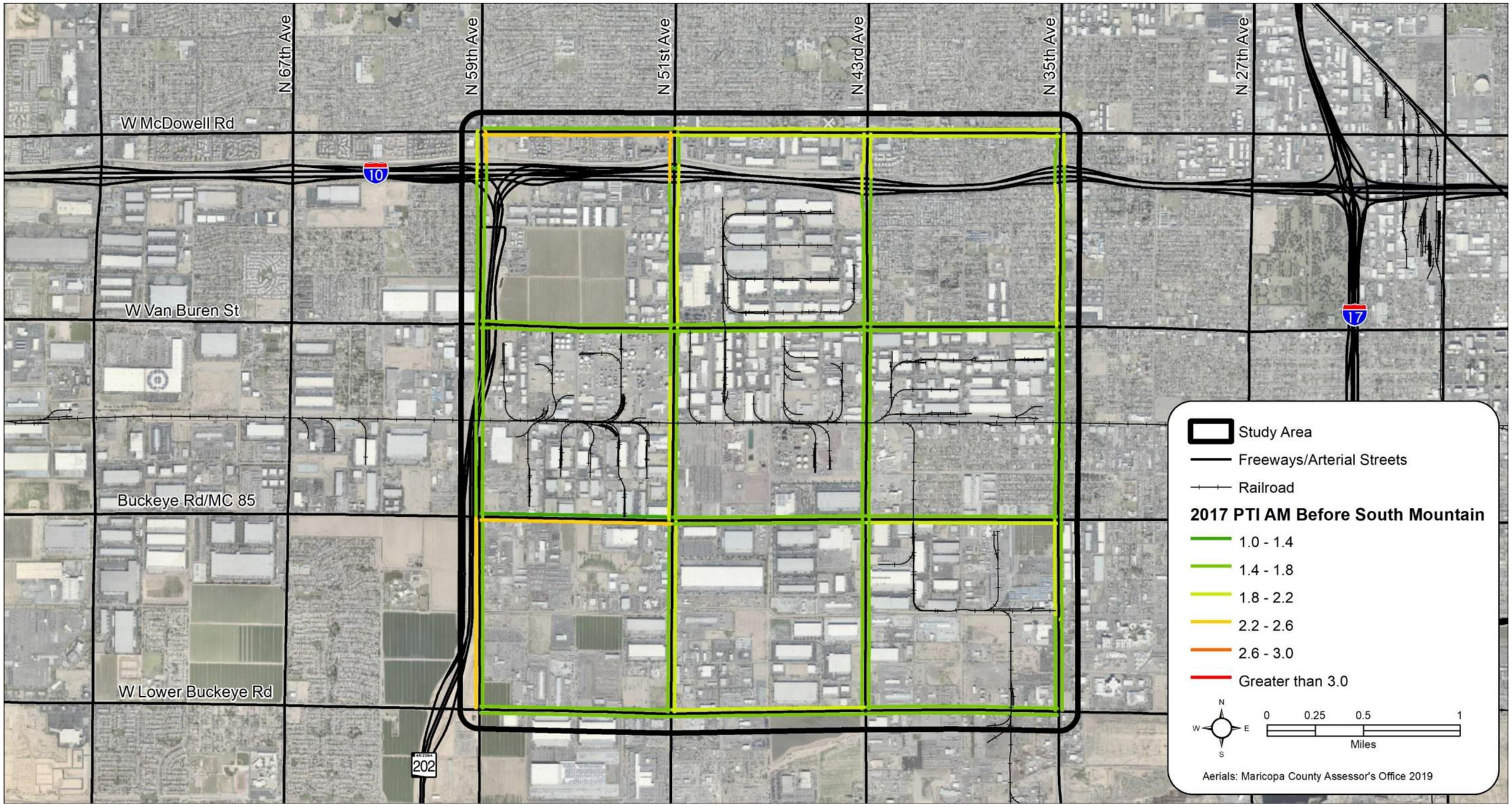

Figure 16 – 2017 AM PTI

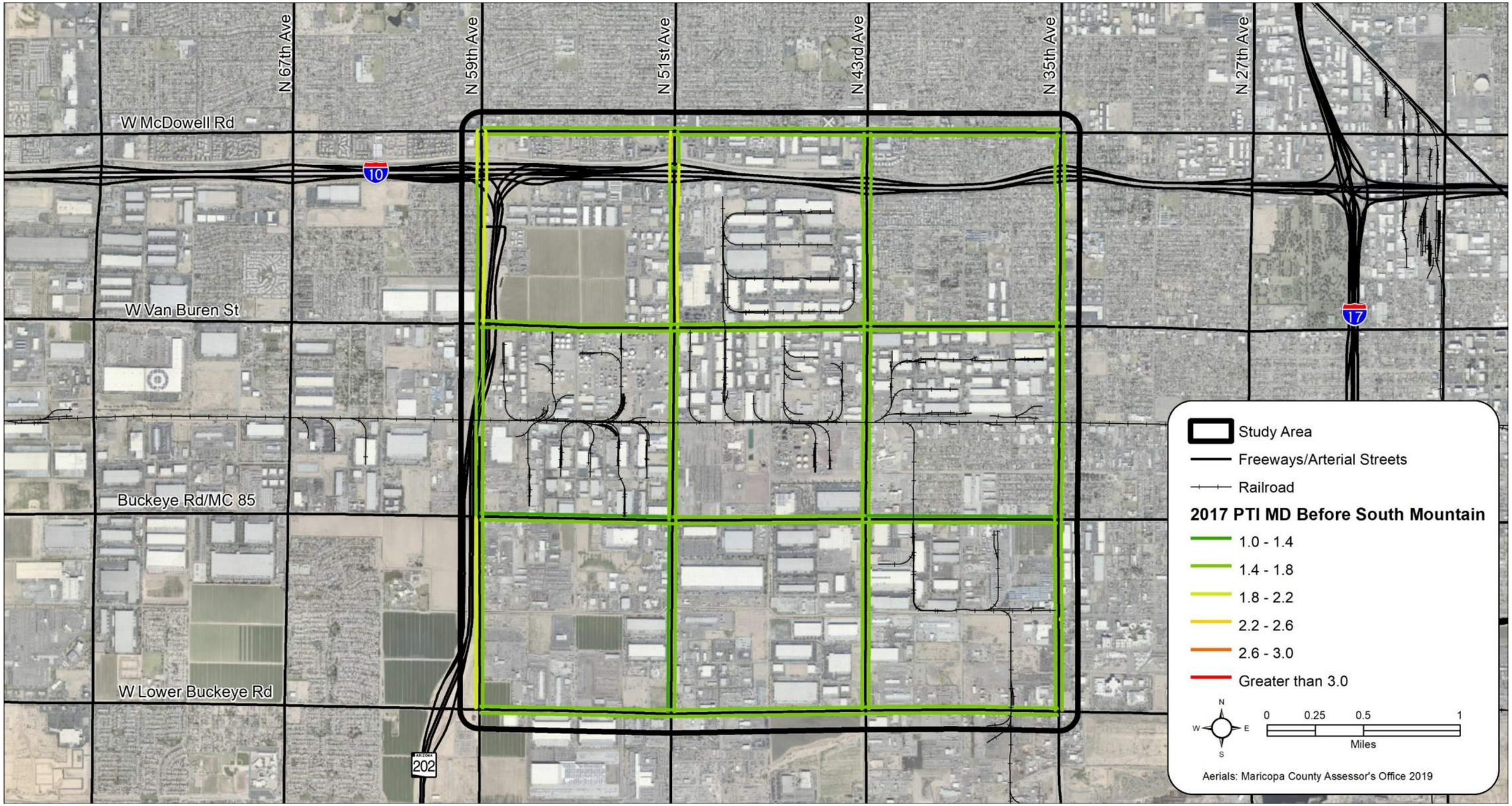

Figure 17 – 2017 MD PTI

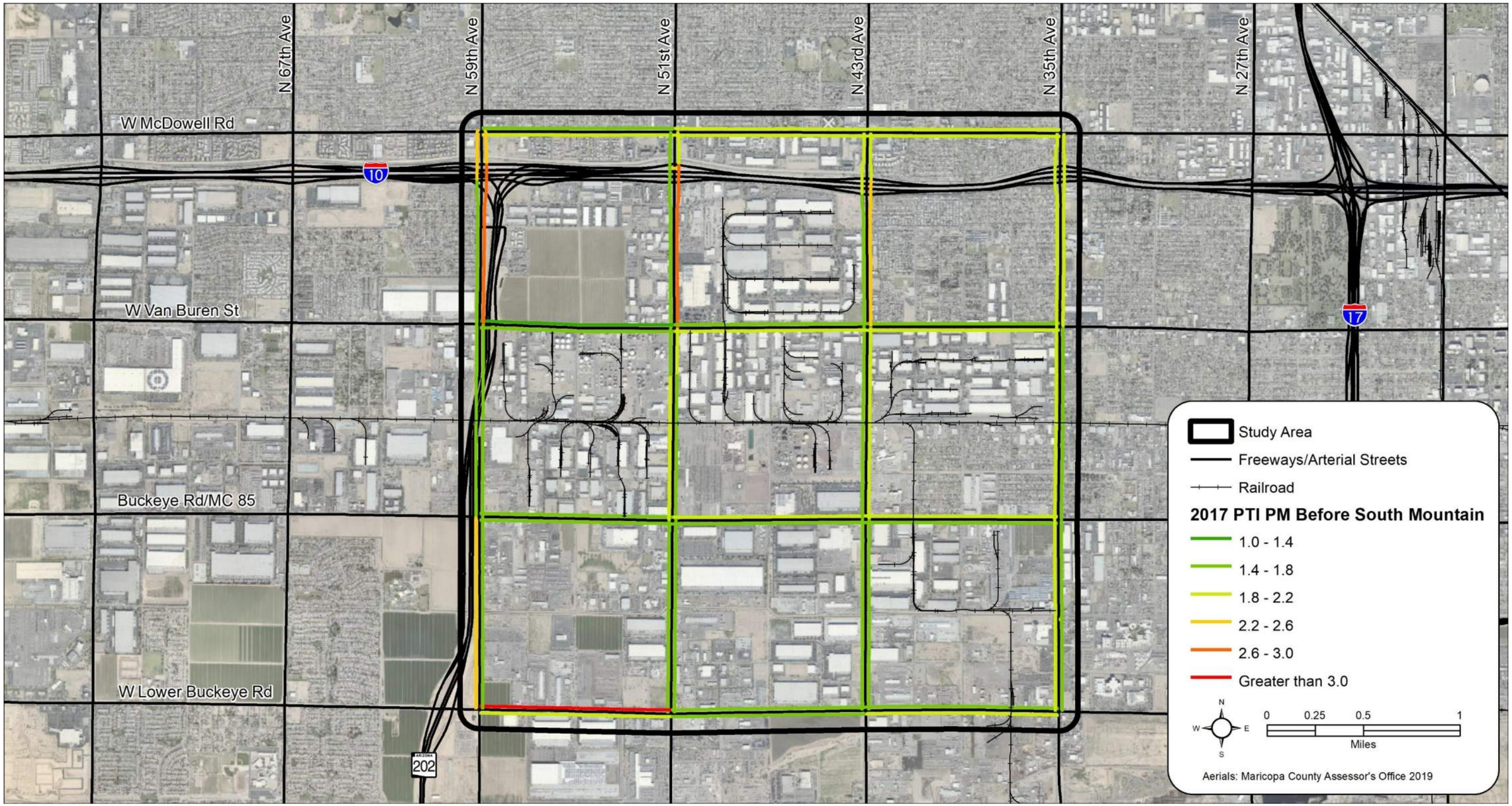

Figure 18 – 2017 PM PTI

2.7 Capacity Analysis

Traffic operations at study area intersections were analyzed based on level of service (LOS), total delay, and queue lengths for signalized intersections using Synchro Studio 10 Traffic Signal Optimization and Simulation Modeling Software, which includes the Synchro and SimTraffic applications.

Typically, the methodology presented in the Transportation Research Board's *Highway Capacity Manual 6th Edition* (HCM 6th) is used to analyze intersection operations. However, the HCM 6th methodology does not support the analysis of clustered intersections or non-NEMA signal phasing, which all freeway ramp intersections currently use. Due to this limitation, Synchro 10 analysis methodology was used to analyze all signalized study area intersections. **Table 2** shows the definition of LOS for signalized conditions.

Table 2 – Level of Service Definitions

Level of Service	Signalized Average Total Delay (seconds/vehicle)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

Definitions provided from the Highway Capacity Manual 6th Edition, Transportation Research Board, 2016.

Based on the existing peak hour traffic data, Synchro models were developed to analyze the existing AM and PM peak hour study area intersection operations. The Synchro models used information provided by ADOT and the City of Phoenix regarding signal timing/phasing for signalized study area intersections. From the Synchro analysis, outputs for LOS, delay, and 95th percentile queues were generated for each intersection and movement, where applicable. Detailed Synchro output sheets for the existing peak hour models are provided in **Appendix D**.

Figure 19 shows the overall intersection LOS, while **Figure 20** shows the average delay per vehicle for each study area intersection in the AM peak hour. The analysis shows that all study area intersections operate at LOS D or better in the AM peak hour.

In addition to LOS and delay, 95th percentile queue lengths calculated by Synchro were also analyzed. **Table 3** shows the movements (L=left, T=through, and R=right) and intersections with excessive queue lengths that either exceed the existing storage lengths or have potential to cause additional delay in the AM peak hour.

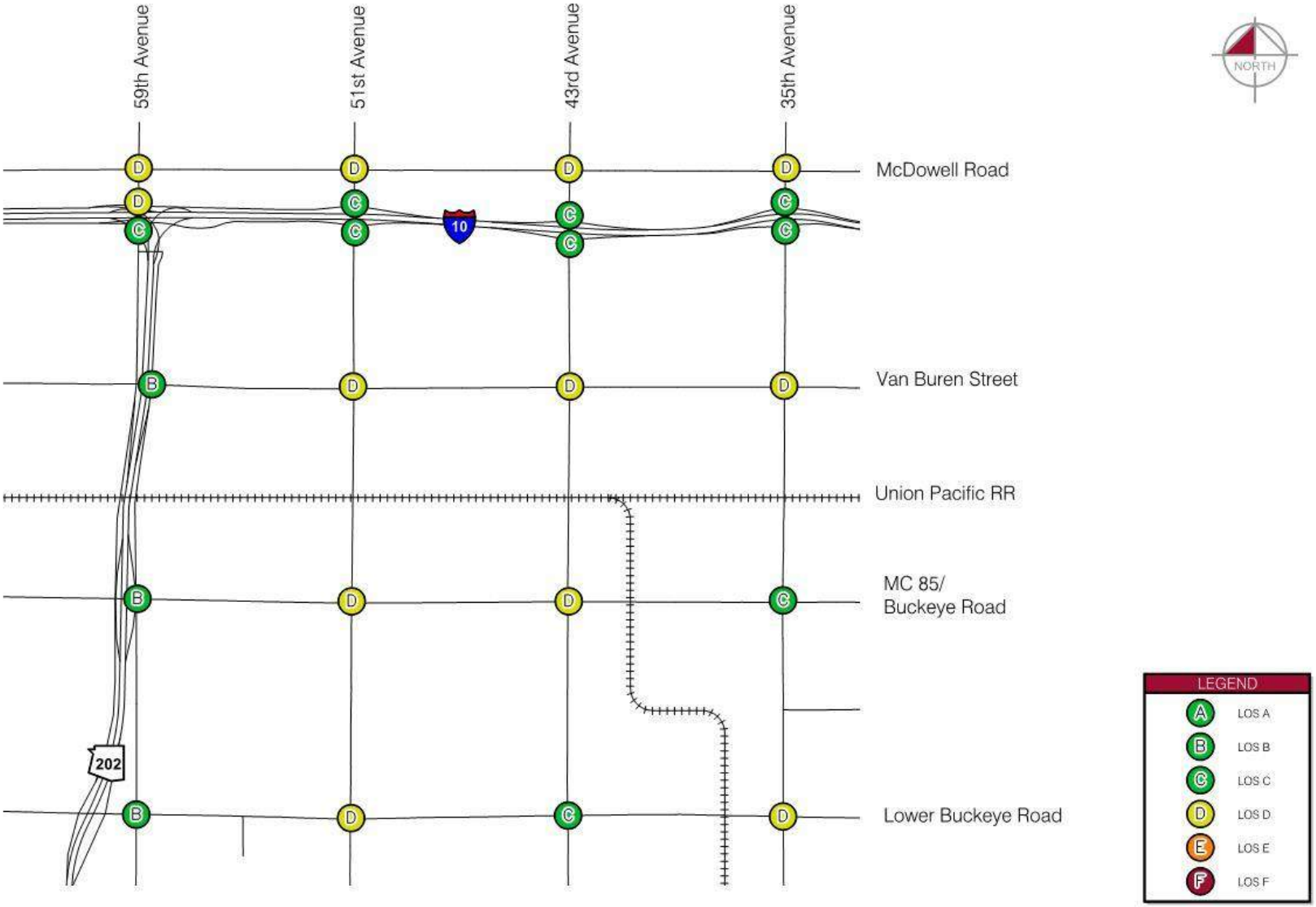

Figure 19 – Existing AM Intersection LOS

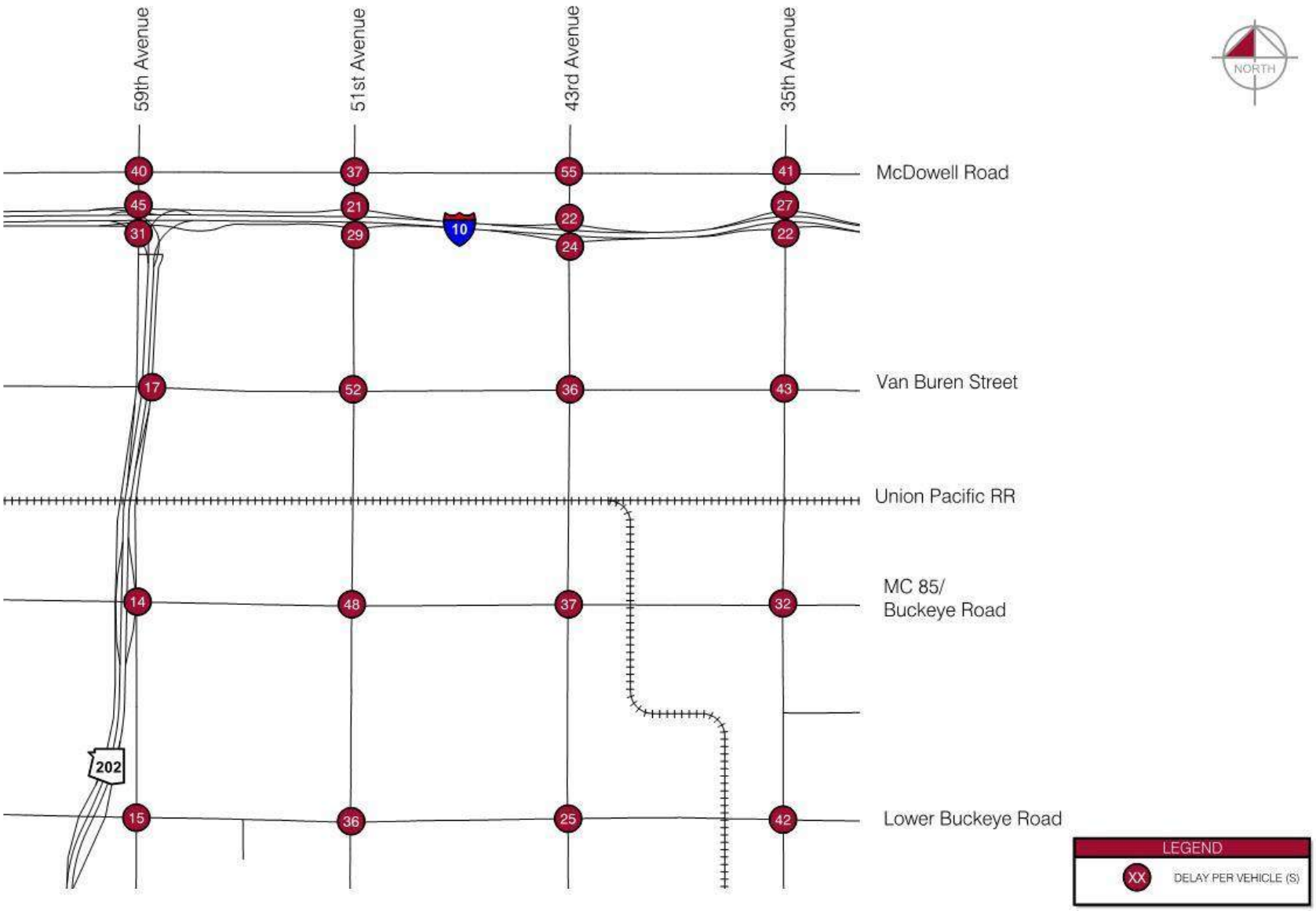

Figure 20 – Existing AM Intersection Delay

Table 3 – AM Queue Analysis – Excessive Queues

Intersection	Movement	Synchro 95th % Queue (ft)
59th Avenue & McDowell Road	EBT	514
59th Avenue & McDowell Road	SBL	247
59th Avenue & I-10 EB Ramps	EBT	573
51st Avenue & I-10 WB Ramps	WBL	334
51st Avenue & Van Buren Street	EBT	642
51st Avenue & Van Buren Street	SBL	287
51st Avenue & Van Buren Street	SBT	744
51st Avenue & MC 85/Buckeye Road	EBT	828
43rd Avenue & McDowell Road	EBT	650
43rd Avenue & McDowell Road	WBL	290
43rd Avenue & McDowell Road	SBT	580
43rd Avenue & I-10 WB Ramps	SBR	358
43rd Avenue & Lower Buckeye Road	EBT	659
35th Avenue & McDowell Road	EBT	541
35th Avenue & I-10 WB Ramps	WBL	406
35th Avenue & Van Buren Street	EBT	501
35th Avenue & MC 85/Buckeye Road	EBT	653
35th Avenue & Lower Buckeye Road	EBT	528
35th Avenue & Lower Buckeye Road	NBT	554

Figure 21 shows the overall intersection LOS, while **Figure 22** shows the average delay per vehicle for each study area intersection in the PM peak hour. All study area intersections operate at LOS D or better in the PM peak hour, except for the following two intersections with their corresponding LOS and delay:

- 59th Avenue/McDowell Road, LOS E with 55 seconds of delay; and
- 43rd Avenue/Lower Buckeye Road, LOS E with 59 seconds of delay.

In addition to LOS and delay, 95th percentile queue lengths calculated by Synchro were also analyzed. **Table 4** shows the movements and intersections with excessive queue lengths that either exceed the existing storage lengths or have potential to cause additional delay in the PM peak hour.

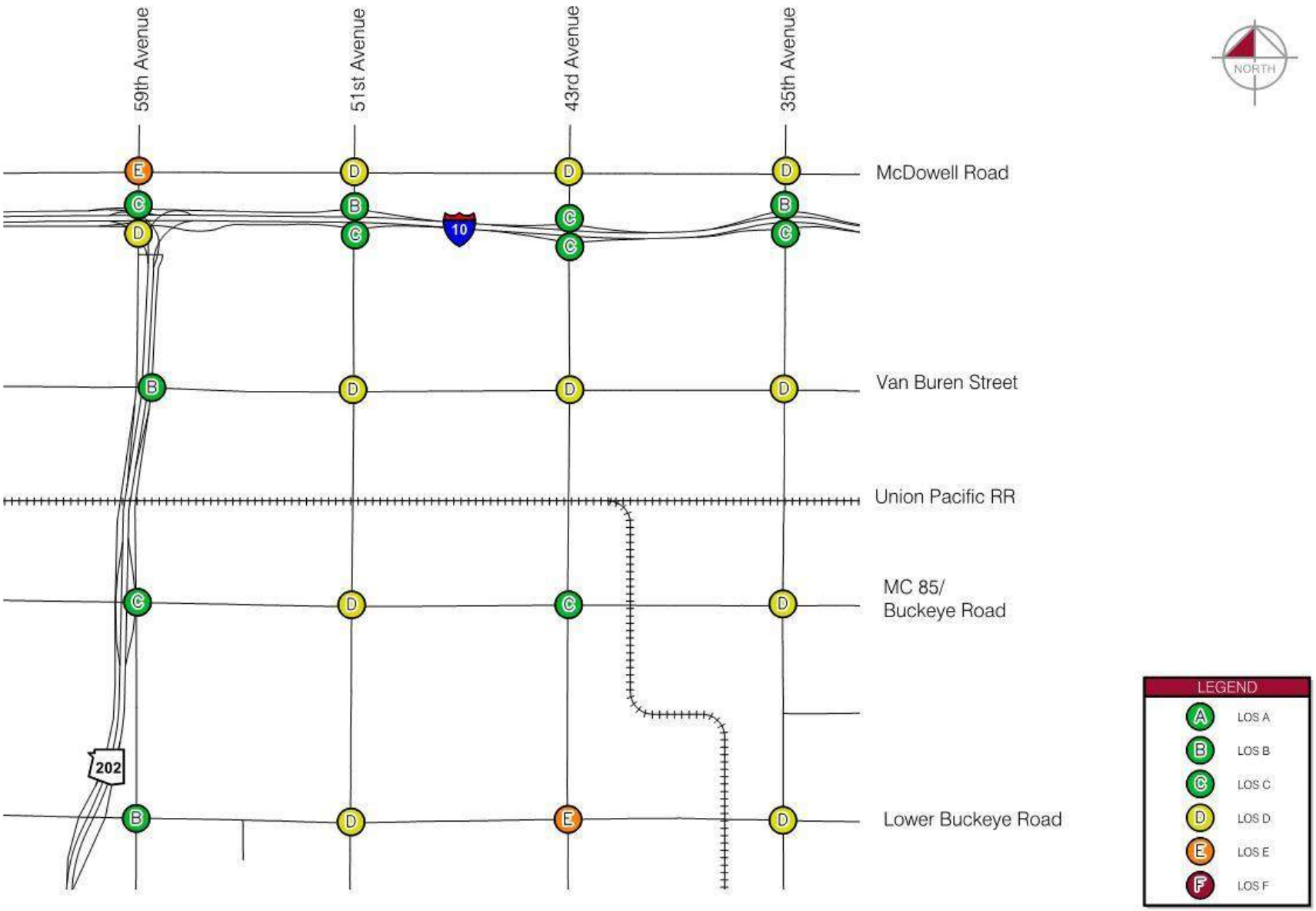

Figure 21 – Existing PM Intersection LOS

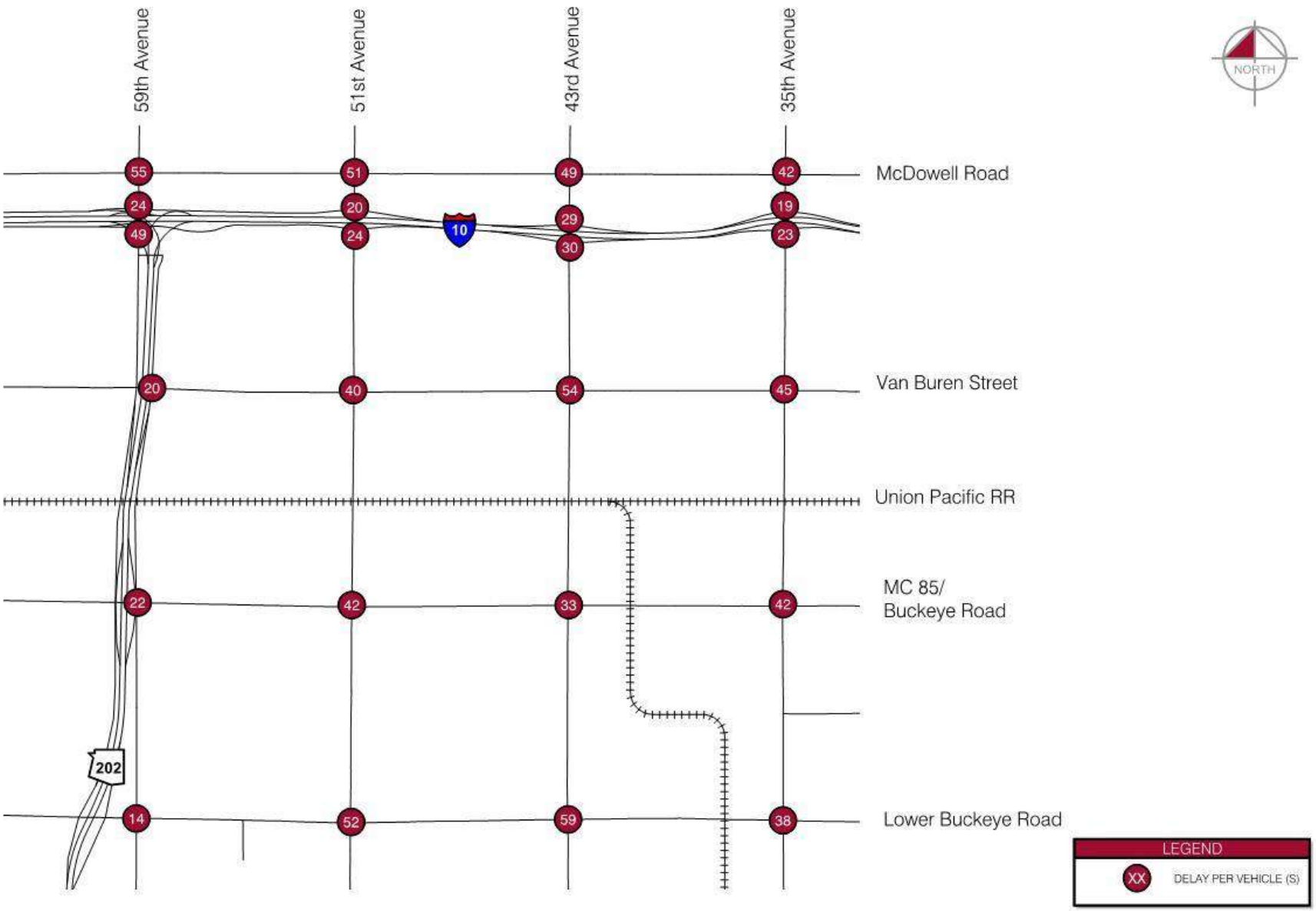

Figure 22 – Existing PM Intersection Delay

Table 4 – PM Queue Analysis – Excessive Queues

Intersection	Movement	Synchro 95th % Queue (ft)
59th Avenue & McDowell Road	WBT	707
59th Avenue & McDowell Road	NBL	310
51st Avenue & McDowell Road	WBT	710
51st Avenue & McDowell Road	NBL	337
51st Avenue & Van Buren Street	WBT	610
51st Avenue & MC 85/Buckeye Road	WBT	695
51st Avenue & Lower Buckeye Road	WBT	558
43rd Avenue & McDowell Road	EBL	231
43rd Avenue & McDowell Road	WBT	503
43rd Avenue & McDowell Road	NBL	309
43rd Avenue & I-10 WB Ramps	SBR	529
43rd Avenue & Van Buren Street	EBL	456
43rd Avenue & Van Buren Street	WBT	528
43rd Avenue & Lower Buckeye Road	WBT	597
35th Avenue & McDowell Road	WBT	506
35th Avenue & McDowell Road	NBL	307
35th Avenue & McDowell Road	NBT	508
35th Avenue & Van Buren Street	NBL	345
35th Avenue & Lower Buckeye Road	WBL	256
35th Avenue & Lower Buckeye Road	SBT	676

2.8 Freight-Involved Crash Analysis

There were 11,205 crashes in the study area in the five-year period 2015 through 2019 according to crash data provided by ADOT. Of these crashes, about 10 percent, or 1,144 crashes, involved freight (heavy) vehicles. As this study focuses on the arterial roadway system, the crashes located on freeway mainlines were removed from the data set analyzed. This resulted in 839 crashes involving heavy vehicles on roadways and intersections within the study area. The breakdown of crashes involving heavy vehicles by year is shown in **Figure 23**. In general, there were between 130 and 210 crashes involving heavy vehicles occurring annually in the study area.

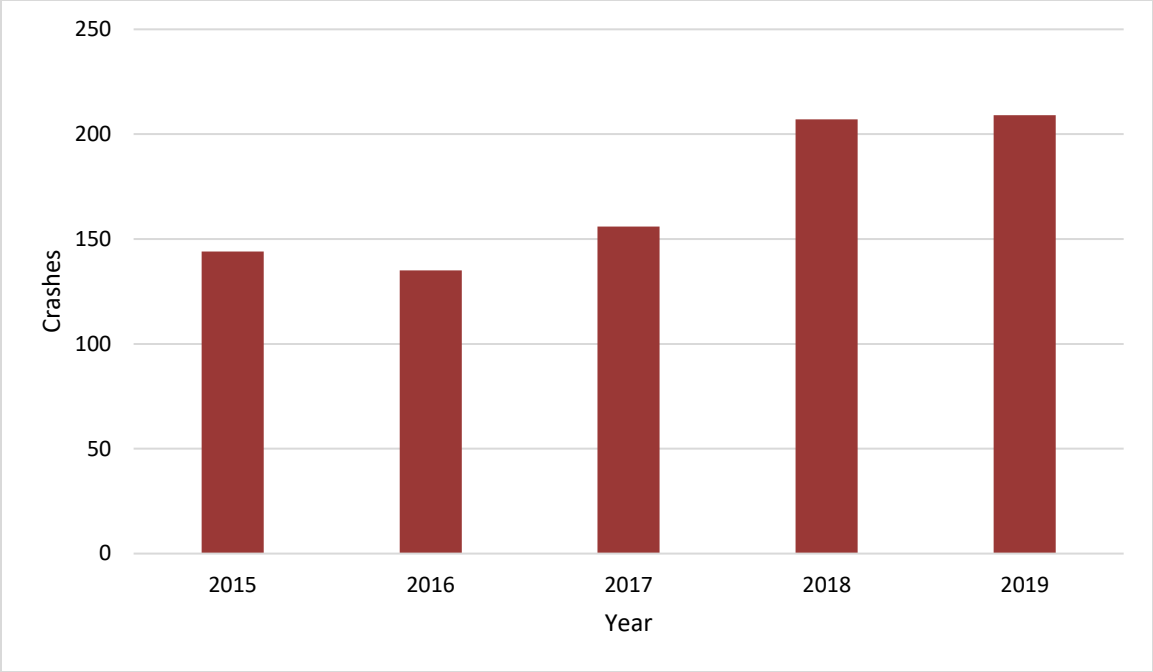

Figure 23 – Heavy Vehicle Crashes by Year

Figure 24 shows the location of each crash involving a heavy vehicle along with the crash injury severity; larger icons indicate a higher degree of crash injury severity.

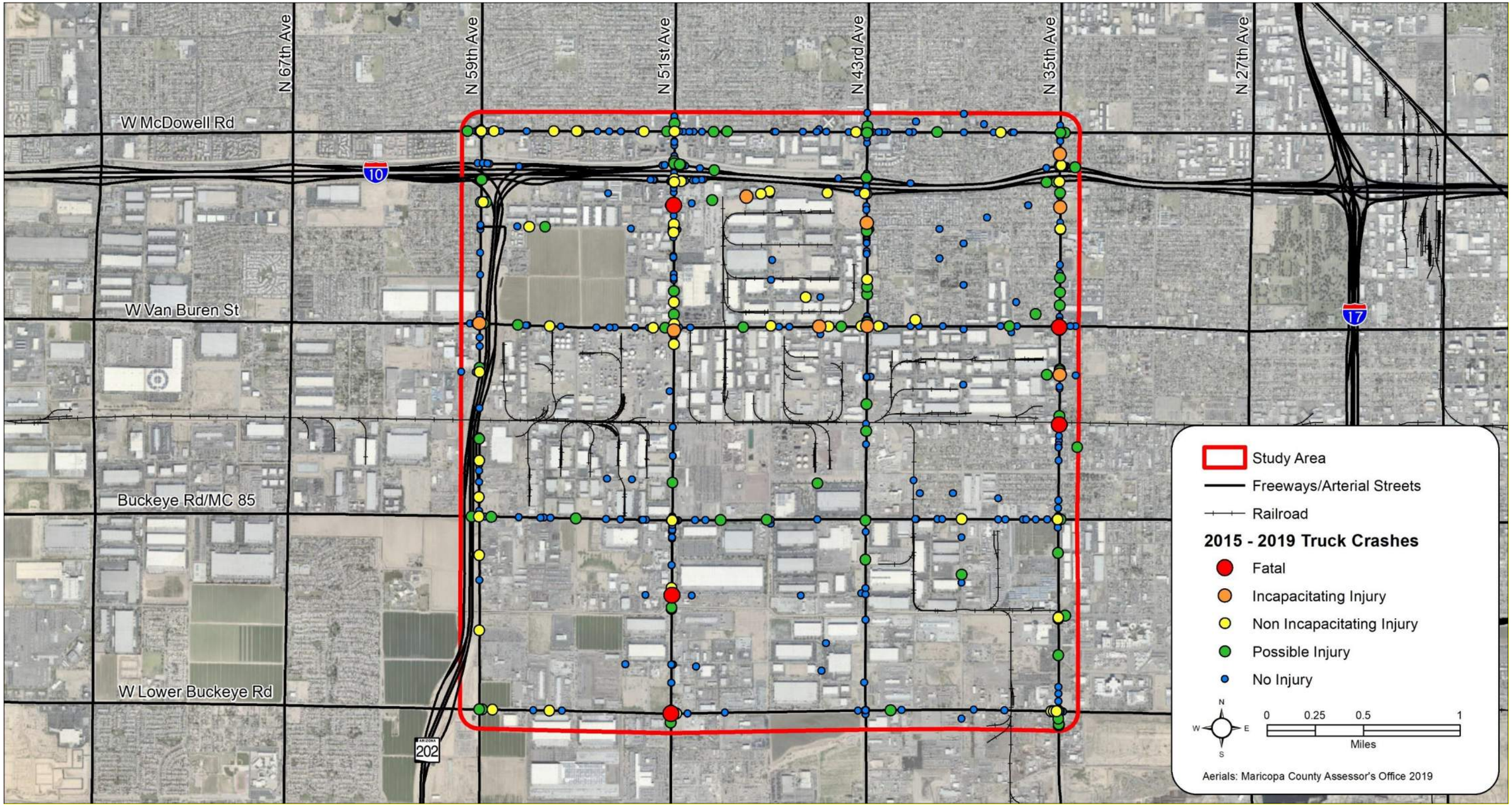

Figure 24 – Crash Location and Severity (2015-2019) for Crashes Involving Heavy Vehicles

Figure 25 shows the percentage of total crashes involving heavy vehicles for each crash severity type.

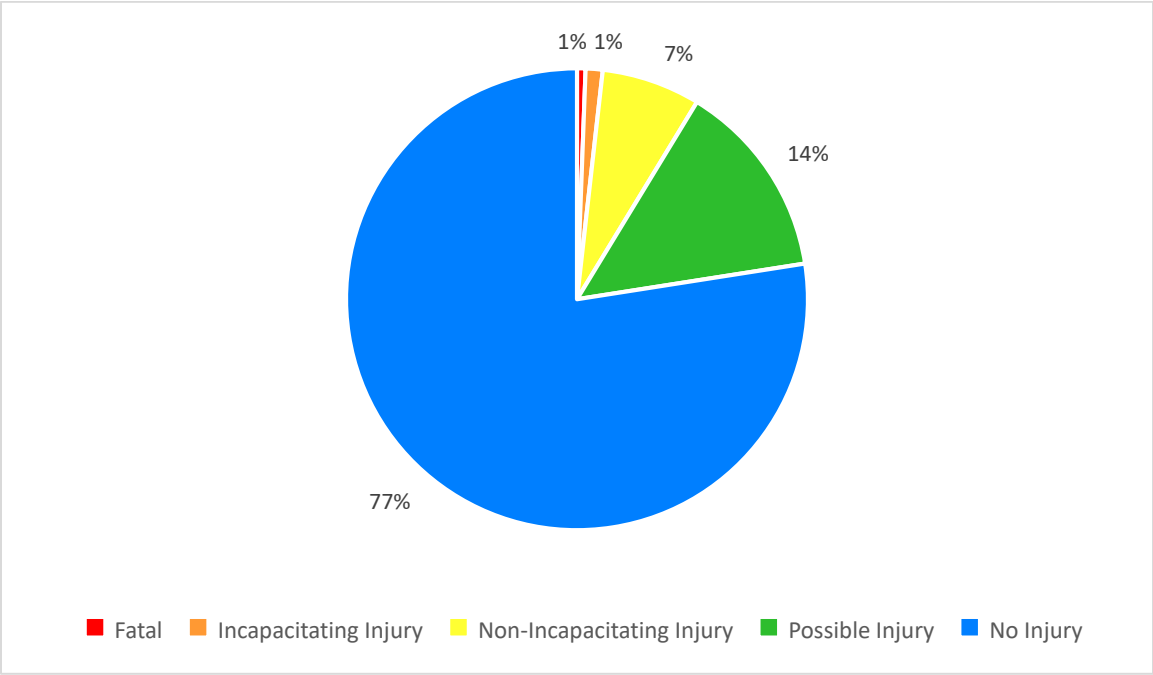

Figure 25 – Crash Severity for Study Area Crashes Involving Heavy Vehicles

An analysis of the dataset of study area crashes involving heavy vehicles determined that:

- 5 crashes (less than 1 percent), resulted in a fatality;
- 10 crashes (1 percent) resulted in an incapacitating injury;
- 650 crashes (77 percent) resulted in no injury;
- 226 crashes (27 percent) were rear end collisions;
- 148 crashes (18 percent) were left-turn collisions;
- 262 crashes (31 percent) were same direction sideswipe crashes;
- 397 crashes (47 percent) occurred at intersections;
- 3 crashes (less than 1 percent) involved bicyclists, one of which resulted in an incapacitating injury and two of which occurred on Van Buren Street;
- 10 crashes (1 percent) involved pedestrians, two of which resulted in a fatality and one of which resulted in an incapacitating injury; four of the pedestrian-involved crashes were on 35th Avenue and four were on 51st Avenue;
- 3 of the 15 fatal or incapacitating injury crashes were angle crashes;
- 5 of the 15 fatal or incapacitating injury crashes were same direction left-turn crashes;
- 3 of the 5 fatal crashes occurred on 51st Avenue, the remaining 2 fatal crashes occurred on 35th Avenue between Van Buren Street and MC 85/Buckeye Road; and
- 2 of the 15 fatal or incapacitating injury crashes occurred at the intersection of Lower Buckeye Road/51st Avenue.

2.9 Field Assessment

A field assessment of all study area intersections and roadways will be completed at a later date. A field assessment helps confirm existing conditions such as geometries, volumes, heavy vehicle percentages, signal timing, queueing, speed limits, bicycle and pedestrian activity, and overall freight mobility throughout the study area. Field assessment observations will be summarized by roadway and peak period.

Figure 26 – May include pictures from field assessment

2.10 Truck Travel Patterns

American Transportation Research Institute (ATRI) origin-destination (O-D) data from October 2017 was analyzed as part of this project. ATRI is an organization comprised of trucking industry leaders, government officials, independent scientists, labor union officials, academics and trucking company executives and suppliers from a diverse cross-section of the industry. Trucking companies participating in the ATRI O-D data allow ATRI to track the locations of their vehicles. This data is then aggregated to provide O-D information. It is estimated that the ATRI O-D data captures approximately 10-15 percent of all heavy vehicle trips based on information provided by MAG. Although not a complete data set, the ATRI O-D data provides insight regarding where heavy vehicles come from and travel to, both inside and outside the study area.

Figure 27 shows the number of inbound truck trips for each TAZ within the study area. The three TAZs with the highest number of inbound trips are TAZ numbers 883, 884, and 887, which are located adjacent to one another. TAZ 883 is located between Van Buren Street and Buckeye Road and east of 59th Avenue. TAZ 884 is located south of TAZ 883, between Buckeye Road and Lower Buckeye Road east of 59th Avenue. TAZ 887 is located east of TAZ 884, between 51st Avenue and 43rd Avenue north of Lower Buckeye Road and south of Buckeye Road. The majority of the high inbound trip TAZs are located south of Van Buren Street within the study area.

Figure 28 shows the number of outbound truck trips for each TAZ within the study area, as well as for the TAZs in the remainder of the western part of the Phoenix metropolitan. Each black line in this figure signifies that more than twenty trips occurred between the two connecting TAZs. A review of which TAZs outside the study area are connected via black lines to TAZs inside the study area indicates that many of the truck trips originating in the study area are destined for intermodal facilities, distribution centers and other industrial facilities, or truck stops directly to the west of the study area. Many of the TAZs west of the study area include larger national suppliers. This suggests that many of the industrial facilities within the study area are smaller or more local.

Figure 29 shows the daily average number of stops and the median duration of stops (in minutes) by trucks for each TAZ within the study area. The three TAZs with the highest number of total stops are TAZ numbers 883, 884, and 887, the same three TAZs that have the highest number of inbound trips. Most of the TAZs have a median stop duration of 10-30 minutes. These three TAZs include some larger distributors such as Amazon, FedEx, and Kraft Heinz Food Companies where many trucks likely arrive, load/unload, and depart within a short period of time each day. However, TAZ 3100 just south of I-10 and west of 43rd Ave has a median stop duration of 941 minutes (15.7 hours), which is significantly higher than the rest of the TAZs in the study area. The reason for the long stop duration in TAZ 3100 is not clear.

All data used in **Figure 27** through **Figure 29** was taken from the four Thursdays in October 2017 per data provided by ATRI.

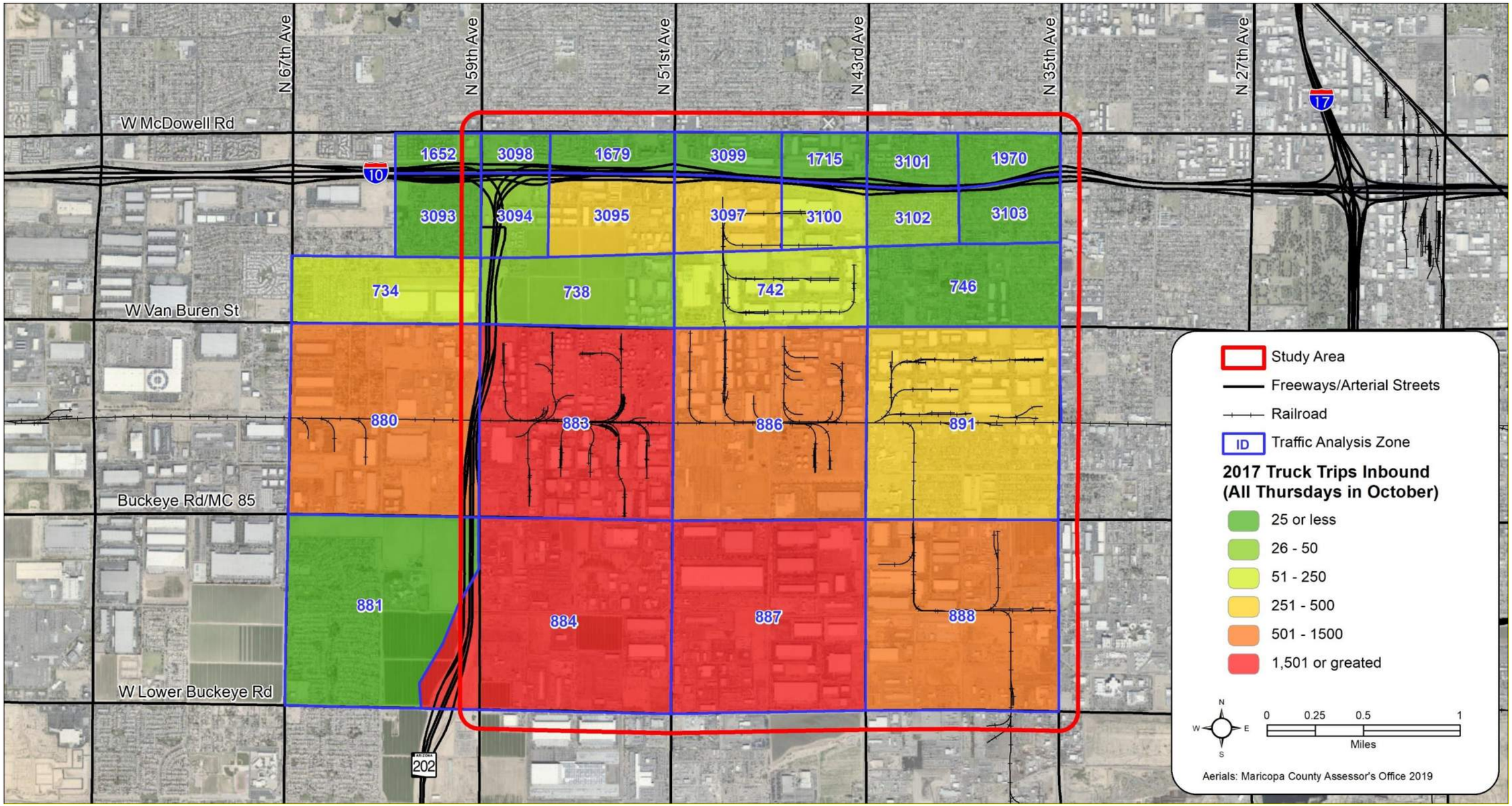

Figure 27 – Number of Inbound Truck Trips by Traffic Analysis Zone

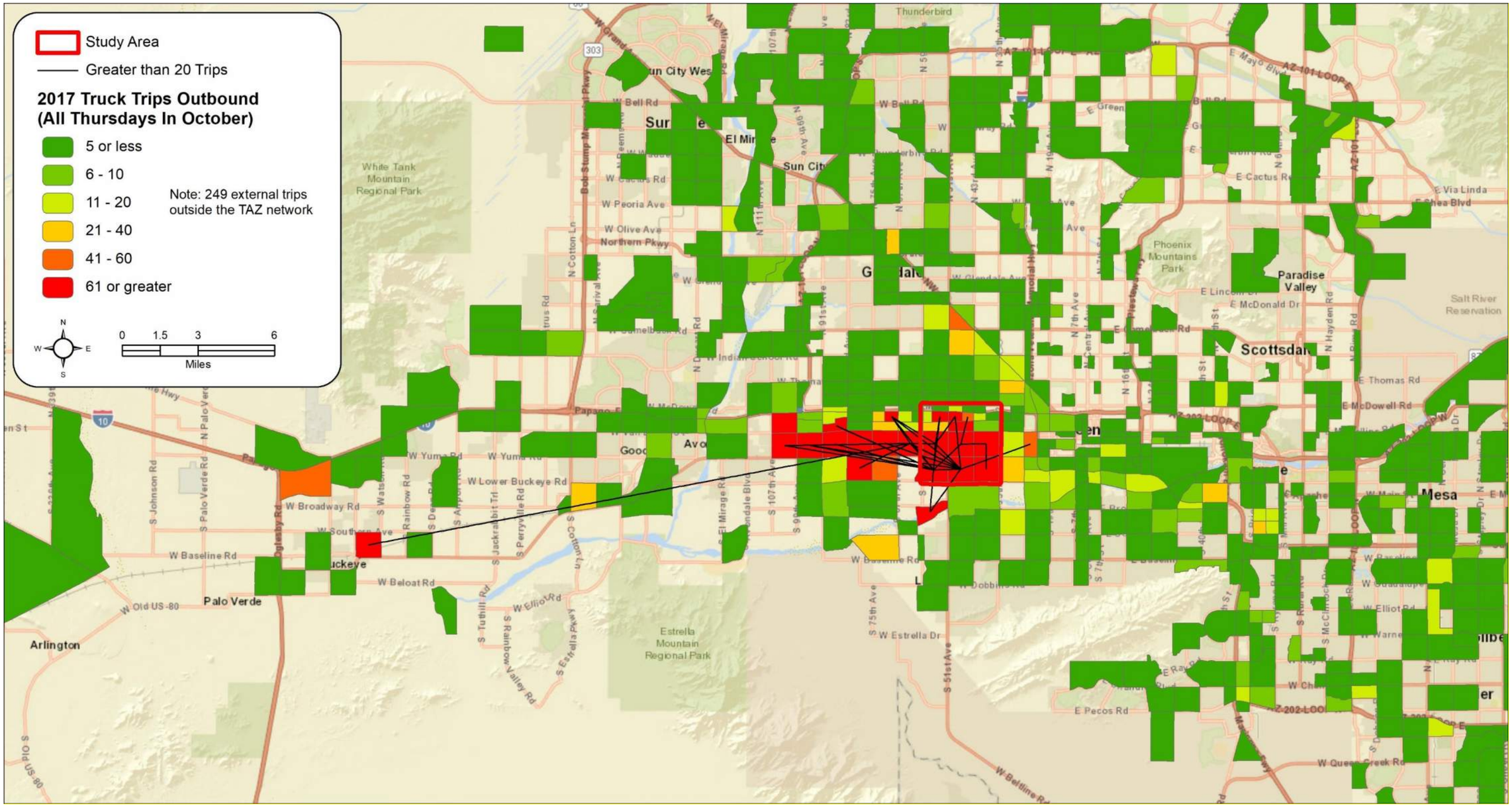

Figure 28 – Number of Outbound Truck Trips by Traffic Analysis Zone

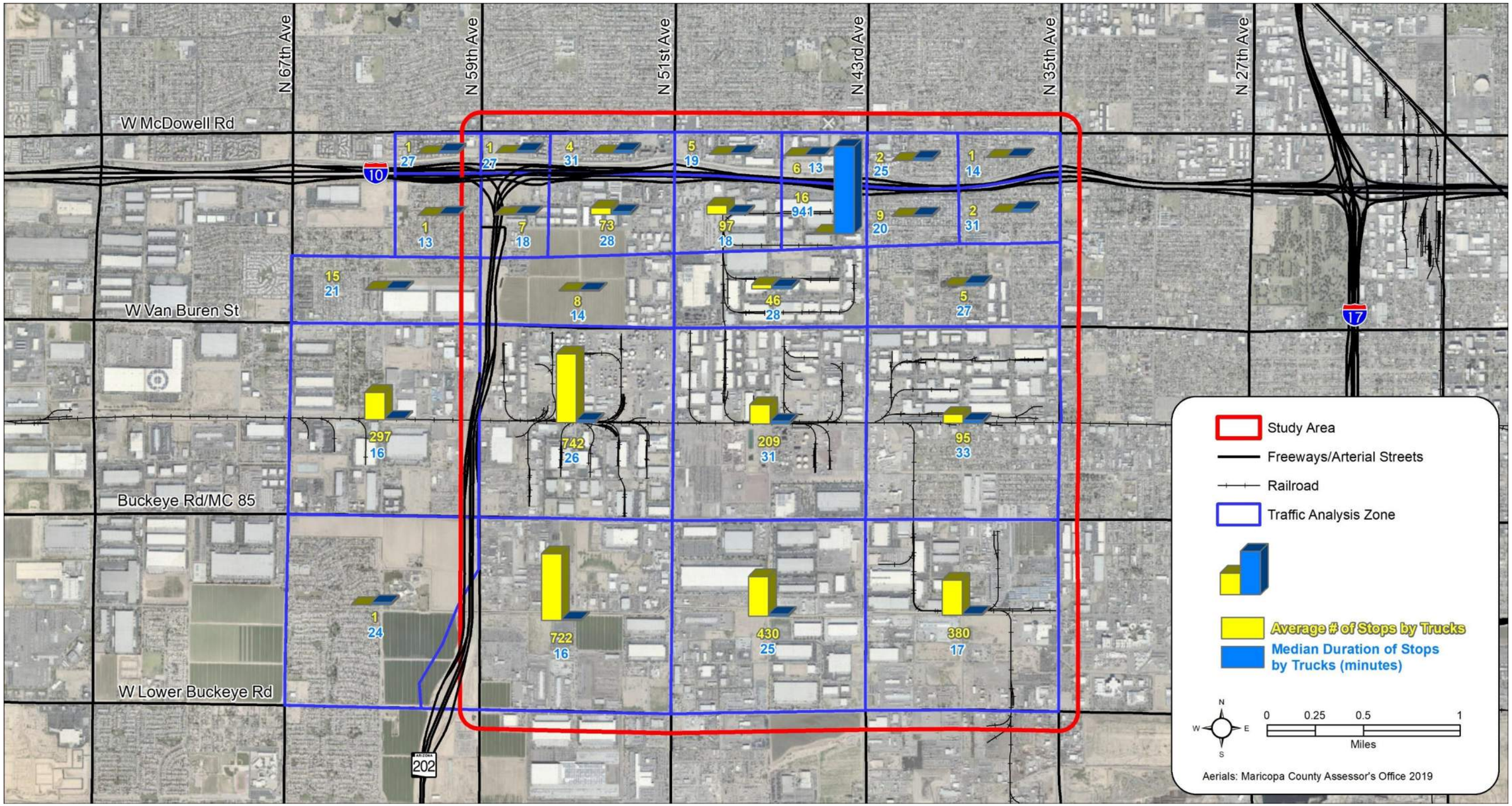

Figure 29 – Number and Duration of Stops by Trucks by Traffic Analysis Zone

2.11 Title VI Disadvantaged Populations Analysis

Title VI populations are disadvantaged populations that are protected by Title VI of the Civil Rights Act of 1964. Disproportionately high and adverse effects on disadvantaged populations can be defined as an adverse effect that (1) is predominantly borne by a disadvantaged population; or (2) will be suffered by the disadvantaged population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-disadvantaged population. For the purpose of social impact analyses for disadvantaged populations, disproportionate adverse impacts are likely to occur when the disadvantaged population is either 50 percent or greater than the total population for a specific area or is more than double the percentage of the disadvantaged population within the comparative county (Maricopa County).

The MAG Demographic Viewer (http://geo.azmag.gov/maps/demographic), which uses 2013-2017 U.S. Census Bureau American Community Survey (ACS) data, was utilized to identify Title VI disadvantaged populations within the study area. The following Title VI disadvantaged population categories are those for which data could be isolated and mapped for the study area and for which comparative state and county data was available:

- Minorities (see **Figure 30**);
- Age 65 Years or Older (see **Figure 31**);
- Persons Below Poverty Level (see **Figure 32**); and
- Limited English Proficiency (see **Figure 33**).

Table 5 summarizes the state, county, and study area Title VI disadvantaged population data.

Table 5 – Title VI Disadvantaged Population Comparison

Disadvantaged Population Category	State of Arizona		Maricopa County		Study Area	
	Total	Percent	Total	Percent	Total	Percent
Population Base	6,946,685	100%	4,253,913	100%	45,476	100%
Minority	3,120,799	45%	1,885,037	44%	40,814	90%
Age 65+	1,158,320	17%	615,277	15%	2,357	5%
Below Poverty Level	1,092,192	16%	618,496	15%	14,331	35%
Limited English Proficiency	577,003	9%	360,346	9%	10,304	23%

The percentage of the total population considered a minority in the study area (90%) is more than 50% and is more than double the percentage of the population considered a minority within the county and the state (44% and 45%, respectively), suggesting a high potential for disproportionate adverse impacts if improvements are not carefully developed to minimize such adverse impacts.

Most of the minority population within the study area lives east of 43rd Avenue and north of I-10, where over 90% of the population are minorities. Almost all parts of the study area have a minority population percentage of over 80%.

The percentage of the total population that is age 65 years or older in the study area (5%) is lower than the county and state percentages. The largest concentrations of individuals in the study area that are age 65 years or older are located in the area from 43rd Avenue to 35th Avenue between Van Buren Street and Buckeye Road, where over 8% of the population is within this category.

The percentage of the total population below the poverty level in the study area (35%) is more than double the percentage of the population below the poverty level within the county (15%), suggesting a high potential for disproportionate adverse impacts if improvements are not carefully developed to minimize such adverse impacts. The population of persons below the poverty level in the study area is mostly concentrated north of Buckeye Road, where over 30% of the population is within this category.

The percentage of the total population with limited English proficiency in the study area (23%) is more than double the percentage of the population with limited English proficiency within the county (9%), suggesting a high potential for disproportionate adverse impacts if improvements are not carefully developed to minimize such adverse impacts. The population of persons with limited English proficiency in the study area is mostly concentrated between east of 43rd Avenue and north of Buckeye Road as well as north of I-10, where over 30% of the population is within this category, however, there are pockets within these areas where limited English proficiency is over 45%.

This information on Title VI disadvantaged populations was taken into account during the development of improvement recommendations and public outreach materials.

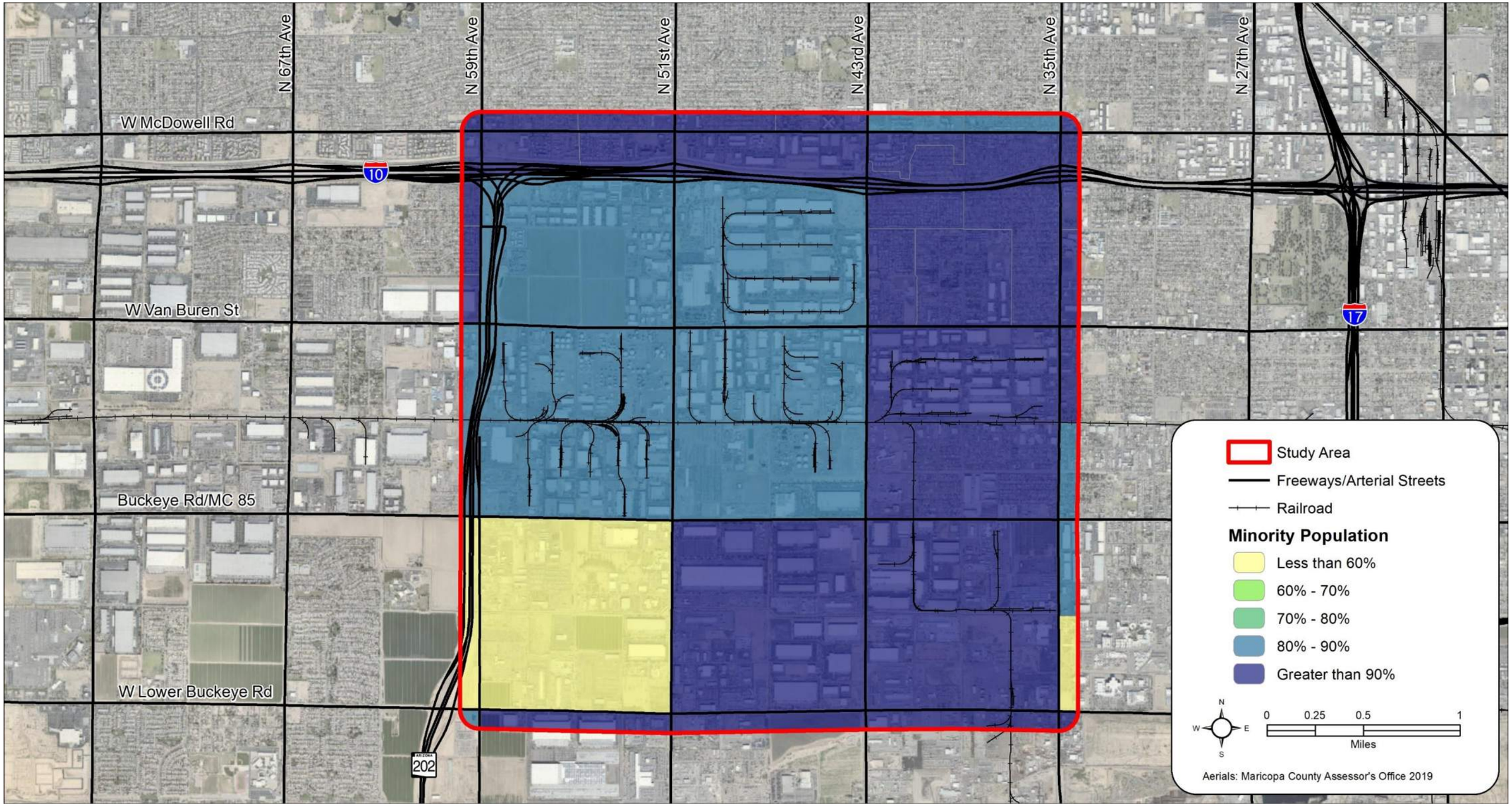

Figure 30 – Minority Population

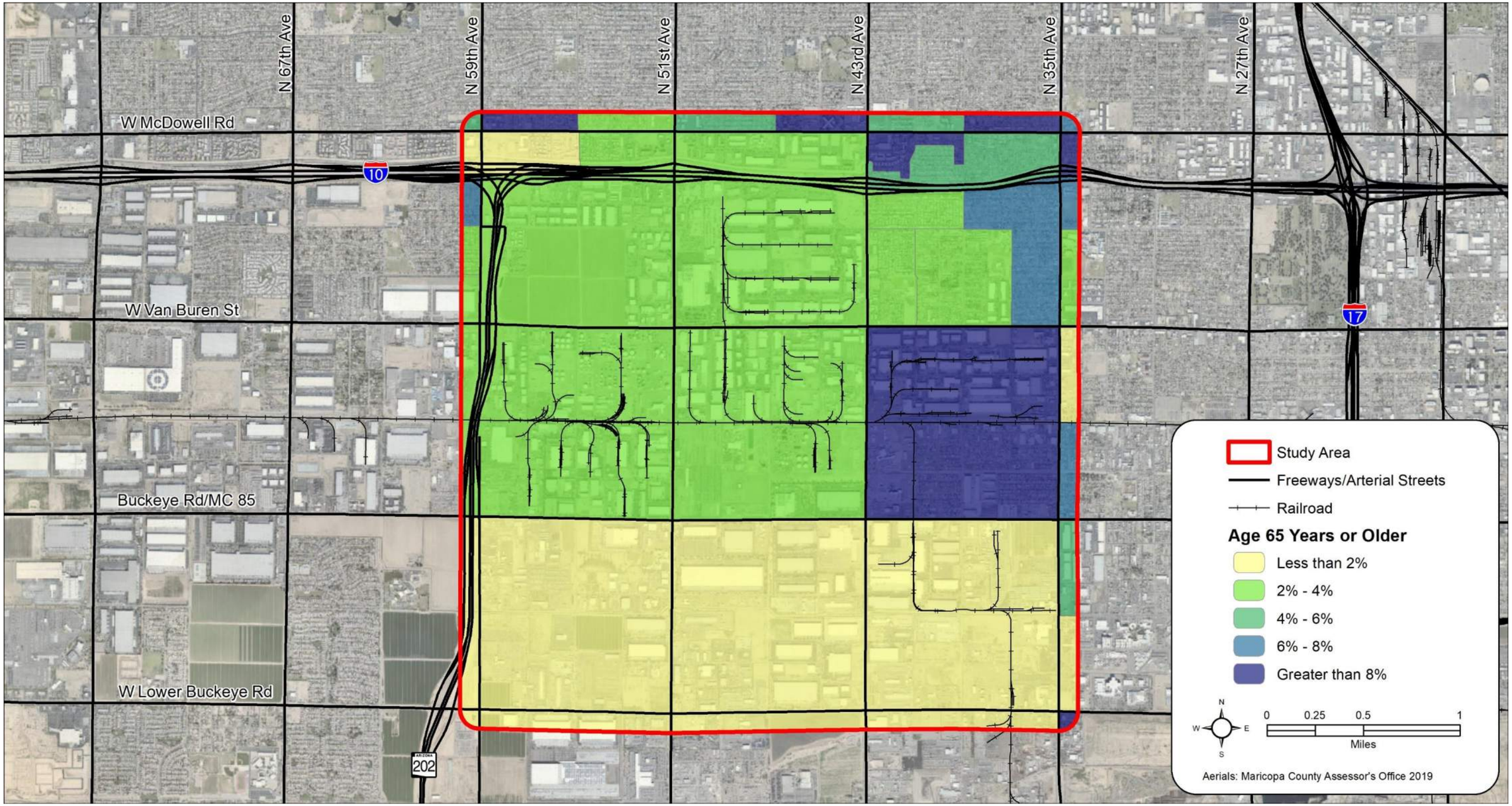

Figure 31 – Population Age 65 Years or Older

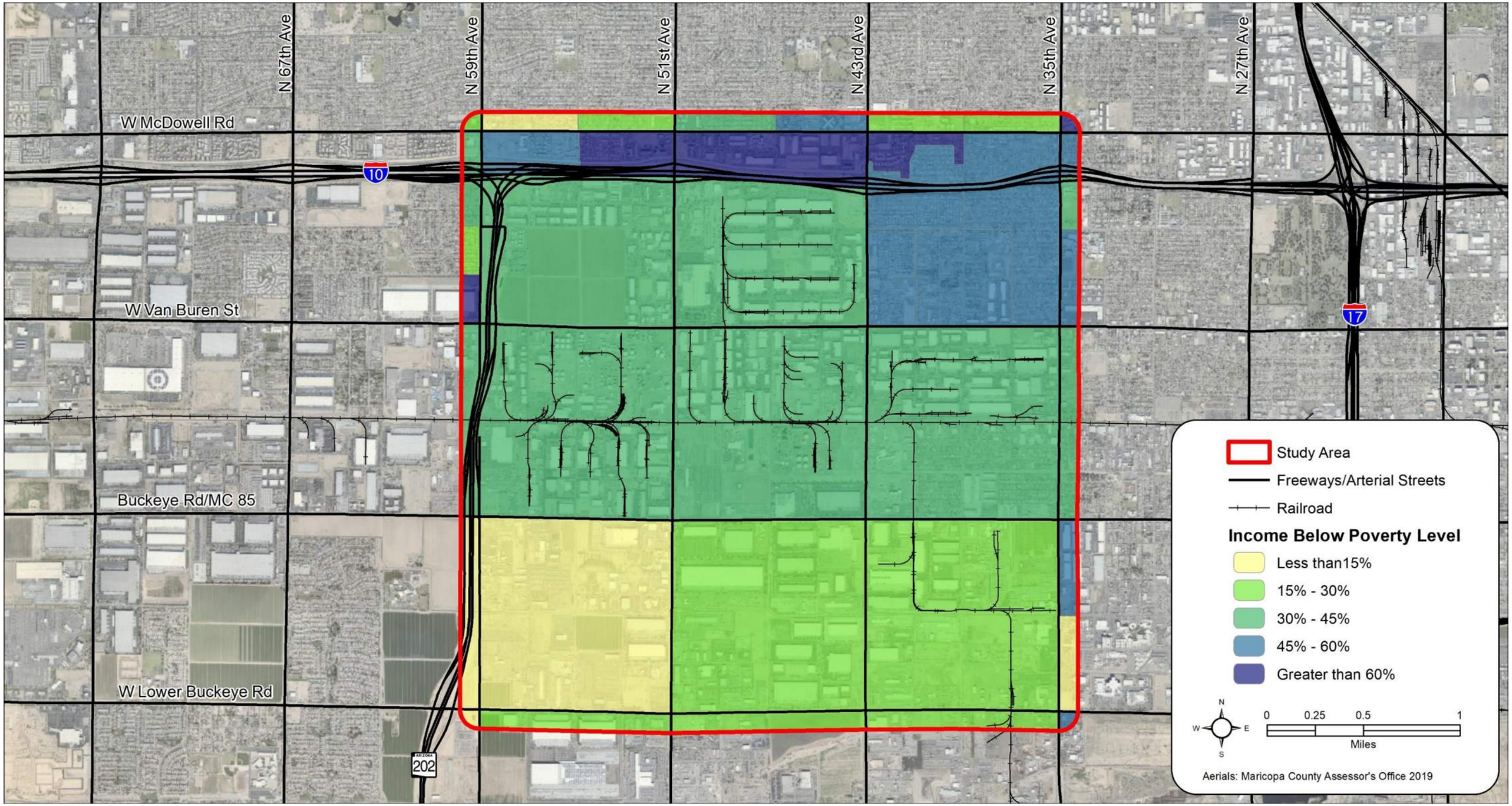

Figure 32 – Persons Below Poverty Level

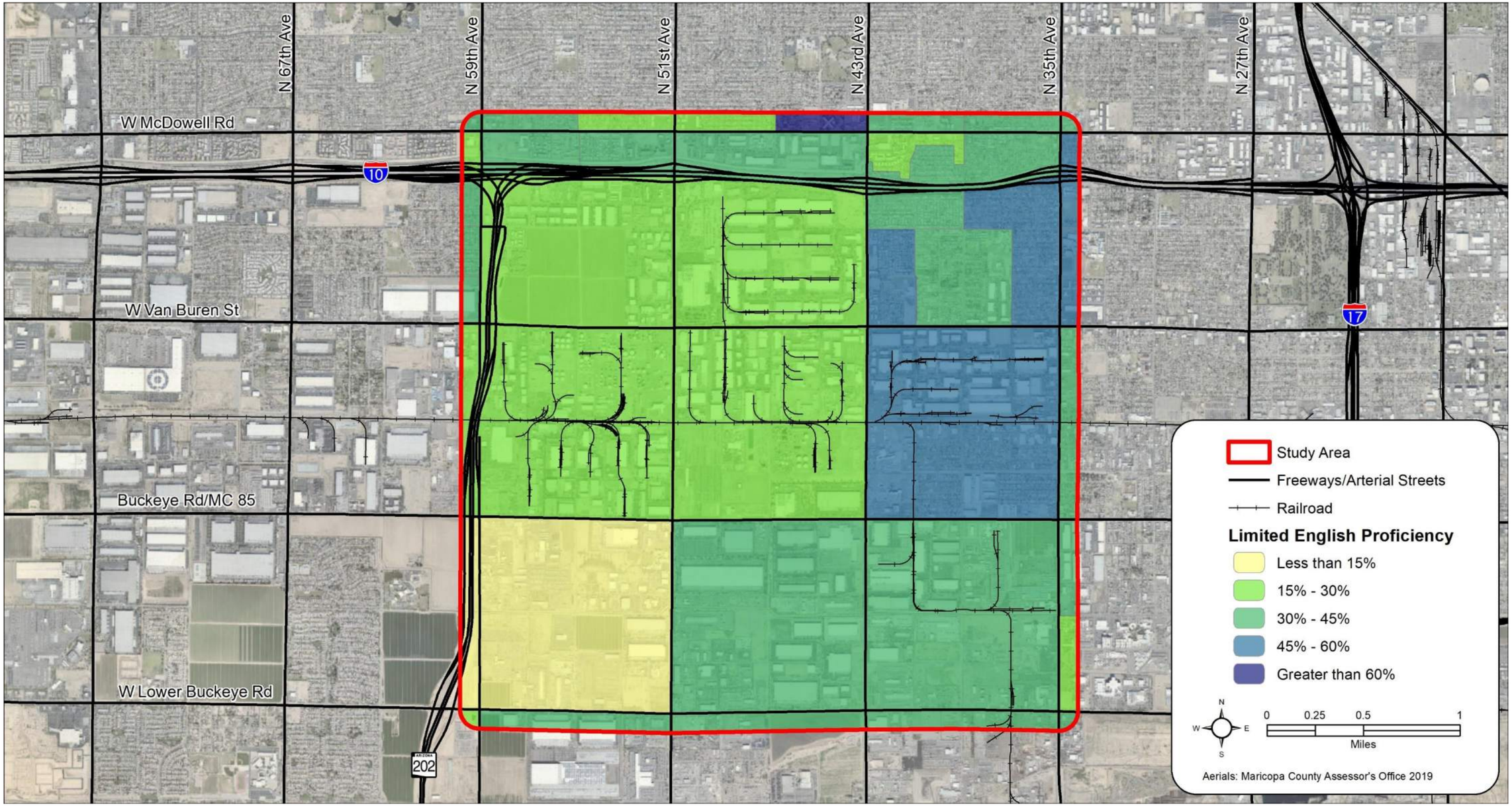

Figure 33 – Limited English Proficiency Population

3 PUBLIC AND STAKEHOLDER OUTREACH

MAG conducted outreach to member agency stakeholders and to the freight-related businesses located within the Rio Salado North Freight study area. A significant amount of outreach occurred through individual phone calls, emails, and in-person interviews. Numerous in-person interviews were conducted with the freight industry to better understand the movement of goods through the study area, and to identify overall transportation issues impacting their business operations. In addition to contacting the freight industry, MAG staff contacted and received comments from the neighborhood homeowner's association and business alliance. All comments collected will be considered in the development of improvement recommendations.

An interactive map where stakeholders could leave specific comments about issues and where they occur was provided on MAG's website. Some of the comments received related to issues caused by the Loop 202 freeway construction that has since been completed or other temporary construction activities. The remaining comments relevant to this study are summarized in the following list:

- A traffic signal is needed at 59th Avenue/Lower Buckeye Road; 0.5-mile to 0.75-mile-long queues are present during the morning and evening peak periods;
- Significant potholes present near 49th Avenue/Van Buren Street and 43rd Avenue/Adams Street;
- Getting on the freeway at the 43rd Avenue/I-10 and 35th Avenue/I-10 traffic interchanges can be challenging;
- A protected southbound left-turn phase is needed at 43rd Avenue/Roosevelt Street; and
- Trains regularly block 43rd Avenue for 15-minutes or longer, which can cause extremely long queues.

4 SUMMARY AND CONCLUSIONS

This working paper details the existing conditions of the major intersections and roadways within the Rio Salado North Freight study area. A review of existing data was conducted to help understand existing transportation conditions and potential areas of concern. The existing transportation network, including facilities for motor vehicles, transit, bicycle, pedestrian, and rail, were reviewed.

General and freight-specific traffic operations at intersections and along roadways were analyzed to better understand the limitations and issues present within the study area for freight movement. A summary of existing conditions and potential freight limitations is provided in the sections below.

Land Use

- Land uses south of I-10 are largely industrial, with smaller amounts of agriculture, residential, and commercial land uses scattered throughout the study area;
- The residential land use is primarily adjacent to I-10 or between 43rd Avenue and 35th Avenue; and
- Most of the industrial employment is located south of Van Buren Street.

Pedestrian, Bicycle, and Transit Facilities

- High pedestrian activity is present along McDowell Road;
- There are multiple transit service routes along all of the arterial roadways and I-10 within the study area;
- Bike lanes are not present on most of the arterial roadways within the study area;
- Sidewalks are present along most of the arterial roadways within the study area; and
- A UPRR railroad line with multiple spurs runs east-west through the study area approximately halfway between Van Buren Street and MC 85/Buckeye Road, creating at-grade railroad crossings on the major north-south study area roadways.

Traffic Volumes

- High heavy vehicle percentages are present throughout much of the study area;
- Daily traffic volumes for all vehicles are between 20,000 and 35,000 vehicles per day (vpd), with 59th Avenue being a notable exception at 5,000-10,000 vpd along the one-way segments of the corridor between Lower Buckeye Road and Van Buren Street;
- Traffic volumes generally decrease in the study area from north to south and from east to west.
- Daily heavy vehicle volumes are generally between 4,000 and 13,000 vpd throughout the study area, with the one-way segments along 59th Avenue as notable exceptions;
- Heavy vehicle volumes on study roadways are generally lowest on McDowell Road and 35th Avenue and highest on Lower Buckeye Road and 51st Avenue, south of I-10;
- Daily heavy vehicle percentages are generally 15-25 percent north of I-10 and 30-60 percent south of I-10;
- Peak hour heavy vehicle percentages are generally 2-10 percent north of I-10 and 10-35 percent south of I-10; and
- A comparison of AM and PM heavy vehicle volumes and percentages indicates that heavy vehicles often have different patterns than the typical commuter trend.

Travel Time Analysis Findings

- 2017 TTI values are generally in the 1.0-1.6 range in the AM, MD, and PM peak periods, with some segments along Lower Buckeye Road, 59th Avenue, 51st Avenue, and 43rd Avenue being above 2.0;
- 2017 PTI values are generally in the 1.0-2.2 range in the AM, MD, and PM peak periods, with the segment of Lower Buckeye Road between 59th Avenue and 51st Avenue being above 3.0;
- It should be recognized that the opening of Loop 202 in December 2019 has altered traffic volumes and patterns – a comparison of this 2017 travel time data with the capacity analysis conducted using 2020 traffic volumes suggests that traffic congestion in the study area has generally decreased with the opening of Loop 202, particularly close to Loop 202 and on Lower Buckeye Road where the road was widening from two to four travel lanes as part of the Loop 202 construction project.

Capacity Analysis Findings

- All study area intersections operate at LOS D or better in the AM and PM peak hours, with the exception of the following two intersections in the PM peak hour with their corresponding LOS and delay:
    - 59th Avenue/McDowell Road, LOS E with 55 seconds of delay; and
    - 43rd Avenue/Lower Buckeye Road, LOS E with 59 seconds of delay.

Freight-Involved Crash Analysis Findings

- There is a higher concentration of crashes on 51st Avenue, 43rd Avenue, and 35th Avenue from I-10 to Van Buren Street and along Van Buren Street from 59th Avenue to 35th Avenue;
- No fatal or incapacitating crashes occurred on McDowell Road or MC 85/Buckeye Road;
- Relatively few crashes occurred along Lower Buckeye Road;
- 3 crashes (less than 1 percent) involved bicyclists, one of which resulted in an incapacitating injury and two of which occurred on Van Buren Street;
- 10 crashes (1 percent) involved pedestrians, two of which resulted in a fatality and one of which resulted in an incapacitating injury; four of the pedestrian-involved crashes were on 35th Avenue and four were on 51st Avenue;
- The crash analysis identified two areas of concern:
    - 51st Avenue, where three of the five fatal crashes and four of the ten pedestrian-involved crashes occurred, specifically 51st Avenue and Lower Buckeye Road, where two of the 15 fatal or incapacitating injury crashes occurred; and
    - 35th Avenue between Van Buren Street and MC 85/Buckeye Road, where three of the five fatal crashes occurred, two of which were pedestrian-involved crashes;
- It should be recognized that the opening of Loop 202 in December 2019 has altered traffic volumes and patterns – this change could also influence crash patterns going forward.

Truck Travel Patterns

- The areas with the highest number of inbound trips are located in the southwestern portion of the study area;

- Many outbound trips within the study area are destined for locations directly west of the study area between 107th Avenue and 59th Avenue;
- The median stop duration for trucks within the study area is generally 10-30 minutes.

Title VI Disadvantaged Populations

- Title VI disadvantaged populations are present throughout much of the study area.

Public and Stakeholder Input

- A traffic signal is needed at 59th Avenue/Lower Buckeye Road; 0.5-mile to 0.75-mile-long queues are present during the morning and evening peak periods;
- Significant potholes present near 49th Avenue/Van Buren Street and 43rd Avenue/Adams Street;
- Getting on the freeway at the 43rd Avenue/I-10 and 35th Avenue/I-10 traffic interchanges can be challenging;
- A protected southbound left-turn phase is needed at 43rd Avenue/Roosevelt Street; and
- Trains regularly block 43rd Avenue for 15-minutes or longer, which can cause extremely long queues.

APPENDIX A –MAG REGIONAL FREIGHT NETWORK MAPS (to be provided with Final Report)

APPENDIX B – EXISTING TRAFFIC COUNTS (to be provided with Final Report)

APPENDIX C – HERE DATA PROVIDED BY MAG (to be provided with Final Report)

APPENDIX D – EXISTING SYNCHRO REPORTS (to be provided with Final Report)