PROVIDENCE CITY, UTAH

TRANSPORTATION MASTER PLAN

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Executive Summary

The Providence Transportation Master Plan is a road map for the next 30 years, acting as a reference guide for City Staff, Council Members, and Citizens. The Transportation Master Plan considers input from the public, City Council, Mayor, and City Staff. It also looks at historic and future traffic volumes, analyzing the major roadways throughout the city and provides consistency within the City. Active and multi-modal transportation strategies are identified, and coordinated with aspects of the General Plan, and the Park Trail and Recreation Master Plan. A list of resulting infrastructure improvements is provided as Capital Improvement Plan (CIP) to direct funding and improvement efforts for the City.

The Transportation Master Plan is a driving force and engine for implementing the General Plan. The vision and portions of the General Plan that are included as part of the Transportation Master Plan have components of key initiatives 1: Sense of Place; 2: Green Infrastructure; 3: Fiscal Responsibility; and 4: A Multi-Modal City.

The primary goals of the Transportation Master Plan include:

1. Maintain and improve mobility within Providence City for all users, placing a focus on moving people and vehicles.
2. Identify facility improvement needs that can be prioritized and scheduled in a City Capital Improvement Plan (CIP).
3. Provide a reference and plan for Providence citizens.
4. Identify cross-sections for minimum required roadway widths while improving bicycle and pedestrian infrastructure and safety.
5. Preserve right-of-way for roadway widening where necessary.

Chapter 1: Introduction

Background

Providence City (City) is a bedroom community in the Cache County Metropolitan Area, located approximately 2.5 miles south of Logan, see Figure 1. The Providence City Transportation Master Plan is the adopted vision for long-term planning of transportation infrastructure projects within the City. A Transportation Master Plan is the road map for the next 5-30 years and outlines strategic projects and goals for Providence City to implement and pursue.

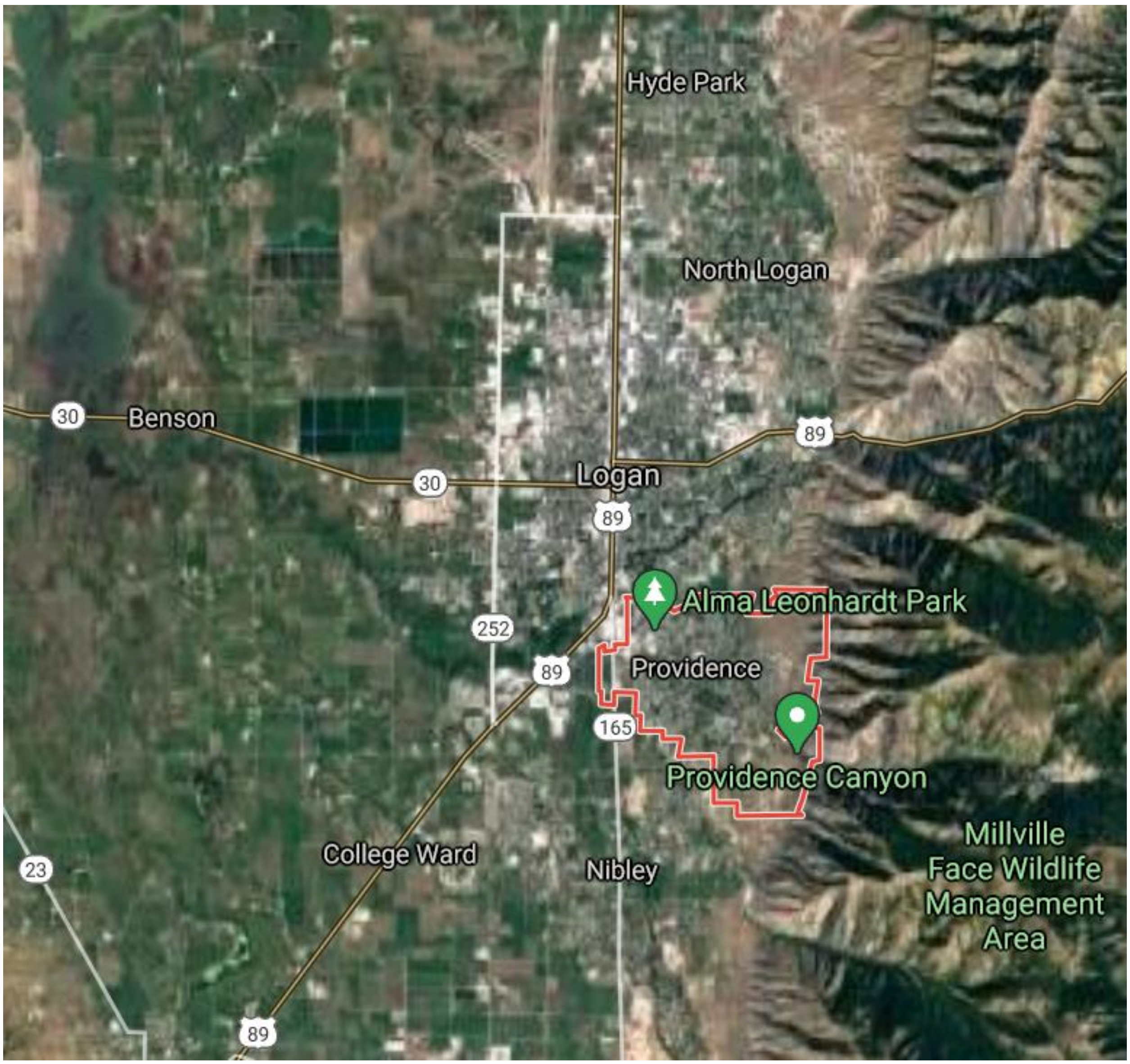


Figure 1: Providence City boundary within Cache County.

Transportation Goals and Objectives

The Transportation Master Plan is a driving force and engine for implementing the General Plan. The key initiatives of the General Plan that are included as part of the Transportation Master Plan are:

1. Key Initiative #1 Sense of Place: Guide future development to support a city-wide network of activity centers, public spaces, and destinations including commercial areas, neighborhood parks, historic areas, and civic places all linked by streets, sidewalks, pathways, trails, and mass transit routes (See Chapters 3 and 6).
2. Key Initiative #2 Green Infrastructure: Integrate existing and future development through zoning and infrastructure standards that will offer requirements, solutions, and compatible support options (See Chapter 1).
3. Key Initiative #2 Green Infrastructure: Provide value to the community's character and identity by maintaining and improving the aesthetics of streets and public rights of way (See Chapter 6).
4. Key Initiative #2 Green Infrastructure: Identify the need for municipal services in developed and undeveloped unincorporated areas (see Chapter 6).
5. Key Initiative #3 Fiscal Responsibility: Accommodate growth and accompanying infrastructure expansion without negative financial impacts to the city (See Chapter 6).
6. Key Initiative #4 A Multi-Modal City: Promote development patterns that provide connectivity (See Chapter 3).
7. Key Initiative #4 A Multi-Modal City: Improve pedestrian safety, walkability and accessibility on Providence City streets, rights of ways and easements (See Chapters 3 and 6).
8. Key Initiative #4 A Multi-Modal City: Create a network of bicycle and pedestrian sidewalks and pathways throughout Providence with interconnecting points to adjacent communities (See Chapter 3 and 6).
9. Key Initiative #4 A Multi-Modal City: Providence City transportation system shall have a workable plan coordinating with county and regional road systems (See Chapter 6).
10. Key Initiative #4 A Multi-Modal City: Plan and construct transportation improvements within Providence City and interconnections to surrounding region (See Chapter 4).
11. Key Initiative #4 A Multi-Modal City: Identify existing and future Right of Way Corridors within the city and interconnections with neighboring communities and agencies (See Chapter 4).

The Transportation Master Plan focuses on identifying and planning for growth. As Providence City continues to grow it is necessary to plan for an appropriate transportation network that meets existing and future needs throughout the City. The Transportation Master Plan is intended to be proactive in identifying and mitigating traffic concerns. Without mitigation efforts, the City roadways can slowly choke under the steady population and housing increases.

The Transportation Master Plan addresses transportation issues as identified by state and local municipalities, as well as from citizen input who identified problem locations. A significant concern addressed by this plan is the anticipated growth from several developments proposed to the City, and the impact they will have on existing corridors. Goals throughout the lifespan of the Transportation Master Plan are:

1. Maintain and improve mobility within Providence City for all users, placing a focus on moving people and vehicles.
2. Identify facility improvement needs that can be prioritized and scheduled in a City Capital Improvement Plan (CIP).
3. Provide a reference and plan for Providence citizens.
4. Identify cross-sections for minimum required roadway widths while improving bicycle and pedestrian infrastructure and safety.
5. Preserve right-of-way for roadway widening where necessary.

Population and Growth Projections

Providence is a growing city in Utah with an estimated population of 7,595 in 2018.[1] Providence has historically seen a steady climb in population, with an estimated 2.6% growth from 2107 to 2018, and 66.4% growth from 2000 to 2010. The City is anticipated to continue growing to a population of 10,572 by 2030 (averaging 2.8% annual growth), and to a population of 17,493 by 2050 (averaging 2.6% annual growth) as forecasted by the CMPO.

Regional and City growth is tracked and estimated by the Cache Metropolitan Planning Organization (CMPO). The CMPO monitors and analyzes population throughout Cache County which is analyzed for additional traffic counts and added to existing traffic for analysis. The anticipated growth from historic data is used in the traffic model and is supplemented by known parcels that have shown interest to City Staff in developing.

Existing Land Use Zoning Map

Providence land use consists of approximately 80 percent residential and public use areas, 10 percent agricultural/developing, and 10 percent commercial/mixed-use, shown in Figure 2. Agricultural areas are along the perimeter of Providence, and many are locations associated with population growth in the next 30 years. Commercial areas are mainly located in the northwest section of Providence, with some businesses located near the Center and Main Street intersection. Most of residential zones consist of single-family homes, with limited multi-family or mixed-use zoned areas, mainly near the commercial areas along the major routes.

[1] https://www.census.gov/quickfacts/fact/table/providencecityutah/IPE120219

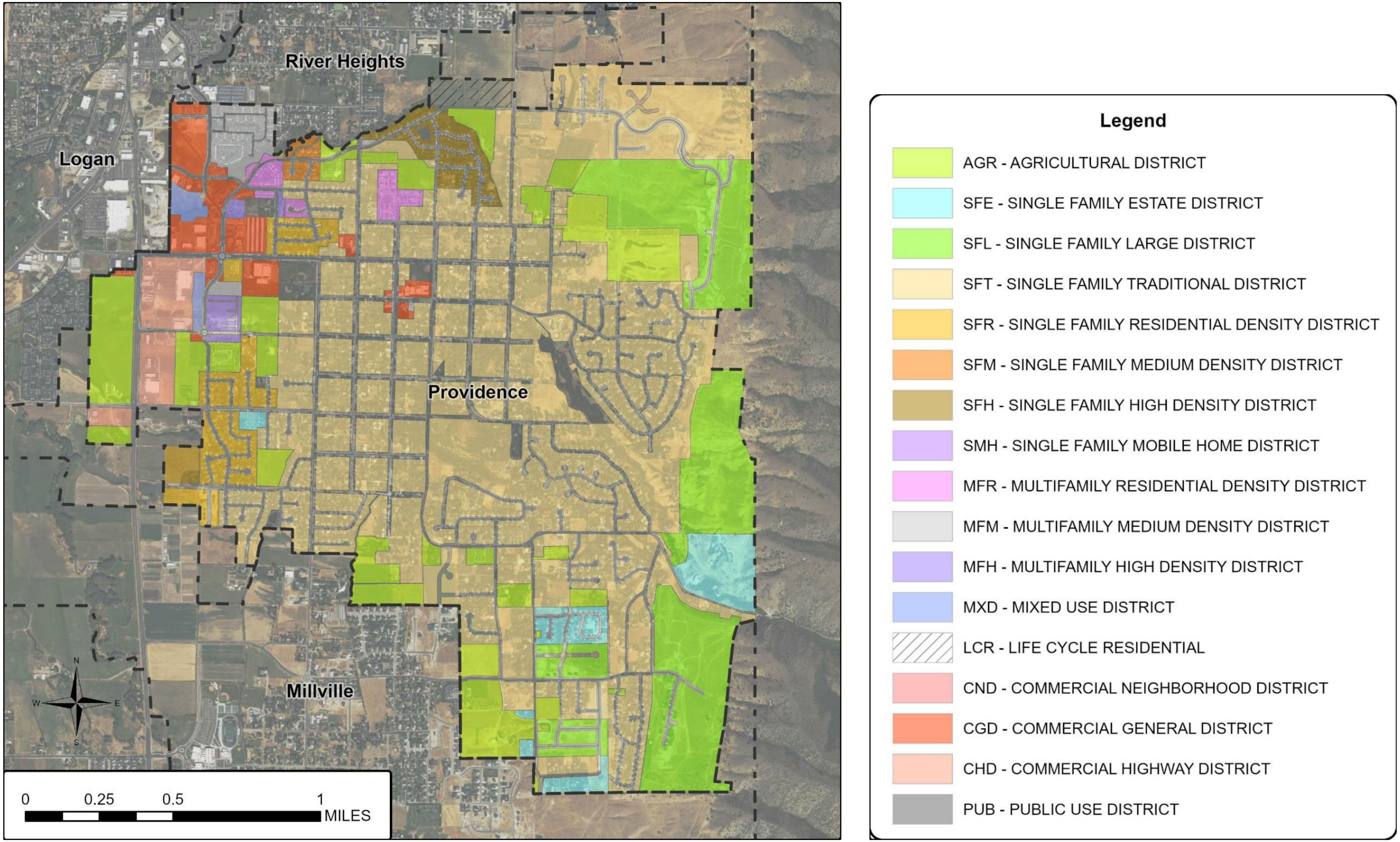


Figure 2: Providence Land Use Zoning Map

Chapter 2: Transportation Master Plan Development

The Transportation Master Plan was created through a series of steps that included public input, city council interviews, consideration for regional planning, and city staff involvement. Each input is checked against engineering principles and traffic demand needs using traffic simulation modeling.

Public Input

Public involvement in the Transportation Master Plan process included an online public forum, allowing citizens to provide input, identify problem areas, and review goals for Providence City. The forum was open for an 8-week period from August to October 2020 and was broadcast through public outreach efforts including City media outlets, and email communication. Public comments were reviewed and categorized against the existing traffic volumes and comments from City Council members and City Staff. A draft Transportation Master Plan was also available for public comment for 30 days in February and March 2021.

City Council Involvement

Input and direction were obtained from each City Council member in developing this Transportation Master Plan. The City Council reviewed the Transportation Master Plan during January 2021, and a presentation made during the January 2021 City Council meeting. Comments were incorporated for acceptance as the final approved Transportation Master Plan.

Many of the City Council members brought up safety and operation concerns in the City. Notable items of concern specifically mentioned in interviews included Canyon Road, Spring Creek Parkway, 300 South, and the 200 West / 100 North intersection.

Public Survey Results

Public comments were categorized and grouped together to avoid repetition in reporting, see Appendix A. Multiple comments indicating the same input were noted and more heavily weighted for implementation. The comments were reviewed by the steering committee and assigned a priority level based on safety concerns, public input frequency, and feasibility of implementation. Figure 3 provides a map location of comments and concerns received with each of the different categories of concerns.

Public input was also requested for bicycle infrastructure on roadways. The input allowed users to draw recommended bicycles lanes on a digital map. Figure 4 provides the combined locations of requested bike lanes, darker lines indicating overlapping recommendations. The recommendations for bicycle lanes were incorporated into the Transportation Master Plan, see Figure 34 for recommended bicycle lanes.

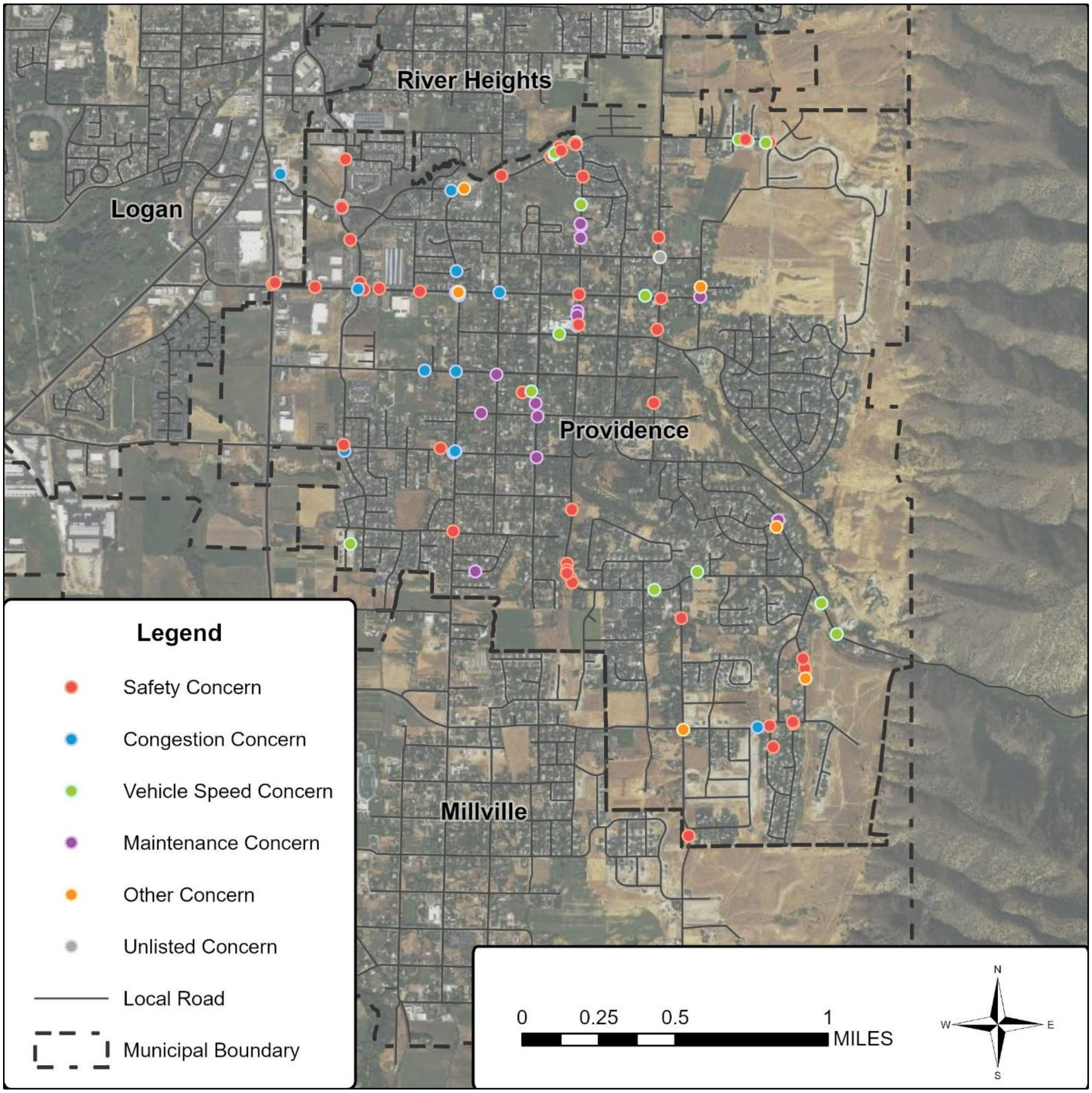


Figure 3: Public input locations with transportation concerns.

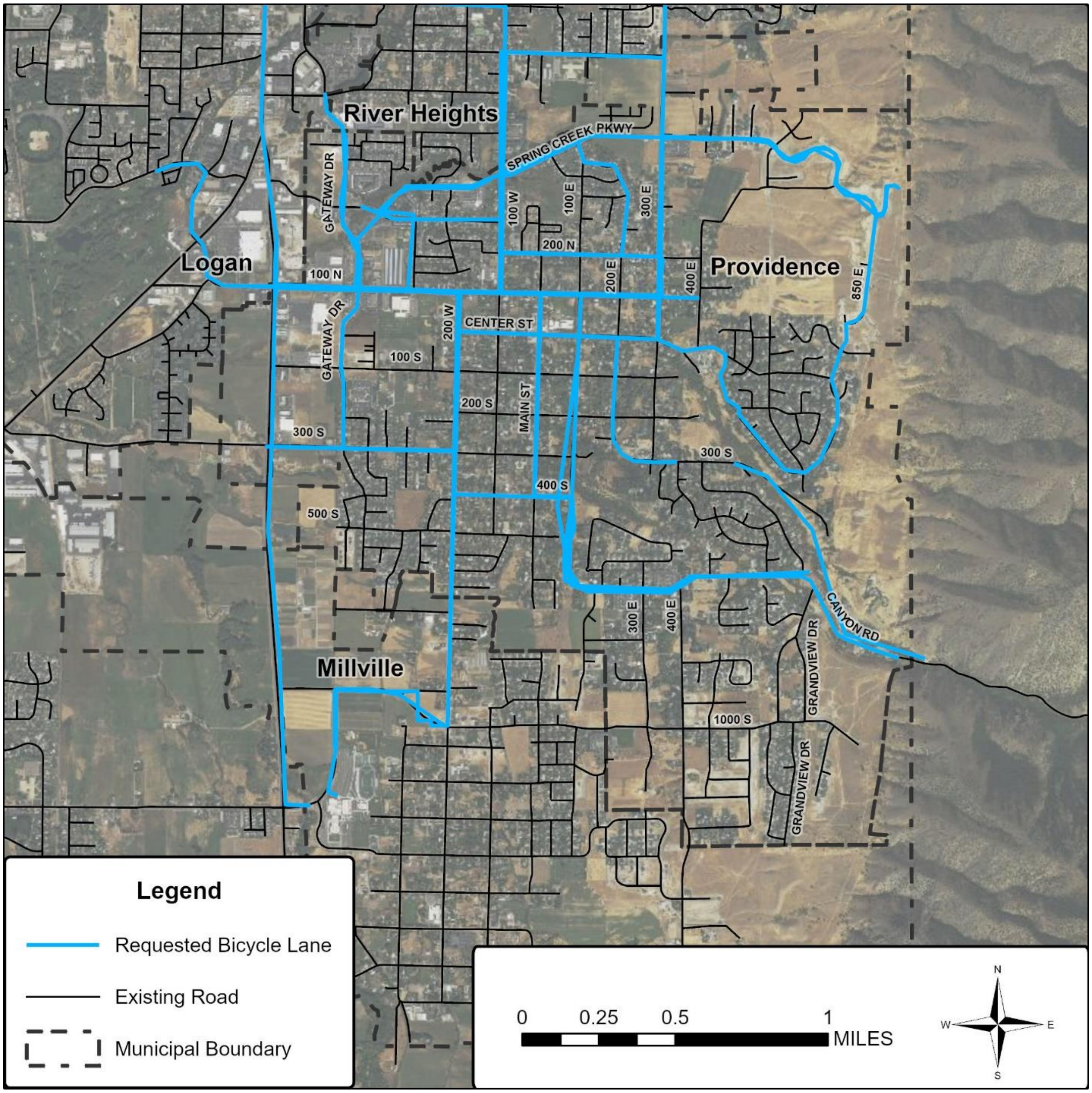
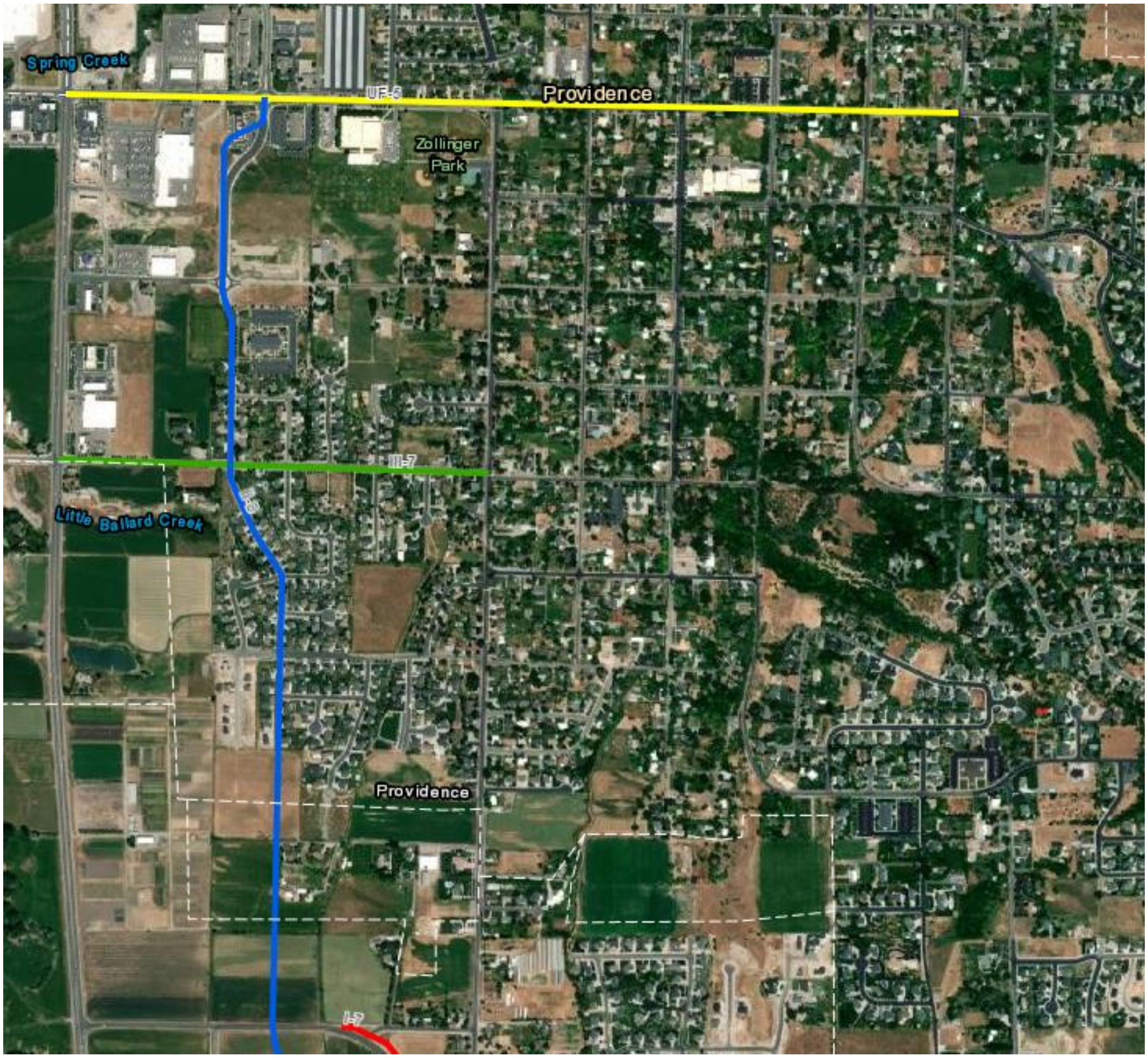


Figure 4: Public input recommendations for bike lane locations.

*For bike lane recommendations see Figure 34 Bike Lane Facility Plan recommendations on roadways in this Transportation Master Plan; also see the Park, Trails, and Recreation Master Plan for facilities not on roadways.

CMPO Regional Plans

The Transportation Master Plan incorporated existing CMPO plans into a cohesive and unified plan. Providence has 3 planned or identified projects for the CMPO within city limits, see Figure 5, including Gateway Parkway extension to 300 West in Millville, 300 South roadway improvements, and 100 North roadway improvements.



Phase I: 2015 – 2024

Phase II: 2025-2034

Phase III: 2035-2040

Needed but unfunded

Figure 5: CMPO Regional Transportation Plan 2040.

Chapter 3: Mobility and Active Transportation Design

The first goal of the Transportation Master Plan is improving mobility and moving people. A primary method of improving mobility is with active transportation. Key initiatives of the General Plan include improving pedestrian safety, walkability, and accessibility on City streets, right of way and easements. This Transportation Master Plan outlines locations to improve mobility for active transportation users of all experience and confidence levels.

Pedestrian Infrastructure

Pedestrian mobility and safety is improved by completing and increasing pedestrian infrastructure with contextual design, and by increasing street connectivity. Pedestrian infrastructure includes frequent street trees, continuous sidewalks, separated trails, intersection crosswalks, and mid-block crossings. Traffic calming amenities, when fully applied, improve pedestrian safety and decrease vehicle speeds. Driver behavior changes when driving is constrained by reducing the operating space with narrow travel lanes, curb extensions, and pedestrian refuge islands. Mid-block crossings should be utilized only in locations where pedestrians frequently cross higher volume roadways and options for intersection crossings are more than 400ft away; residential roadways should use other traffic mitigation infrastructure other than mid-block crossings. Frequent street trees in the park strip, or close to the curb, reduce the perception of large open spaces; enclosed spaces reduce vehicle speeds and provide a barrier between pedestrians and vehicles. Street trees also increase property values and create a greater sense of community.

Street Connectivity Infrastructure

The Multi-Modal City Key Initiative #4 in the General Plan has an objective to promote development patterns that provide connectivity. This initiative specifically focuses on streets accommodating a variety of transportation modes and improving connectivity.

Street connectivity is the process of linking neighborhoods and communities together through roadways or active transportation infrastructure. Street connectivity disperses traffic in the network, leading to reduced travel times, delays, and the need to construct large streets.[2] Adding street connectivity increases the use of transit, bicycling, and walking by helping active transportation users make trips efficiently, without out-of-the-way travel. Connectivity helps active transportation by connecting dead end cul-de-sacs with trails or walkways for pedestrians and cyclists. High connectivity creates an efficient transportation system and improves safety, health, economic vitality, the environment, and quality of life; helping accomplish Key Initiative #1 in the General Plan of establishing a Sense of Place and Key Initiative #4 of a Multi-Modal City.

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[2] https://wfrc.org/Studies/UtahStreetConnectivityGuide-FINALAndAppendix.pdf

Connectivity should focus on specific destinations and improving access to schools, parks, businesses, and neighboring cities. Not all destinations along a network are equally popular, and improvements along destinations to schools, parks and businesses are the most effective ways of improving connectivity. Walkable streets with pedestrian accommodations and infrastructure are also needed for good connectivity, including sidewalks, paths, buffers, amenities, and safe roadway crossings.

New developments and city capital improvement projects should take connectivity into account to link neighborhoods. Cul-de-sacs should be limited, and new developments should plan for and provide future connections to adjacent undeveloped parcels. Efforts should be made to coordinate with city staff in determining where connections should be made.

Traffic Calming Types

Traffic calming measures should be applied based on roadway type, target vehicle speed, presence of pedestrians, and frequency of speeding infractions. Traffic calming measures should add roadway complexity and contextually fit the roadway, meaning residential roads have narrower lanes and tighter turn radii than commercial areas with frequent large vehicles. Complex roadways are typically safer by eliciting caution, slower speeds, and more attentive driving. It is not the intent of the City to reduce complexity by modifying offset intersections but do so where traffic operations require improvements. Traffic calming is best achieved using narrower lanes with street widths matching the intended functional classification where higher volume roads match wider roadway widths and low volume roadways have smaller roadway widths. Traffic calming is a contributor to a Sense of Place as a Key Initiative for both the Transportation Master Plan and the General Plan. Street pavements should be functionally practical, providing complete infrastructure for pedestrians, bicyclists, and vehicles. Bike lanes, sidewalks, and safe crossings should be considered for all roadways. See Chapter 7 for typical street cross-section examples.

See Figures 6 through 12 for traffic calming examples. Traffic calming selection and application should consider roadway type, vehicle volume, and long-term maintenance. See AASHTO Greenbook sections 5.3.2.1 Width of Traveled Way, and 7.3.3.2 Lane Widths. Where extra asphalt is provided that is wider than existing cross section requirements, additional traffic calming should be considered, such as buffered bike lanes or raised center medians. Design vehicle for residential streets should be a single unit box truck or bus. Large semi-trucks rarely enter residential areas, and traffic volumes are low enough they can utilize the entire roadway to maneuver turns. The design vehicle in commercial areas should match the vehicle that uses the facility with considerable frequency.

The Transportation Master Plan does not identify every location where traffic calming can and should exist. As concerns are identified, a review of the location can be performed, and an individualized traffic study performed by transportation engineers to determine if and what type of traffic calming measures to implement. In theory, any residential street can apply some type of traffic calming type when the 85th percentile vehicle speed exceeds the speed limit by more than 5mph.

Traffic Calming Options for Local and Minor Collector Roadways*):*

1. Lane narrowing and striped bicycle lanes
2. Curb extensions / bulb-outs and visibly enhanced crosswalks[3]
3. Roadway pinch-points
4. Chicanes and lane shifts

Traffic Calming Options for Major Collector and Minor Arterial Roadways:

1. Lane narrowing and striped bicycle lanes
2. Narrow roadway: gateway treatments, landscaping, and curb extensions
3. Medians, pinch-points, and mid-block crossings
4. Raised medians

Figure 6: Intersection curb extension and crosswalk on residential roadway.

[3] https://safety.fhwa.dot.gov/ped_bike/step/docs/TechSheet_VizEnhancemt_508compliant.pdf

Figure 7: Visibly enhanced crosswalks.

Figure 8: Raised medians create vehicle lane pinch-points, which can double as a pedestrian refuge island. Crosswalks can be further enhanced with flashing beacons.

Figure 9: Center island pinch-point and mid-block crossing with curb extensions. Pedbikeimages.org-Dan Burden.

Figure 10: Intersection gateway treatment with curb extensions and raised median. Pedbikeimages.org-Dan Burden.

Figure 11: Chicanes / lane shifts calm traffic. Pedbikeimages.org-Dan Burden.

Figure 12: Narrowed roadway segments cover stretches of roadway. Pedbikeimages.org-Dan Burden.

Stop Signs Regulate Traffic, Not Speeds

Many studies have shown that stop signs are not an effective measure for controlling or reducing midblock speeds[4]. In fact, the overuse of stop signs may cause drivers to carelessly stop at the stop signs that are installed. In stop sign observance studies approximately half of all motorists came to a rolling stop and 25 percent did not stop at all. Stop signs can give pedestrians a false sense of safety if it is assumed that all vehicles will come to a complete stop at the proper location. A study conducted by Beaubien also showed that placing stop signs along a street may actually increase the peak speed of vehicles, because motorists tend to increase their speed between stop signs to regain the time spent at the stop signs.

Warrants for a stop sign

Stop signs are frequently violated if unwarranted. Because of this, stop signs should only be placed if they meet a Manual on Uniform Traffic Control Devices (MUTCD) warrant. Before warrants are even considered, however, less restrictive measures (such as a yield sign) are usually considered. In certain cases, the use of less restrictive measure or no control at all will accommodate traffic demands safely and effectively.

Unwarranted stop signs reduce the effectiveness of all other stop signs and should be used only where needed. A stop sign may be warranted at an intersection where one or more of the following conditions exist:

- intersection of roadways where right-of-way rules are not typical or hazardous
- street entering a through highway or street
- unsignalized intersection in a signalized area
- intersections where high speed, restricted view, or serious accident record indicates a need

A yield sign can also be considered where a full stop is not necessary. Existing sign installations should be regularly reviewed to determine whether the use of a less restrictive control or no control at all could accommodate the existing and projected traffic flow safely and more effectively. Stop signs are not to be used to regulate speeds; regulating speeds is performed using appropriate cross-sections, roadway designs, and traffic calming measures discussed in the other sections of this Transportation Master Plan.

CRS reviewed placement of the stop signs in the City based on functional classification and traffic flow. Recommendations for directional orientation of the intersection control is shown in Figure 13; not all controls will or should be stop signs, and a traffic study should be performed to identify the appropriate traffic control type when a change in signage is being considered.

[4] https://safety.fhwa.dot.gov/intersection/other_topics/fhwasa09027/resources/Iowa%20Traffic%20and%20Safety%20FS-%20Unsignalized%20Intersections.pdf

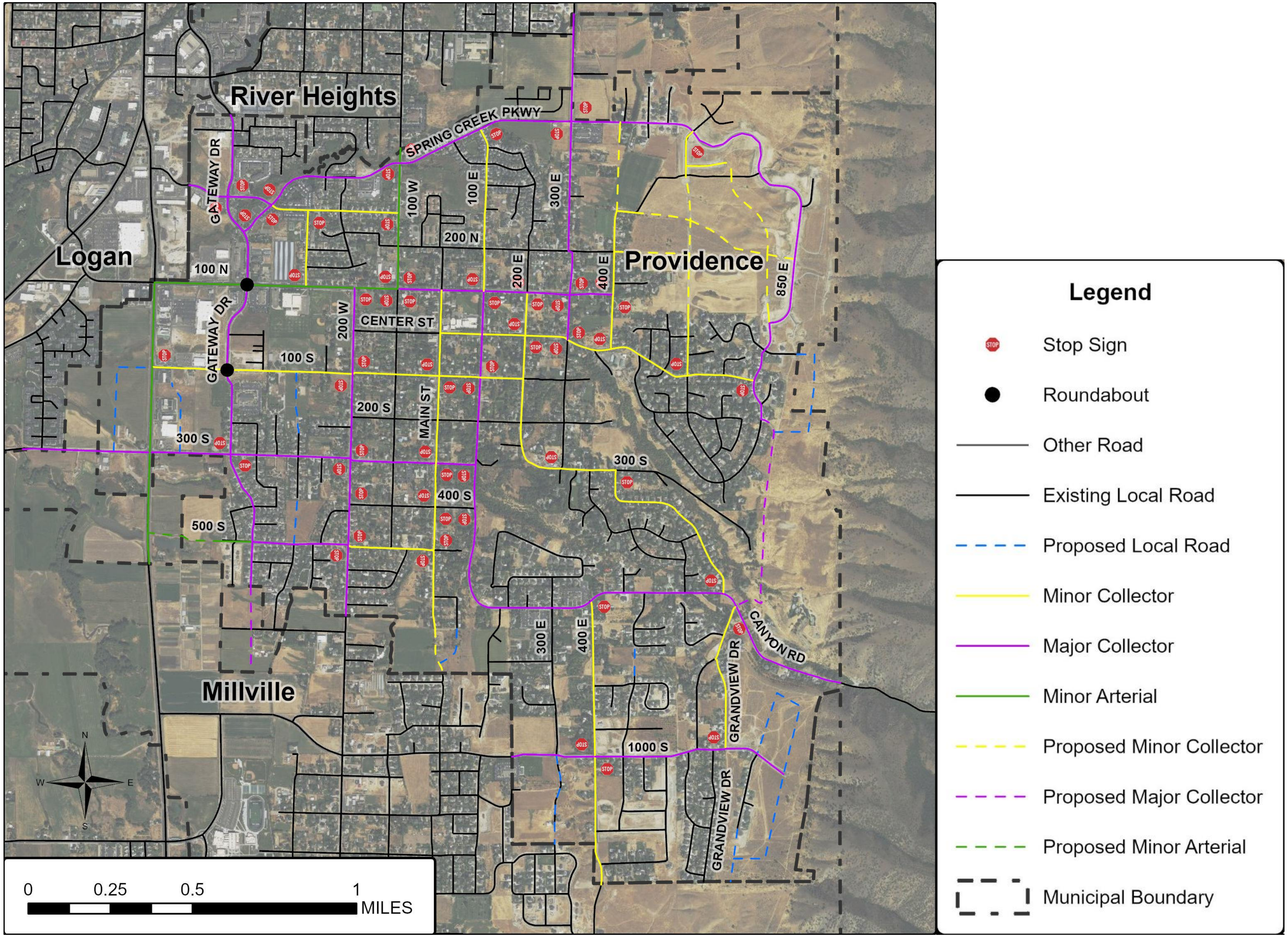

Figure 13: Stop sign orientation map

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Bicycle Infrastructure

An objective of the General Plan is to create a network of bicycle and pedestrian sidewalks and pathways throughout Providence with interconnecting points to adjacent communities. Planning for active transportation users requires considering the needs and capabilities of each user and planning different types of infrastructure. Cyclists are grouped into needs and capabilities using four types:

1. Strong and Fearless
2. Enthused and Confident
3. Interested but Concerned
4. No Way No How.

An estimated 60% of adults fall into the 'Interested but Concerned' category of cycling, where they would like to ride more, but are afraid. They would ride if they felt safer on the roadways – if cars were slower and less frequent, if there were more options of streets with fewer cars, or there were paths without any cars at all.

The comfort level of each rider is reflected by a Level of Traffic Stress (LTS) indication that looks at the roadway type and the provided bicycle infrastructure. LTS ratings are based on how comfortable bicyclists feel when using each road segment, rating them from 1-4:

LTS-1: Low Traffic Stress Bikeway is comfortable for Interested by Concerned Bicyclists

LTS-2: Moderate Traffic Stress Bikeway is comfortable for Somewhat Confident Bicyclists

LTS-3: High Traffic Stress Bikeway is comfortable for Highly Confident Bicyclists

LTS-4: Extreme Traffic Stress is not comfortable for most bicyclists

Confident bicycle type users handle a full range of stress levels, from LTS-1 up to LTS-4, while less confident users will only utilize facilities with LTS-1 or LTS-2 stress levels. This Transportation Master Plan applies bike lane types matching the expected stress level and user of that facility.

Bicycle Lane Types

Four types of bike lanes are outlined for implementation in the Transportation Master Plan. Cyclists vary significantly in their experience, comfort level, and skill; to encourage greater use of bicycle infrastructure, it is necessary to provide appropriate bicycle lanes for the expected cyclist type, as outlined below, with examples of applications in other cities in Figures 14-17:

1. Sharrows. Bicyclists share the same space with vehicles, creating a LTS-3. A sharrow does not separate bicyclist from motor vehicles, and instead bicycles ride in the vehicle lanes. They are often only utilized by the experienced Strong and Fearless

riders. Sharrows are typically used on roadways where there is not enough room for different bicycle infrastructure/lanes that would typically be placed along the shoulders. While most roadways can be used by bicycles and vehicles alike, a sharrow bike lane is designated where vehicle and bicycle speed and/or volumes raise safety concerns or to increase awareness.

2. Striped bike lane. Striped bike lanes separate a space on the roadway specifically for bicycles, directly adjacent to vehicle lanes, creating LTS-2 or LTS-3. Vehicles are not permitted to drive or park in bike lanes. Typical users will be Enthused and Confident riders. Application will include roadways with a wide enough shoulder to include the bike lane which may or may not prohibit on-street parking.
3. Buffered bike lane. Buffered bike lanes also separate a space on the roadway specifically for bicycles, but also include additional buffer space between the bicycle lane and vehicle lane, creating LTS-2. Buffer space is created using additional longitudinal or diagonal striping.
4. Protected/Separated bike lane. As the name implies, a protected or separated bike lane provides dedicated space for cyclists as well as providing a physical separation from other users using bollards, raised planters, or curbing. These types of bike lanes are the most expensive but provide the highest safety for all skill levels and experience, creating LTS-1. The high cost of these bike lanes limits the application to roadways with higher vehicle and expected bicycle traffic, such as Gateway Drive or 100 North, but would increase costs significantly and require additional right-of-way.

The bike lanes outlined in the Transportation Master Plan are identified and assigned in the following manner:

1. Public and City input identifies corridors for bike lanes
2. Bicycle user type is determined for each corridor
3. Perceived LTS level is assessed
4. Bike lane type is assigned matching user type need/abilities and stress level.

Recommendations for bicycle improvement projects are included in Chapter 6 of this Transportation Master Plan as part of the Active Transportation Capital Improvement Plan.

Figure 14: Green painted sharrow lanes on 200 South in Salt Lake City, UT.

Figure 15: Striped bike lanes on 2500 North in North Logan, UT.

Figure 16: Buffered bike lanes on 500 North in Logan, UT.

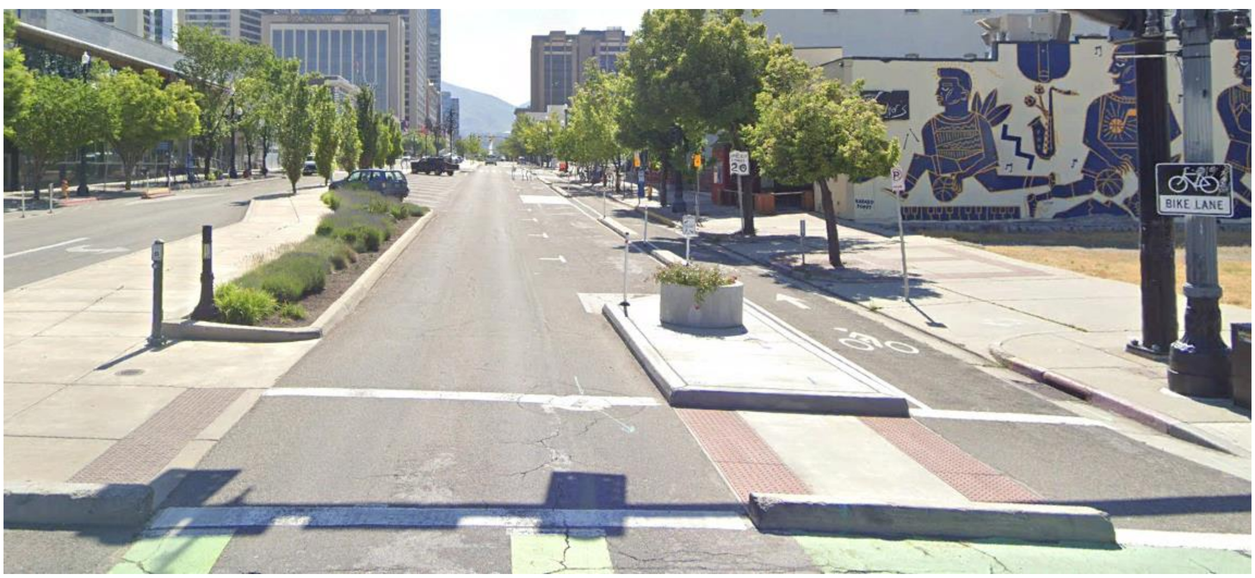

Figure 17: Protected bike lanes on 300 South in Salt Lake City, UT.

Chapter 4: Existing Conditions

Providence City has several major collector roadways connecting the City. North and south corridors include Gateway Drive, 200 West, and 100 East; east and west corridors include 100 North and 300 South. UDOT functional classifications at the time of this study (2020) are shown in Figure 18 and updated functional classifications are provided in Figure 19.

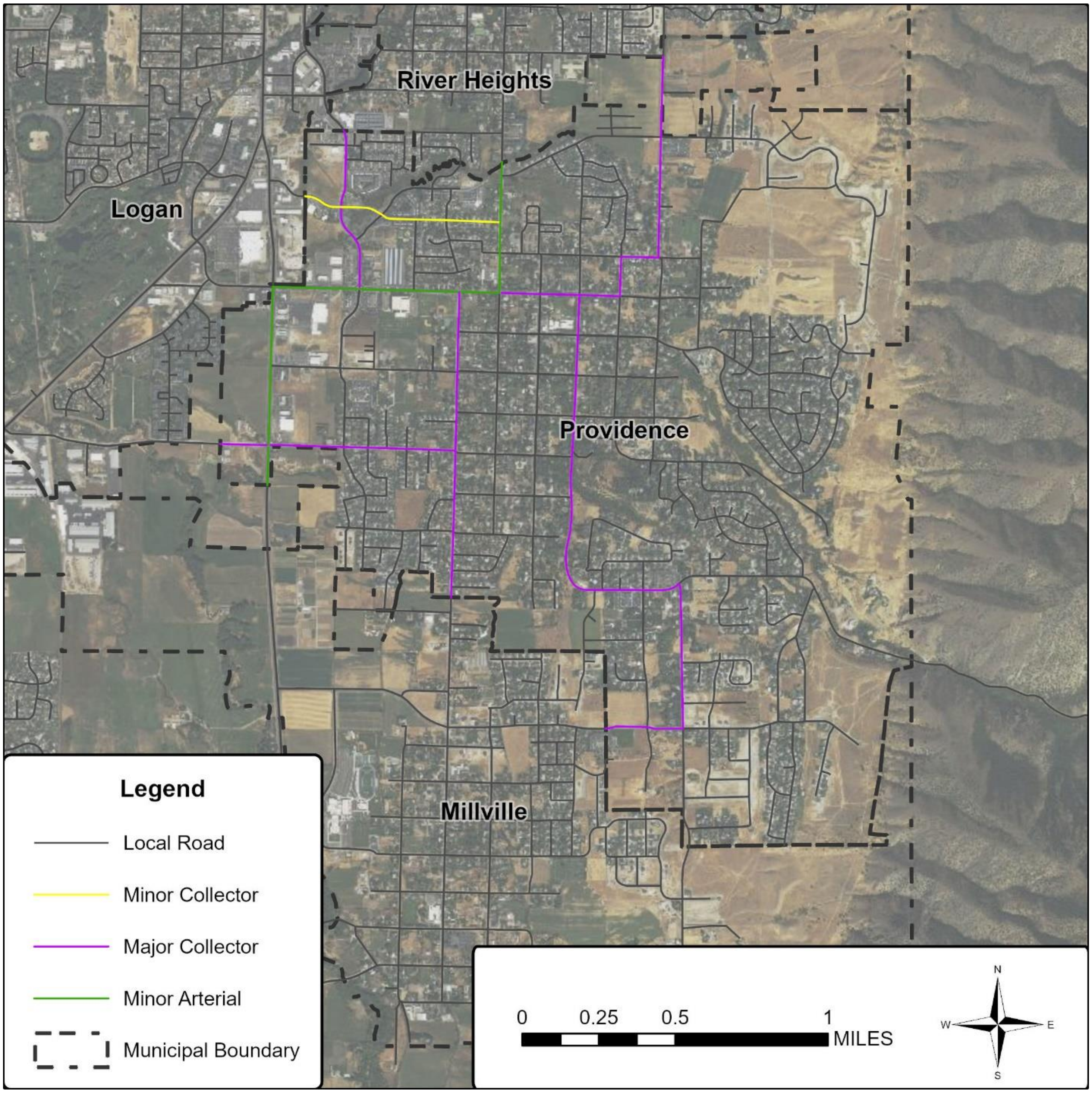

Figure 18: 2020 UDOT Functional classification map.[5]

[5]https://www.arcgis.com/home/webmap/viewer.html?webmap=494d57208ea4464bb664ac2da38f9c91

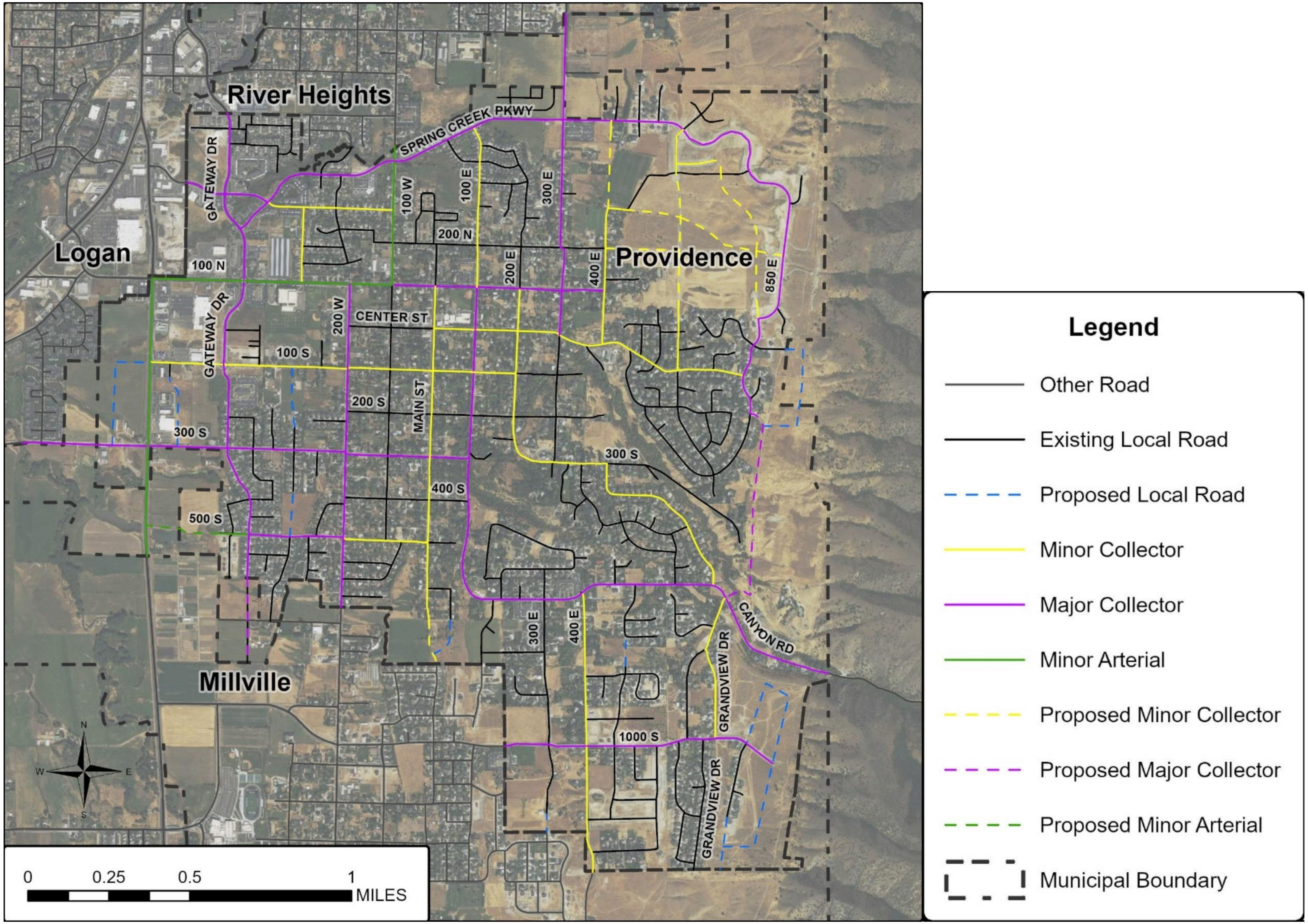

Figure 19: Updated UDOT functional classification recommendations.

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Transportation Analysis Zones

Data from the CMPO was acquired for projecting the 2030 and 2050 expected traffic volumes. The CMPO provides Transportation Analysis Zones (TAZs) that show anticipated growth in Providence City associated with 32 different TAZs, see Appendix B for a list of TAZs. Each TAZ includes data for total developable area (vacant land), or land that is zoned for a different land use, such as residential housing or businesses. The TAZ data also includes the number of households, population, and average household size. This data is used in modeling and predicting growth for that TAZ which translates into additional vehicle trips, outlined in the next section.

The TAZs were assigned new identifiers from 1-32 to aid with visual clarity. The TAZ data includes shapes, locations, and key information about the TAZs, but did not include anticipated growth. Growth data was obtained from the CMPO and associated to the corresponding TAZ. Predicted growth and population is shown provided in Appendix B, Table 5.

Safe Routes to School

The Safe Routes to School maps provide a designated safe path for children to walk to and from school. The map is determined by the individual schools and is available at saferoutes.utah.gov for all submitted routes. The routes were referenced as part of the Transportation Master Plan to identify infrastructure improvement needs for active transportation to and from the schools. Figure 20 provides a rendering of the maps that were referenced during development of the Transportation Master Plan.

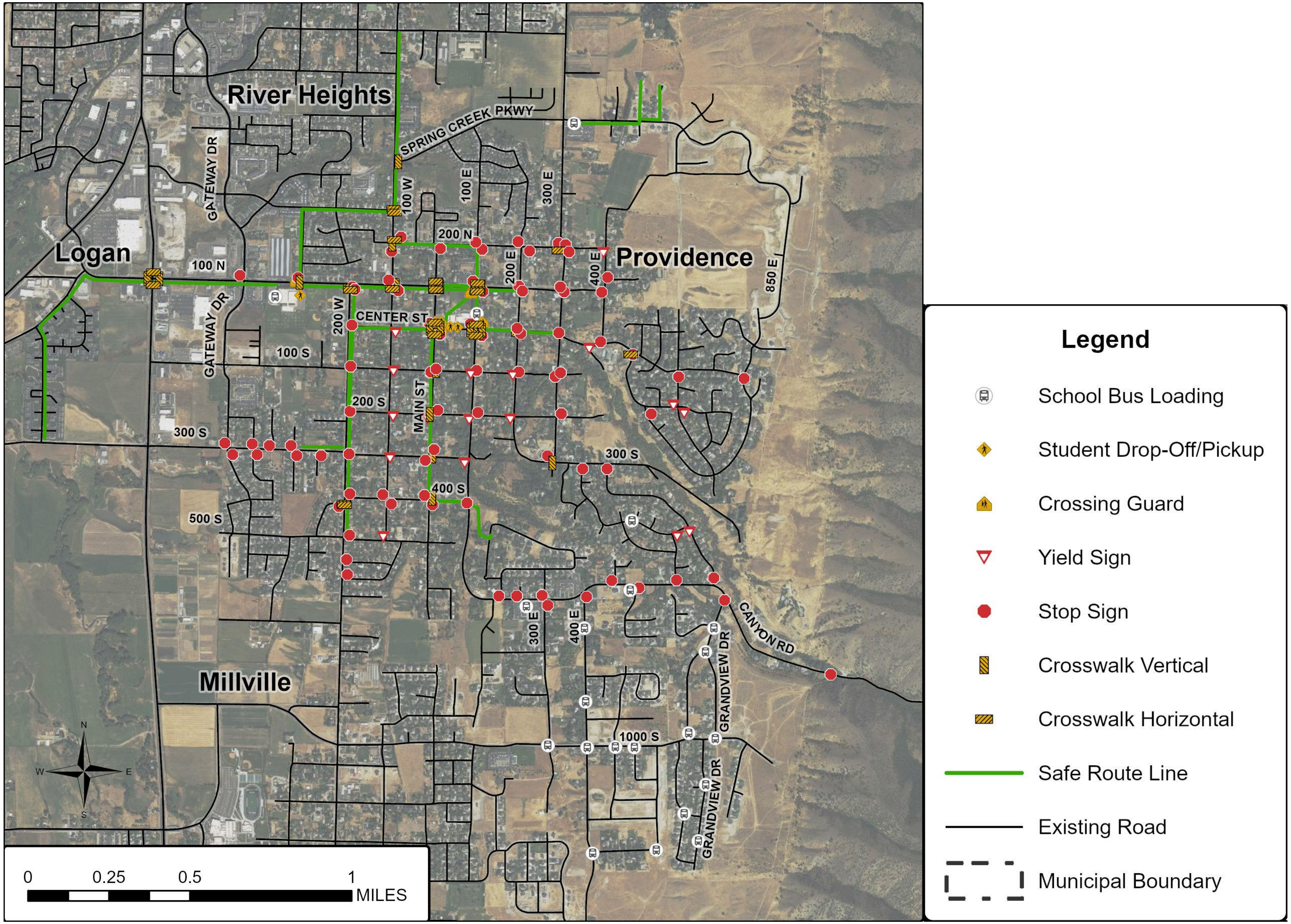

Figure 20: Safe Route to School map.

Bus Routes

Bus routes from the Cache Valley Transit Department were incorporated into the Transportation Master Plan. Additional proposed bus routes were identified as part of the planning process to increase coverage in the city and create better east/west connection. A map of the existing and proposed bus routes is shown in Figure 21. Bus Route 14 runs every 45 minutes through the City and provides additional service to Hyrum four times a day, which bus number is changed to Route 13 when it is providing that service. The combined schedule for both Route 13 and 14 is only one CVTD bus through Providence every 45 minutes.[6] Bus Route 12 runs along SR-165 within Providence City boundaries, with stops just south of 100 North.

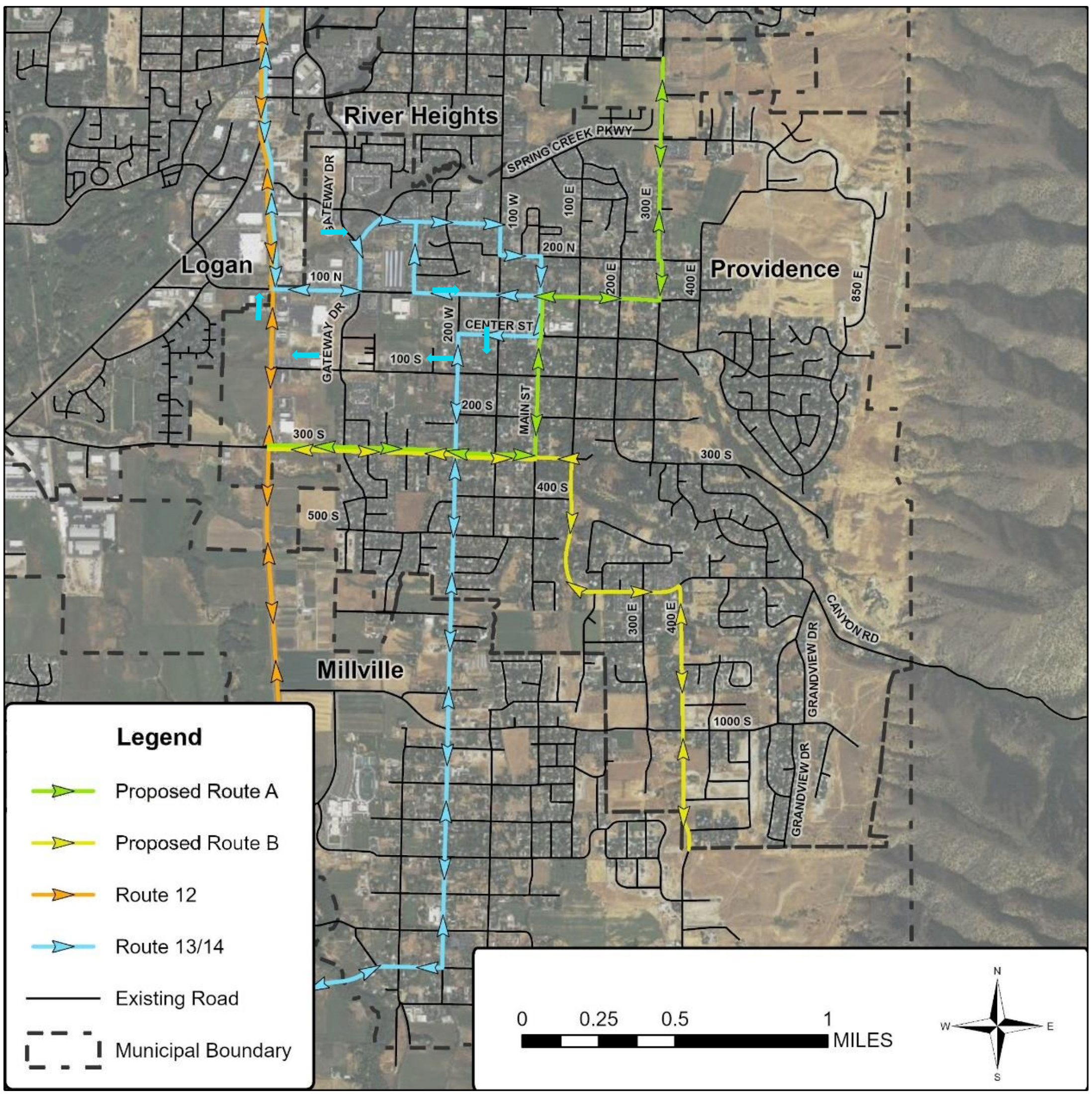

Figure 21: Existing and proposed bus routes in Providence City.

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[6] https://cvtdbus.org/routes/

Chapter 5: Analysis

The second goal of the Transportation Master Plan is to identify facility improvement needs that can be prioritized and scheduled in a City Capital Improvement Plan (CIP). The analysis identifies facilities for improvements based on future traffic needs.

Data Collection

The City regularly gathers traffic vehicle counts and speed data throughout Providence using radar detection. The City has been collecting data for the past several years along major roadways throughout the City. The City uses traffic counts to analyze locations and data trends over time. For example, the City has utilized the data to determine vehicle speed and manage speed mitigation efforts.

CRS utilized the available traffic count data to create a generalized traffic model of the City and identified locations for additional data gathering. CRS and the City collaborated in collecting additional data for turning movement counts at key intersections. Manual counts were recorded with video which was analyzed to identify individual turning count movements. Video files improve the vehicle count accuracy particularly at more complex or busy intersections such as roundabouts. Turning count data were collected at the following intersections, see Figure 22:

- North Gateway Drive and 100 North
- North Gateway Drive and Spring Creek Parkway
- North Gateway Drive / 485 West and 100 South
- 200 West and 100 South
- 200 West and 100 North
- 100 West and 100 North
- 100 West and 100 South
- Spring Creek Parkway and Golf Course Road / 280 North
- North Gateway Drive and Golf Course Road
- 300 East and Spring Creek Parkway
- 100 West and Spring Creek Parkway
- 300 East and 100 North
- Garden Drive and 500 South
- 200 West and 500 South
- Garden Drive / 485 West and 300 South
- 200 West and 300 South
- 100 West and 280 North
- 300 South and Hwy-165

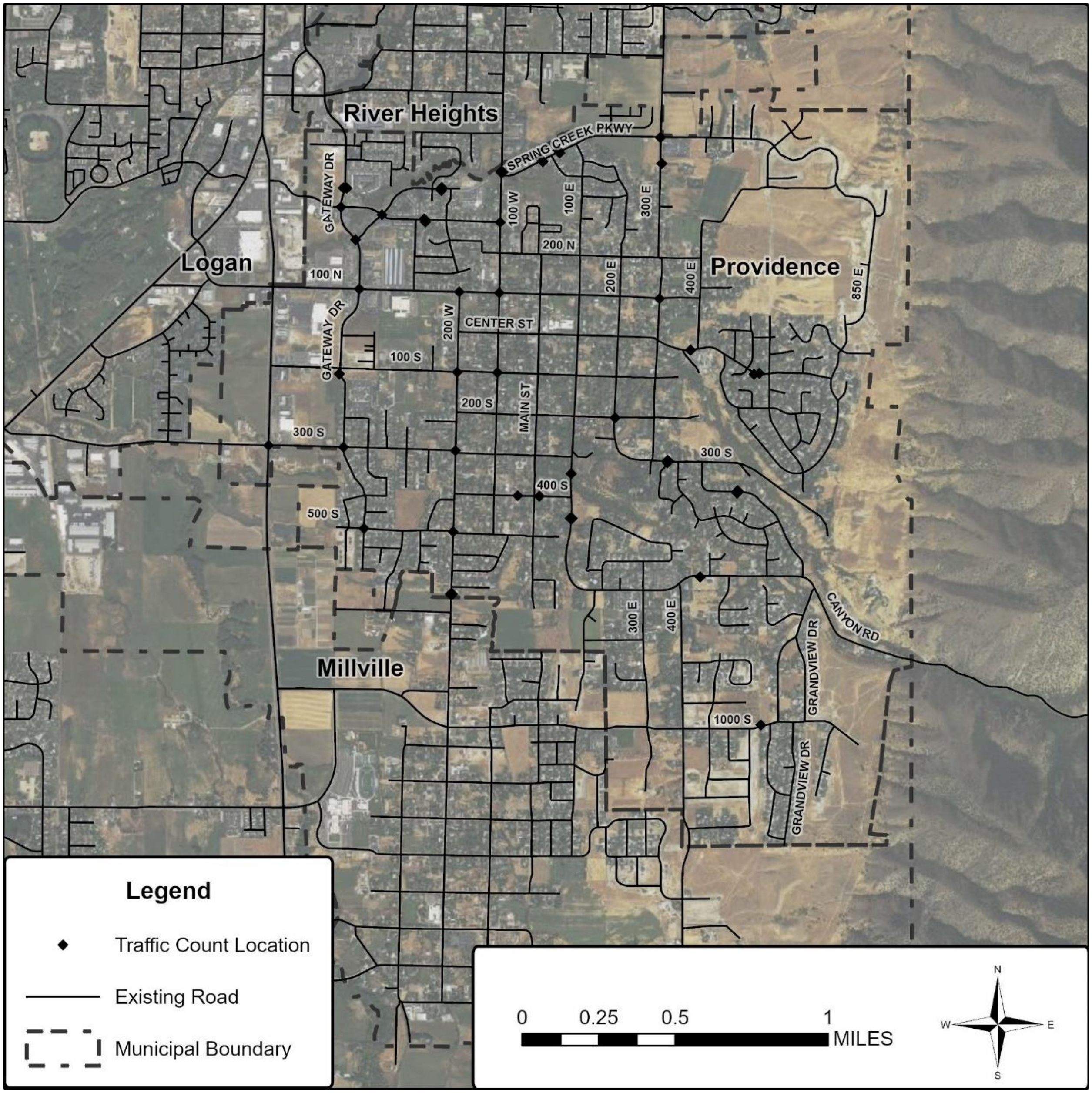

Figure 22: Providence City traffic data collection locations.

Traffic Modeling

Peak hour turning movement counts were entered in a traffic model and count balanced. Vehicle counts do not match perfectly from intersection to intersection and it requires assessing if the discrepancy needs to be adjusted or if the difference is reasonable for the number of access points. The driveways and business accesses were assessed, and the traffic model was balanced accordingly – allowing for some discrepancy in count data between intersections where multiple access points were along the roadway segment. As vehicle traffic increases this balance is vital in estimating future traffic needs so that the influx of additional traffic is accounted for properly at intersections and roadway segments throughout the City.

CRS created AM and PM peak period traffic models to account for both directions of traffic. AM peak period traffic is generally heading out of residential areas towards business areas, and PM peak period traffic is reversed, heading to the residential areas. Directional modeling is particularly beneficial with heavy left or right turning counts; a heavy right turning movement in the morning has a corresponding heavy left turning movement in the afternoon. Turning movements favor right turns over left turns, and as a result congestion is different during AM and PM peak periods.

Vehicle Trip Growth Modelling

The population difference was calculated between 2050 anticipated population and 2020 population to get the total number of anticipated new residents for each TAZ. This difference was divided by the TAZ's unique average household size to get the number of anticipated new households. This figure was then multiplied by a factor of 1.02 PM vehicle trips per dwelling unit, according to the Single-Family Detached Housing Land Use Scenario (210) in the ITE Trip Generation Manual. Total vehicle trips for each route in each TAZ were determined by adding the anticipated new vehicle tips on each route to the number of existing vehicle trips and carrying the additional trips from origin to destination during each peak period.

Traffic Simulation Model

Models were created of the total trips for the entire roadway network. This process was created for an existing 2020 trip count model, a 10-year (2030) trip count model, and a 30-year (2050) trip count model. These models became the basis of the Transportation Master Plan by representing how current infrastructure would fare given an increase in traffic data.

The 2030 and 2050 models were analyzed using the calculated Intersection Capacity Utilization (ICU), turning movement level of service (LOS) and the intersection LOS. The LOS was determined using delay ratios defined in the 2010 Highway Capacity Manual (HCM). Results for the traffic simulation models are provided in Appendix C.

Traffic Mitigation Solutions for the 2050 Model

To determine solutions to the traffic problems, CRS Engineers applied infrastructure modifications to the 2050 model to determine recommended improvements. The analysis specifically looked at mobility and traffic operation concerns to determine locations and roadways that would need to be improved to meet projected demand. CRS Engineers proceeded with the general guideline to design for intersection LOS C, allowing the possibility that some movements may be briefly lower than LOS C during peak periods.

Interim Traffic Mitigation Solutions for the 2030 Model

Once recommended infrastructure improvements were established for 2050, an interim model was created for 2030 vehicle traffic data. Solutions were implemented in the 2030 model which would apply into the 2050 solutions, looking specifically to match timing for infrastructure improvements near the time they are needed. CRS Engineers looked to determine which projects are needing to be implemented on a shorter timescale. The analysis also provides insight into how these problems can be addressed with an effectively scalable solution.

Chapter 6 Planned Roadways and Roadway Design Guidelines

This chapter outlines the recommendations determined during the public input and analysis phases making up the Transportation Master Plan. Recommendations include a 5-yr, 10-yr, and 30-yr horizon in implementing plans throughout the City. Guidelines published by the American Association of State Highway and Transportation Officials (AASHTO) are provided in the industry standard Geometric Design of Highways and Streets, affectionately called the Greenbook. The guidelines in the Greenbook are a result of peer-reviewed research and are adopted in design as state-of-the-practice. This section outlines the guideline recommendations for the Providence Transportation Master Plan.

Design Speed Guidelines

Lower speeds are desirable for safer roadways, particularly in areas with pedestrian and bicycles. The intent for lower speeds should influence the selection of the design speed, and a target speed should be selected. The target speed is the highest speed at which vehicles should operate on a roadway and is intended to be used as the posted speed limit. The design speed should match the target speed, which encourages an actual operating speed that equals the target speed. If design speeds are used that are higher than the target speed, operating speeds will also be higher than the target speed. Safety is increased by matching the design speed to the target speed. See the AASHTO Guidelines (2018 – 7th Edition).

Lane Width Guidelines

Lane widths should be sized according to safety and needed operations; narrow lanes encourage slower and safer speeds and meet the key initiatives of the General Plan and goals of the Transportation Master Plan. Vehicle lane widths influence speeds, which impact pedestrian safety, walkability, and accessibility (General Plan Key Initiative #4). Average sedan vehicle widths are 6ft wide, while pick-up trucks are 7ft wide. The recommended lane widths from the AASHTO Greenbook are:

a. 5ft bicycle lanes on all striped, buffered, or separated facilities
b. 9ft vehicle lanes on residential roadways with design speed at or below 25 mph
c. 11ft vehicle lanes on commercial roadways with design speed at or below 25mph
d. 10ft vehicle lanes with design speed at or below 35mph
e. 11ft vehicle lanes where traffic has more than 8% trucks, buses, or large vehicles
f. 12ft vehicle lanes on roadways with 40+mph design speeds
g. Turn lanes should match or be +/-1ft width of the vehicle lanes on all roadways

Typical Street Cross-Sections

Providence City standard cross-sections include street types for Residential, Residential G.P., Commercial, and Major cross sections.[7] Each section has matching components for typical sidewalks, park strip, and curb and gutter. However, asphalt widths differ between the typical cross sections. Providence City standards and specifications for street cross section are replicated in Table 1 and include the corresponding industry standardized functional classification. Example exhibits of possible application of the City standard cross-sections are provided in Figures 23 to 31, and reflect efforts to implement the City General Plan goals. The exhibits apply minimum widths for each element of the cross-section, but some elements will need to be widened to meet city standards for the required right-of-way for each functional classification. The back of sidewalk on each side should be at the right-of-way line to be consistent throughout the city and to increase pedestrian safety by creating larger buffers where possible between the sidewalk and moving vehicles. Some of the goals and purpose in planning city street cross-sections include:

1. Improve safety, walkability, and accessibility on City streets rights of way and easements
2. Create a network of bicycle and pedestrian sidewalk and pathways throughout the City
3. Provide value by maintaining and improving aesthetics of streets and public rights of way
4. Create a high level of connectivity; interconnection with county and regional road systems

Table 1: Typical Street Cross-Sections

Type of Street	**Functional Classification**	**Right-of-way**	**Paved Asphalt**	**Curb & Gutter**	**Park Strip**	**Sidewalk**
Residential	Local	66ft	30ft	2.5ft	7.0ft	5.0ft
Residential G.P.	Minor Collector	66ft	37ft	2.5ft	7.0ft	5.0ft
Commercial	Major Collector	80ft	49ft	2.5ft	7.0ft	5.0ft
Major	Minor Arterial	99ft	66ft	2.5ft	7.0ft	5.0ft

[7] http://providencecity.com/wp-content/igov_files/street_cross_sections_drawing_c_1_as_per_ordinance_2017_008_272.pdf

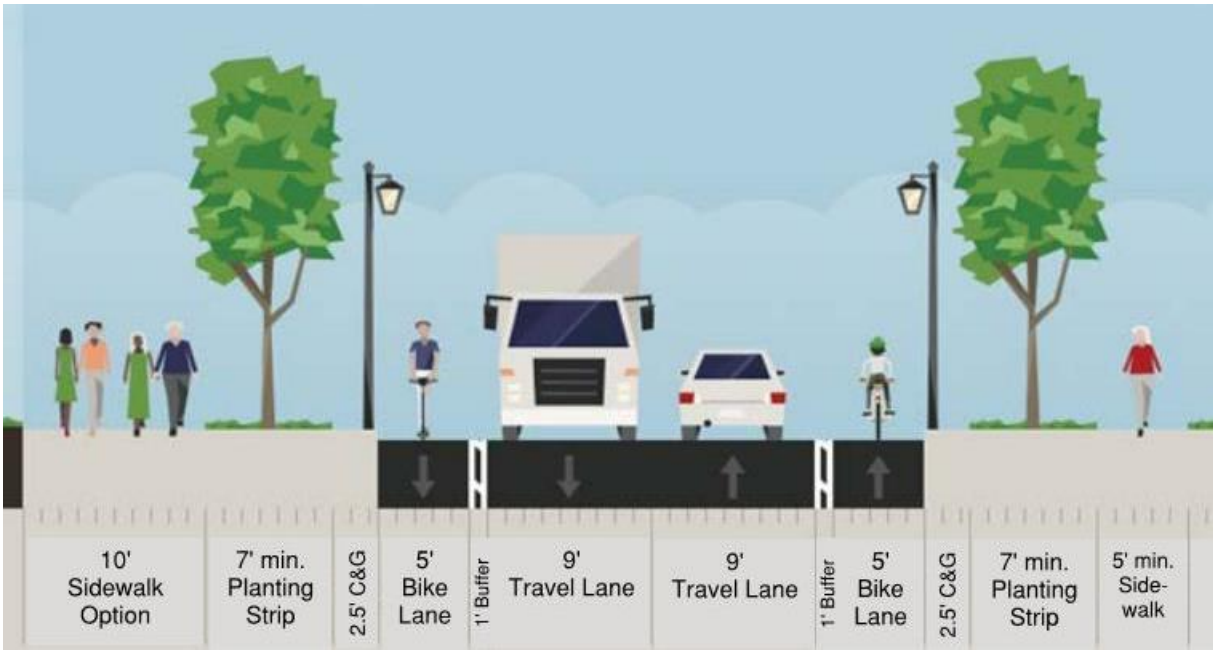

Figure 23: Local roadway (30ft asphalt- 66ft ROW), buffered bike lanes in place of on-street parking and 10ft multi-use path increase active transportation – 25mph design. Cross section shows only 59ft of 66ft required ROW; widening or adding elements is needed.

Figure 24: Low volume Local roadway (30ft asphalt- 66ft ROW) – On-street parking with a single "give and go" vehicle and sharrow bicycle lane, creates a true 20mph design. Cross section shows only 59ft of 66ft required ROW; widening or adding elements is needed.

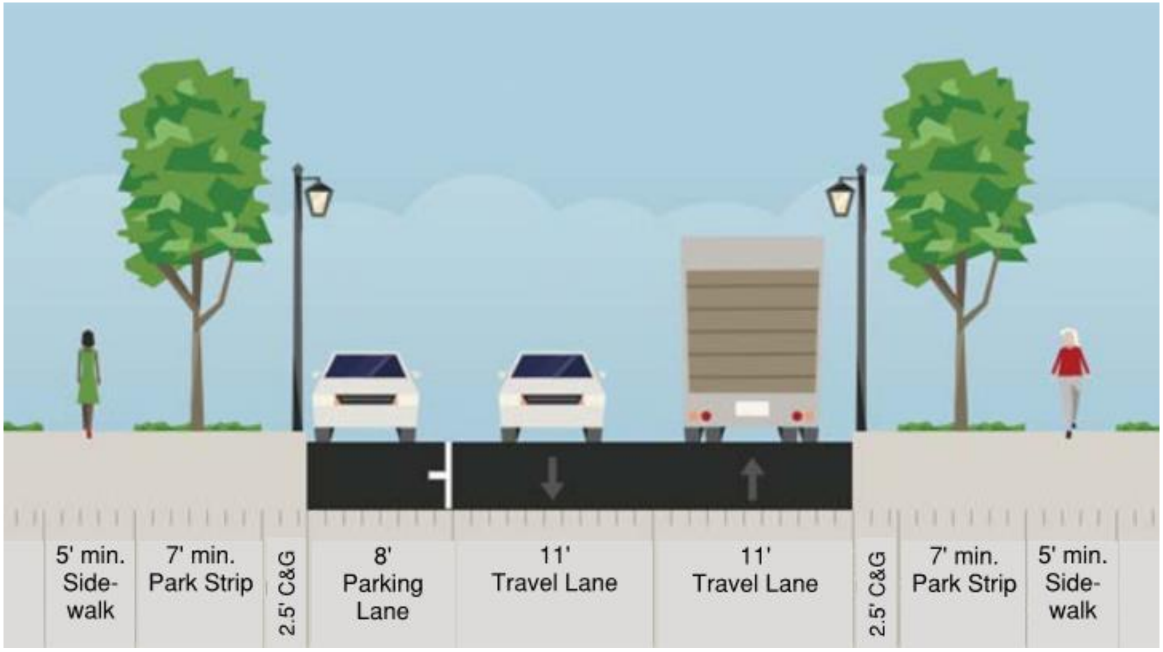

Figure 25: Local roadway/Minor Collector (30ft asphalt – 66ft ROW), two-way continuous traffic and limited on-street parking – 25mph design. Cross section shows only 59ft of 66ft required ROW; widening or adding elements is needed.

Figure 26: Local roadway (30ft asphalt), separated and plowable 2-way cycle track, and a 10ft multi-use path, reduced on-street parking – 25mph design. Cross section shows only 64ft of 66ft required ROW; widening or adding elements is needed.

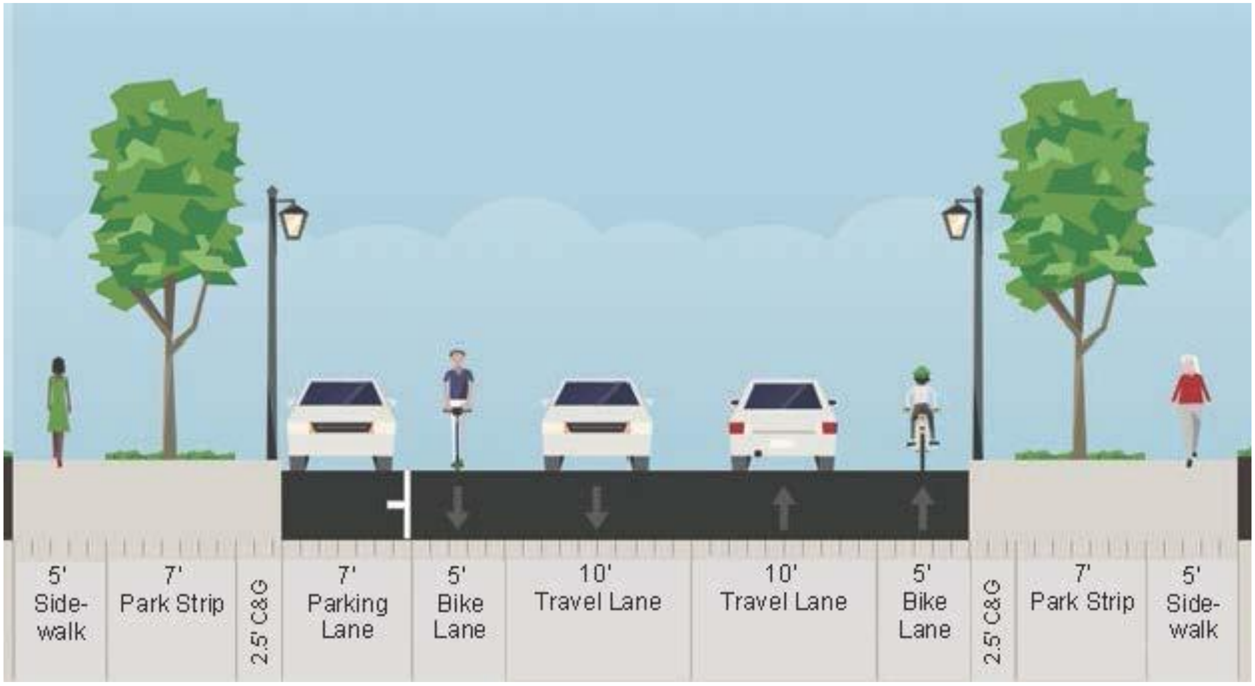

Figure 27: Minor Collector roadway (37ft asphalt) with striped bike lanes – 25mph design.

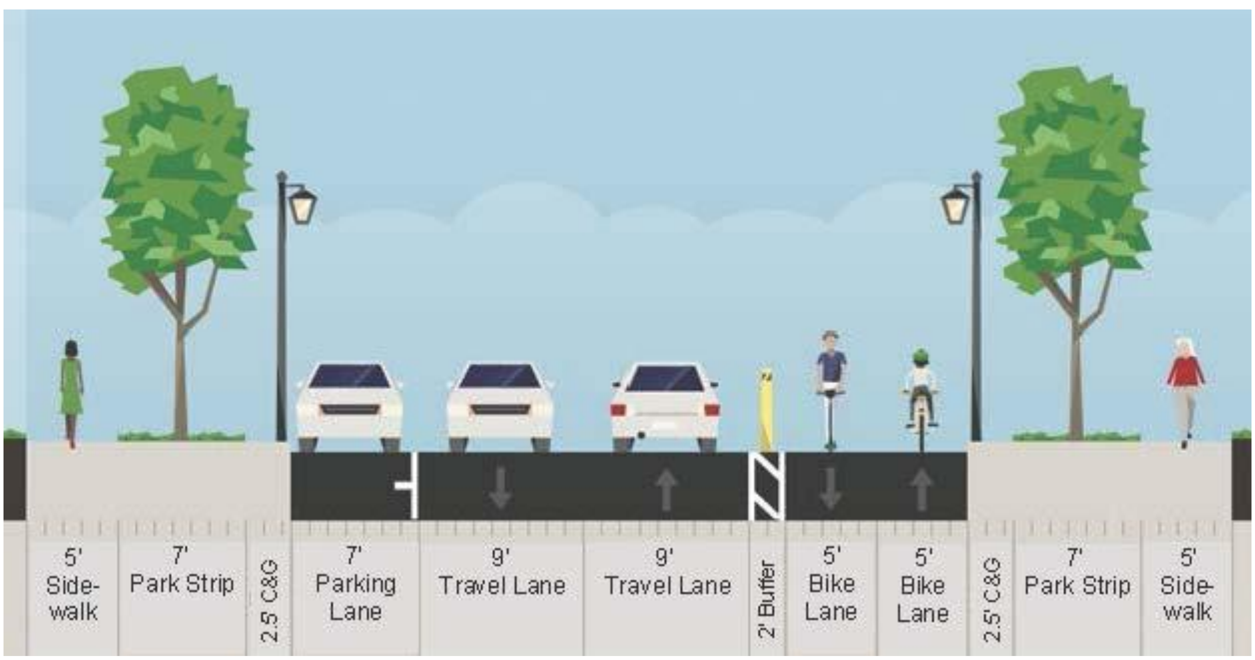

Figure 28: Minor Collector roadway (37ft asphalt) with separated and plowable 2-way cycle track – 25mph design.

Figure 29: Major Collector (49ft asphalt) with center turn lane, sharrow bike lane and striped bike lane, widen sidewalk as available – 35mph design.

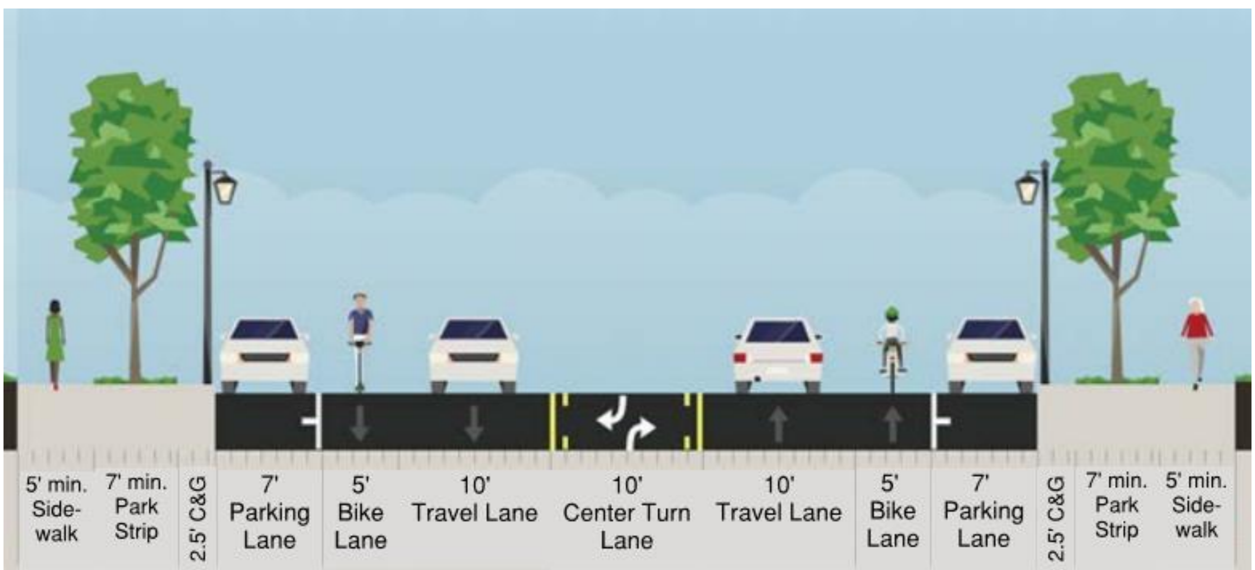

Figure 30: Major Collector (49ft min asphalt, showing 54ft) with center turn lane, striped bike lanes, narrowed park strip as required – maximum 35mph design. Cross section shows 83ft ROW where 80ft is the required minimum ROW; widening or adding elements is needed.

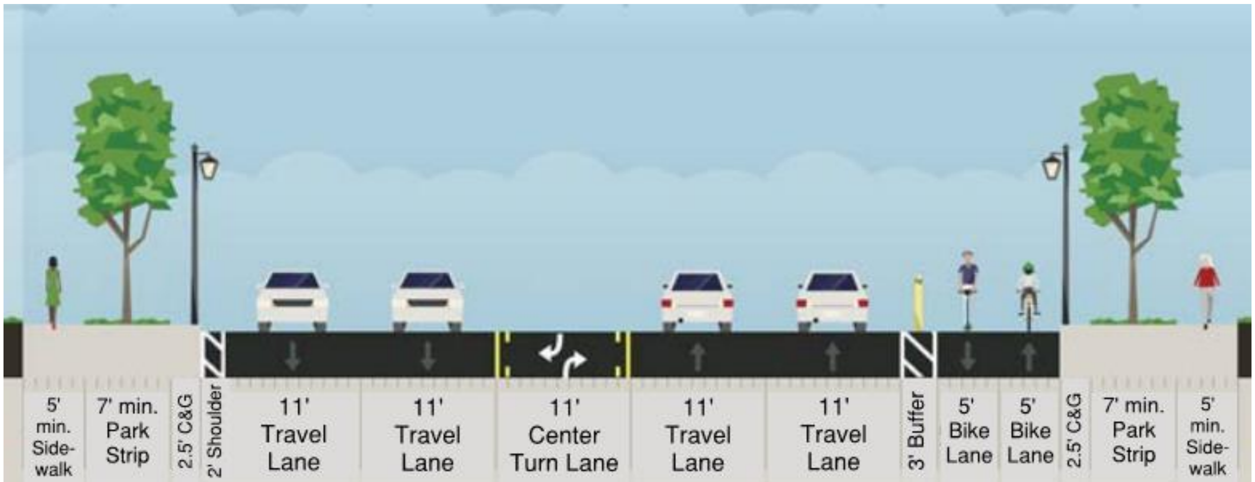

Figure 31: Minor Arterial (66ft min asphalt, showing 70ft) with center turn lane, separate and plowable 2-way cycle track – max 35mph design. Cross section shows 99ft ROW; widening or adding elements is needed.

Existing commercial roadways, such as Gateway Drive, may have paved roadway widths at or greater than 54ft. The three-lane roadway shown in Figure 29 can be applied to these roadways easily, encouraging a 35mph vehicle speed, and adding bike lanes. Extra pavement width can be used to create a buffer between the vehicle lanes and bike lanes. When new or widened roadways are constructed, a decision will be made determining the asphalt width and cross section.

Transportation Corridor Master Plan - Limited Access Roadways

This Transportation Corridor Master Plan identifies limited access roadways, outlined in Figure 32. Providence City code 11-4-3-Q indicates access to major, commercial, or specified residential streets from a residential unit (i.e. driveway cutout) shall only be allowed where no other option or solution exists. The City code that references major, commercial, or specified residential streets have industry standard functional classifications matching major collectors, and minor arterials.

Financing Options

Transportation projects are funded through sales taxes, property taxes, state appropriated B & C road funds, and transportation impact fees. State B & C road funds are generally used for maintenance and are subsidized by sales and property taxes. Impact fees are restricted to only new capacity. Property tax and sales tax also fund Police, Fire, and Parks and can have various other demands on this revenue. Often the shortage of revenue results in reduced road reconstruction, emphasizing the importance of regularly maintaining existing roads.

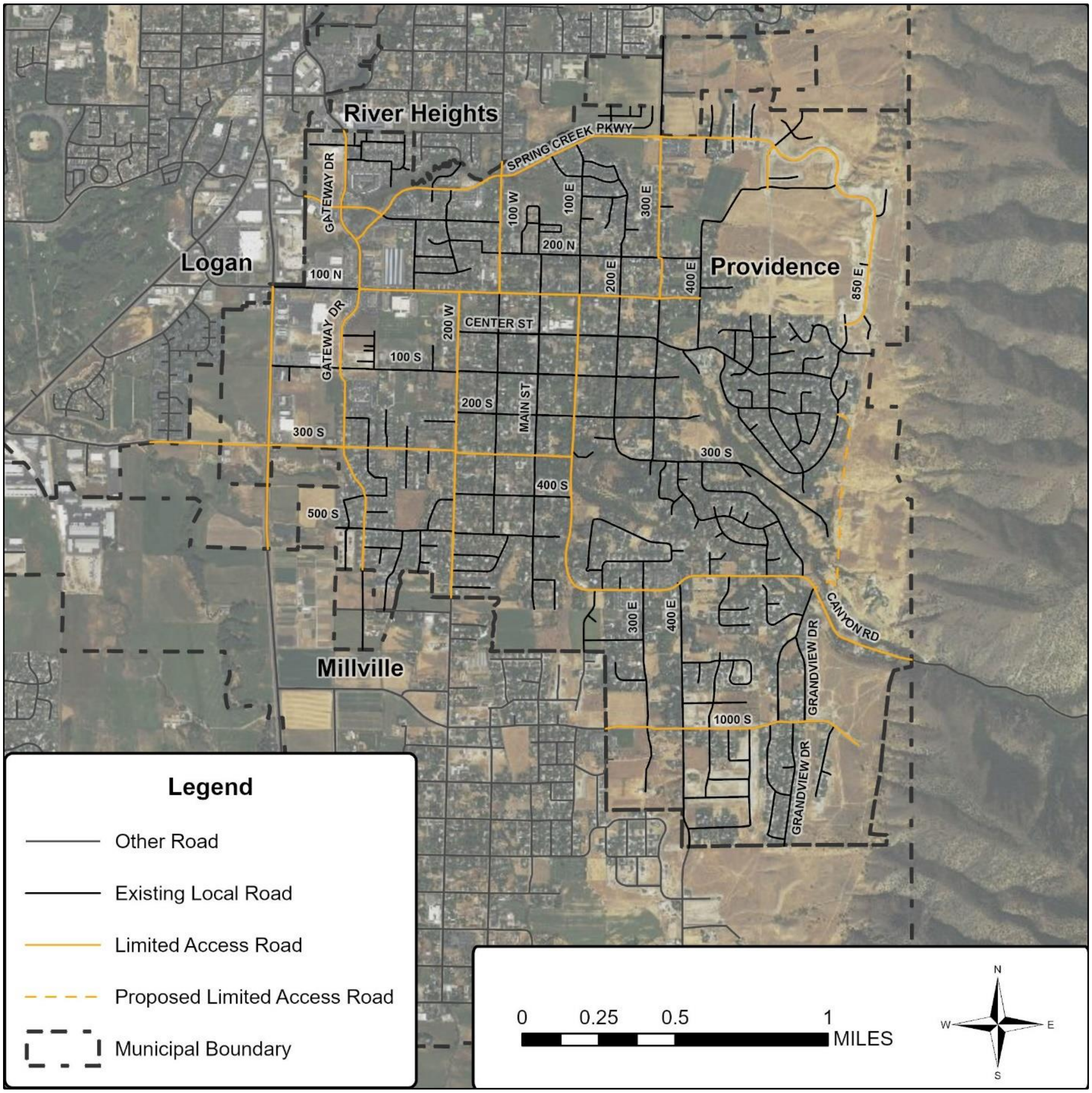

Figure 32: Transportation corridor master plan for limited access major, commercial, and specified residential roadways.

Roadway Cross Section Needs Identified

Roadway widths were identified for the intended cross sections and compared to the existing conditions. The roadway segments were measured at various locations representing a typical cross section of a corridor. Locations were noted where the existing roadway widths did not match city standards and guidelines as well as the intended cross section for the corresponding functional classification. Figure 33 shows black outlined roadways for the identified segments where roadway widths are less than City design standards. The figure is not intended to identify projects, or locations where widening will occur, only to identify where existing asphalt does not meet the cross section for the planned pavement widths.

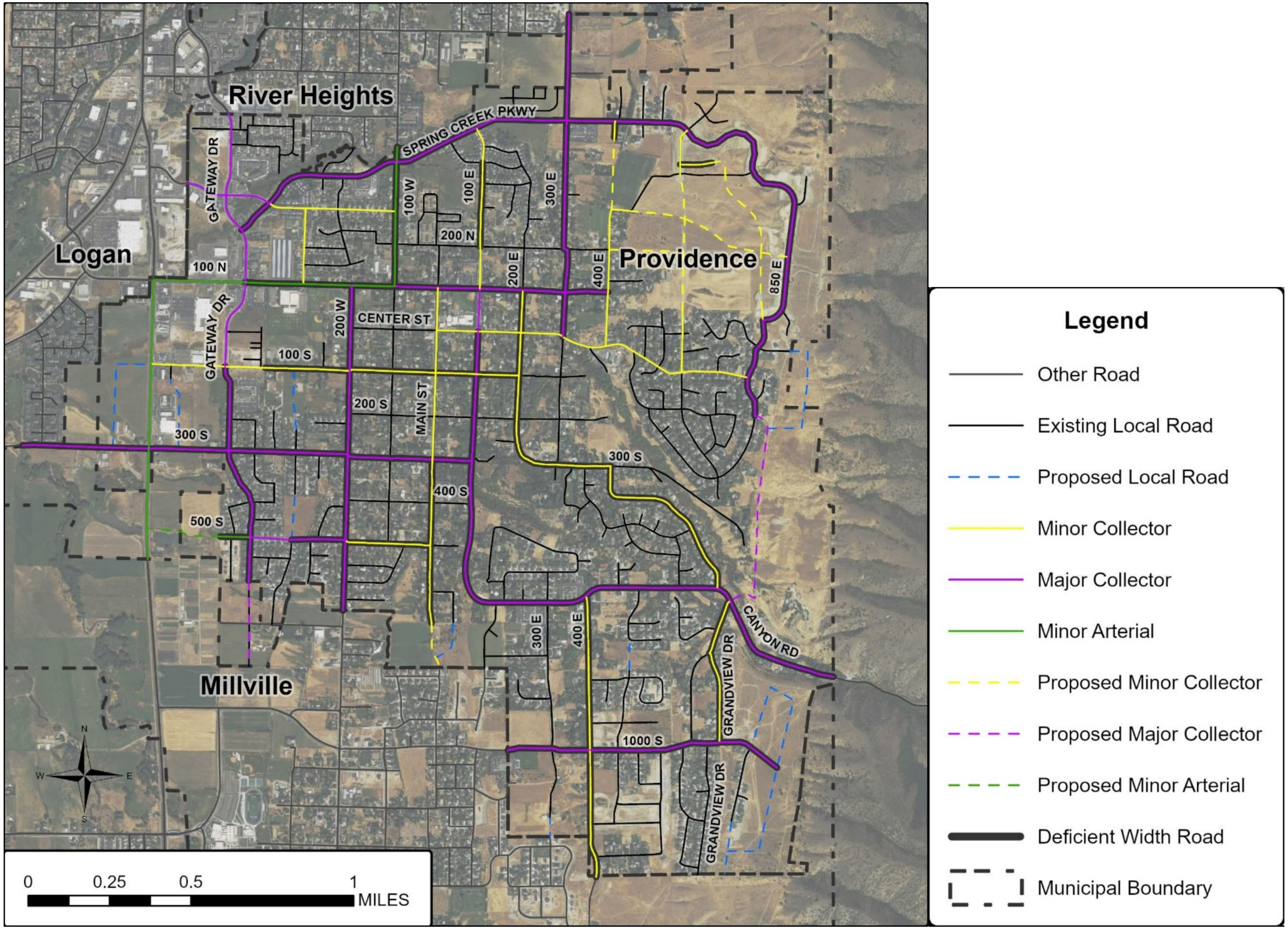

Figure 33: Identified roadway widening to meet city standards and functional classification.

Active Transportation Capital Improvement Plan

A compiled map and table of recommended bicycle lane improvements are shown in Figure 34 and Table 2, respectively. The active transportation capital improvement plan is incorporated into the overall roadway capital improvement plan. The Active Transportation Capital Improvement Plan works in conjunction with the Parks, Trails, and Recreation Master plan. Projects that fall within the paved asphalt are included in the Transportation Master Plan, and projects alongside that are outside the paved asphalt are included in the Parks, Trails, and Recreation Master Plan.

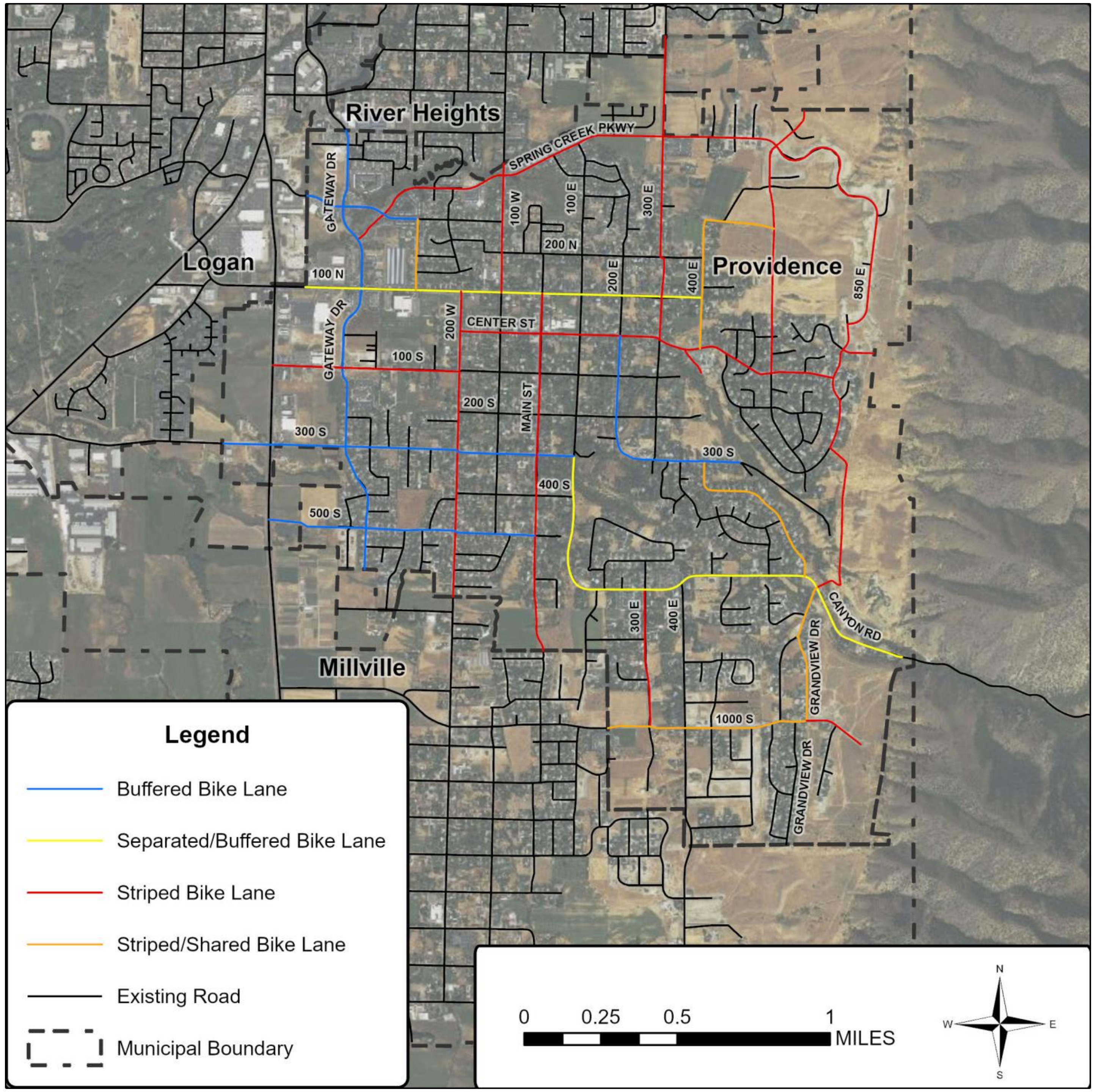

Figure 34: Bike Lane Facility Plan recommendations on roadways.

Table 2: Recommendations for Bicycle Infrastructure Improvement

Bike Lane Type	Corridor	Notes
Striped	Spring Creek Parkway	Striped bike lane preferred but a shared bike/vehicle lane (sharrow) may be used downhill, allowing for parking on both sides of the roadway.
Buffered	Gateway Drive	Widen buffer between vehicle and bike lanes when existing asphalt is available. Connectivity to Logan
Separated/ Buffered	100 North	Two-way cycle track could be used to improve safety
Separated/ Buffered	Canyon Road	Separated bike/multi-use path may allow for a tiered cross section on steep slopes
Striped	200 West, 100 North going south to Millville	Connectivity to Millville
Buffered	300 South	Connectivity to Hwy 165.
Striped	300 East, South of Canyon Rd	Connectivity to Millville
Striped	300 East, River Heights to 300 South	Connectivity to River Heights
Striped	Main Street	
Striped	100 South	Connectivity from Highway 165 to 200 West
Striped	100 West, North of 100 N into River Heights	Connectivity to River Heights
Striped	Center Street	Connectivity from Foxridge to 200 West.

Capital Improvement Plan

A compiled map and table of recommendations for capital improvement projects (CIP) are shown in Figure 35 and Table 3, respectively. Table 3 provides an estimated cost for each project and a sum of project costs for each horizon year. Projects outlined in the 2025 and 2030 horizon years are typically maintenance and restoration projects, with some capital improvement projects as needed to improve safety and maintain operations. The 2050 horizon year is looking at economic development and growth within the city. Projects within the 2050 horizon year are identified and planned to guide City growth, which growth can be induced either by third party developer or through City resources. The Transportation Master Plan will be regularly re-evaluated for City goals and intended outcomes.

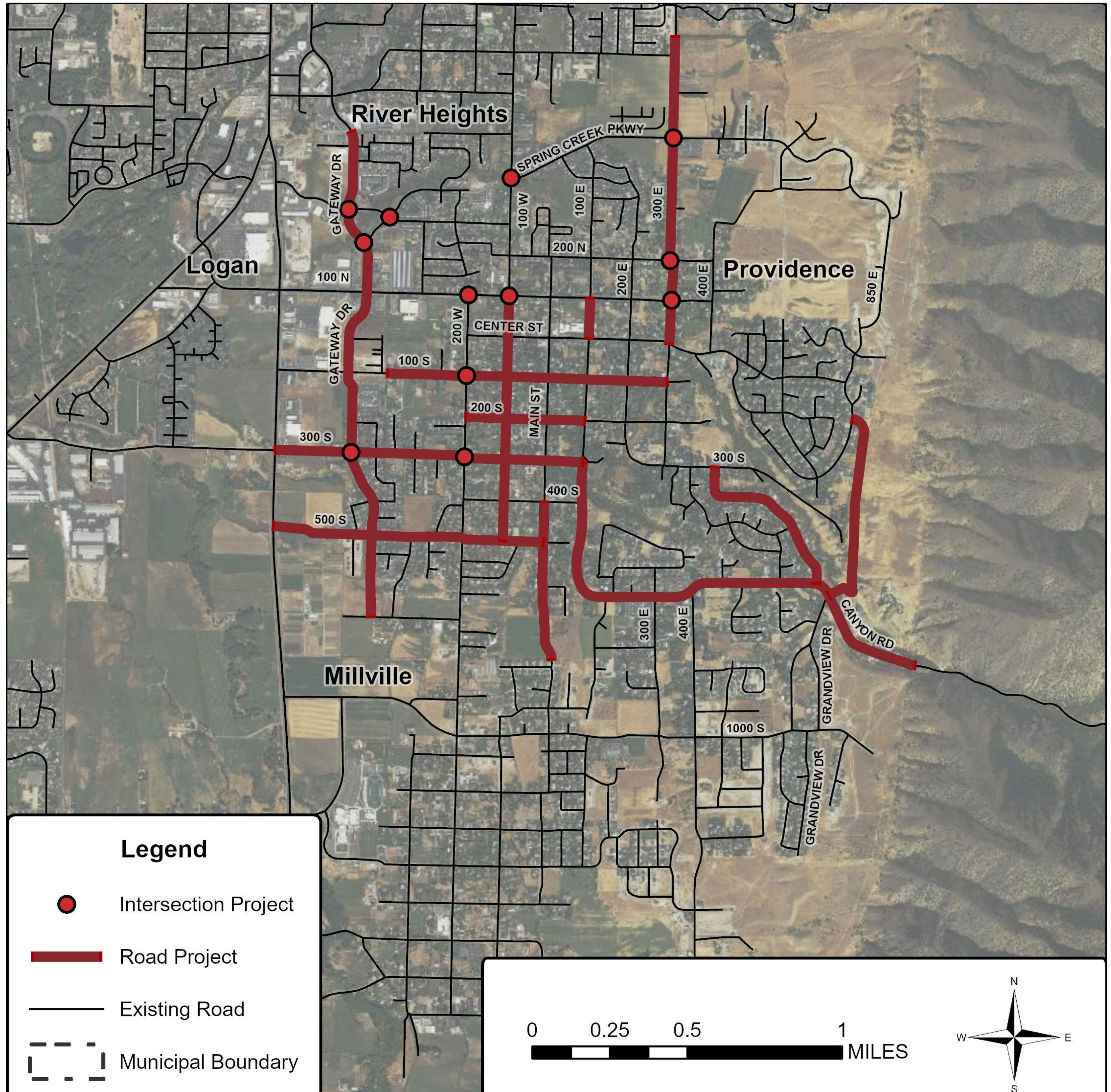

Figure 35: Transportation Capital Improvement Plan map.

Table 3: Capital Improvement Project (CIP) Plans

Street 1	Street 2	2025 Maintenance/Restoration Project	Estimate	2030 Maintenance/Restoration Project	Estimate	2050 Growth and Development Project	Estimate
Gateway Drive	Logan to Millville City limits	Establish 3-lane cross section with bike lanes for built segments	$20,000	Extend roadway, maintain 3-lane cross section with bike lanes	$2,750,000	Build 5-lane cross section with bike lanes from north City limit going south through 100 North roundabout and past the s-curve.	$2,250,000
200 West	100 South			Align lanes at 100 South and 200 west intersection; the East approach shifts south to match the west approach	$390,000		
Canyon Road	400 S at 100 E to the canyon			Complete roadway, adding curb and gutter (address regional drainage infrastructure), sidewalk, and bike lane	$2,950,000		
Gateway Drive	Golf Course Road			Construct 2-lane roundabout. Golf course road 4-lane cross section between Spring Creek and Gateway Dr.	$1,750,000		
Golf Course Road	Spring Creek Parkway			2-way stop control on Spring Creek; Golf Course Road is free flowing	$10,000	Construct roundabout.	$1,200,000
200 West	100 North	Stripe 100 N from 200 W to 100 W to 3-lane cross section, add northbound left and westbound left turn lanes	$35,000	5-lane roadway between Hwy 165 and 100 West on 100 N. Build 3-leg roundabout with channelized through movement westbound at 200 W and 100 N.	$4,250,000		
100 East	*Center to 100N*	Reconstruct street	*$200,000*				
400 East	*Center to 200N*	Roto mill/surface treatment					
100 South	200W to 475W	Widen and improve roadway	$600,000				
100 South	300E to 200W	Roto mill and roadway improvements	$350,000				
300 South	100E to 200W	Roto mill/surface treatment	$210,000				
200 South	100E to 200W	Roto mill/surface treatment & waterline	$280,000				
100 West	500S to 100N	Roto mill/surface treatment & waterline	$360,000				
Spring Creek Road	Canyon Road to 300 South	Roto mill/surface treatment	$300,000				
100 West	100 North			4-way stop sign	$5,000		
300 South	Hwy 165 to 100 East			Construct full cross section, completing curb and gutter, sidewalk	$3,800,000		
200 North	300 East			Construct roundabout	$950,000		
Spring Creek Parkway	100 West 300 East			Stripe bike lanes along Spring Creek Parkway	$25,000	Construct roundabout at each intersection.	$800,000 $1,100,000
500 S	Hwy 165 to Main Street					Build out 500 S between Hwy 165 and Main Street. 4-way stop at Garden Drive.	$4,000,000
Main St	400 S to 200 E Millville					Construct Main street with full cross section, and roadway connection to 200 East Millville	$2,750,000
300 East	100 North					Provide left and right turn lanes on each approach. 4-way stop control.	$400,000
Gateway Drive	Spring Creek Pkwy					Left turn delays on Spring Creek. Signalizing intersection is an option.	$400,000
Garden Drive	300 South					Construct roundabout	$800,000
200 West	300 South					Construct roundabout	$1,000,000
Grandview Dr	Canyon Rd to Sherwood Dr					Connect Grandview Dr / Canyon Rd intersection to Sherwood Dr	$6,000,000
300 East	River Heights to Center St.					Establish 300 East as a Major Collector, add bike lanes, shoulders sidewalk, curb and gutter	$3,000,000
		Total:	$2,355,000	Total:	$16,880,000	Total:	$23,700,000

Appendix

Appendix A – Public Comments

Table 4: Summary of Categorized Public Input Comments

Major Roadway	Comment Description	Notes for Discussion and Consideration	Priority Level
Spring Creek Parkway	Speeding on East bench	Traffic calming - narrow lanes, bike lanes, and curb extension	1
Spring Creek	1000 East intersection	Roundabout	2
Spring Creek Parkway	Safety and speed at 450 North T-intersection	Traffic calming - narrow lanes, bike lanes, and curb extension	1
Spring Creek Parkway	Pedestrian safety at Brookside Park (29 Springcreek Pkwy)	Traffic calming - mid-block crosswalk and curb extensions	2
Spring Creek	Intersection improvement at 100 West	Roundabout	1
Spring Creek Parkway	Congestion and safety near the Charter School	Traffic calming - narrow lanes, bike lanes, and curb extension	1
Gateway Drive	Gold Course Road intersection congestion and safety concerns	Signalized intersection	1
Gateway Drive	100 North roundabout pedestrian safety concerns	Traffic calming - RRFB lights	2
100 North	Main St/SR-165 Intersection approach, safety concerns	Raised median preventing strategic driveway exiting left turns	3
100 North	Zollinger Park parking, safety concern	Switch to parallel parking with 100 North build out to 5-lanes	3
100 North	200 West T-intersection, congestion concerns	Install Continuous Green T-intersection (CGT), accommodate build out of 100 North to 5 lanes	1
100 North	100 West intersection congestion concerns	Roundabout	2
100 North	100 East pedestrian safety	Traffic calming - narrow lanes, intersection gateway curb extensions	2
100 North	300 East, safety concern	Traffic calming - narrow lanes, intersection gateway curb extensions	2
100 East	Center St to 100 N congestion and maintenance	Traffic calming - narrow lanes. Provide bus parking.	2
100 East	100 N to 360 N, safety and maintenance	Traffic calming - narrow lanes, curb extensions	3
Center Street	Main St to 100 E speeding concerns	Traffic calming - narrow lanes, bike lanes, and curb extension	3
200 N	300 East intersection, operation concern	Roundabout	1
300 East	Center St to 100 North, pedestrian safety	Complete sidewalk	1
Main St	200 S to 100 s, speeding concern	Traffic calming - narrow lanes, bike lane	2
200 S	200 West to Main St, pedestrian safety	Complete sidewalk	1
100 S	200 W intersection, congestion	Build out 100 S and align intersection	1
300 South	Gateway Drive intersection, pedestrian and congestion concerns	Roundabout	1
300 South	200 West intersection, congestion and safety	Roundabout	1
300 S	East of 200 West, congestion and maintenance	Build out to 2-lane residential street with bike lanes. Connect 100 East to 300 East	2
500 South	200 West, pedestrian safety	Traffic calming, narrow lanes, curb extension, add crosswalk	2
Canyon Road	100 East to 300 East, pedestrian and bicycle safety	Multi-use separated bike and pedestrian trail	1
Canyon Road	400 East to Canyon, speeding concern	Traffic calming - narrow lanes, bike lanes, curb extension	2
Grandview Dr	Foothill to 1000 South, pedestrian safety concern	Continuous sidewalk	3
Grandview Dr	Foothill to 1000 South, congestion	Build out to residential cross section	3
Grandview Dr	1000 S intersection, safety concern	Stop sign on minor approach to T-intersection	1
1000 S	Forgotten Ln	Stop sign on minor approach to T-intersection	1
1000 S	300 East to Grandview Dr	Traffic calming - residential road build out, stripe narrow lanes	1

Appendix B – Traffic Analysis Zones

CMPO Data Modifications referenced in Chapter 4.

Table 5: Predicted 2030 and 2050 Population Data for Providence TAZs

Project ID	2020 Population	2030 Pop change	2030 Population	2050 Pop Change	2050 Population
1	87	5	92	18	105
2	29	7	36	17	46
3	8	2	10	4	12
4	94	1	95	6	100
5	305	4	309	42	347
6	282	24	306	97	379
7	469	44	513	173	642
8	72	54	126	102	173
9	9	30	39	52	61
10	446	6	452	65	511
11	114	1	115	15	129
12	81	3	84	15	96
13	1525	778	2303	1634	3159
14	47	41	88	77	124
15	367	4	371	50	417
16	254	31.60	286	86	340
17	92	2	94	23	115
18	281	29	310	86	367
19	208	22	230	63	271
20	844	205	1049	536	1380
21	129	16	145	55	184
22	430	6	436	62	492
23	174	0	174	19	193
24	22	1	23	5	27
25	291	75	366	194	485
26	214	113	327	232	446
27	183	48	231	103	286
28	367	115	482	277	644
29	29	11	40	22	51
30	373	143	516	592	965
31	211	311	522	546	757
32	18	108	126	179	197

Recent developments are outpacing the estimated growth in TAZ 9 and 13. The two regions are anticipated to have accelerated growth after construction of a privately funded roadway running through the area. The method used to calculate new growth rate in this case involved using the Developable Area in the TAZ as defined in Acres. This Area was divided into typical quarter acres plots to determine a full build-out Potential. A factor was then determined to assess how far into development the area- is anticipated to grow by 2050, and growth rates were then applied and modeled to adjust for the unaccounted growth. See Tables 6 and 7 for information regarding the adjustments to growth made. Figure 36 provides a GIS mapping from CMPO for the designated TAZs within the City. The TAZs are set by the CMPO. The CMPO also uses the TAZs to identify developable land and anticipated changes to population and business growth.

Table 6: Adjusted Developable Areas

Calculated Properties				
Project ID	**Max Pop**	**Max Homes**	**Developable Acres**	**Household Size**
9	1006	294	84.08	3.42
13	6234	1914	547.00	3.26

Table 7: Development with Accelerated Growth

	Original Data				Alternative Estimates			
Project ID	**2020 Pop**	**2030 Pop**	**2050 Pop**	**2050 Total Homes**	**2020 Alt Start**	**2030 Alt Pop**	**2050 Alt Pop**	**Alt Yearly Growth Rate**
9	9	38.91	61.45	18	85	192	982	8.50%
13	1525	2302	3159	970		2439	6234	4.80%

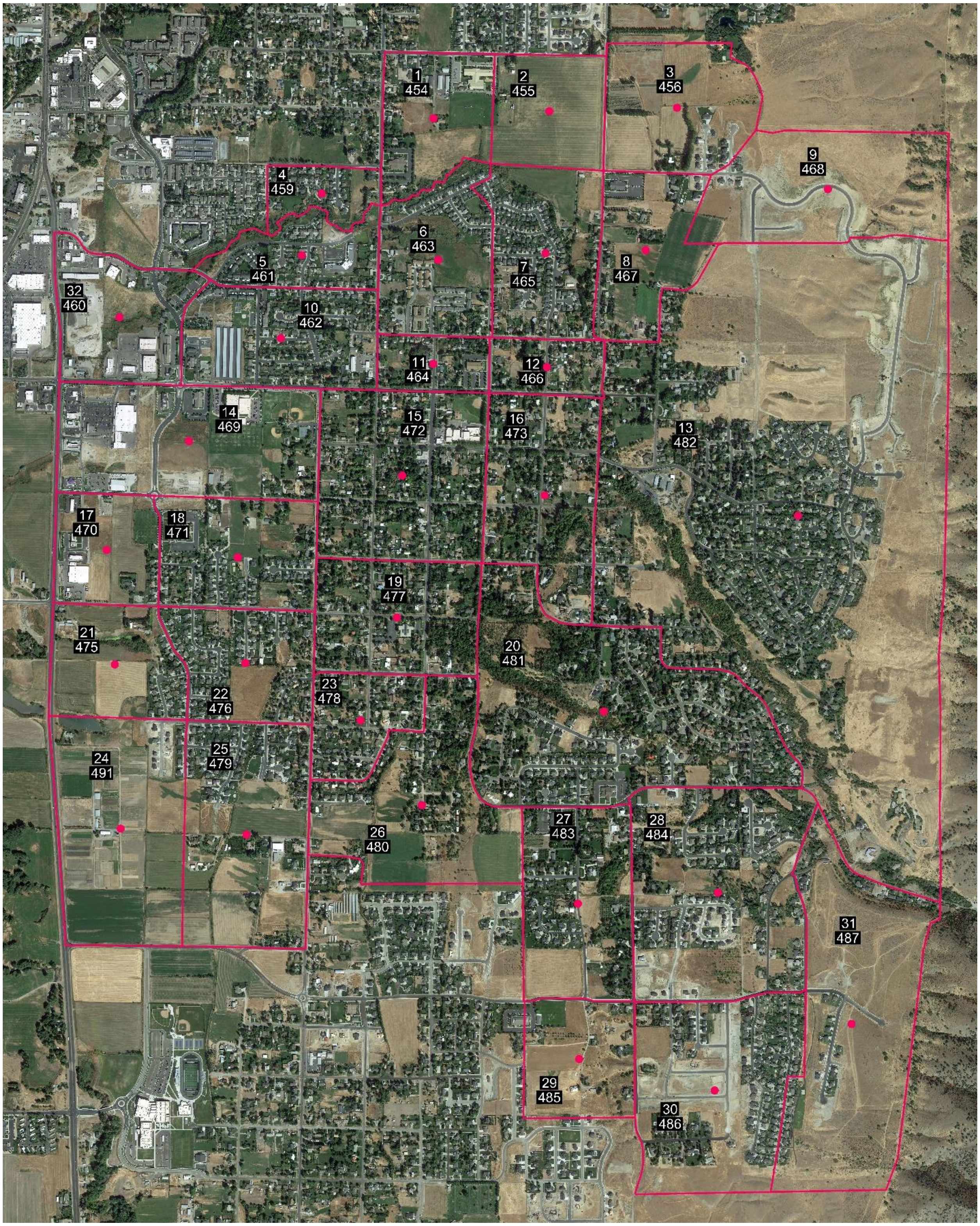

Figure 36: Transportation Analysis Zones (TAZs) Encompassing Providence City

Table 9 provides a list of TAZs found within Providence City boundaries as assigned by the CMPO (TAZ ID). The table provides the total acres as well as potential developable acreage which is used in determining traffic generated from those developments.

Table 8: Transportation Analysis Zones Around Providence City

Project ID	TAZ ID	Acres	Developable Acres	Total Households	Total Population	Household Size (avg)	City Name
1	454	49.15	49.15	23	86	3.72	River Heights
2	455	43.73	43.73	4	27	6.39	River Heights
3	456	64.18	56.26	3	8	2.43	River Heights
4	459	20.29	19.73	26	94	3.60	River Heights
5	461	37.25	35.98	106	308	2.90	Providence
6	463	59.64	53.67	135	283	2.10	Providence
7	465	65.08	63.95	132	469	3.56	Providence
8	467	52.51	52.51	27	67	2.52	Providence
9	468	89.18	84.08	0	0		Providence
10	462	67.38	67.38	157	449	2.86	Providence
11	464	21.70	21.70	34	115	3.35	Providence
12	466	22.31	22.31	26	81	3.10	Providence
13	482	585.64	547.00	450	1467	3.26	Providence
14	469	101.55	101.55	13	44	3.26	Providence
15	472	98.77	98.77	124	369	2.99	Providence
16	473	76.26	75.85	87	253	2.91	Providence
17	470	40.08	40.08	22	93	4.18	Providence
18	471	60.56	60.56	67	281	4.20	Providence
19	477	64.92	64.92	69	208	3.01	Providence
20	481	174.88	167.35	242	832	3.44	Providence
21	475	49.70	49.37	30	129	4.24	Providence
22	476	53.55	53.55	100	432	4.29	Providence
23	478	33.87	33.87	60	176	2.92	Providence
24	491	100.29	98.12	7	23	3.17	Millville
25	479	97.54	97.54	80	286	3.56	Millville
26	480	93.57	92.22	77	205	2.67	Providence
27	483	73.54	73.32	49	181	3.70	Providence
28	484	126.57	108.13	108	358	3.32	Providence
29	485	45.46	45.23	11	28	2.67	Providence
30	486	103.60	103.03	94	364	3.86	Providence
31	487	134.19	125.14	45	186	4.10	Providence
32	460	56.79	56.23	3	14	3.88	Providence

Appendix C – Traffic Models

Figures 37 to 56 provide snap shots of the traffic simulation model that include vehicle movement counts, intersection capacity utilized, and LOS at key intersections.

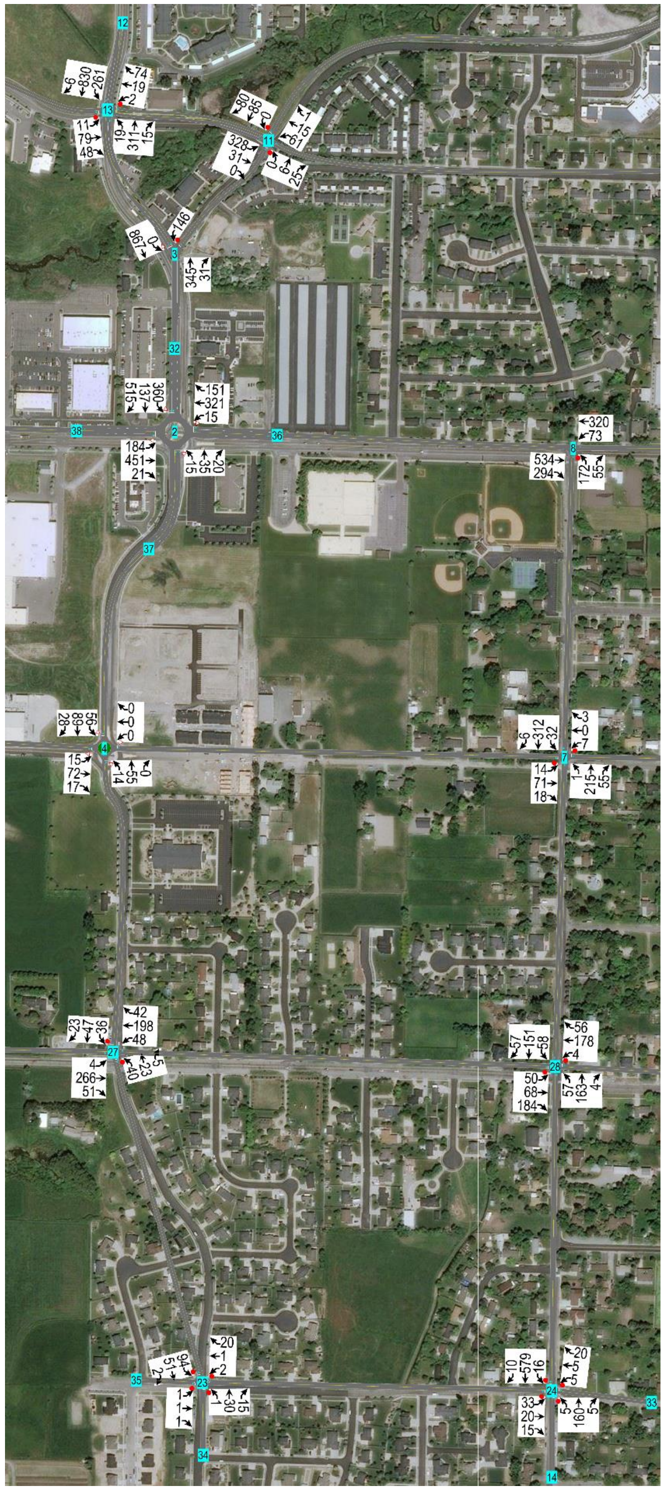

Figure 37: 2030 model with node numbers and anticipated traffic (West).

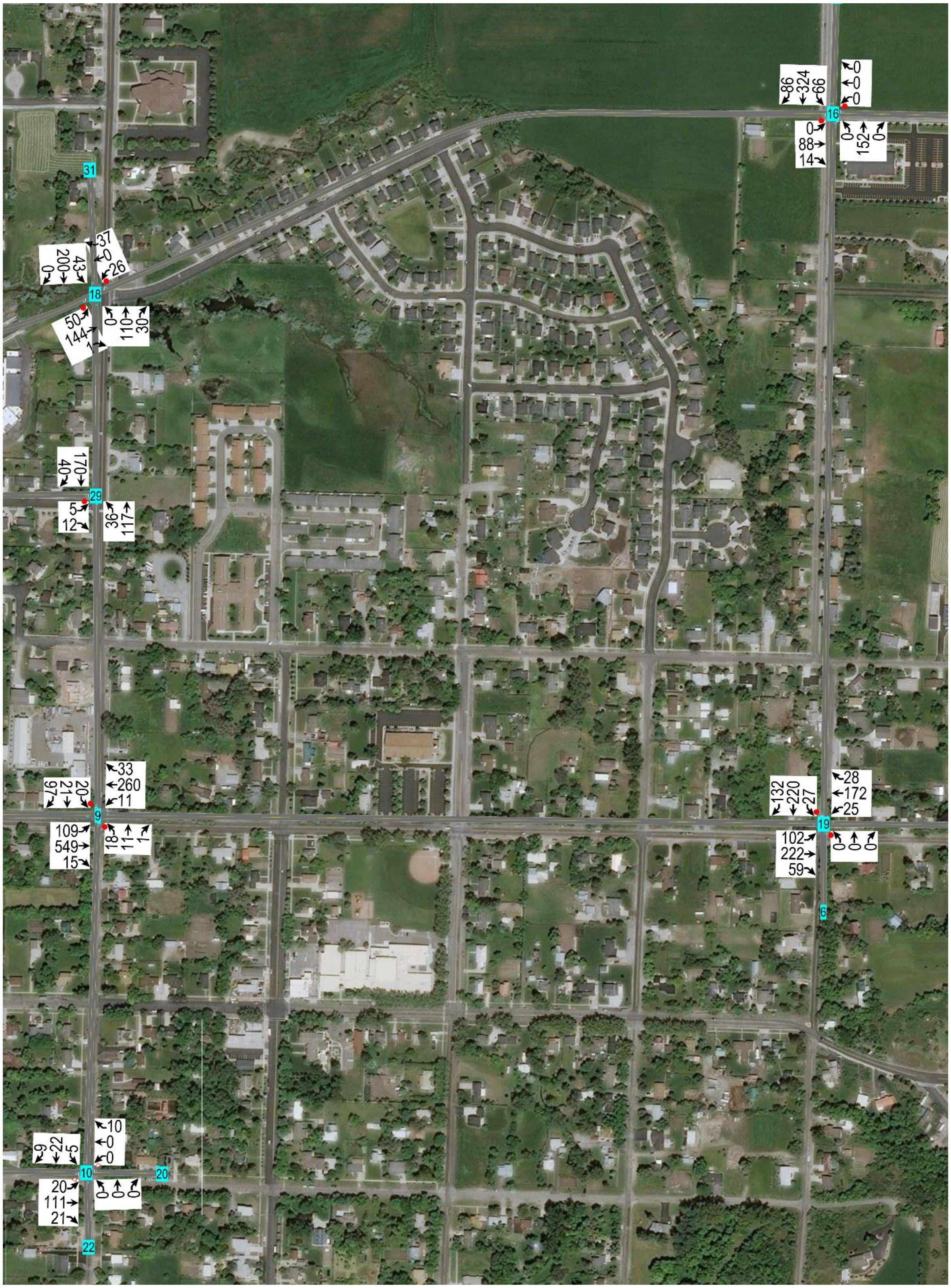

Figure 38: 2030 model with node numbers and anticipated traffic (East).

Figure 39: 2030 model with Intersection Capacity Utilized (ICU) expressed as a percent (West).

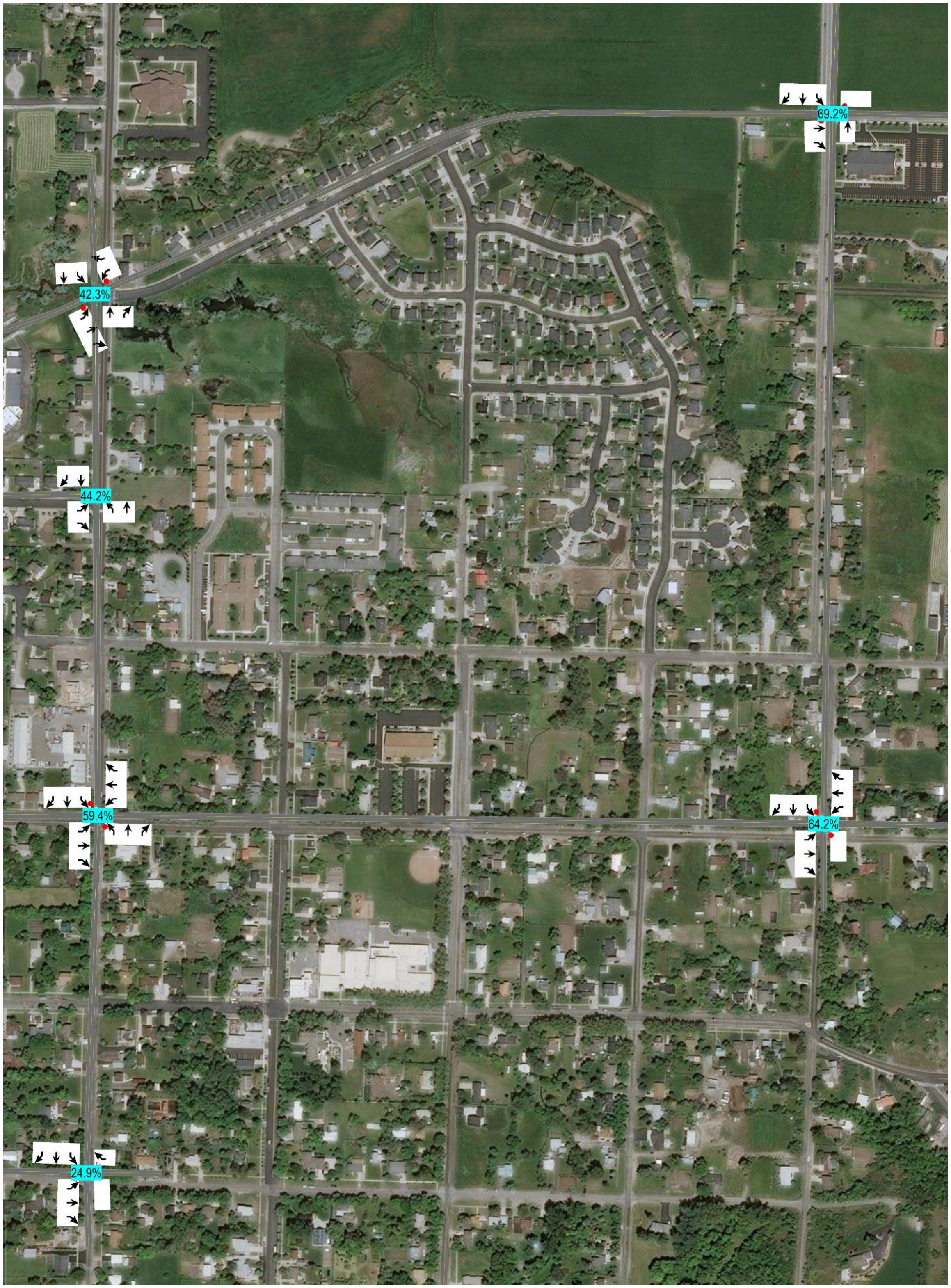

Figure 40: 2030 model with Intersection Capacity Utilized expressed as a percent (East).

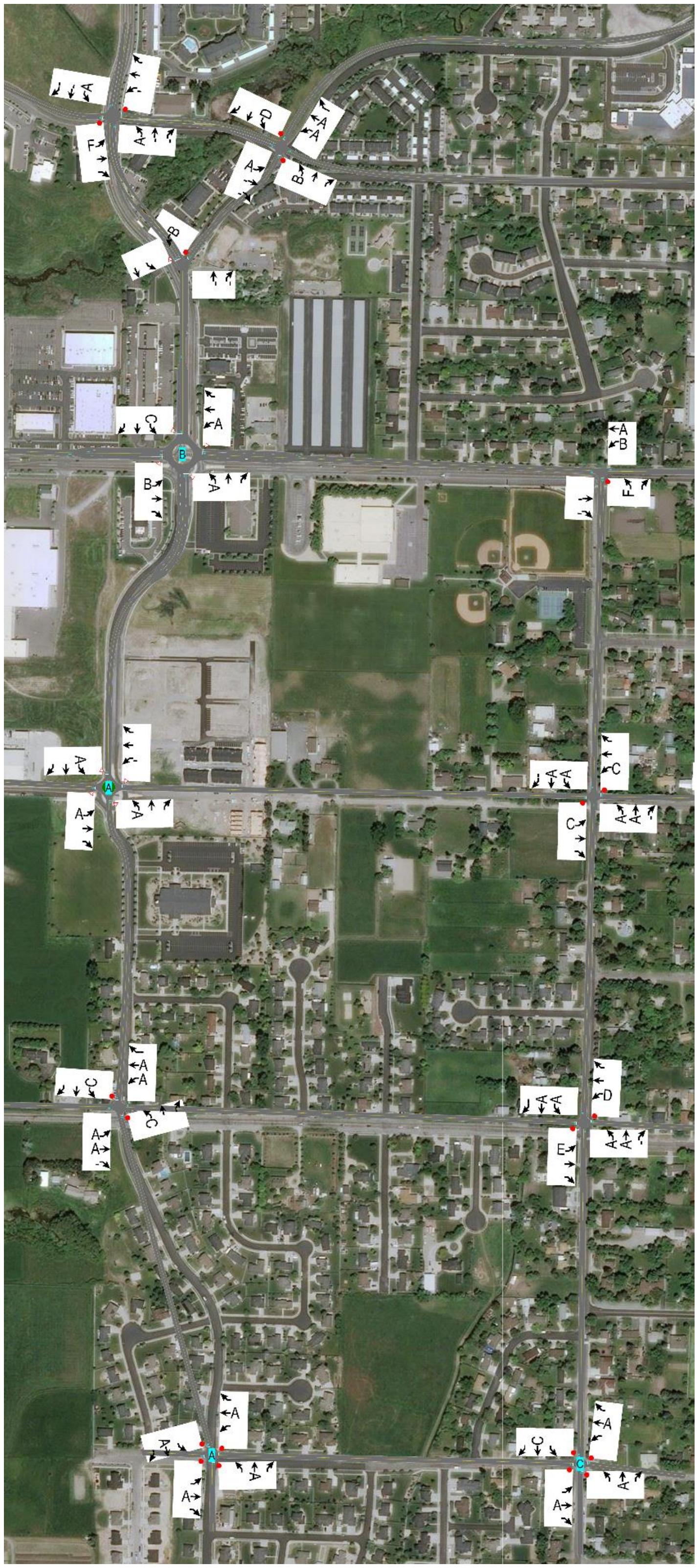

Figure 41: 2030 model with intersection movement LOS (West).

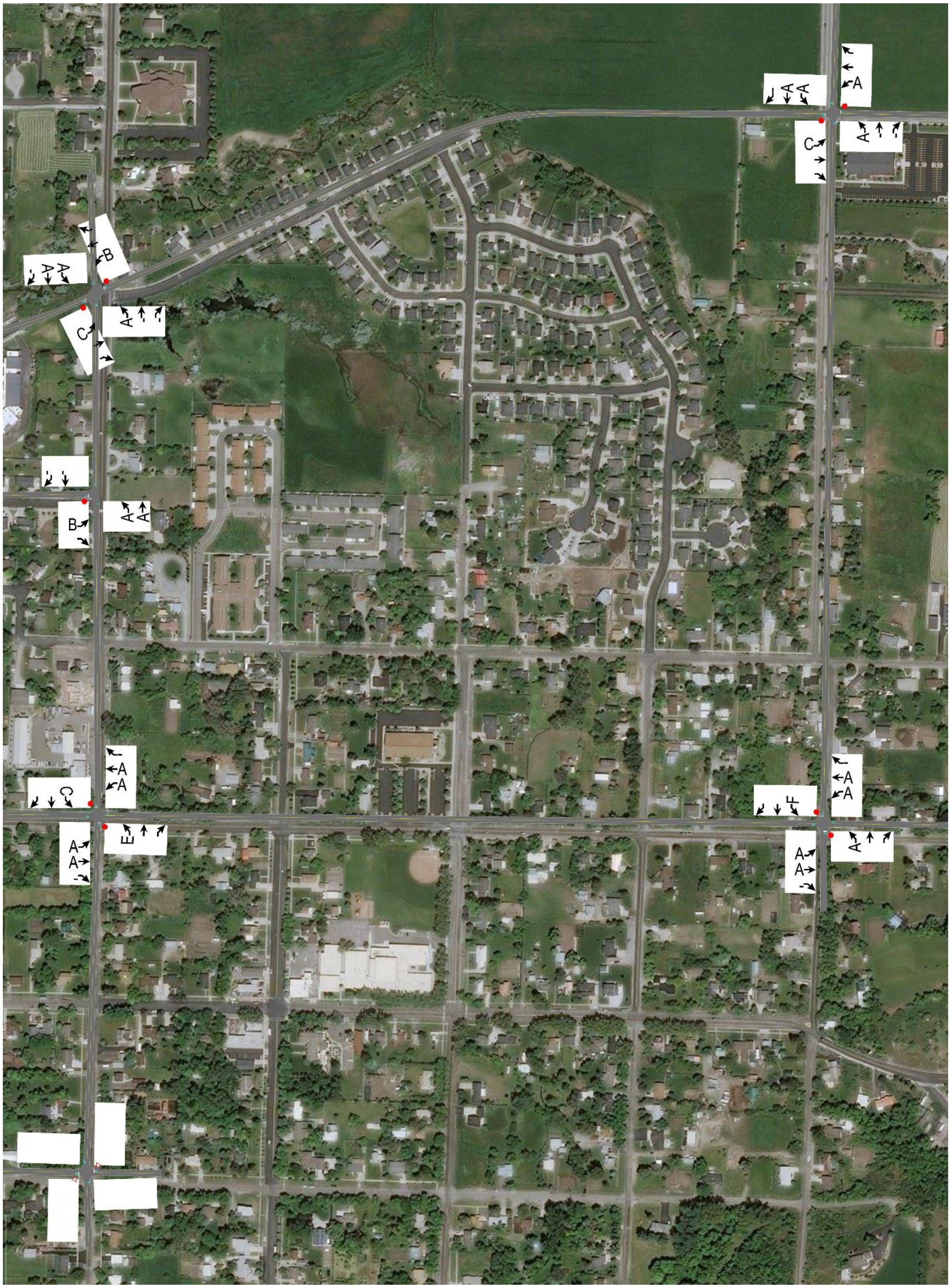

Figure 42: 2030 model with intersection movement LOS (East).

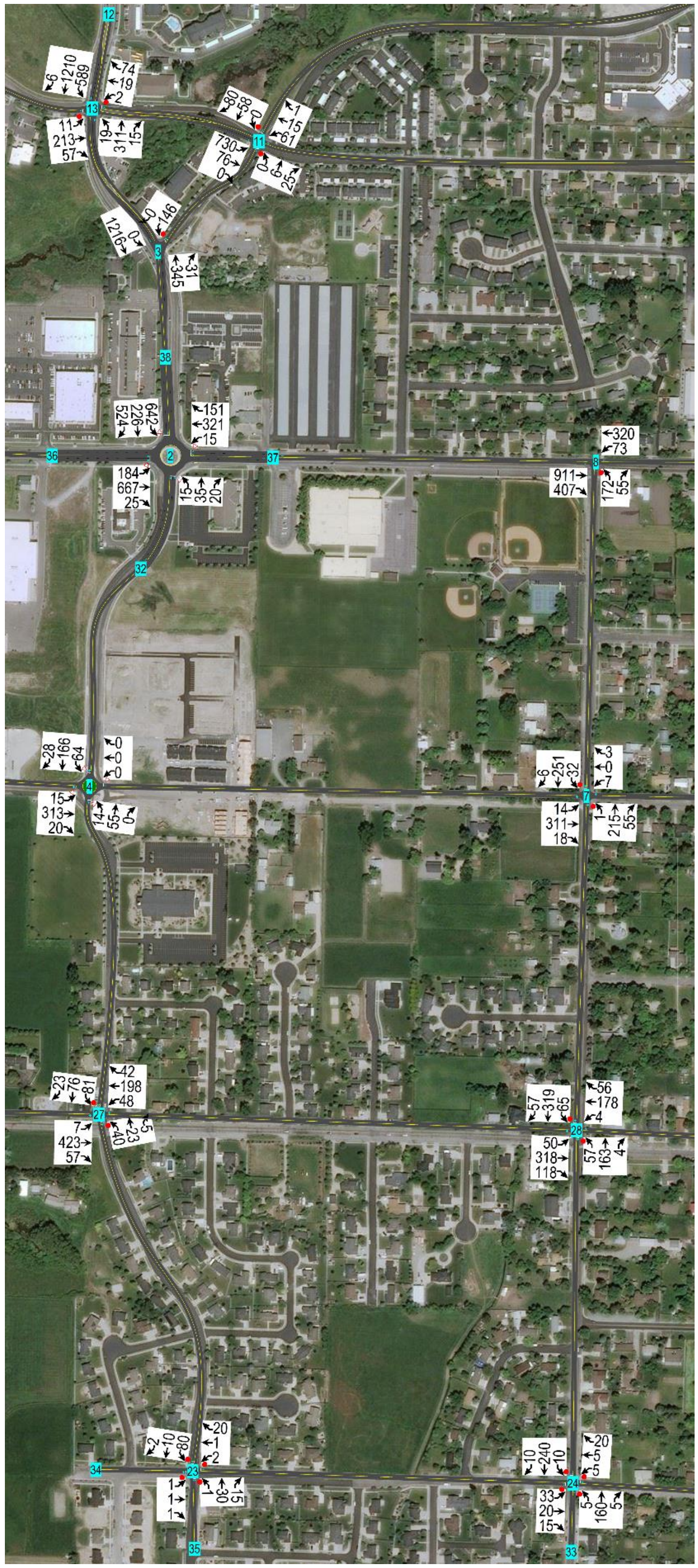

Figure 43: 2050 model with anticipated traffic (West).

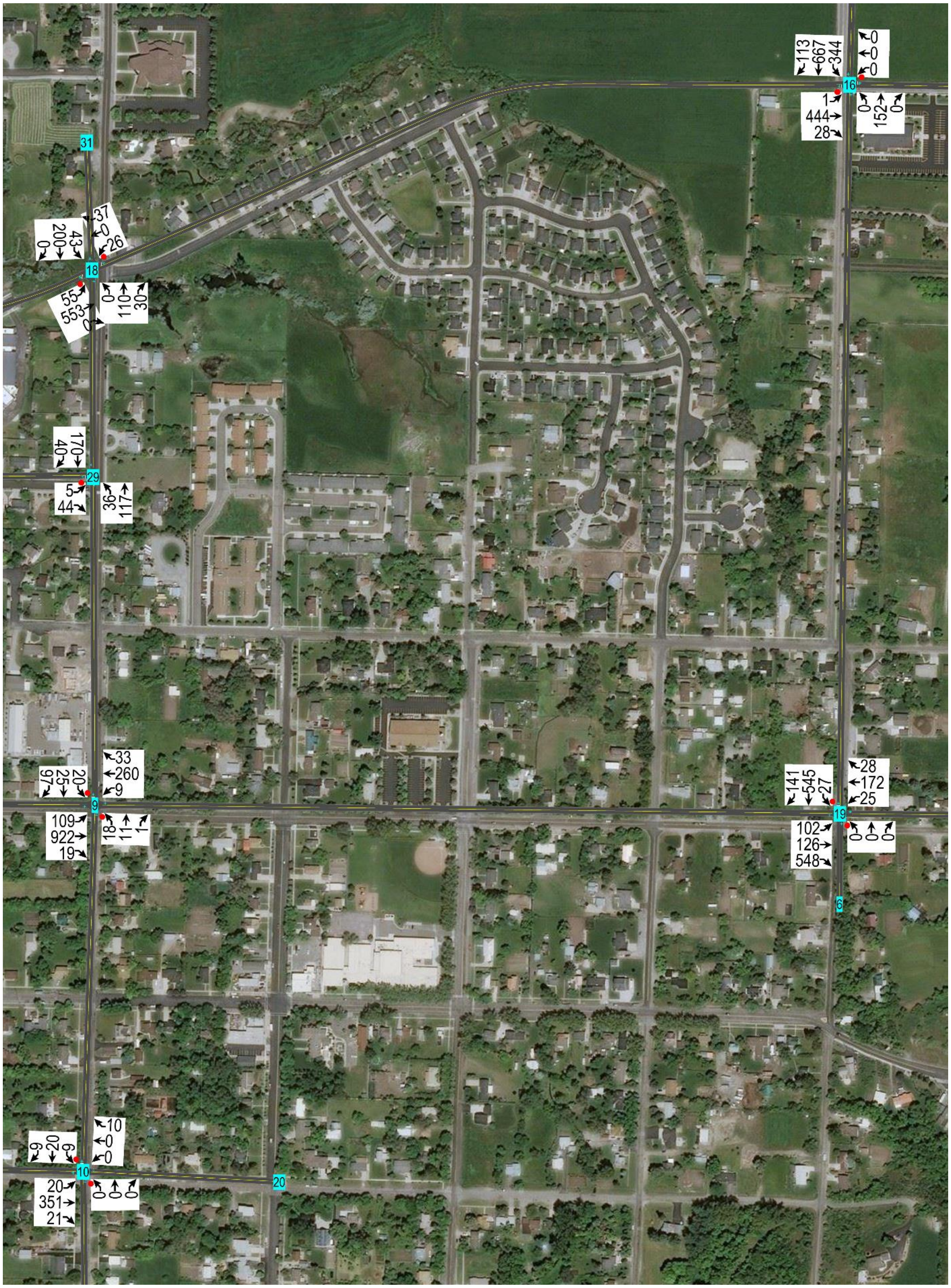

Figure 44: 2050 model with anticipated traffic (East).

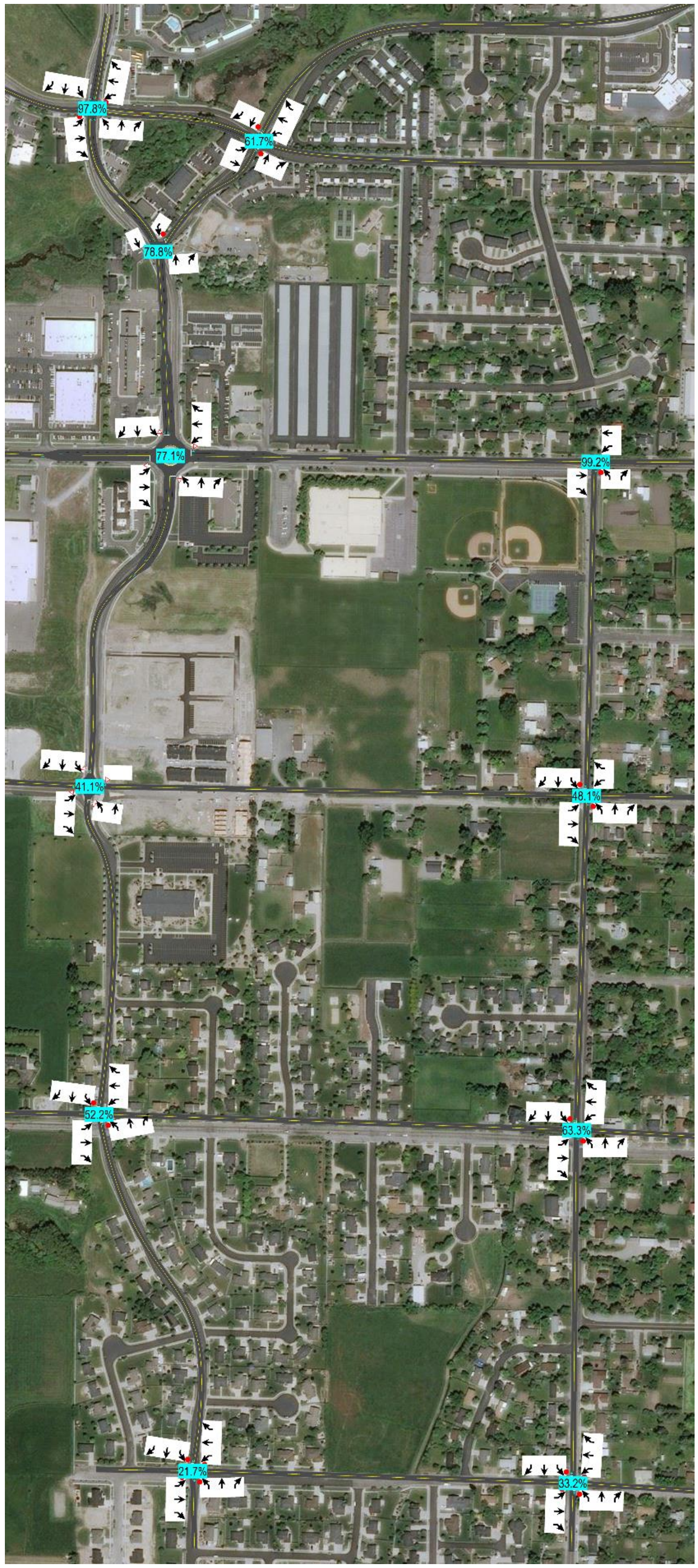

Figure 45: 2050 model with Intersection Capacity Utilized expressed as a percent (West).

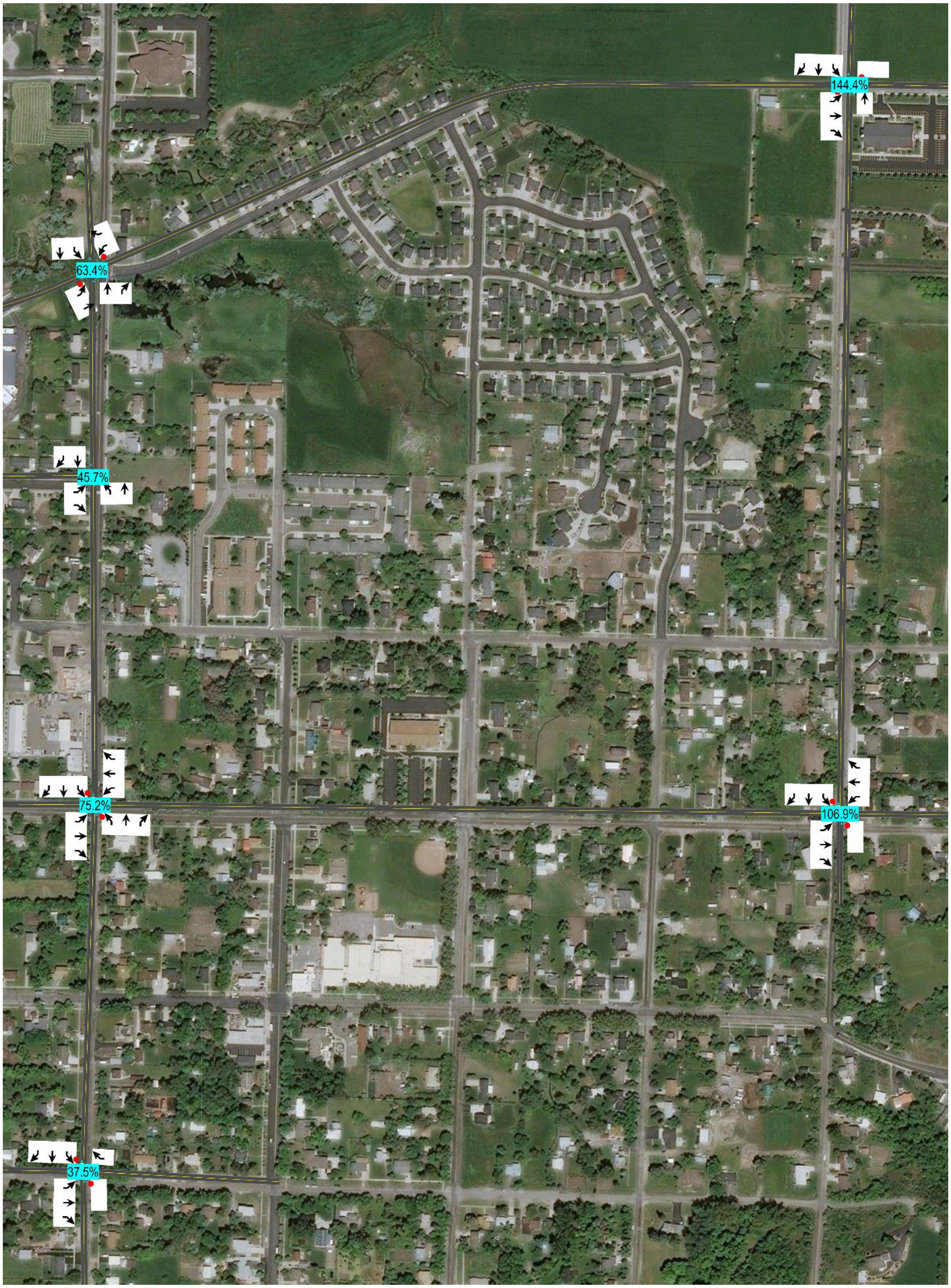

Figure 46: 2050 model with Intersection Capacity Utilized expressed as a percent (East).

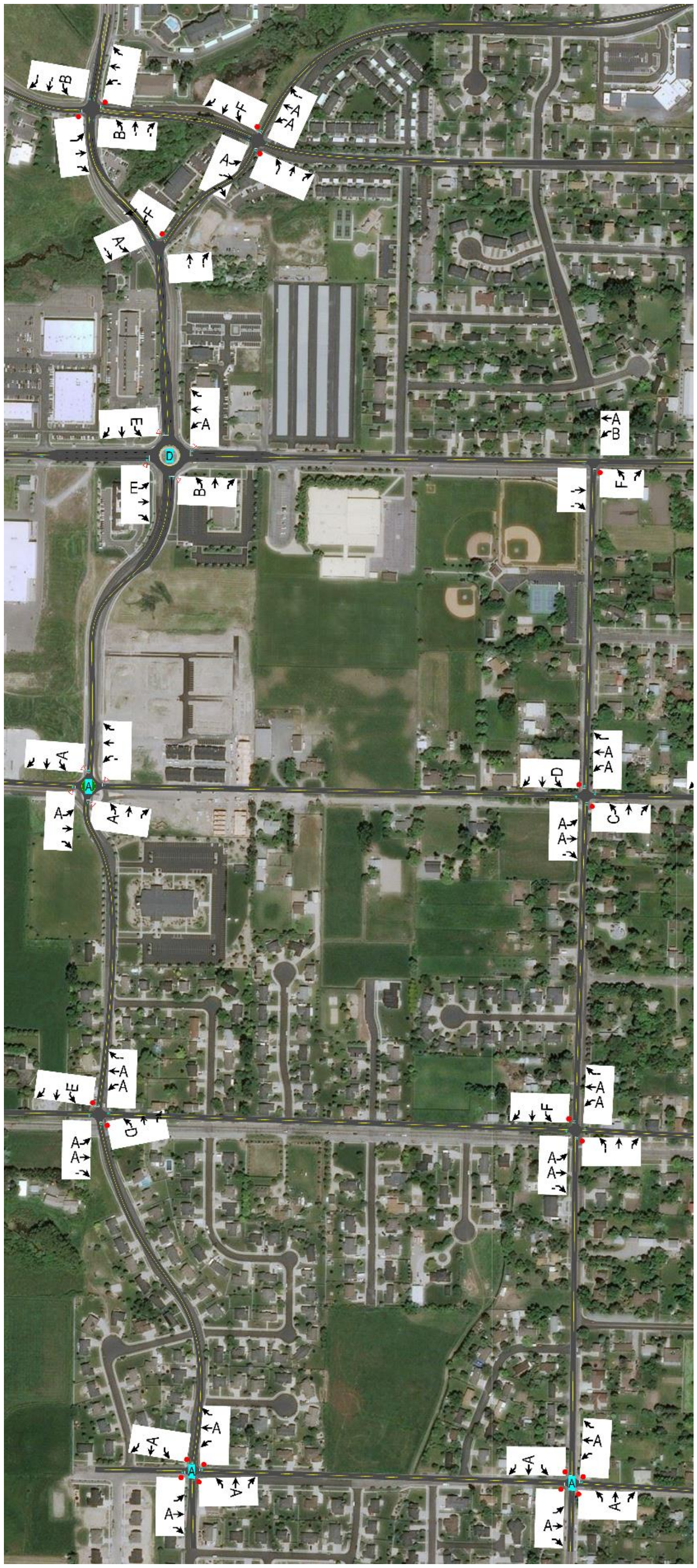

Figure 47: 2050 model with turning movement LOS (West).

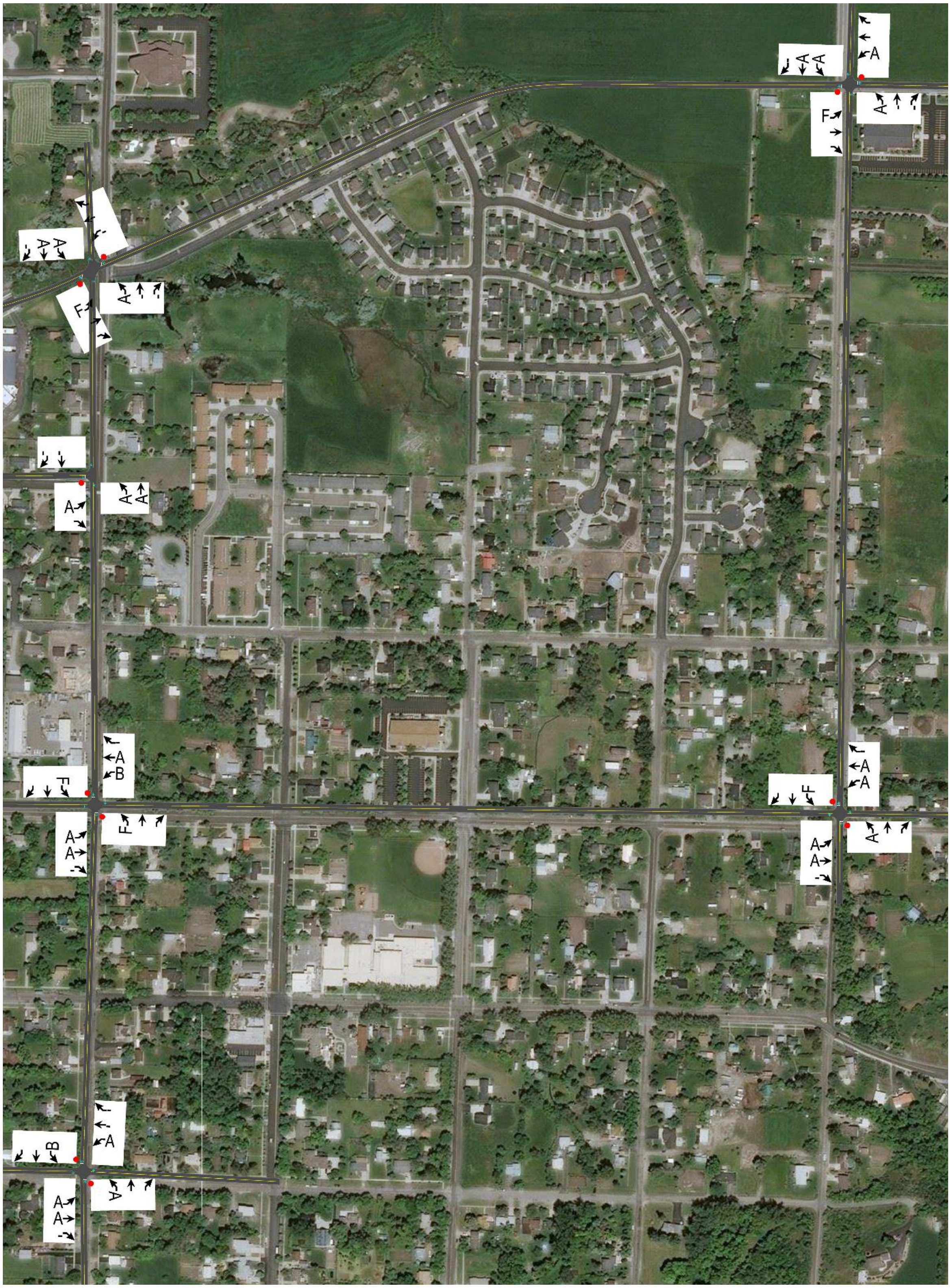

Figure 48: 2050 model with turning movement LOS (East).

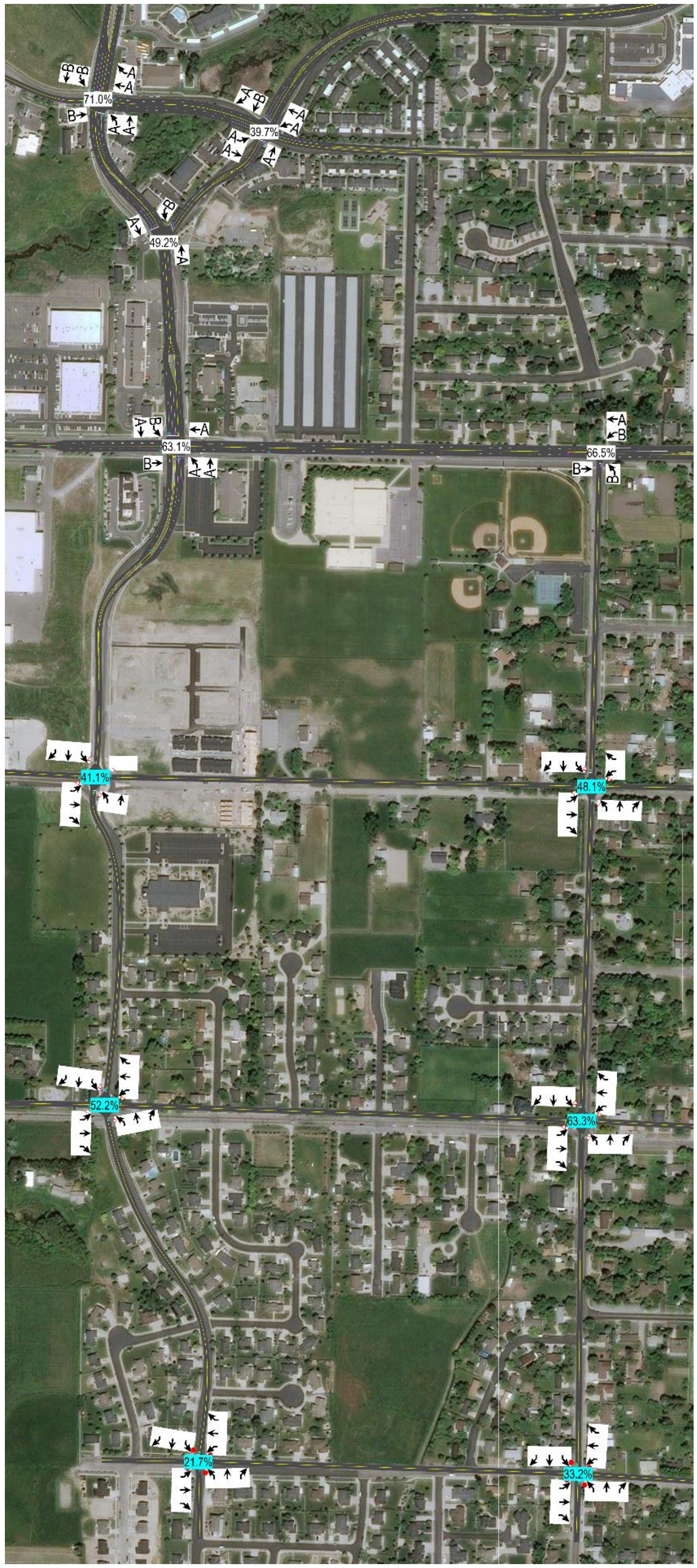

Figure 49: 2050 model with Intersection Capacity Utilized expressed as a percent (West).

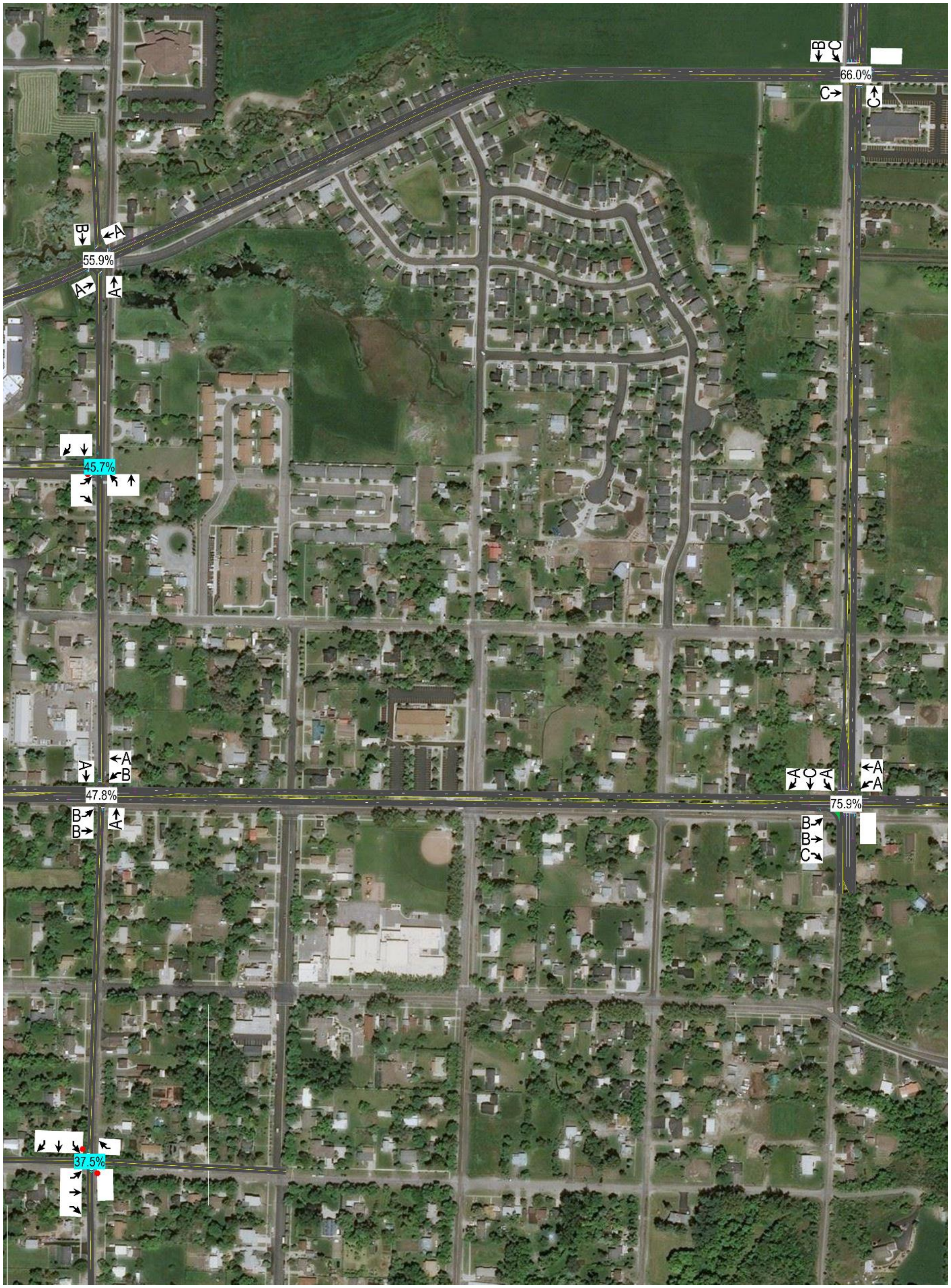

Figure 50: 2050 model with Intersection Capacity Utilized expressed as a percent (East).

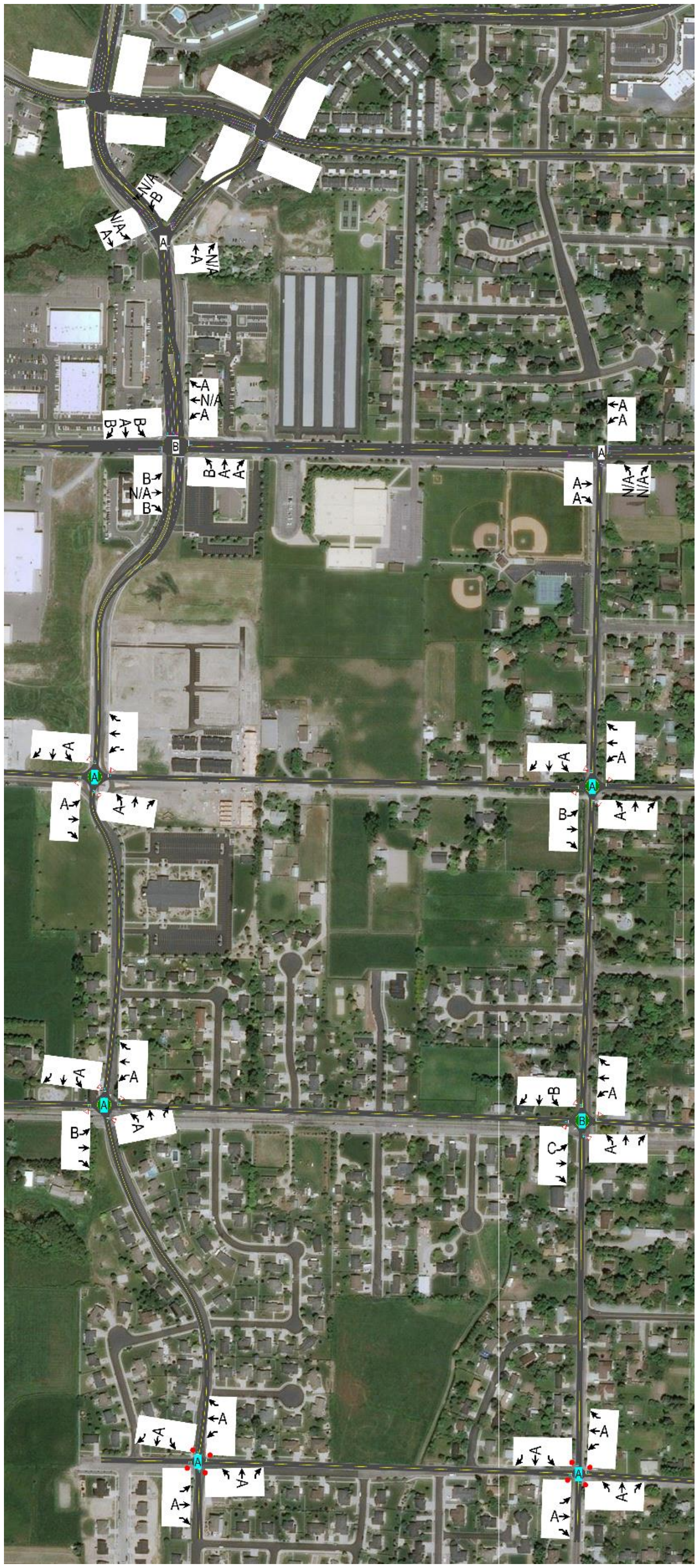

Figure 51: 2050 model with turning movement LOS (West).

Figure 52: 2050 model with turning movement LOS (East).

Figure 53: 2030 model with Intersection Capacity Utilized expressed as a percent (West).

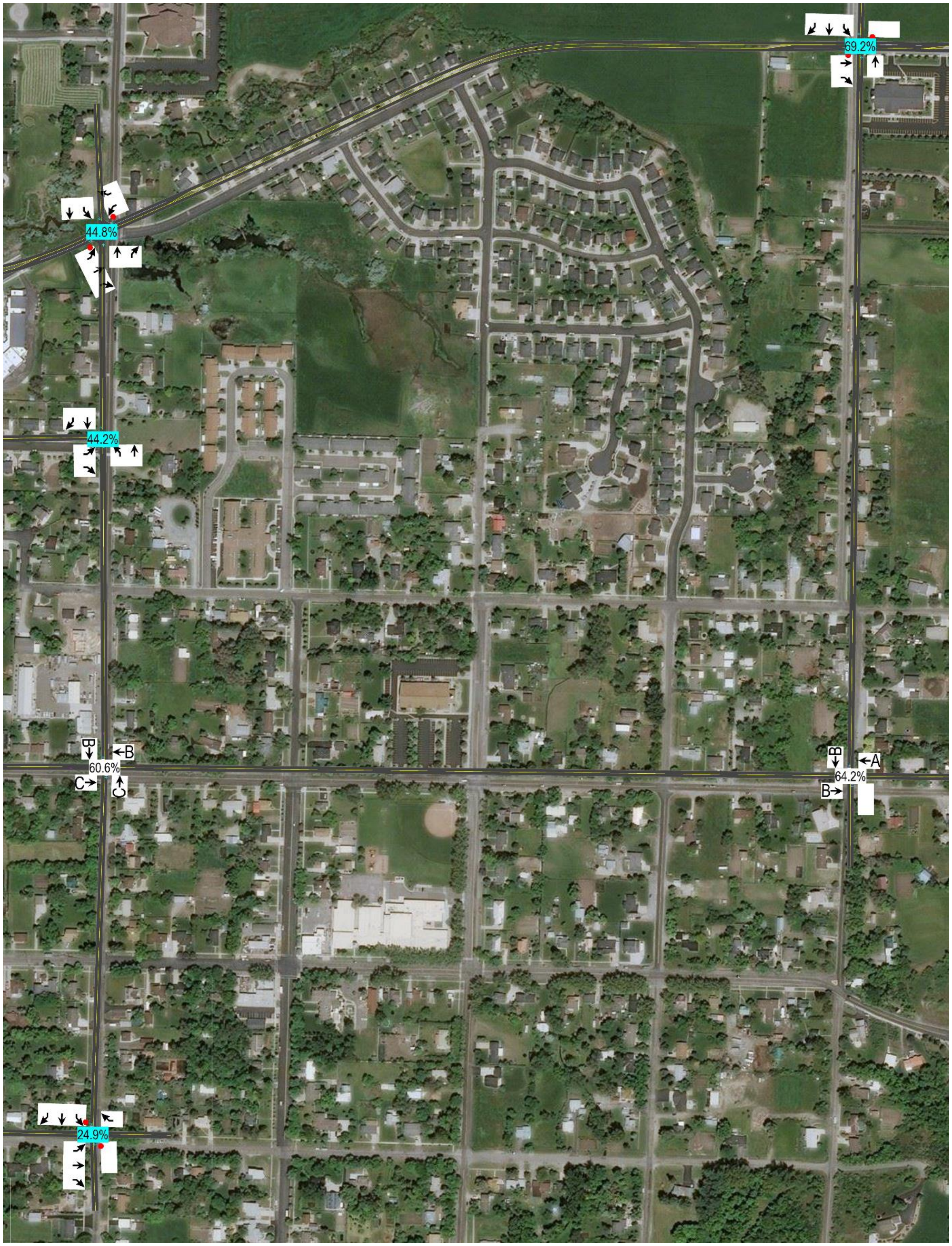

Figure 54: 2030 model with Intersection Capacity Utilized expressed as a percent (East).

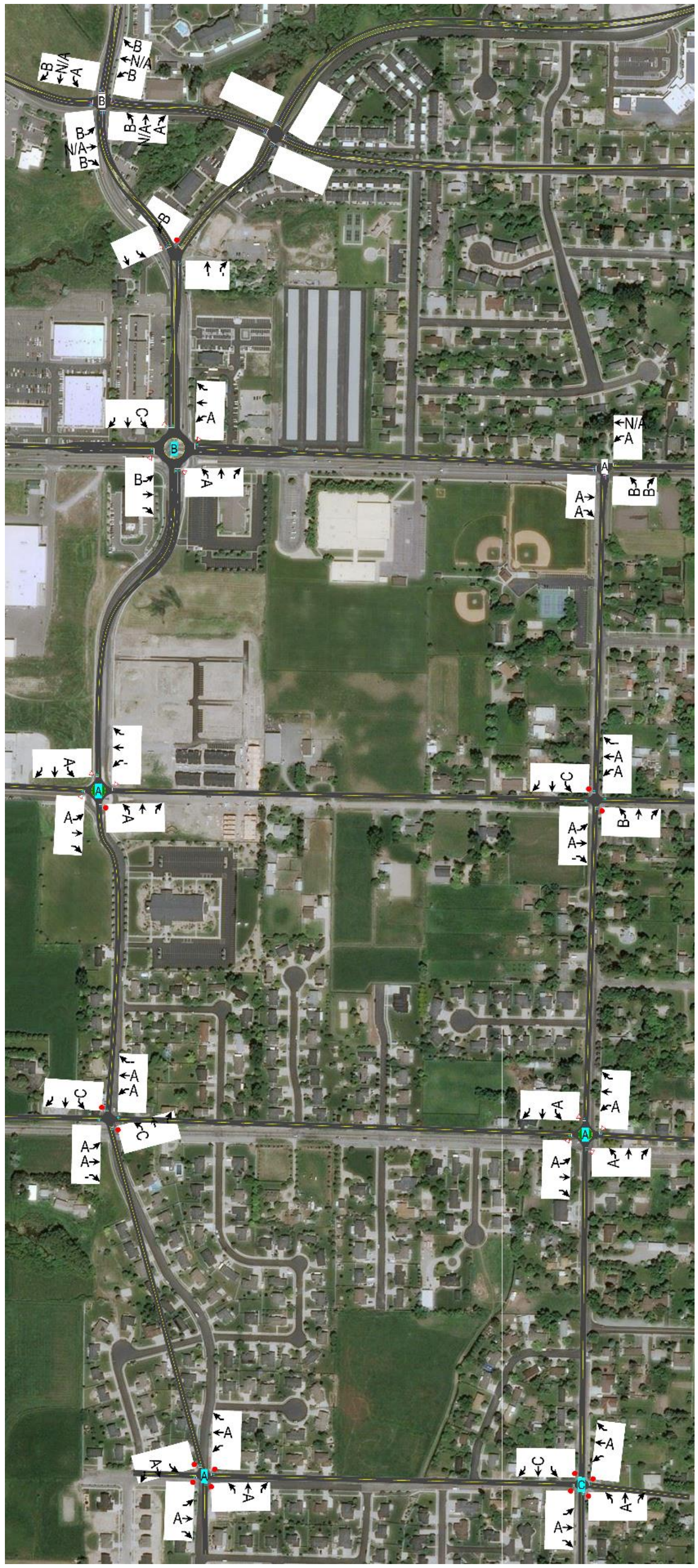

Figure 55: 2030 model with intersection LOS (West).

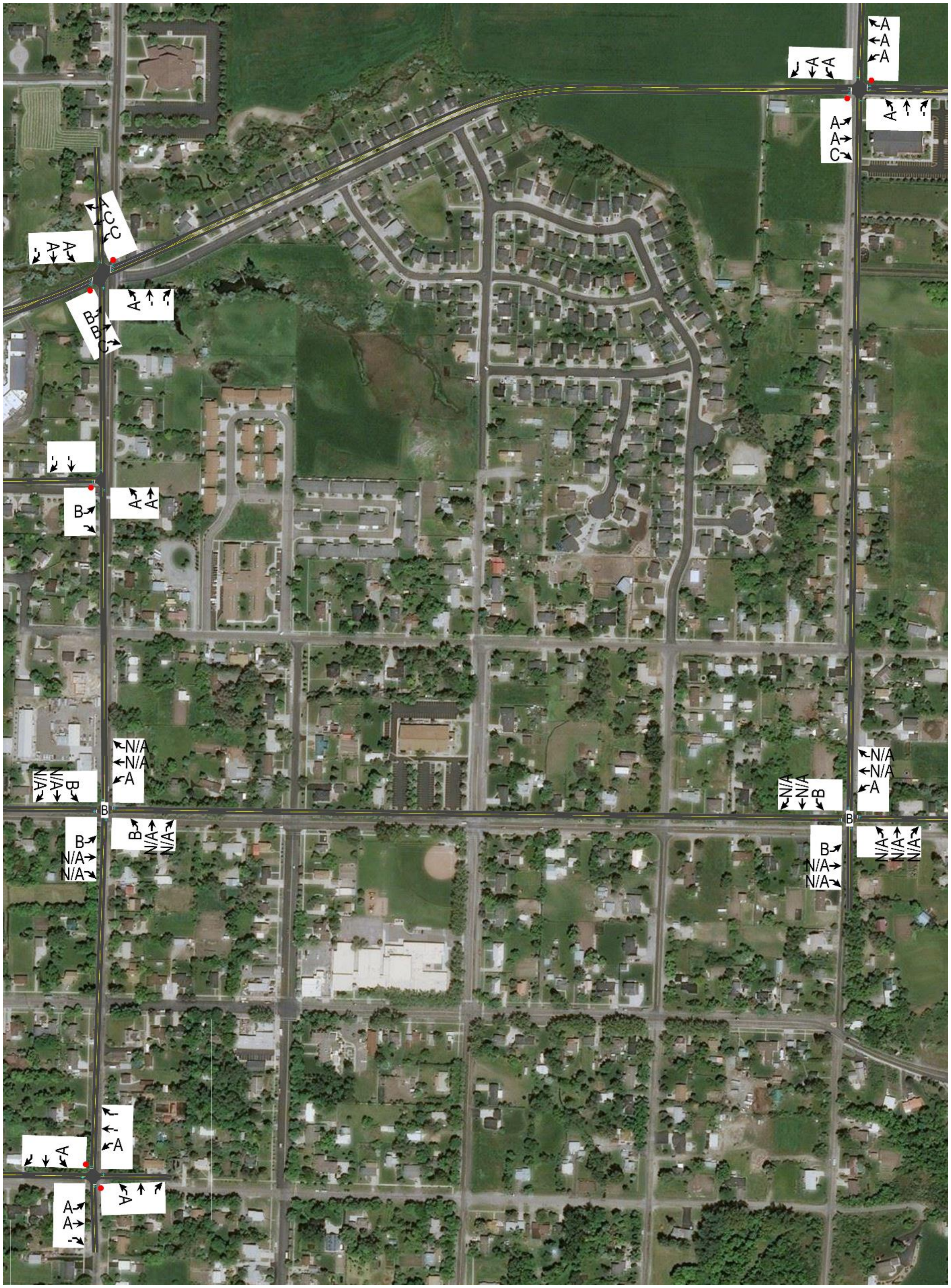

Figure 56: 2030 model with intersection LOS (East).