

Ordinance 2020-11

SHORT TITLE:

An ordinance amending the Provo City General Plan relating to The Transportation Master Plan. Citywide application. (PLGPA20200038)

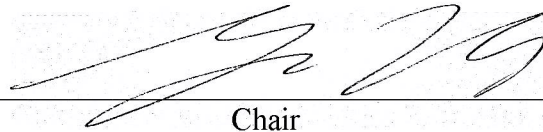
I

PASSAGE BY MUNICIPAL COUNCIL

ROLL CALL

DISTRICT	NAME	FOR	AGAINST	OTHER
CW 1	DAVID SEWELL	✓		
CW 2	DAVID SHIPLEY	✓		
CD 1	BILL FILLMORE	✓		
CD 2	GEORGE HANDLEY	✓		
CD 3	SHANNON ELLSWORTH	✓		
CD 4	TRAVIS HOBAN	✓		
CD 5	DAVID HARDING	✓		
TOTALS		7		

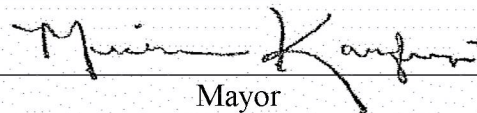
This ordinance was passed by the Municipal Council of Provo City, on the 14th day of April 2020, on a roll call vote as described above. Signed this 28th day of April 2020.


Chair

II

APPROVAL BY MAYOR

This ordinance is approved by me this 28th day of April 2020.


Mayor

Ordinance 2020-11

III

CITY RECORDER'S CERTIFICATE AND ATTEST

This ordinance was signed and recorded in the office of the Provo City Recorder on the 28th day of April 2020, with a short summary being published on the 18th day of April 2020, in The Daily Herald, a newspaper circulated in Provo, Utah. I hereby certify and attest that the foregoing constitutes a true and accurate record of proceedings with respect to Ordinance Number 2020-11.



Amanda Grambrack

City Recorder

1 ORDINANCE 2020-11.

2
3 AN ORDINANCE AMENDING THE PROVO CITY GENERAL PLAN
4 RELATING TO THE TRANSPORTATION MASTER PLAN. CITYWIDE
5 APPLICATION. (PLGPA20200038)
6

7 WHEREAS, it is proposed that the Provo City General Plan be amended to adopt the
8 2020 Transportation Master Plan; and
9

10 WHEREAS, on February 26, 2020, the Planning Commission held a duly noticed public
11 hearing to consider the proposed amendment, and after such meeting, the Planning Commission
12 recommended approval to the Municipal Council by a vote of 4:1; and
13

14 WHEREAS, on March 10, 2020, March 31, 2020, and April 14, 2020, the Municipal
15 Council met to ascertain the facts regarding this matter and receive public comment, which facts
16 and comments are found in the public record of the Council's consideration; and
17

18 WHEREAS, after considering the Planning Commission's recommendation and facts and
19 comments presented to the Municipal Council, the Council finds (i) Provo City Code should be
20 amended as described herein and (ii) the proposed amendment reasonably furthers the health,
21 safety and general welfare of the citizens of Provo City.
22

23 NOW, THEREFORE, be it ordained by the Municipal Council of Provo City, Utah, as
24 follows:
25

26 PART I:
27

28 The Provo City General Plan is amended with the adoption of the 2020 Transportation
29 Master Plan, which has been provided to the Municipal Council, is available to the public at
30 Council offices, and at the time of the passage of this ordinance [was](#) as shown in Exhibit A.
31

32 PART III:
33

- 34 A. If a provision of this ordinance conflicts with a provision of a previously adopted
35 ordinance, this ordinance shall prevail.
36
37 B. This ordinance and its various sections, clauses and paragraphs are hereby
38 declared to be severable. If any part, sentence, clause or phrase is adjudged to be
39 unconstitutional or invalid, the remainder of the ordinance shall not be affected
40 thereby.
41
42 C. The Municipal Council hereby directs that the official copy of the Provo City
43 Code be updated to reflect the provisions enacted by this ordinance.
44

45 D. This ordinance shall take effect immediately after it has been posted or published
46 in accordance with Utah Code 10-3-711, presented to the Mayor in accordance
47 with Utah Code 10-3b-204, and recorded in accordance with Utah Code 10-3-713.

48
49 END OF ORDINANCE.

51
52
53

Exhibit A

[Due to document format, this exhibit will be attached at a later time.]



PROVO CITY
Transportation Master Plan
2020



Acknowledgements

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Isaac Paxman, Deputy Mayor

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Bill Fillmore, Council Member

George Handley, Council Member

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Township + Range

Tim Sullivan

About Parametrix

Parametrix is a 100-percent employee-owned firm dedicated to providing high quality, client-oriented planning, engineering, and environmental consulting services. Founded in Washington in 1969, Parametrix has 14 offices located in the Western U.S. with a staff of 500 professionals providing multidisciplinary services in transportation, environmental planning and compliance, water resources, and community building. The Utah office of Parametrix serves the transportation planning and traffic engineering markets in Utah and the Intermountain West. Parametrix offers clients the best of both worlds: a local office with demonstrated success that understands client needs supplemented by a national firm with resources and expertise in a wide range of transportation-related skills.

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List of Abbreviations and Acronyms

AADT	Average Annual Daily Traffic
AT	Active Transportation
ATRI	American Transportation Research Institute
BRT	Bus Rapid Transit
BYU	Brigham Young University
C/AV	Connected/Autonomous Vehicles
CFP	Capital Facilities Plan
CSD	Context Sensitive Design
CSS	Context Sensitive Solutions
DOT	Department of Transportation
DSRC	Dedicated Short-Range Communications
GPS	Global Positioning System
H.B.	House Bill
ICM	Integrated Corridor Management
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation Systems
LOS	Level of Service
LTE	Long-Term Evolution
MAG	Mountainland Association of Governments
MPO(s)	Metropolitan Planning Organization(s)
ROW	Right-of-way
SAE	Society of Automotive Engineers
SR	State Route
TAZ	Traffic Analysis Zone
TDM	Transportation Demand Management
TMAC	Transportation Mobility and Advisory Committee
TMP	Transportation Master Plan
TSM	Transportation System Management
UDOT	Utah Department of Transportation
US	United States
USC	United States Code
UTA	Utah Transit Authority
UVX	Utah Valley Express
V2I	Vehicle-to-Infrastructure
V2V	Vehicle-to-Vehicle
WFRC	Wasatch Front Regional Council

Chapter 1 – Introduction

Provo City is located in Utah County and is Utah’s third largest city with approximately 117,335 residents, according to the U.S. Census Bureau. Provo is surrounded by Orem City to the north, Springville City to the south, Utah Lake to the west, and the Wasatch Mountain Range to the east. Portions of unincorporated Utah County are also adjacent to Provo, primarily on the west side of the city.

Provo continues to be a rapidly growing city with development on the west side as well as other residential and commercial developments throughout the city. Provo is the county seat for Utah County and provides numerous regional commercial and employment opportunities for much of the county. As such, its transportation system is heavily utilized by both residents and non-residents alike.

1.1 Purpose of Transportation Master Plan

The purpose of a transportation master plan (TMP) is to ensure that a coordinated, master planned effort is undertaken to plan for the transportation needs of the city given the current and future land use planning. Because of differing growth patterns, which are often unpredictable due to changing economic circumstances within the city and beyond, it becomes necessary to update the TMP periodically. Additionally, due to state law requirements to spend impact fees within a certain number of years, it is recommended that the TMP and capital facilities plan (CFP) process be updated every five years to remove completed projects from the impact fee facilities plan list and re-prioritize additional projects with any projects that have not been constructed.

1.2 Values, Goals, and Objectives

The Provo City General Plan, last updated in 2011, outlines several values, goals, and objectives for the future of Provo. Those that are relevant to transportation are listed below in Value IV.

Value IV. We value convenient access to all parts of our city with well-planned streets and neighborhoods.

4.1 Goal: Provide an Efficient and Integrated Transportation System

4.1.1 Objective: Evaluate existing traffic and the current transportation system.

4.1.2 Objective: Develop a Congestion Management Plan that will encourage flex-time, rideshare programs, alternative methods of parking, and discourage driving to work and school.

4.1.3 Objective: Establish acceptable service levels for roads and intersections and limit growth to maintain those levels.

4.1.4 Objective: Complete a collector and arterial road system (major streets plan) throughout the city.

4.1.5 Objective: Improve east/west traffic flow.

4.1.6 Objective: Control access on arterial streets.

4.1.7 Objective: Prohibit on-street parking on major arterial and collector streets.

4.1.8 Objective: Work towards becoming a gold-level bicycle friendly city as designated by the League of American Bicyclists.

4.2 Goal: Reduce Reliance on Automobiles by Encouraging Alternative Modes of Transportation

4.2.1 Objective: Expand and encourage rail, bus, bike, air, and other modes of transportation.

4.2.2 Objective: Design streets to favor mass transit options.

4.2.3 Objective: Secure future rights-of-way for all types of transportation systems.

4.2.4 Objective: Improve pedestrian safety by evaluating pedestrian crossings, sidewalks, trails, and overpasses.

1.3 Policy Statements

The following policy statements found in 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.5, 1.3.6, and 1.3.7 were found in the 2011 Provo Transportation Master Plan and adopted by the Provo City Council on September 6, 2011. Even though this transportation master plan is completely a new plan, these policy statements were the foundation of the two previous plans and were referenced in the development of this plan.

1.3.1 Physical Roadway Capacity and Livable Street Standards

Factors that impact the ability of a road to carry traffic have been evaluated and quantified, and the maximum physical capacities of roadways in Provo City have been identified. Since the maximum physical capacities are higher than is needed or desired on residential streets, maximum desired roadway volume standards have been established for livable street conditions in Provo. The livable street standards were developed with significant input from the citizens advisory committee originally in 2001 and since have been updated with volume ranges identified by new research. To protect residential neighborhoods and provide mobility, the city will strive to increase the efficiency and utilization of the arterial and collector street system. Capacity enhancement measures such as lane additions, signal improvements and access control will be considered to increase capacity and improve safety.

1.3.1.1 Livable Street Standards Policy Statements

The following statements reflect Provo City's policy on livable street standards.

1. Provo City will support measures to increase the efficiency and utilization of the existing and future arterial and collector roadway system.
2. To maintain the safety and livability of Provo's residential streets, a threshold of maximum acceptable traffic volumes is hereby adopted. The maximum acceptable traffic volume on a local residential street in a single-family neighborhood is 1,800 vehicles per day. Furthermore, means of controlling or reducing traffic shall be considered when traffic volumes on these local streets reach 1,400 vehicles per day. The above residential threshold values shall apply to streets within R-1, R-2, and R-3 zoned classification areas. However, recognizing that some lower density areas do not have an adequate spacing of collectors, achievement of this standard may be difficult.

3. The average daily traffic volumes should not exceed 4,200 vehicles per day for local streets in multi-family residential or commercial areas of Provo. The 4,200 vehicle per day threshold shall apply to R-4, R-5, RM, PO, PF, SC-1, SC-2, SC-3, CBD, CG, CH, CM, CA, MP, M-1, M-2, and PIC zones. However, recognizing that some areas do not have an adequate spacing of collectors, achievement of this standard may be difficult.
4. In the event that one of the above standards is exceeded by a proposed project, an improvement or mitigation plan should be developed to meet the standard. The city may elect to require one of the following methods of mitigation:
 - a. The city may elect to increase the number of lanes on an over capacity road to allow for additional capacity along the alignment. The increase in the number of lanes will likely require a capital improvement project or elimination of on street parking to widen the road and may delay any development projects until the capacity is available.
 - b. The city may choose to restrict development that contributes to an overloaded road by denying or delaying additional rezoning or development proposals.
 - c. The city may elect to increase the percentage of open space or reduced density until volumes are attenuated under the designated threshold requirement.
 - d. The city may accept proffered improvements along the corridor that will mitigate contributing traffic generation along the over threshold road segments.
 - e. The city may allow development to continue and accept congestion over allowable limits if they deem the project to be in the best economic development interest of the city.
 - f. The city may elect to focus the CFP in specific areas to upgrade these facilities where growth is occurring, or where growth is wanted.

The livable street standards were originally created during the development of the 2001 Provo City TMP. Table 1.1 shows the livable street standard expressed as a maximum average annual daily traffic (AADT) according to street classification and area type. Area types generally reflect elements that affect capacity, such as the number of driveways and streets accessing the roadway, level of pedestrian activity, frequency of traffic signals, and presence of on-street parking.

Table 1.1: Summary of Daily Livable Street Standards Average Annual Daily Traffic

Street Classification	Number of Lanes	Area Type		
		Limited Conflicts	Moderate Conflicts	Many Conflicts
Local ^{1,3}	2	1,800	1,400	n/a
Collector	3	16,800 ¹	13,500 ²	10,100 ²
Collector ²	4	30,900	22,700	20,000
Minor Arterial ²	3	19,100	16,000	13,500
Major Arterial ²	5	41,000	35,000	33,000
Major Arterial ²	7	57,000	50,000	46,500

1. Source: Provo City Transportation Master Plan 2001.
2. Source: Parametrix Maximum Daily Traffic Capacity Estimates.
3. Applies to R-1, R-2 and R-3 zones only.

1.3.2 Trip Generation Rate

Provo City staff and officials have been concerned that the national daily trip generation rates do not accurately reflect daily trip generation rates in Provo. Provo is a unique community in many ways. As an example, just over 60 percent of the residential units in Provo are renter occupied, not owner occupied. Further, with large families, a young population, and a high number of cars per residential unit, the amount of traffic generated by each residential unit is higher than the national averages presented in the Institute of Transportation Engineers (ITE) Trip Generation Manual.

Provo City has performed traffic counts within its city boundaries to identify daily average trip generation rates for both single and multiple family residential units. The current daily average trip generation rates for single and multiple family units three stories and less is 11.4 trips per unit. For multiple family units of four stories to nine stories, the daily average trip generation rate is 8.74 trips per unit. These rates will continue to be monitored and updated in the future as needed. The data obtained from the updated traffic counts will be useful in developing realistic traffic projections and properly evaluating potential traffic impacts associated with proposed developments in Provo City. With these projections, streets and intersections can be properly designed to accommodate future traffic volumes and appropriate traffic mitigation measures can be identified for new developments. Table 1.2 compares the Provo City average trip generation rates to the ITE average trip generation rates.

Table 1.2: Residential Trip Generation Rates Comparison

Residential Land Use	Provo City Trip Generation Rate	ITE Trip Generation Rate
Single Family	11.40	9.44
Multiple Family (two stories or less)	11.40	7.32
Multiple Family (three stories to nine stories)	8.47	5.44

Source: Provo City Engineering, 2019. Trip Generation Manual 10th Edition, Institute of Transportation Engineers, 2020.

Office and retail sites in Provo that were previously studied had trip generation rates similar to the published national averages. Therefore, it is recommended that ITE trip generation rates be used for office and retail uses in the city.

1.3.2.1 Provo City Trip Generation Rates Policy Statements

The following statements reflect Provo City’s policy on trip generation rates.

1. Trip generation rates developed for the Provo City Transportation Master Plan shall be used to develop all future traffic forecasts for single and multiple family residential projects in Provo City.
2. For any traffic studies done in Provo City for multi-unit residential projects, trip generation studies should be done at comparable land use sites. The site selection and the method used to conduct the trip generation study should be approved in advance by Provo City Engineering.

3. For any traffic studies done in Provo City for non-residential land uses the most recent version of the ITE Trip Generation Manual should be utilized.
4. For unique land uses or land use combinations not specifically identified in the ITE Trip Generation Manual, trip generation studies should be done at comparable land use sites. The site selection and the method used to conduct the trip generation study should be approved in advance by Provo City Engineering.

1.3.3 Funding

The purpose of these funding policies is to identify sources from which to obtain the funding necessary to construct the projects and carry out the programs put forth in the Provo City Transportation Master Plan.

1.3.3.1 Funding Policy Statements

The following statements reflect Provo City's policy regarding funding for the transportation network.

1. The city should aggressively seek funds from regional sources to pay for significant transportation system upgrades.
2. The city should seek funds from non-traditional sources.
3. The city should pursue the adoption of a traffic impact fee for new development that would fund the required transportation improvements that cannot be funded using other revenue sources.

1.3.4 Access Management

The proliferation of driveways is a major contributor to roadway accidents and can significantly reduce the roadway capacity. The main goal of access management is to reduce conflicts along roadways in order to improve traffic safety and the ability of the road to carry traffic.

1.3.4.1 Access Management Policy Statements

The following statements reflect Provo City's policy on access management.

1. Access on an arterial street should not be permitted when another reasonable access to the street system can be provided.
2. Where access is provided on either an arterial or collector street, no direct access should be located within the functional area of an intersection (the area where future traffic is expected to stack back from the intersection).
3. Spacing of driveways on arterial and collector streets should conform to the state and city driveway spacing standards to the greatest extent possible.
4. As new development or redevelopment occurs along arterial and collector streets the consolidation of driveways should be required.
5. All new development proposals should be carefully reviewed to ensure that project access and on-site circulation is provided to minimize adverse impacts to the adjacent street system.

6. Raised medians may be used on arterial and collector streets where a traffic engineering study indicates that a median would be beneficial to control access, maintain street capacity and improve traffic flow.
7. Strive to space all new traffic signals uniformly and do not install a new traffic signal if it would significantly impact traffic progression along an arterial or collector street.

1.3.5 Traffic Calming

Traffic calming strategies encompass the three E's of traffic engineering: Education, Enforcement and Engineering, to create streets which accommodate all modes of travel in a balanced manner. Traditional traffic engineering approaches to street design have focused on providing streets which are primarily designed to carry automobiles. Today, transportation planners and engineers are following a worldwide trend which began in the 1960's in Europe, where streets are designed to equally accommodate bicycling, walking, and transit travel, as well as automobile driving. Traffic calmed streets are seen as more "livable" places—where people can stroll and meet, children can play, and there is less traffic noise and emissions.

Traffic calming strategies focus on three primary objectives: reduce automobile speeds, reduce automobile volumes, particularly on residential streets, and reduce cut-through commuter traffic in residential neighborhoods. Of these objectives, reduction in traffic speeds is the primary method for creating a greater balance among all roadway users—bicyclists, pedestrians, and drivers.

1.3.5.1 Traffic Calming Policy Statements

The following statement reflects Provo City's policy on traffic calming.

1. The goal of the city's traffic calming program is to assist in efforts to improve the quality of life in residential neighborhoods by decreasing excessive traffic speeds and cut-through traffic in residential neighborhoods.
2. The city will encourage traffic calming measures (bulb outs, roundabouts, etc.) in new subdivisions and new developments.

1.3.6 Transcontinental Truck Traffic on University Avenue (U.S. 189)

It is the desire of Provo City to have fewer trucks on University Avenue and therefore recommends that 800 North (S.R. 52) in Orem remain the critical urban freight corridor connecting U.S. 89 from Provo Canyon to I-15.

1.3.6.1 Transcontinental Truck Traffic on U.S. 189 (University Avenue) Policy Statement

The following statement reflects Provo City's policy on truck traffic on University Avenue.

1. University Avenue should not be designated as a critical urban freight corridor.
2. 800 North in Orem should remain the critical urban freight corridor connecting U.S. 89 from Provo Canyon to I-15.

1.3.7 Transportation Demand Management Strategies

Transportation system management (TSM) strategies are intended to increase the efficiency of the existing roadway, without increasing the number of through traffic lanes thereby increasing the number of vehicle trips that a facility can carry. Examples of TSM strategies include change of intersection control (two-way stop to a roundabout, all-way stop to a traffic signal, etc.), adding turning lanes, access management, and improving traffic signal coordination. TSM also encourages automobile, public and private transit, ridesharing programs, and bicycle and pedestrian improvements as elements of a unified transportation system. Modal alternatives integrate multiple forms of transportation modes including pedestrian, bicycle, automobile and transit.

Travel demand management (TDM) focuses on regional strategies for reducing the number of vehicles trips and vehicles miles traveled as well as increasing the vehicle occupancy. It facilitates higher vehicle occupancy or reduces traffic congestion by expanding an individual's choice in terms of travel method, travel time, travel route, travel costs, and the quality and convenience of the travel experience. Examples of TDM include transit, carpool programs and incentives, promoting biking and walking, telecommuting, flexible work hours, and compressed workweeks. Because many TDM strategies are only effective if implemented on a regional basis, a coordinated effort is critical. The Utah Department of Transportation (UDOT) currently has a TDM program in place called TravelWise that proves beneficial for a city to review as a plan is developed. More information on this program can be found at its website: www.TravelWise.utah.gov.

1.4 Existing Zoning

Land use and transportation are inseparably connected as land use affects transportation and transportation affects land use. The coordination of land use and transportation requires both local government and the public concerned with the well-being of a community to assess and evaluate how land use decisions effect the transportation system and can increase viable options for people to access opportunities, goods, services, and other resources to improve the quality of life. In turn, the transportation sector should be aware of the effects the existing and future transportation systems may have on land use development demand, choices, and patterns.

1.5 Future Land Use

The most recent regional travel demand model by Wasatch Front Regional Council (WFRC) and the Mountainland Association of Governments (MAG) has projected the total population, number of households, and total employment for Provo City in 2014, 2024, and 2040. These numbers have been revised to reflect information provided by Provo City.

From 2014-2040 population is projected to grow by 27,008, households are projected to grow by 10,338, and employment is projected to grow by 28,927. Table 1.3 shows the socioeconomic data by model year.

Table 1.3: Socioeconomic Data from Travel Demand Model

	2014	2024	2040
Population	110,510	121,424	137,518
Households	34,741	38,860	45,079
Employment	81,822	96,570	110,749

Source: WFRC/MAG Travel Demand Model, 2018. Input from Provo City Community Development and Engineering on socioeconomic data by traffic analysis zone, 2018.

Chapter 2 – Roadway Network Conditions

The WFRC/MAG travel demand model version 8.2 was used to forecast traffic conditions and travel patterns in Provo City. An existing condition baseline along with 2024 and 2040 forecast year models were developed for the purpose of this transportation plan. The following sections outline the modeling preparation and calibration processes, along with discussions surrounding the resulting datasets and other information developed to best understand existing and forecasted travel patterns and network conditions.

2.1 Travel Demand Model Calibration

When applying regional models to small-scale areas and individual corridors, it is often necessary to undergo a calibration process specific to that area or corridor, because the models have originally been developed and calibrated for regional performance. The calibration process provides an opportunity to tailor the model to detailed specifics of a corridor, which may have been missed in model development or have since become outdated. The calibration process generally includes review and revision of the two main inputs of the models: socioeconomic data and the roadway network. For the base year calibration, Parametrix calibrated the available model inputs closest to present day conditions, which in this case was 2014.

2.1.1 Socioeconomic Inputs

Socioeconomic data is the driving factor for trip generation in a travel demand model. This data is provided for geographic subsections of the model, known as traffic analysis zones (TAZs), for each modeled year. Parametrix created summary maps displaying the base socioeconomic data influencing the study area by TAZ for review with the city. Parametrix received comments about existing or proposed development and about future growth within the city and made revisions to the socioeconomic datasets accordingly. The socioeconomic revisions made to the WFRC/MAG Travel Demand Model version 8.2 were limited to seven TAZs and are shown in green in the revised columns in the tables below. See Appendix D for a map of Provo City traffic analysis zones. Table 2.1 shows the changes to household and employment numbers by traffic analysis zone.

Table 2.1: Household and Employment Revisions

TAZ	Households					Employment				
	2014	2024	2024 Revised	2040	2040 Revised	2014	2024	2024 Revised	2040	2040 Revised
1982	7	184	184	492	492	0	7	127	56	176
1983	100	194	213	253	278	55	56	62	57	63
1996	223	265	265	337	337	5,136	5,361	5,361	5,570	5,570
2019	30	47	56	65	78	289	412	412	593	593
2020	11	11	11	11	11	92	208	508	220	808
2023	330	387	406	475	499	37	50	53	57	60
2024	321	381	400	478	502	18	53	56	140	147

Tables 2.2 and 2.3 show the modifications to school enrollments for grades K-6 and 7-12. The significant changes in the revised numbers are for TAZ 2019, an elementary school was listed as a 7-12 grade school instead of K-6 grade school. Also, the changes to TAZs 1996 and 1982 reflect the relocation of Provo High School.

Table 2.2: Enrollment K-6 Revisions

TAZ	2014	2014 Revised	2024	2024 Revised	2040	2040 Revised
1982	0	0	0	0	637	637
1983	0	0	0	0	0	0
1996	14	14	16	16	19	19
2019	0	576	0	647	0	720
2020	0	0	0	0	0	0
2023	0	0	438	438	514	514
2024	0	0	0	0	0	0

Table 2.3: Enrollment 7-12 Revisions

TAZ	2014	2014 Revised	2024	2024 Revised	2040	2040 Revised
1982	0	0	0	1,987	0	2,210
1983	0	0	0	0	0	0
1996	1,770	1,917	1,987	0	2,210	0
2019	576	0	647	0	720	0
2020	0	0	0	0	0	0
2023	0	0	0	0	0	0
2024	0	0	0	0	0	0

2.1.2 Road Network Inputs

2.1.2.1 2014 Calibration Year

No changes were made to the base year model networks provided in the WFRC/MAG model for the 2014 calibration year.

2.1.2.2 Existing 2018 Network

Updates were made to the 2014 WFRC/MAG model network to best reflect existing roadway network conditions. Updates were based upon the most recently available satellite imagery and input from the city. This network is used for the model 2018 for current conditions. Figure 2.1 depicts the modeled functional classification system, with changes highlighted in yellow.

2.1.2.3 2024 and 2040 No-Build Network

The future no-build model network is meant to represent network conditions if no new projects are completed. Incomplete projects that are committed to be completed before the forecast

years have been included. Figure 2.2 shows these inclusions, which is limited to the extension of Lakeview Parkway west of Lakeshore Drive north to Center Street.

2.1.2.4 Future Networks

Future networks were created for the 2024 and 2040 forecast years. These networks are modified from the existing network described above to include capital facilities plan projects scheduled to be completed by the respective forecast year. Figures 2.3 and 2.4 show the final modeled functional classification system for the 2024 and 2040 forecast years respectively.

Figure 2.1: 2018 Modeled Network

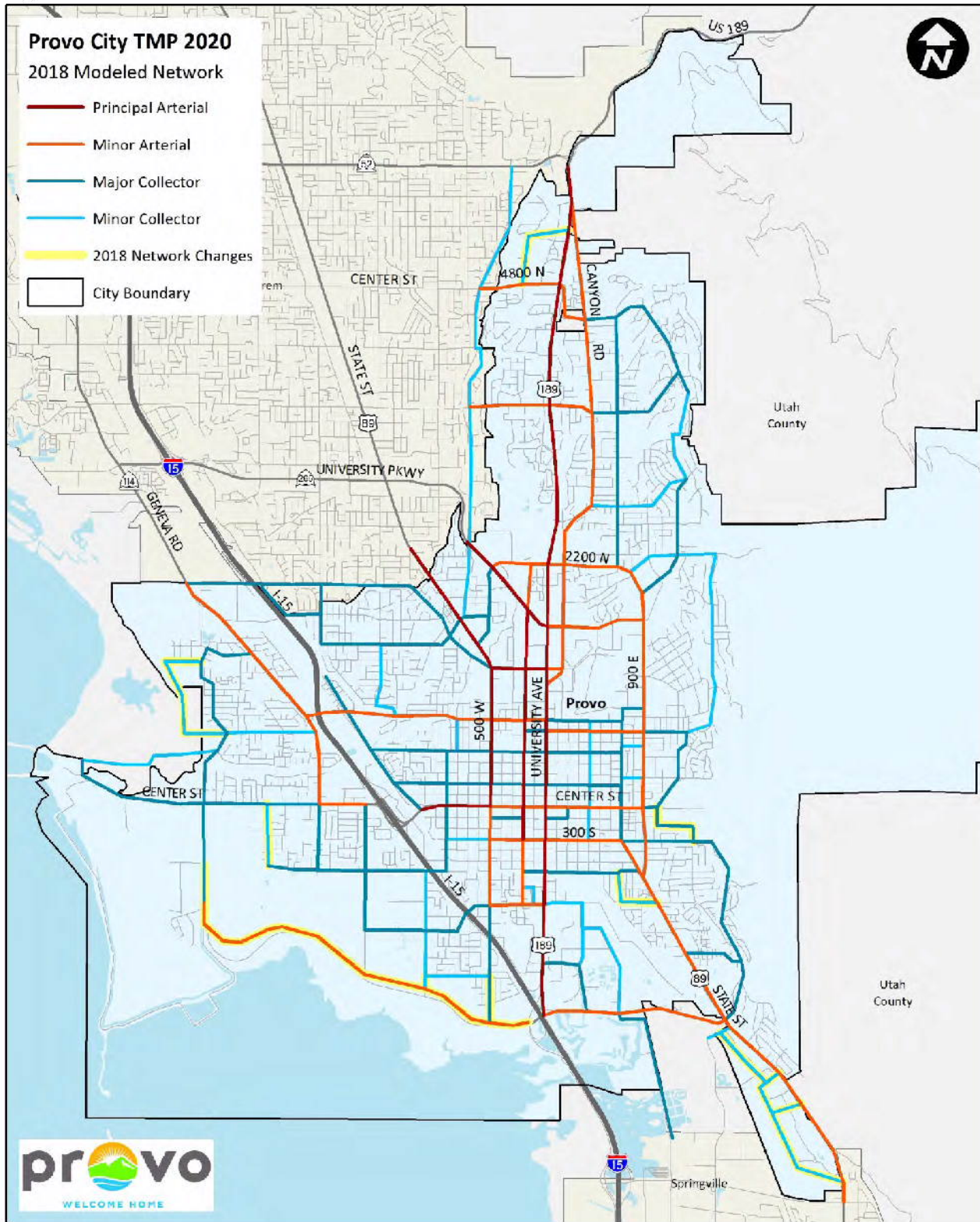


Figure 2.2: 2024 and 2040 No-Build Network Change

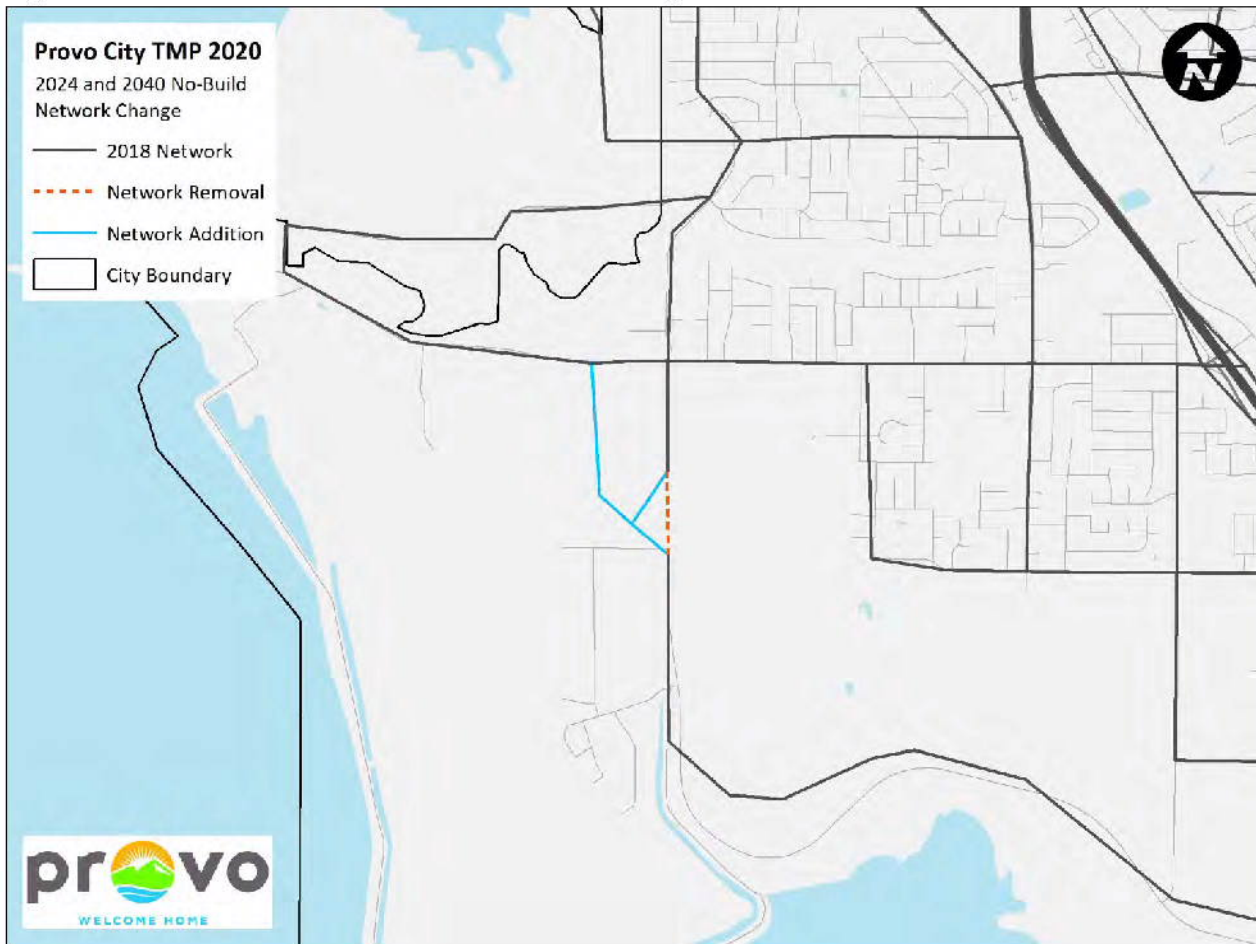


Figure 2.3: 2024 Modeled Network

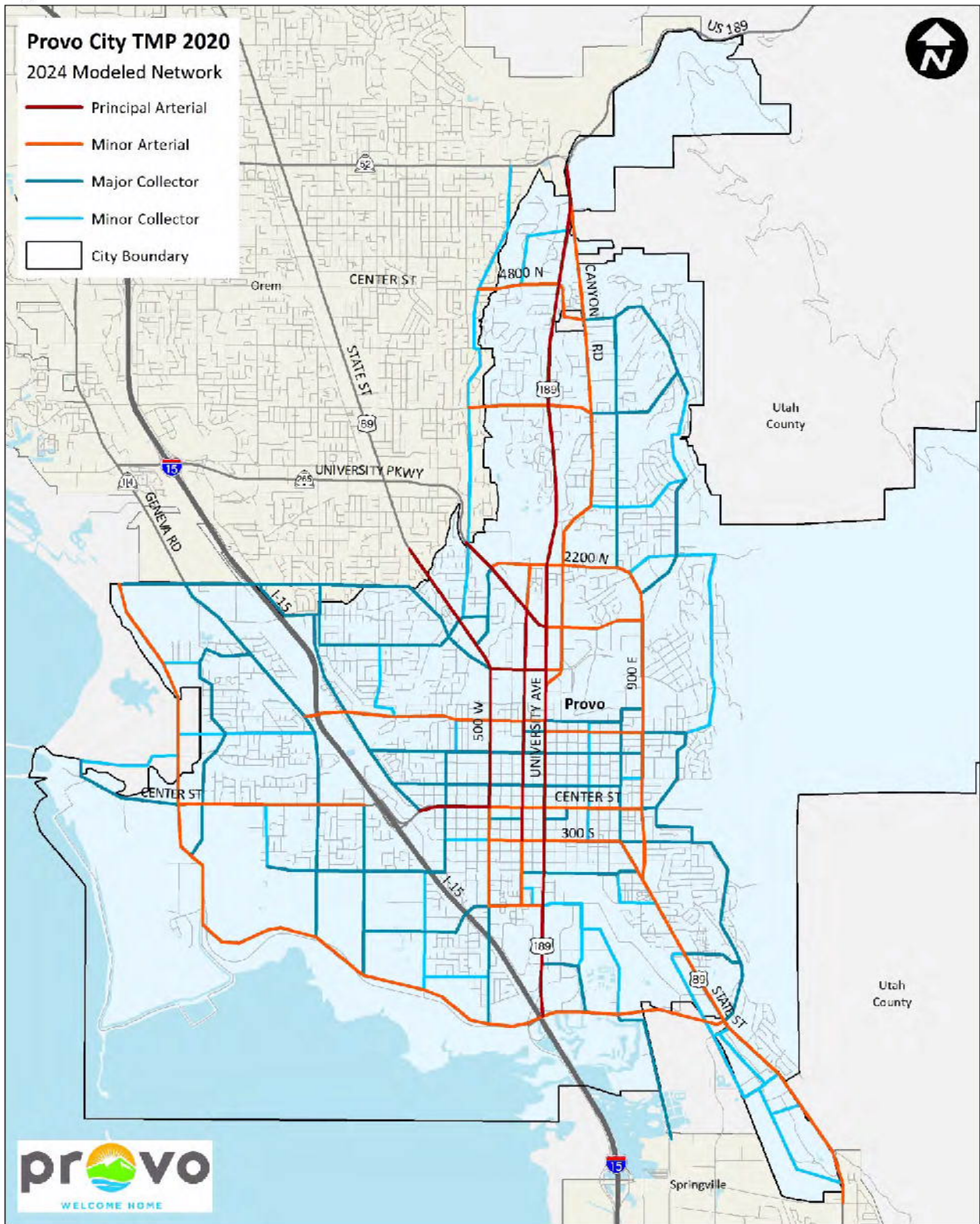
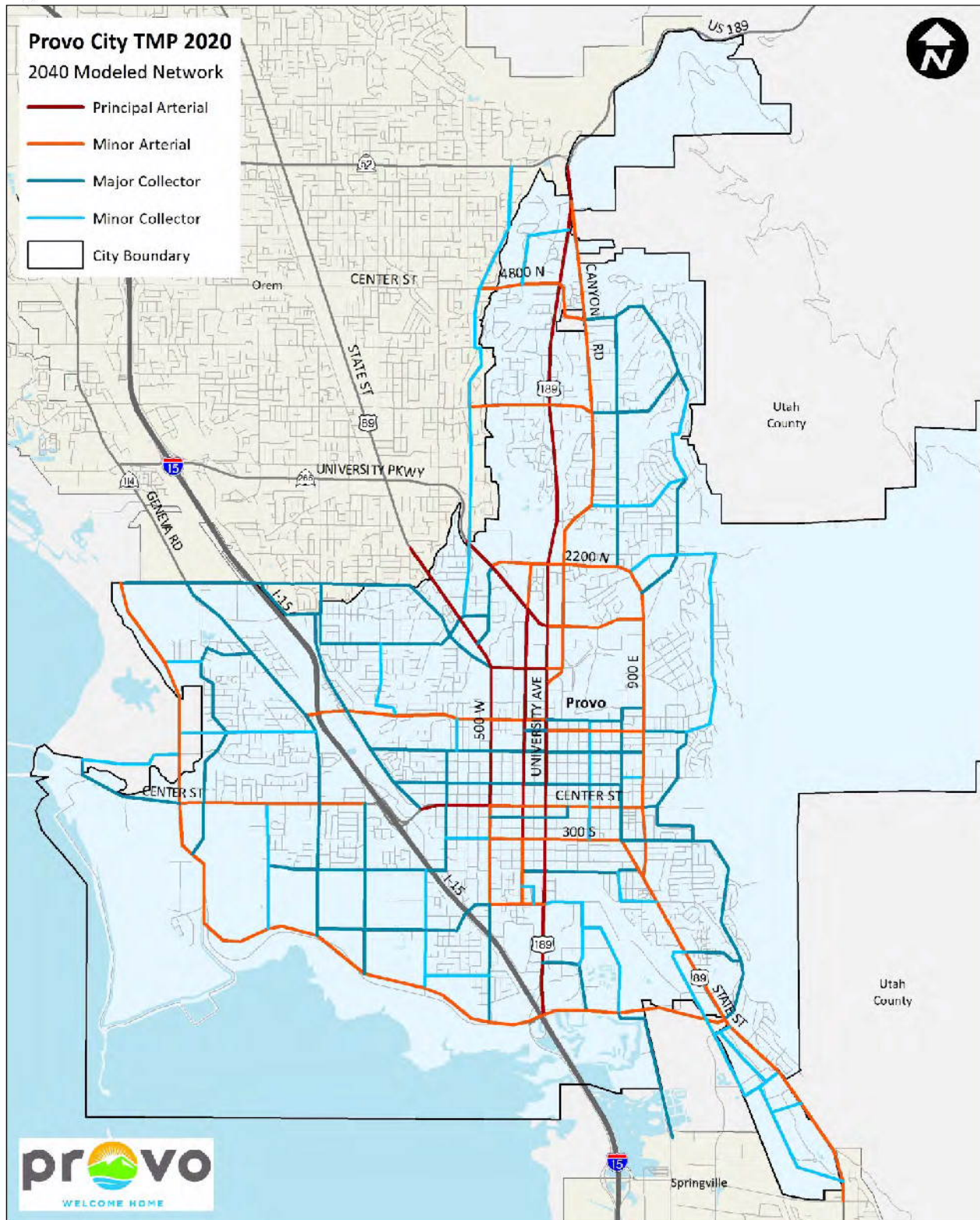


Figure 2.4: 2040 Modeled Network

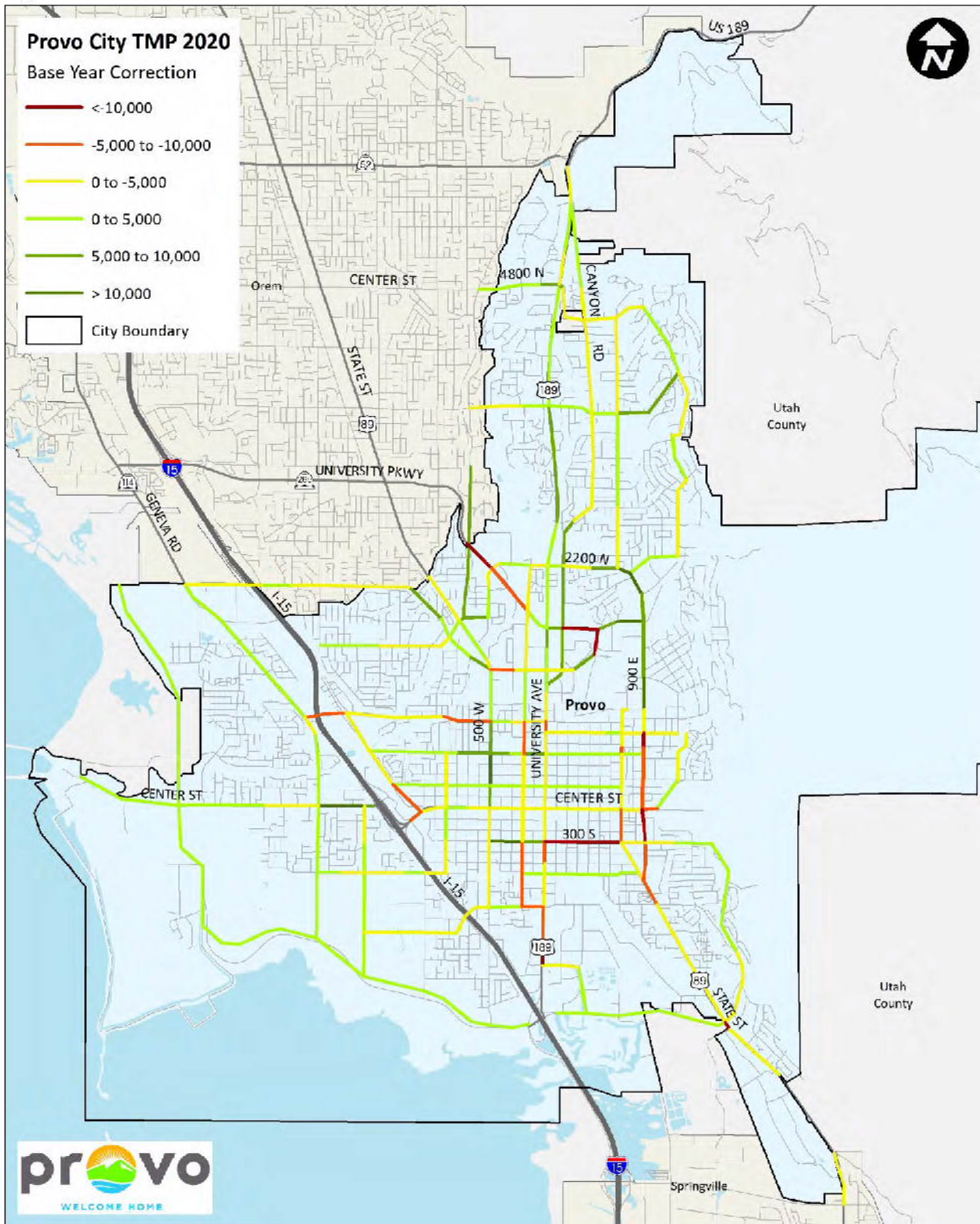


2.1.3 Base Year Model Correction Factors

To account for the error inherent in each model, a base year correction was applied to forecast 2024 and 2040 segment volumes. Base year correction factors are generated by calculating the difference between base year model data and actual traffic counts. Modelers then apply the correction factors to the long-term model outputs to develop volume forecasts that minimize the effects of model computational biases.

The base year for the WFRC/MAG model is 2014, so Parametrix used 2014 UDOT AADT data to generate the base year correction factor. These base year correction values were then applied to 2024 and 2040 model forecasts for respective segments. Additionally, because Lakeview Parkway is not included in the 2014 model network or the 2014 UDOT AADT data, a correction network model was run, which was calculated based upon 2017 counts provided by the city. For new routes forecasted in build scenario models, a base year correction was assumed from adjacent segments, only if they are a continuation of an existing route with similar characteristics. This occurred for new segments of Lakeview Parkway, 1600 West, 2050 West and the extension of 500 North. Figure 2.5 shows the correction factor by segment within the city.

Figure 2.5: 2018 Base Year Correction



2.2 Level of Service

Level of service (LOS) calculations can be complex and data intensive, but simplified planning methods are reasonably accurate. Level of service calculations according to the Highway Capacity Manual 6th Edition depend on the following factors:

1. Number of travel lanes.
2. Number of turn lanes.
3. Number of trucks in the travel flow.
4. The level of "platooning" of vehicles approaching each intersection.
5. The timing of traffic signals and the coordination of multiple traffic signals.
6. The number of turning vehicles.
7. The vertical grade of the roadway and other horizontal alignment factors.
8. The familiarity of drivers to local conditions.
9. The availability of shoulders and lateral clearances.
10. Various natural environmental conditions.

To simplify the analysis, travel models use a link-based capacity (even though much of the actual delay is manifested at intersections). Algorithms exist in the travel model to estimate the delay associated with increased traffic volume with the primary input being the travel link number of lanes, functional classification of the road, and area type (urban, suburban, rural, etc.). These simplifications are necessary since detailed data may not be available for forecasting future conditions and the travel model is developed at a regional (metropolitan area) scale. The analysis in Provo City estimated the capacity of existing and future roads based on the design standards of the city and available information related to transportation plans such as number of travel lanes and functional classification. Table 2.4 summarizes the daily traffic capacities used in the Provo City analysis. Conflict types refer to the number of driveways and streets accessing the roadway thereby affecting capacity of the roadway.

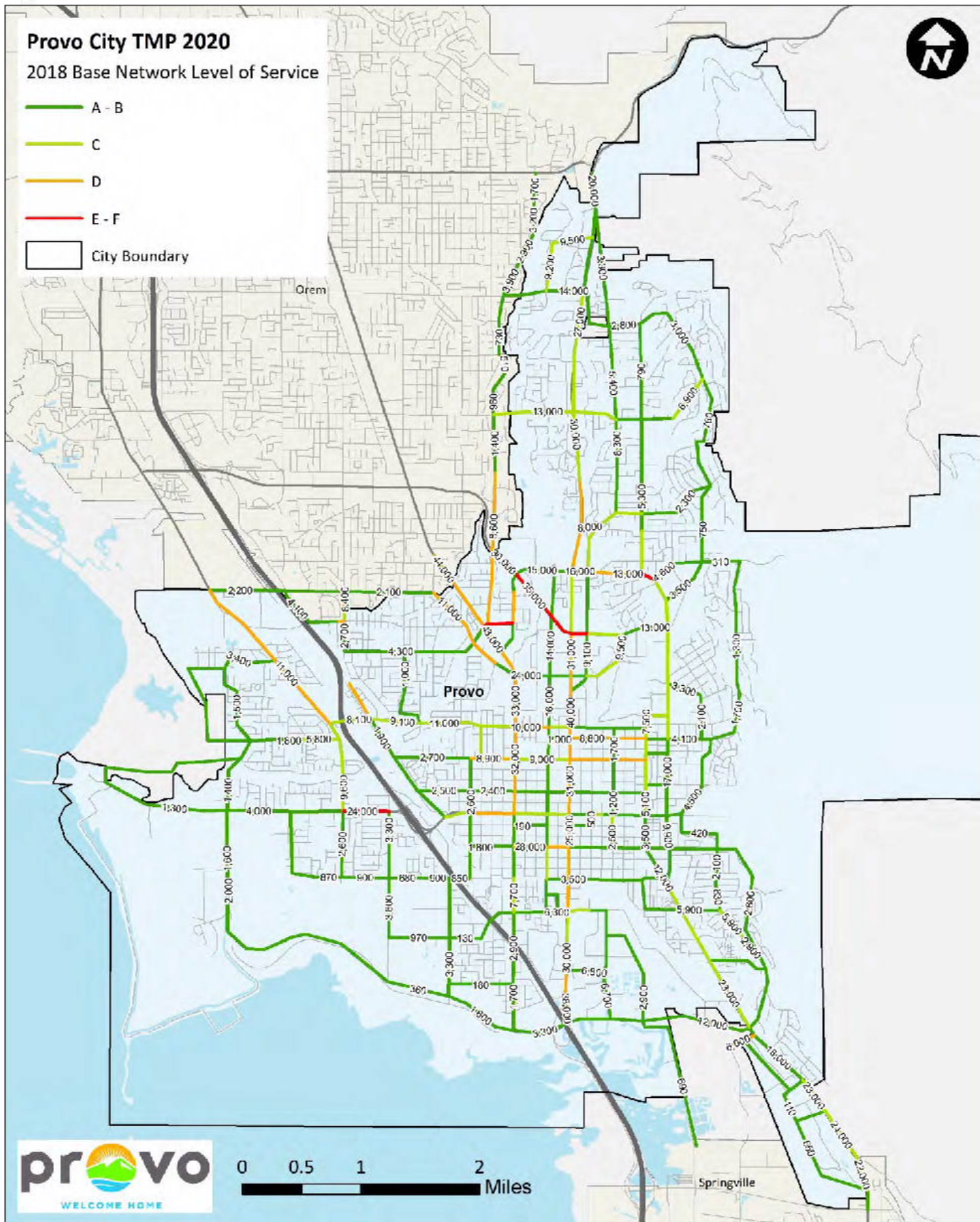
Table 2.4: Daily Level of Service D Capacity in Provo City

Functional Classification	Lanes	AADT with Limited Conflicts	AADT with Moderate Conflicts	AADT with Many Conflicts
Collector	2	7,000	7,000	6,400
	3	16,800	13,500	10,100
	4	30,900	22,700	20,000
Minor Arterial	2	12,500	11,300	10,200
	3	19,100	16,000	13,500
Major Arterial	5	41,000	35,000	33,000
	7	57,000	50,000	46,500

2.3 Existing Roadway Level of Service

The calculated daily LOS for the modeled 2018 base network is shown in Figure 2.6. Most notable capacity issues are constrained to UDOT facilities Center Street, University Avenue, and University Parkway. Local roads with capacity issues include 1720 North and 2230 North.

Figure 2.6: 2018 Base Network Level of Service



2.4 2024 Roadway Modeled Network

Two roadway networks were modeled for the 2024 forecast year, a no-build network containing no improvements to the existing network and a build network including all projects from the first phase of the capital facilities plan.

Figure 2.7 shows the calculated daily LOS for the 2024 No-Build model scenario. Much of the existing capacity deficiencies are exasperated with increased travel demand and no system improvements. Additionally, there are new deficiencies on Independence Avenue, Columbia Lane, 800 North, and several other roads in the downtown area.

Figure 2.8 shows the calculated daily LOS for the 2024 Build model scenario. With most of the projects in the first phase of the capital facilities plan being new facilities on the west side, much of the capacity deficiencies in the central city area remain. However, capacity failures on 2230 North, 800 North, and Independence Avenue are cleared up with roadway extensions and widening projects in this phase. Figure 2.8 also illustrates that the new roadways are more than adequate to serve development through 2024 and into the future.

Figure 2.9 shows the increase in daily volumes from the existing 2018 network to the 2024 build model. The most significant volume increases occur on University Avenue, University Parkway, Lakeview Parkway and Center Street. Other notable increases are found on Freedom Boulevard, 900 East, 200 North and 2230 North.

Figure 2.7: 2024 No-Build Level of Service

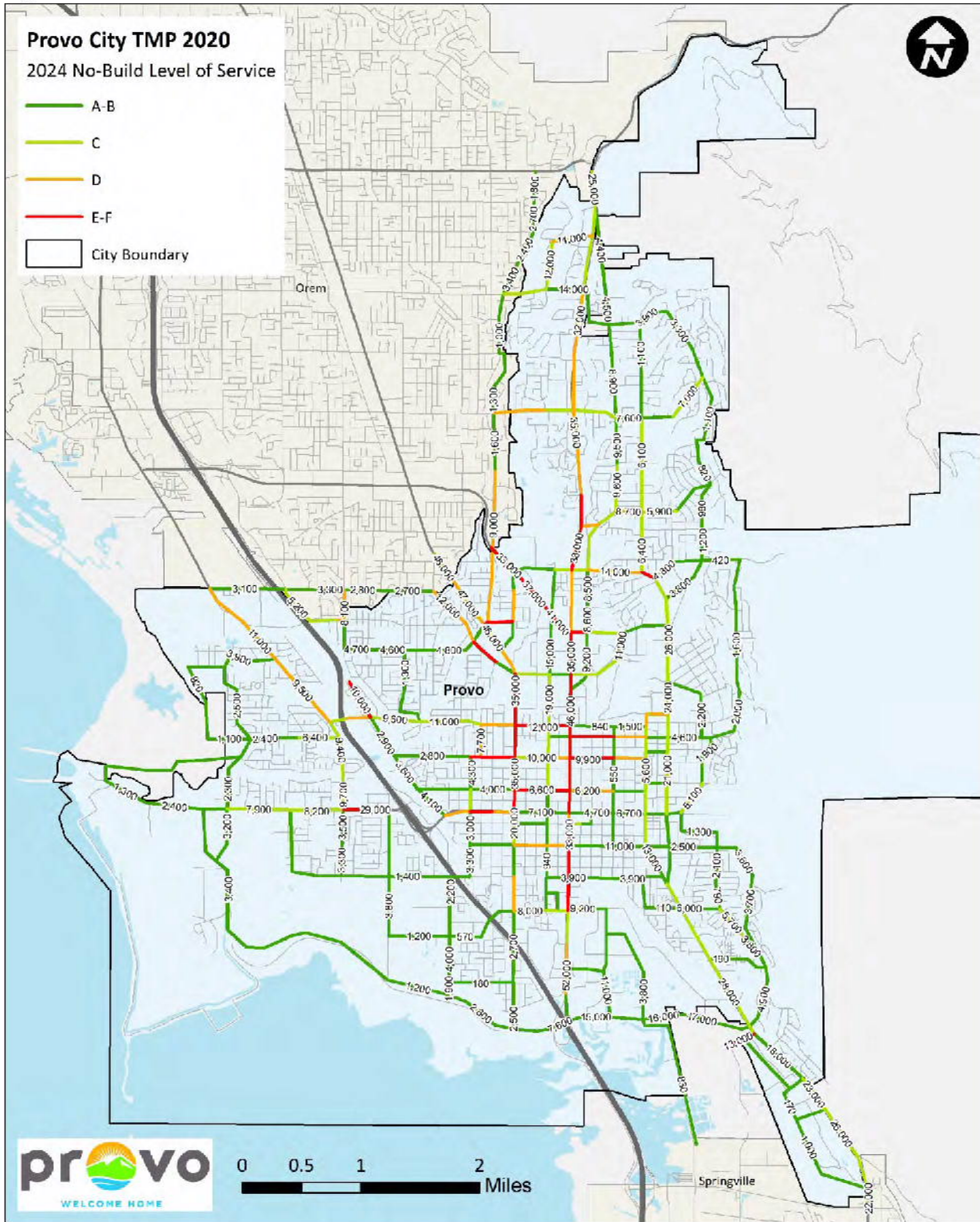


Figure 2.8: 2024 Build Level of Service

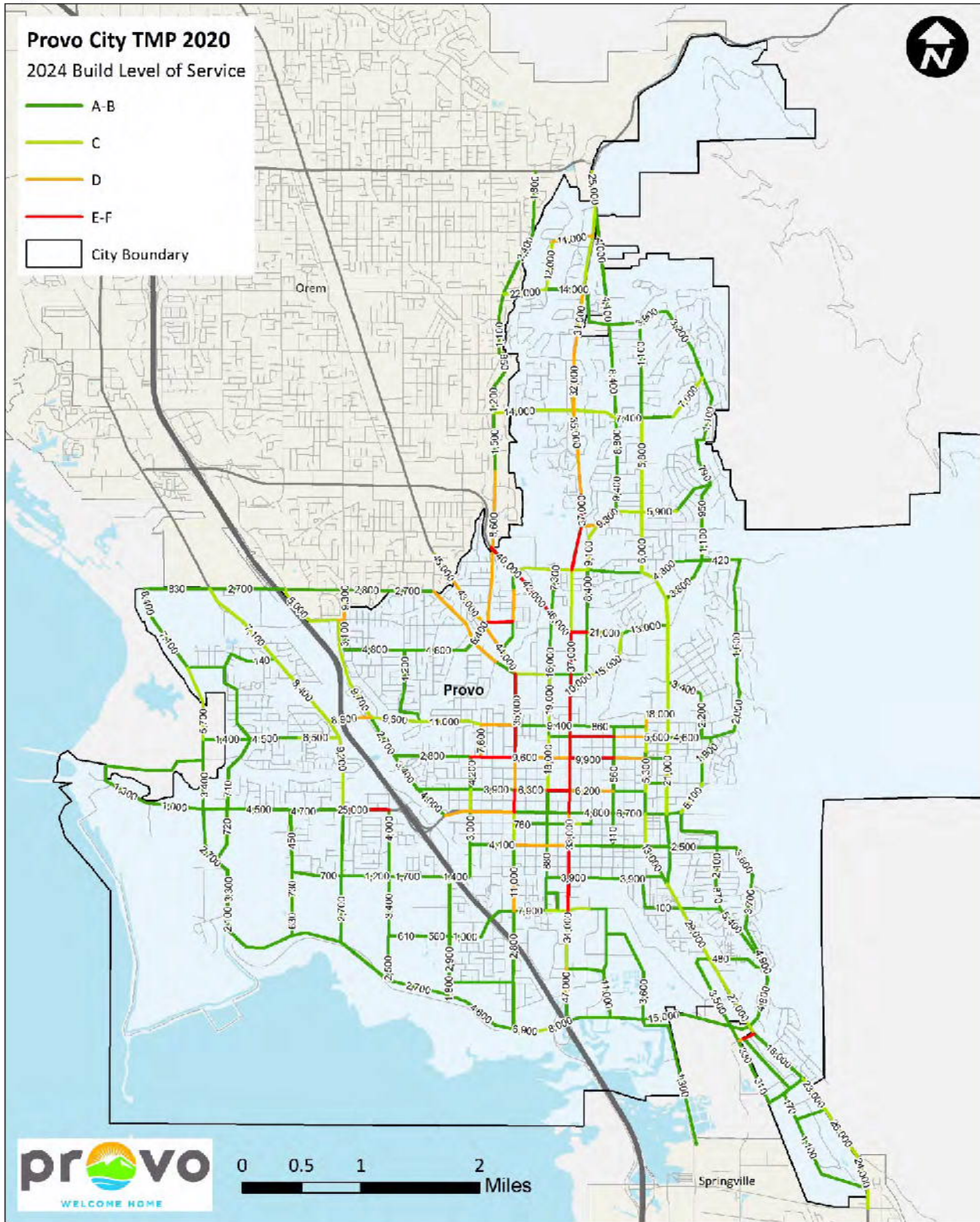
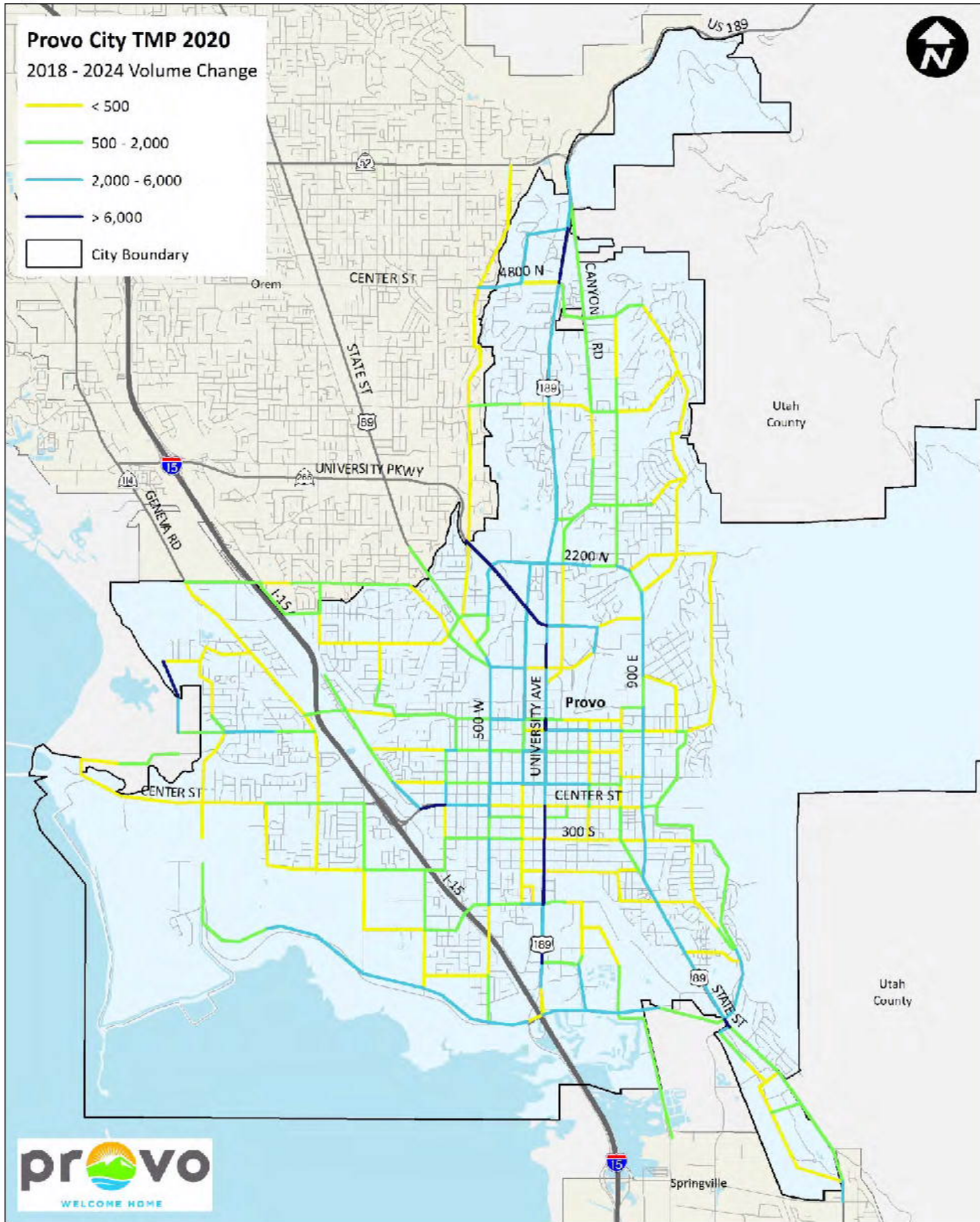


Figure 2.9: 2018-2024 Volume Change



2.5 2040 Roadway Modeled Network

Two roadway networks were modeled for the 2040 forecast year, a no-build network containing no improvements to the existing network and a build network including all projects from the capital facilities plan with planned projects extending through 2040.

Figure 2.10 shows the calculated daily LOS for the 2040 No-Build model scenario. This shows a very similar picture to the 2024 No-Build LOS map, with much of the existing capacity deficiencies exasperated and other deficiencies on Independence Avenue, Columbia Lane, 800 North, and several other roads in the downtown area.

Figure 2.11 shows the calculated daily LOS for the 2040 Build model scenario. With all the capital facilities plan projects completed, much of the capacity issues highlighted in the no-build scenario are addressed. The most notable capacity issue remaining off the state system is 700 North paralleling the Utah Valley Express (UVX) Bus Rapid Transit (BRT) route.

Figure 2.12 shows the increase in daily volumes from the existing 2018 network to the 2040 build model. The volume change is similar to the change to 2024, with the most significant increases occurring on University Parkway, University Avenue, Lakeview Parkway, Freedom Boulevard, and 900 East.

Figure 2.10: 2040 No-Build Level of Service

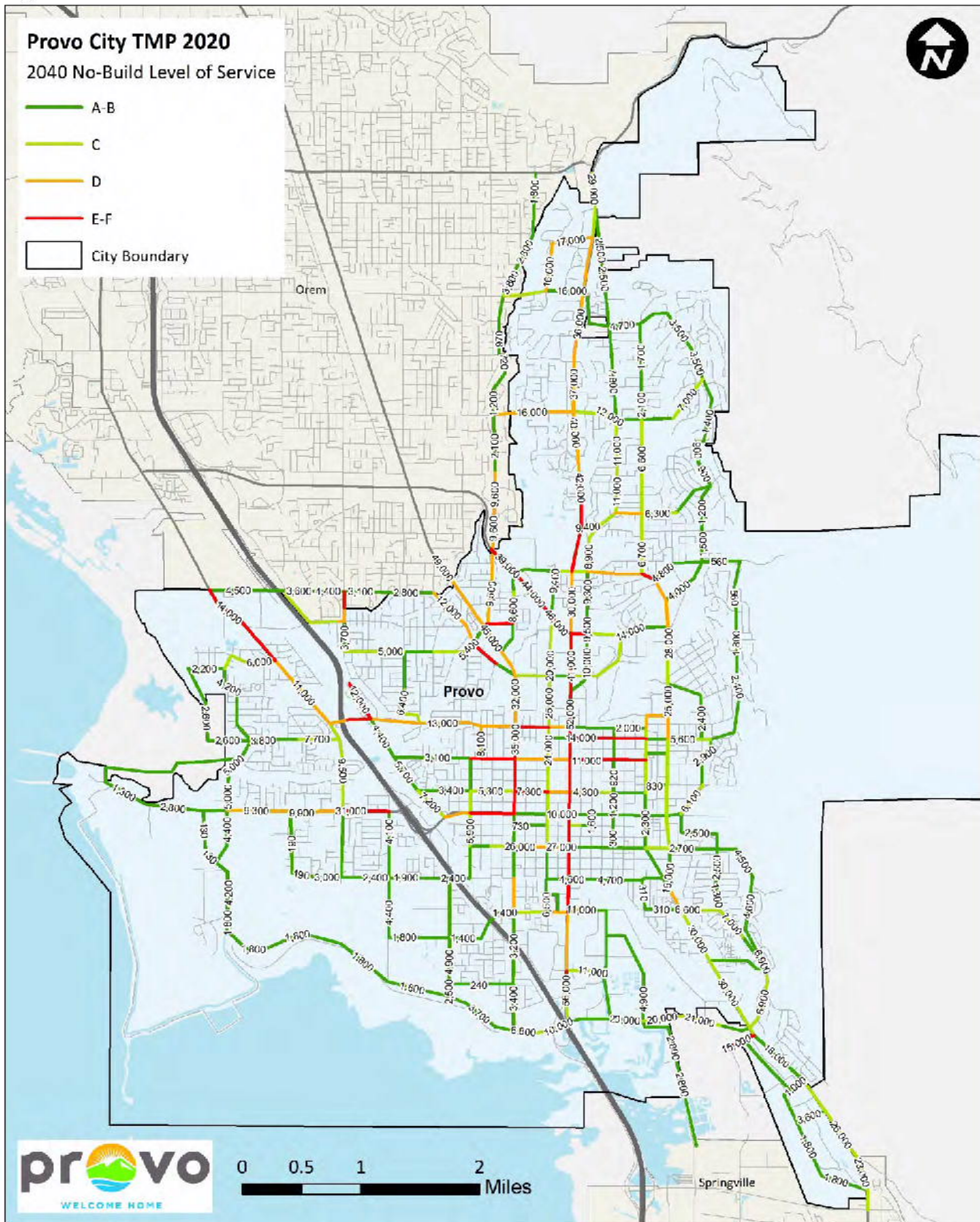


Figure 2.11: 2040 Build Level of Service

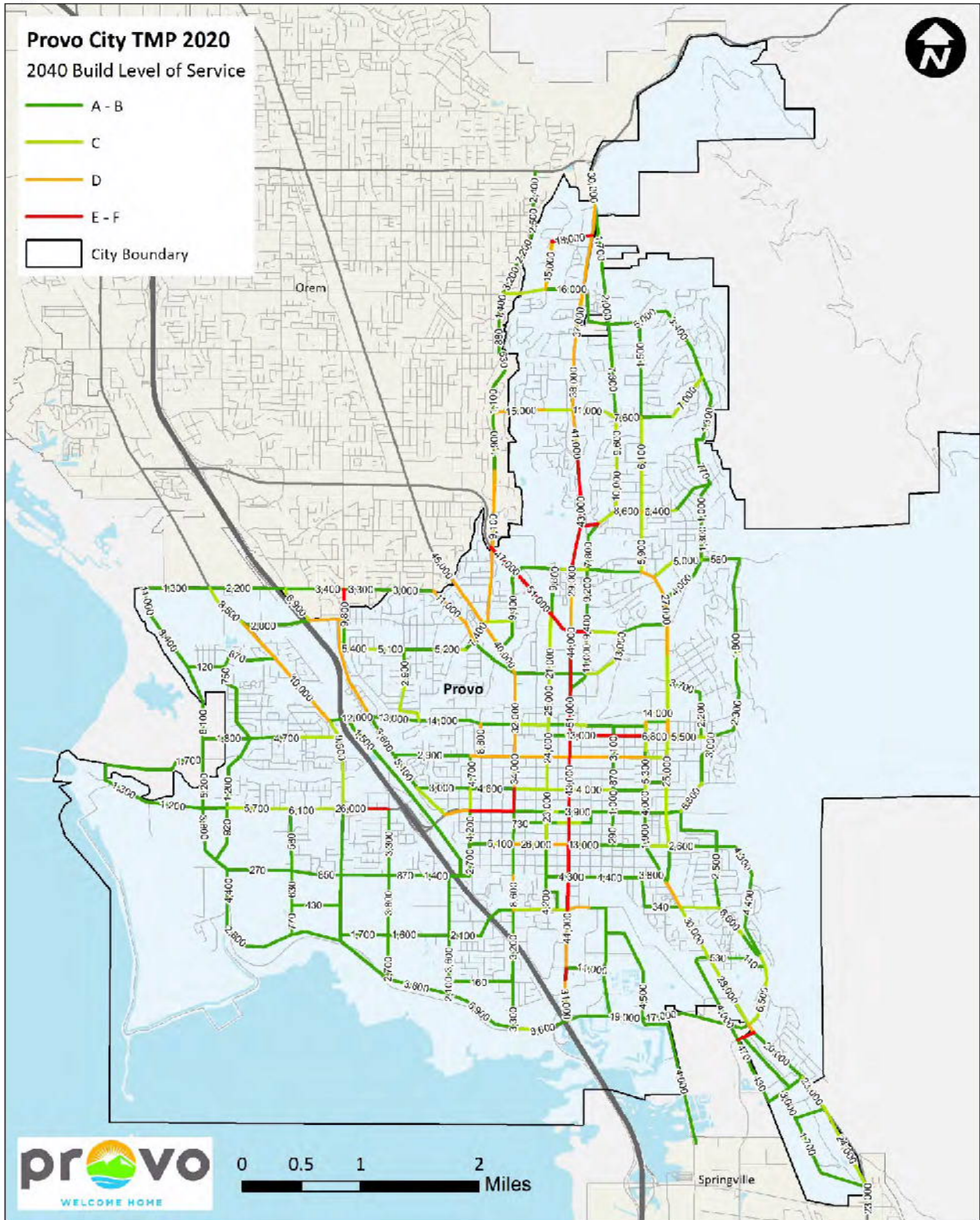
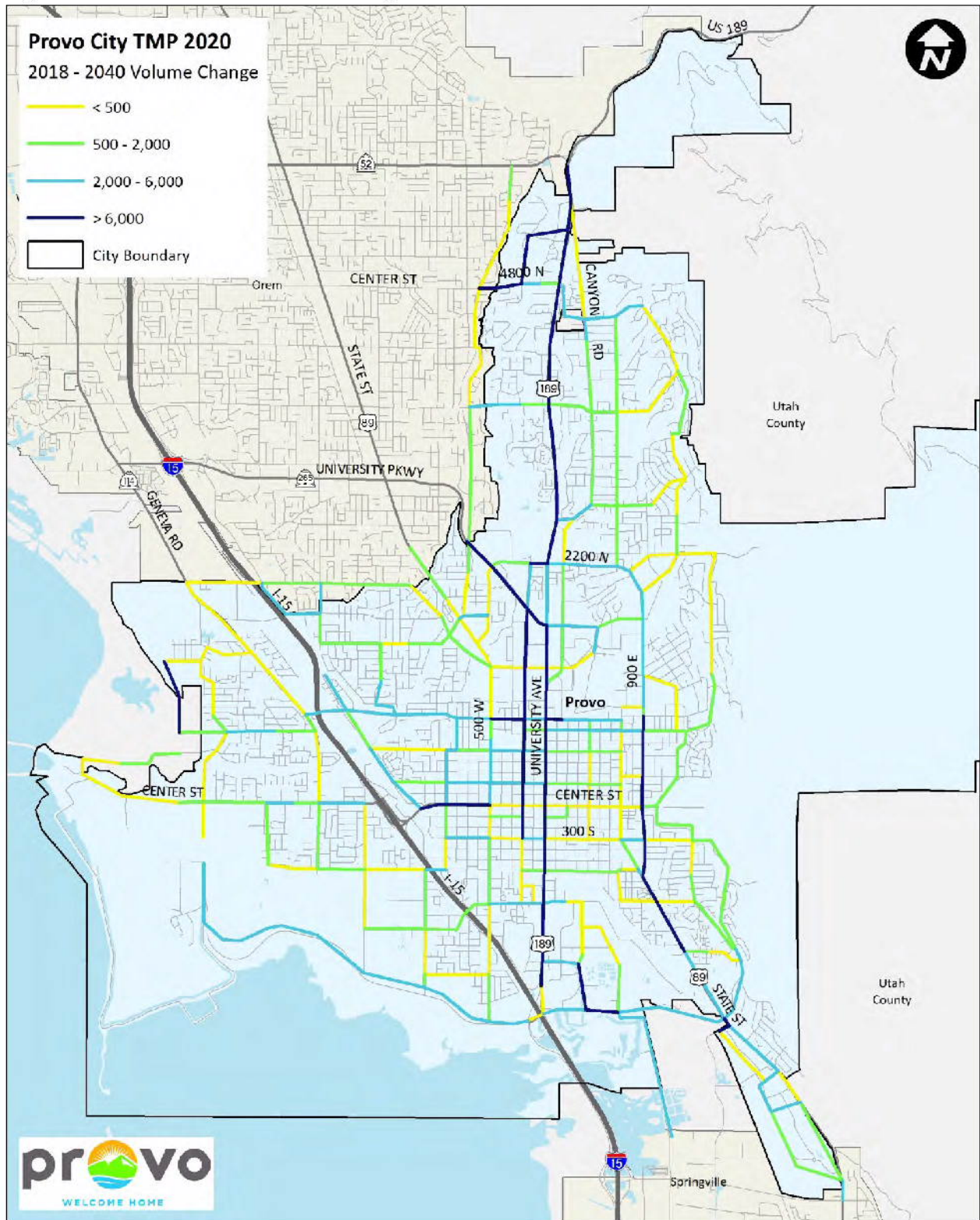


Figure 2.12: 2018-2040 Volume Change

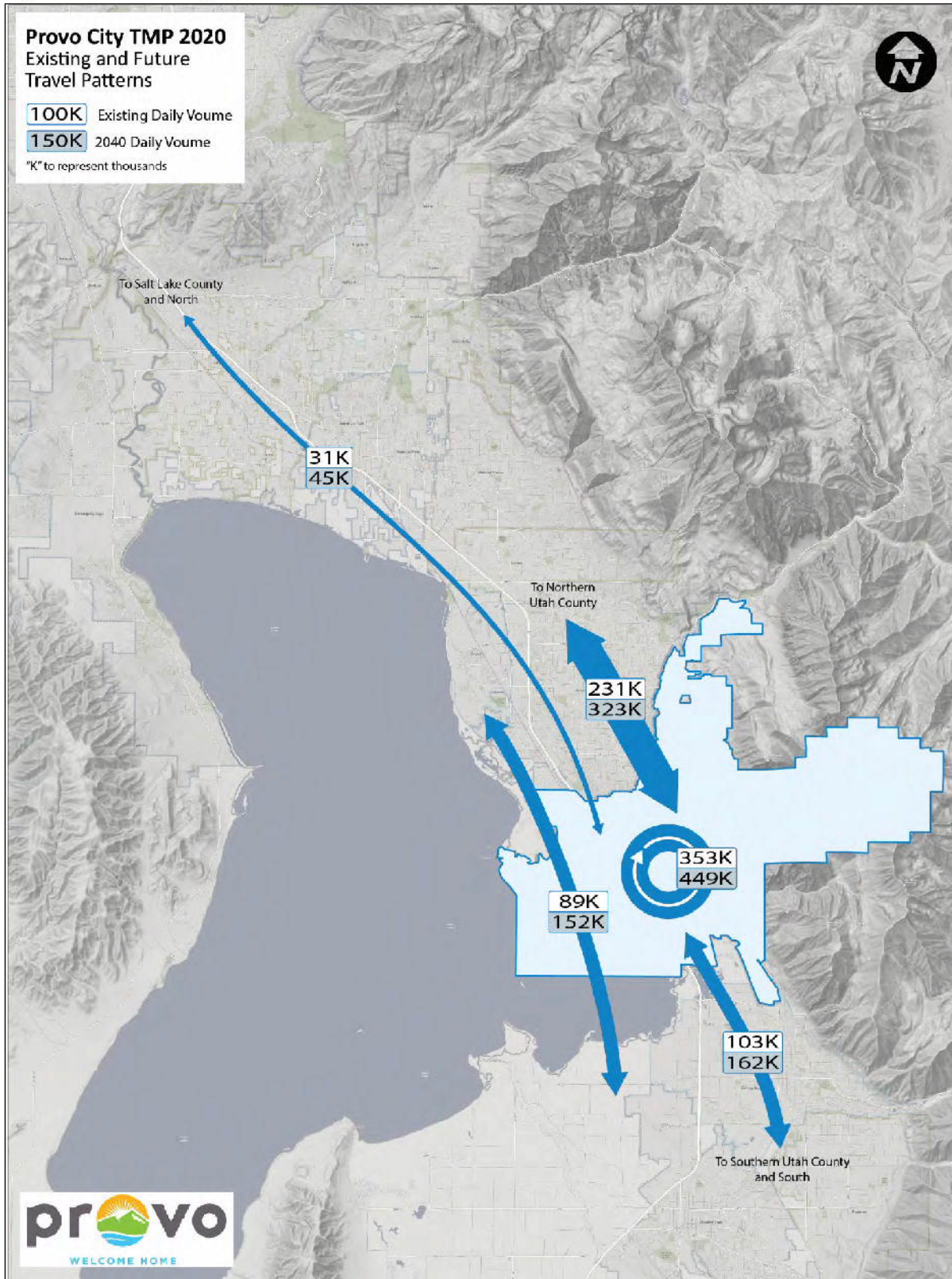


2.6 2040 Regional Travel Patterns

Beyond specific roadway traffic conditions model forecasts were used to understand regional traffic patterns as they relate to Provo City. Figure 2.13 shows existing and 2040 traffic flows, illustrating the extent to which traffic flow to, across and within Provo City. The largest traffic flows occur within Provo, with 353,000 and 449,000 daily trips occurring in 2018 and 2040 respectively. The second largest flow occurs between northern Utah County and Provo City, which 231,000 and 323,000 daily trips for 2018 and 2040 respectively. The other flows, from north of Utah County, through Provo, and to south of Provo, are much smaller, together representing 28 percent and 32 percent of daily trips for 2018 and 2040 respectively. The smallest flow, from north of Utah County, only consists of four percent of daily trips for both 2018 and 2040.

These regional travel patterns remain relatively stable from 2018 to 2040. There is a four percent reduction in internal travel, while through trips and trips going to and from the south increase by 2.4 percent and 1.6 percent respectively. The share of trips northwards, both to northern Utah County and beyond, does not change from 2018 to 2040.

Figure 2.13: Existing and Future Travel Patterns



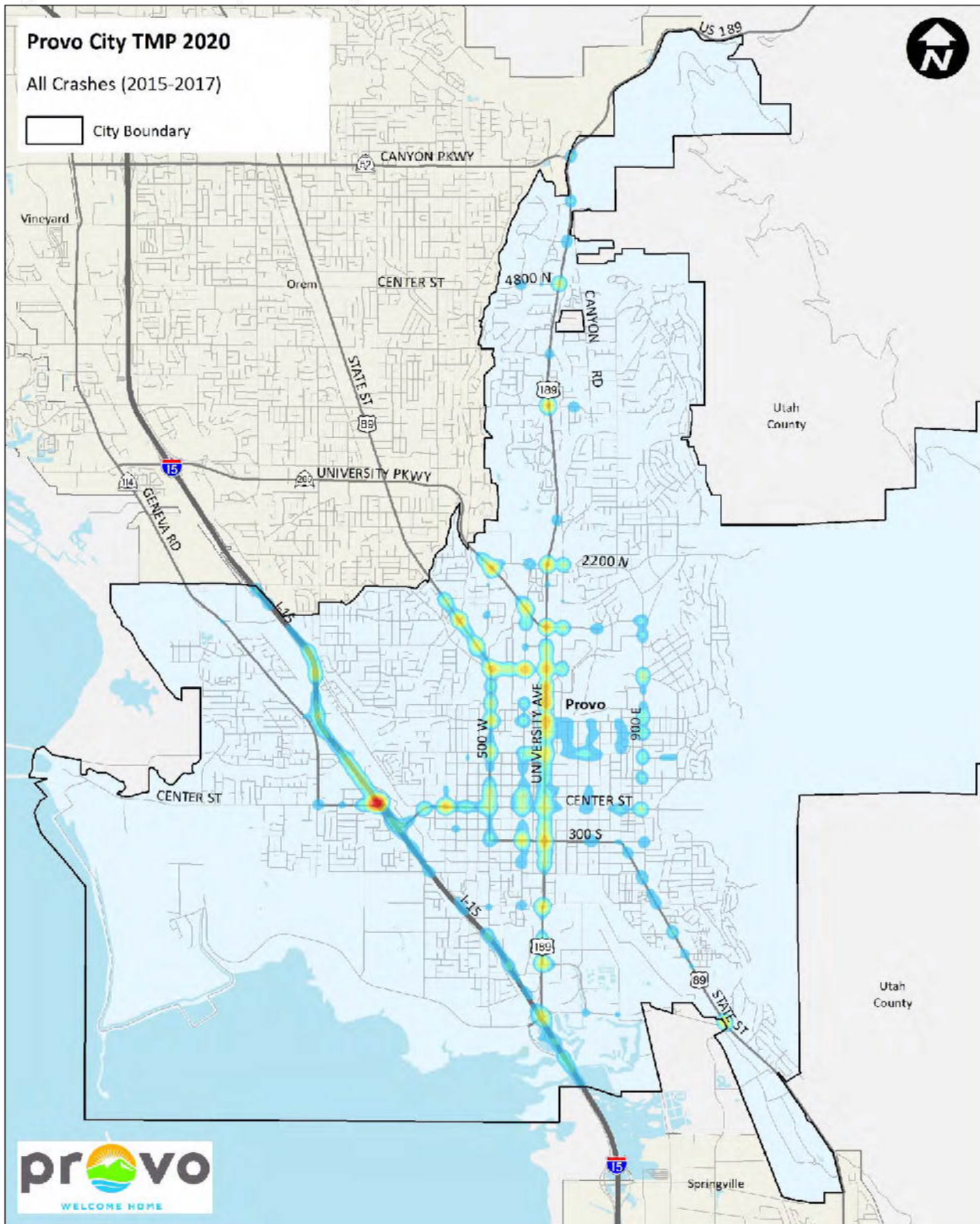
Chapter 3 – Safety

For the Provo City Transportation Master Plan, a safety analysis was performed using the most recent three years of crash data (2015-2017) from the UDOT Traffic and Safety Division. Historical crash patterns and conditions within Provo City were analyzed to develop project and policy recommendations. This chapter presents data and methodology documenting this process.

3.1 City-wide Crashes

Parametrix identified all crashes within Provo City boundaries for 2015-2017. In total, there were 4,954 reported crashes. Figure 3.1 is a heat map of crash locations illustrating the highest concentrations of crashes within the city. Crashes tend to cluster along major corridors such as, I-15, University Avenue (US-189), 500 West (US-89), State Street (US-89), and Cougar Boulevard. In particular, the I-15/Center Street (State Route (SR) 114) interchange area is the highest concentration area in the city featuring approximately 230 crashes during the three analysis years.

Figure 3.1: All Crashes (2015-2017)



3.1.1 Fatal and Serious Injury Crashes

Crash severity is reported according to a five-category scale ranging from no injury to fatality. There is considerable emphasis in Utah among safety agencies, transportation planners and engineers to eliminate fatal crashes. However, the low frequency of fatal crashes can result in an insufficient sample size to identify meaningful patterns. As a result, the next level of crash severity, serious injury crashes, is often included in a crash severity analysis.

Figure 3.2 illustrates the fatal and serious injury crashes in Provo City. For the analysis period, there were 13 crashes with a fatality and 99 serious injury crashes. Most of the fatal crashes occurred on major roads except for fatal crashes on Oakmont Lane and 920 South. Just over half of the fatal crashes (seven) occurred at intersections and two crashes occurred at the I-15/Center Street interchange area.

The number of fatal and serious injury crashes in Provo City as a percentage of total crashes is about on par with Utah County as a whole – about two percent of crashes were fatal and serious injury crashes in both Provo City and Utah County. By comparison, Orem City fatal and serious injury crashes comprise about one percent of all crashes as shown in Table 3.1.

Table 3.1: Fatal and Serious Injury Crashes Peer Comparison (2015-2017)

	Provo City	Orem City	Utah County
Fatal and Serious Injury Crashes	112 (2.3%)	82 (1.4%)	606 (2.1%)

Note: Confidential: This data may be protected under 23 United States Code (USC) 409.

Table 3.2 documents a few of the key characteristics of each fatal crash. Considering there were 13 fatal crashes total, a significant proportion of fatal crashes involved non-motorists – two crashes involved pedestrians and two crashes involved bicyclists. In one instance of each type, the pedestrian or bicyclist was crossing at an intersection against the red “do not walk” signal. In the other two instances, the pedestrians or bicyclist were hit by drowsy or distracted drivers.

Driver condition plays an important role in several fatal crashes. Two crashes involved a drowsy driver, two additional crashes involved a driver distracted by a global positioning system (GPS) device, and two more crashes involved an impaired driver.

Finally, driver age factored into several fatal crashes. Five crashes involved an older driver (65 and older) and three crashes involved a teen driver, although the teen driver and older driver was not always at fault. One of these crashes involved both a teen driver and an older driver.

Figure 3.2: Fatal and Serious Injury Crashes (2015-2017)

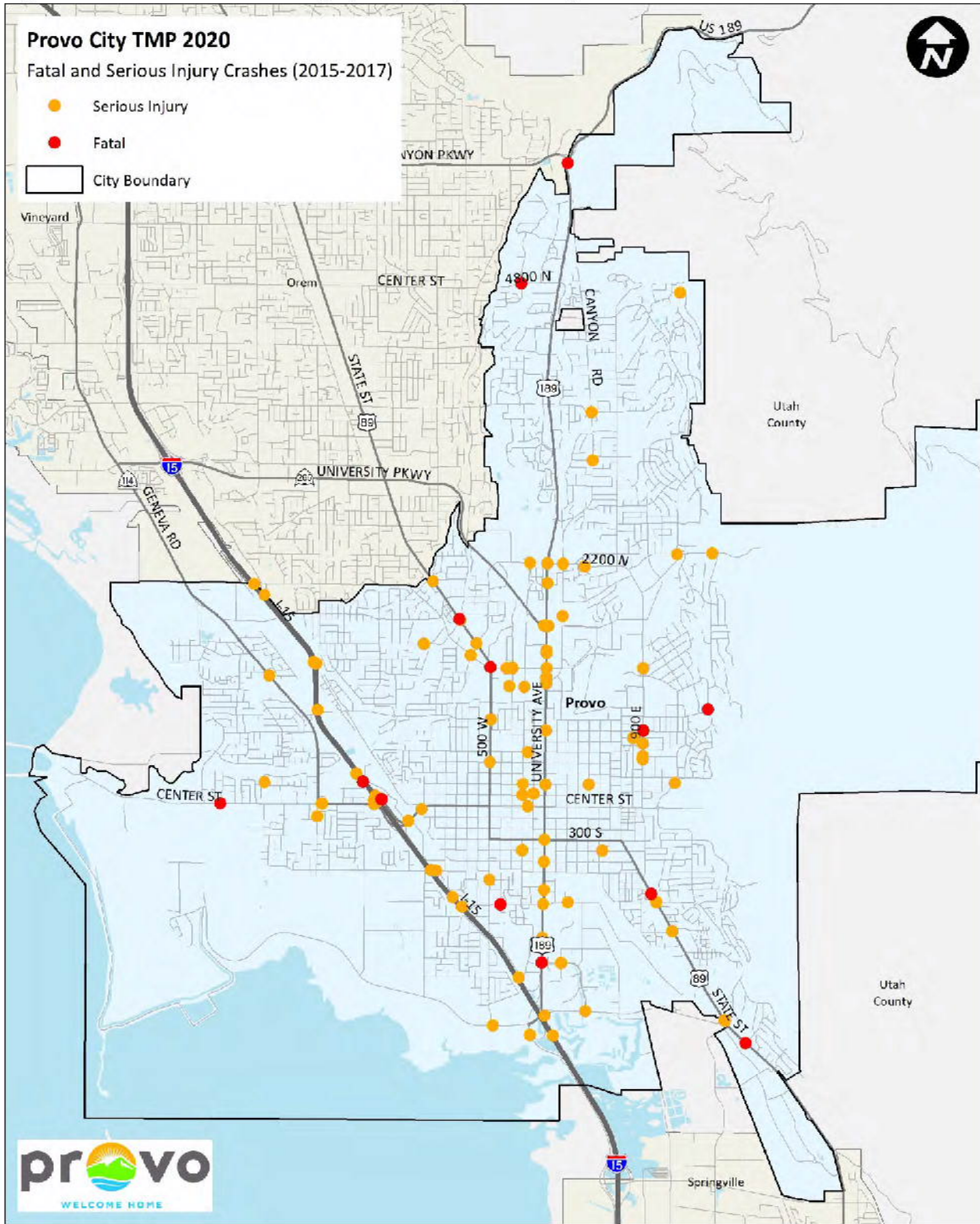


Table 3.2: Fatal Crash Characteristics (2015-2017)

Year	Key Crash Characteristics
2015	Left-turning vehicle ran red light and hit by oncoming vehicle. Older driver involved.
2015	Pedestrian crossing against red signal struck by vehicle. Older driver involved.
2015	Drowsy driver ran off roadway.
2016	Left-turning vehicle hit by oncoming vehicle. Older driver and teen driver involved.
2016	Speeding motorcycle hit by left-turning vehicle.
2016	Left-turning vehicle hit by oncoming vehicle. Older driver involved.
2016	Driver distracted by GPS ran red light. Teen driver involved.
2016	Bicyclist fell in roadway then struck by driver distracted by GPS.
2016	DUI. Speeding vehicle drifted into oncoming vehicle.
2016	DUI. Speeding vehicle ran off roadway.
2016	Bicyclist crossing roadway against red signal struck by vehicle.
2017	Drowsy driver ran off roadway and struck pedestrians. Teen driver involved.
2017	Left-turning vehicle hit by oncoming vehicle that ran red light. Older driver involved.

Note: Confidential: This data may be protected under 23 USC 409.

3.2 Bicycle-Involved Crashes

For 2015-2017, 145 vehicle crashes involving a bicyclist occurred in Provo City. Figure 3.3 symbolizes the locations of these crashes by crash severity. The biggest groupings of crashes are near the Center Street/Freedom Boulevard intersection, the State Street/Grandview Boulevard intersection, the Cougar Boulevard corridor, and the 800 North corridor, east of University Avenue.

As shown in Table 3.3, the percent of all crashes involving a bicyclist is higher in Provo City than in Orem City and higher than in Utah County as a whole. The bicycle infrastructure in Provo City may play a role in this trend. However, because of the large amount of student housing, Provo City likely has many more bicyclists than Orem City and more than the rest of Utah County meaning the higher percentage of bicycle crashes may also be representative of a much higher frequency of vehicle-bicycle conflicts. The same relationship sometimes occurs with bicycle facilities. Sometimes a road with bike lanes may exhibit more bicycle crashes than a road without bike lanes simply because more bicyclists are choosing to use the road with bike lanes.

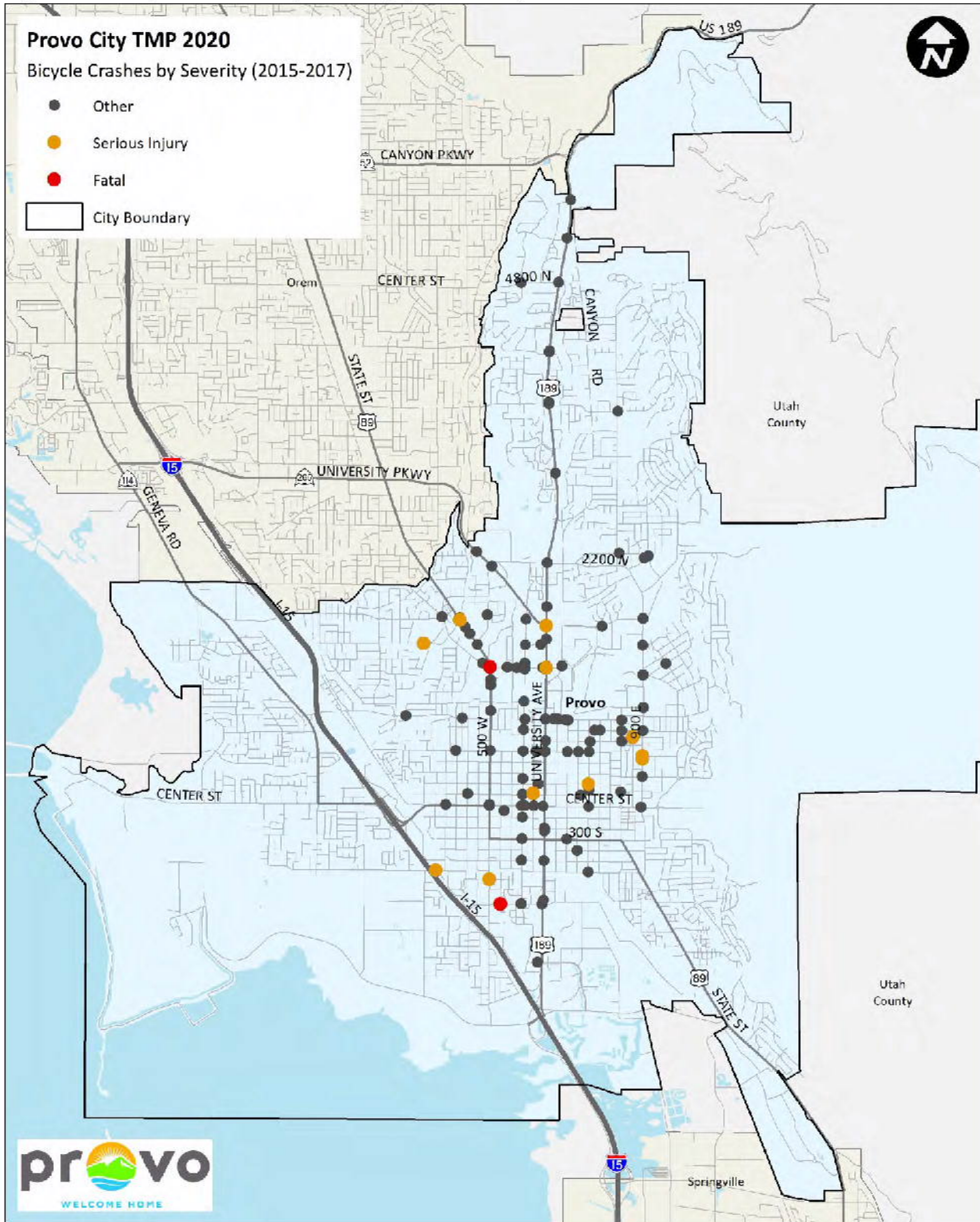
Thirty-four percent of all bicycle-involved crashes occurred within a crosswalk or sidewalk. Of these, 73 percent occurred where there were no bike lanes or other bicycle facilities present. This high prevalence of crosswalk/sidewalk crashes may indicate a lack of on-street bicycle facilities if bicyclists are choosing to ride on sidewalks rather than in the roadway.

Table 3.3: Bicycle-Involved Crashes Peer Comparison (2015-2017)

	Provo City	Orem City	Utah County
Bicycle-Involved Crashes	142 (2.9%)	66 (1.2%)	317 (1.1%)

Note: Confidential: This data may be protected under 23 USC 409.

Figure 3.3: Bicycle Crashes by Severity (2015-2017)



3.3 Pedestrian-Involved Crashes

For 2015-2017, 89 vehicle crashes involving a pedestrian occurred in Provo City. Figure 3.4 presents the locations of these crashes by location. Clusters are hard to define because crashes are spread across the city, but there is a trend of crashes occurring within crosswalks. Many of these crashes occurred on Center Street and University Avenue, particularly at 700 North and 800 North.

As shown in Table 3.4, the percent of all crashes involving a pedestrian is higher in Provo City than in Orem City and higher than in Utah County as a whole. The more urban nature of Provo City may play a role in this trend. And similar to bicyclists, the student population in Provo City likely contributes to higher pedestrian activity than Orem City and in Utah County, meaning the higher percentage of pedestrian crashes may also be representative of a much higher frequency of vehicle-pedestrian conflicts.

Fifty-nine pedestrian-involved crashes (66 percent) occurred within a crosswalk, with many involving a driver turning right or left. Of these, seven were severe crashes with one fatality. This high prevalence of crosswalk pedestrian crashes indicates instances of poor compliance from drivers or pedestrians. Specific location may need to be reviewed to determine if amenities would be beneficial to increase driver compliance and instill an appropriate level of caution for pedestrians.

Table 3.4: Pedestrian-Involved Crashes Peer Comparison (2015-2017)

	Provo City	Orem City	Utah County
Pedestrian-Involved Crashes	89 (1.7%)	61 (1.1%)	307 (1.1)

Note: Confidential: This data may be protected under 23 USC 409.

For 2015-2017, 89 crashes involving a pedestrian occurred in Provo City. Figure 3.5 symbolizes the locations of these crashes by crash severity. The biggest groupings of crashes are along Center Street, Freedom Boulevard, and University Avenue.

Figure 3.4: Pedestrian Crashes by Position (2015-2017)

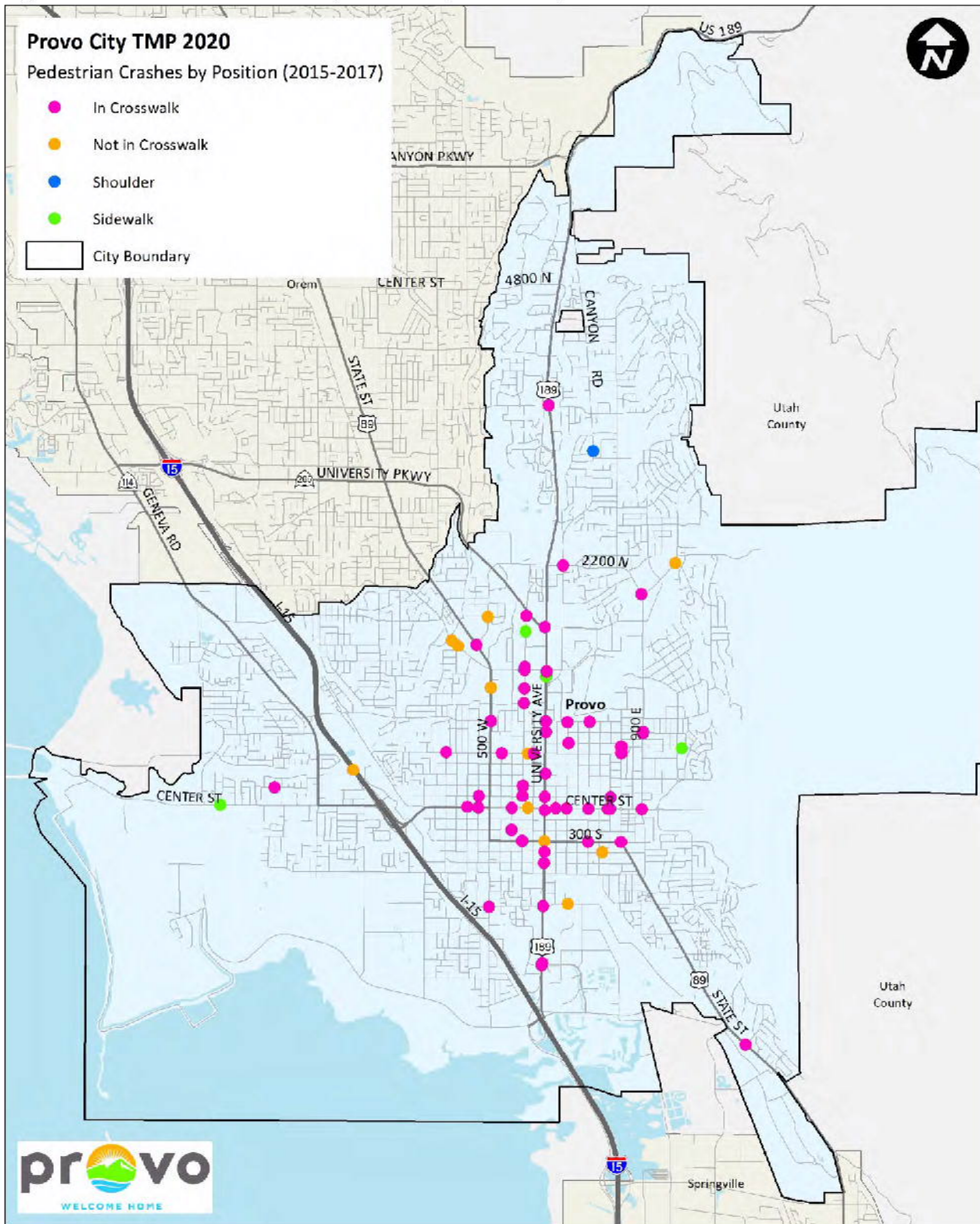
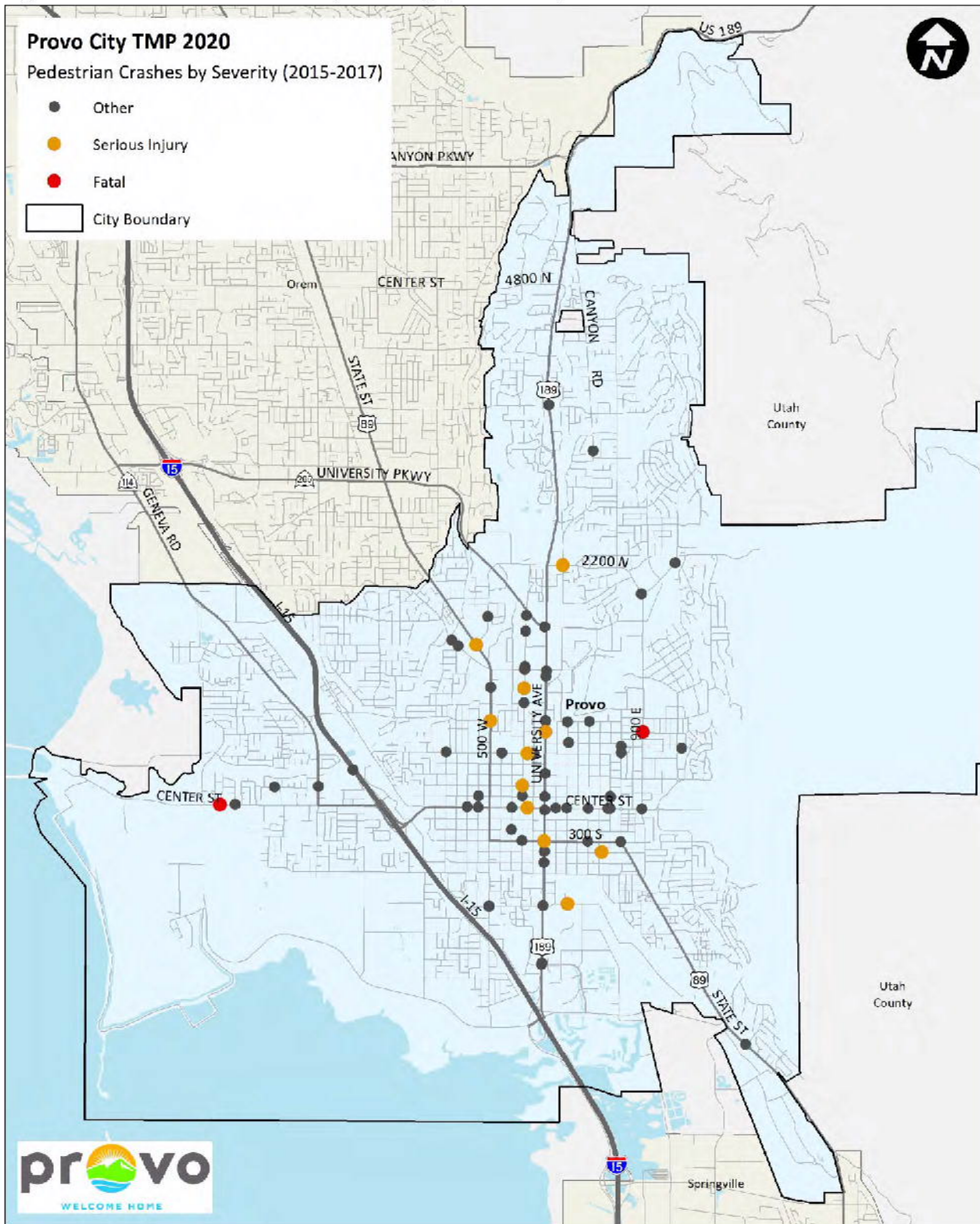


Figure 3.5: Pedestrian Crashes by Severity (2015-2017)



3.4 Non-State Route Crashes

A large concentration of the vehicle activity in Provo City occurs on state routes. As such, most crash hotspots occur on state routes or at junctions with state routes where Provo City has limited influence to correct potential design deficiencies leading to high crash rates. Because of this, it is helpful to look at crashes off state routes to isolate potential hotspots where the city can influence change. Figure 3.6 shows a heat map of non-state route crashes within Provo City.

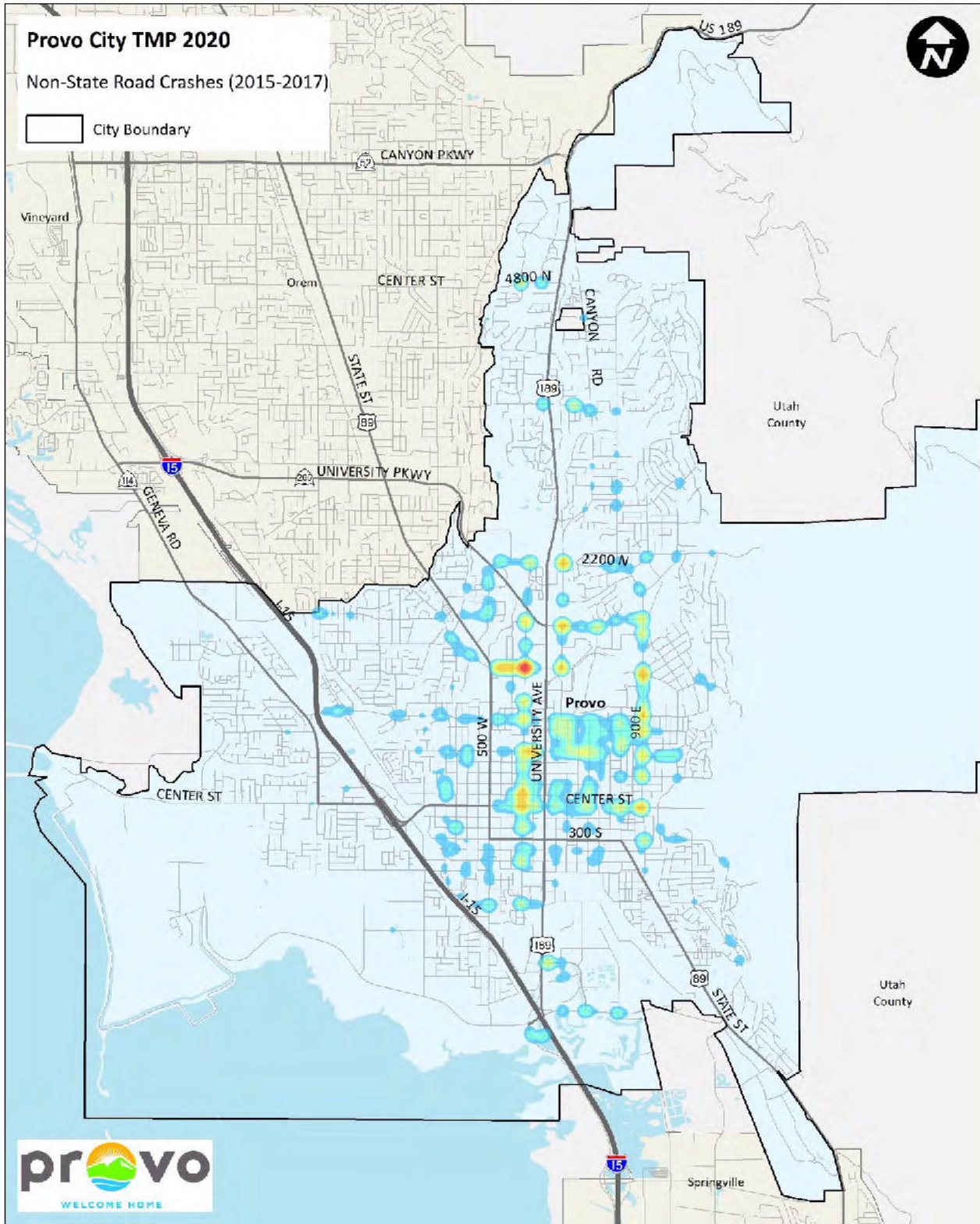
Non-state corridors that stand out are Freedom Boulevard, Center Street, and 900 East. Table 3.5 shows intersection hotspots within the city. Most of these hotspot intersections occur along notable and high traffic corridors, with the largest hotspot occurring at the intersection of Cougar Boulevard and Freedom Boulevard.

Table 3.5: Non-State Route Hotspot Locations (2015-2017)

Location	Total Crashes
Freedom Boulevard and Cougar Boulevard	55
900 East and Birch Lane	26
Freedom Boulevard and 100 North	25
Freedom Boulevard and Center Street	24
Canyon Road and 2230 North	23
900 East and 820 North	16

Note: Confidential: This data may be protected under 23 USC 409.

Figure 3.6: Non-State Route Crashes (2015-2017)

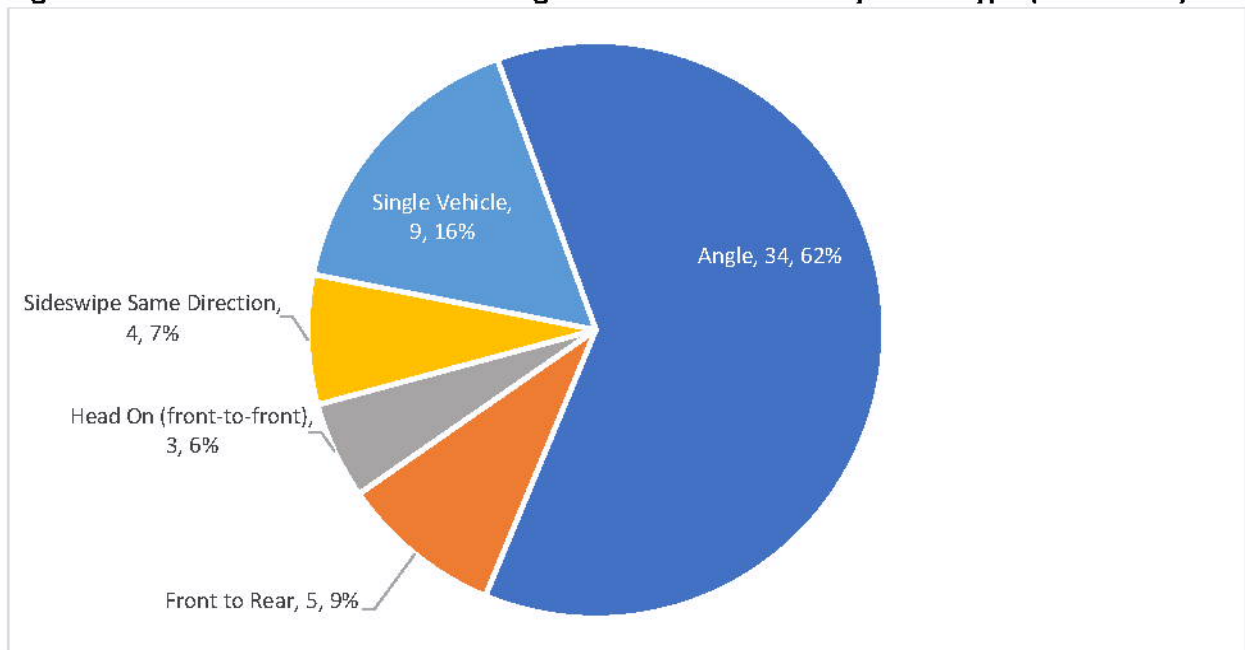


3.4.1 Freedom Boulevard and Cougar Boulevard

This intersection represents the largest crash hotspot with 55 crashes between 2015 and 2017. Figure 3.7 shows crashes by crash type. The most predominant crash type was angle with 34 crashes, 62 percent of the total. A majority of the angle crashes were the result of a failure to yield while turning left, with 10 occurring in the northbound direction, six in the eastbound direction, five in the westbound, and two in the southbound direction. A left turn flashing yellow was implemented in 2015 and may have influenced the prevalence of left turn crashes. An investigation of the three years before the flashing yellow shows a slightly reduced prevalence of angle crashes with 28 crashes. The Freedom Boulevard and Cougar Boulevard intersection also sees a high occurrence of red light running crashes, with 10 crashes. This is a trend which continues along the Freedom Boulevard corridor. Finally, there were four bicyclists and three pedestrian crashes.

It is important to note that in 2019 a project was completed on Cougar Boulevard that altered this intersection and provided enhanced accommodations for bicyclists. After one to three years of the completed improvements being constructed, it could be worth updating the crash analysis for this intersection to compare change in data.

Figure 3.7: Freedom Boulevard and Cougar Boulevard Crashes by Crash Type (2015-2017)



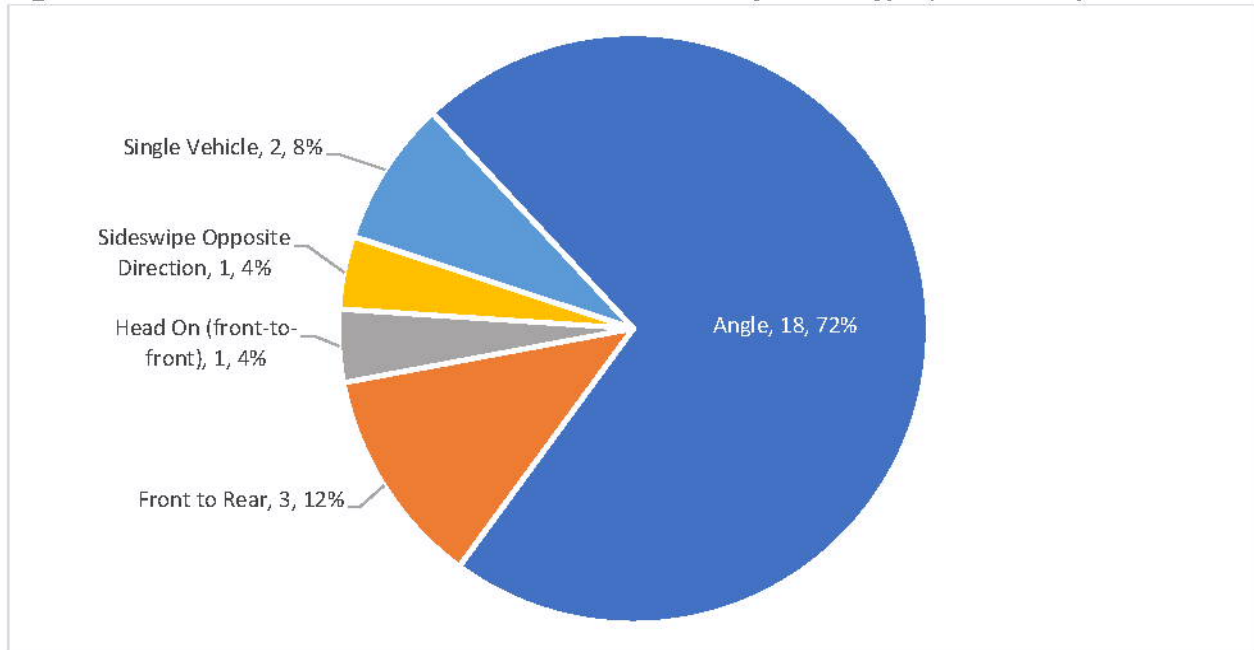
Note: Confidential: This data may be protected under 23 USC 409.

3.4.2 Freedom Boulevard and 100 North

There were 25 crashes at this intersection between 2015 and 2017. Figure 3.8 shows crashes by crash type. The most predominant crash type at this intersection was angle, accounting for 72 percent of all crashes. Most of these were from red light running, which was a predominant contributing factor to crashes occurring at this intersection, with 64 percent of all crashes. With no real grade or sight distance issues present at this intersection, it is difficult to discern the cause

for the high prevalence of red light running. High visibility back plates on the signal heads would emphasize the presence of the signal and could help reduce unintentional red light running. Additionally, further investigation of signal timing may reveal some insights. A short yellow phase can catch people off guard, or the dominant north-south signal coordination of Freedom Boulevard could be contributing to driver frustration, leading people to intentionally run the red light.

Figure 3.8: Freedom Boulevard and 100 North Crashes by Crash Type (2015-2017)

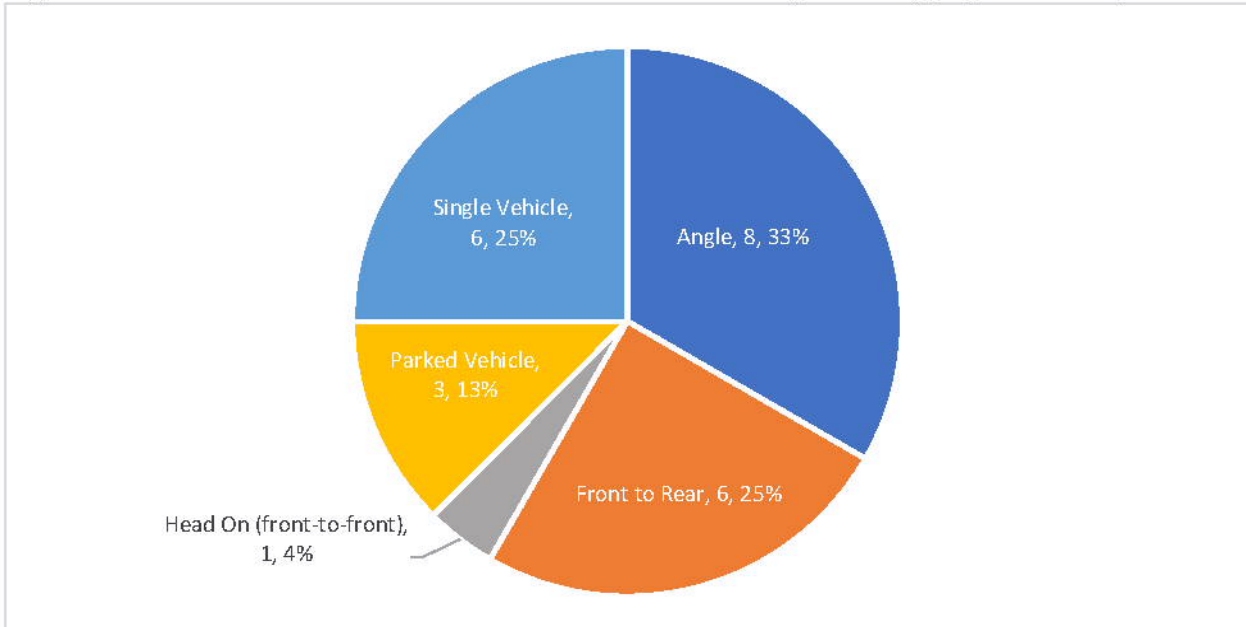


Note: Confidential: This data may be protected under 23 USC 409.

3.4.3 Freedom Boulevard and Center Street

There were 24 crashes at this intersection between 2015 and 2017. Figure 3.9 shows crashes by crash type. For this intersection there was no single predominant crash type with angle, front to rear, and single vehicle, accounting for 33 percent, 25 percent, and 25 percent of all crashes respectively. Like the other two Freedom Boulevard intersection hotspots, red light running was a major contributor to crashes, comprising of 29 percent of all crashes. Again, high-visibility signal heads and signal timing adjustments may help with red light running. There was a relatively high occurrence of six bicycle-involved crashes. The relatively high bicycle-involved crashes may be a byproduct of increased bicycle activity in Downtown Provo. There were no pedestrian-involved crashes.

Figure 3.9: Freedom Boulevard and Center Street Crashes by Crash Type (2015-2017)

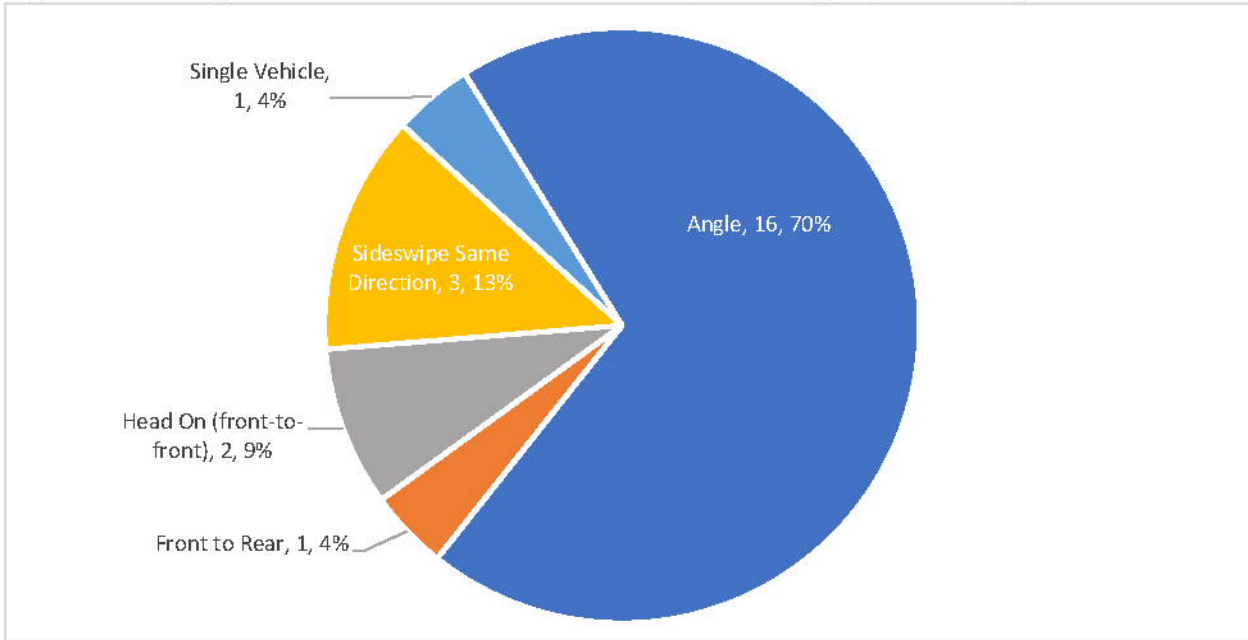


Note: Confidential: This data may be protected under 23 USC 409.

3.4.4 Canyon Road and 2230 North

There were 23 crashes at this intersection between 2015 and 2017. Figure 3.10 shows crashes by crash type. The predominant crash type was angle crashes, with nearly half being eastbound turning left. The eastbound turning left crashes mostly occurred in the evening or afternoon, so visibility due to the setting sun is not a contributing factor to this trend. Left turns are protected-permitted at this intersection. A short and abrupt turn phase could lead to these types of crashes and a review of the signal timing at this intersection could be advantageous. There were as many red light running crashes, six in total. As described above, high-visibility signal heads and signal timing adjustments may help with red light running. There were one pedestrian-involved crash and no bicycle-involved crashes.

Figure 3.10: Canyon Road and 2230 North Crashes by Crash Type (2015-2017)

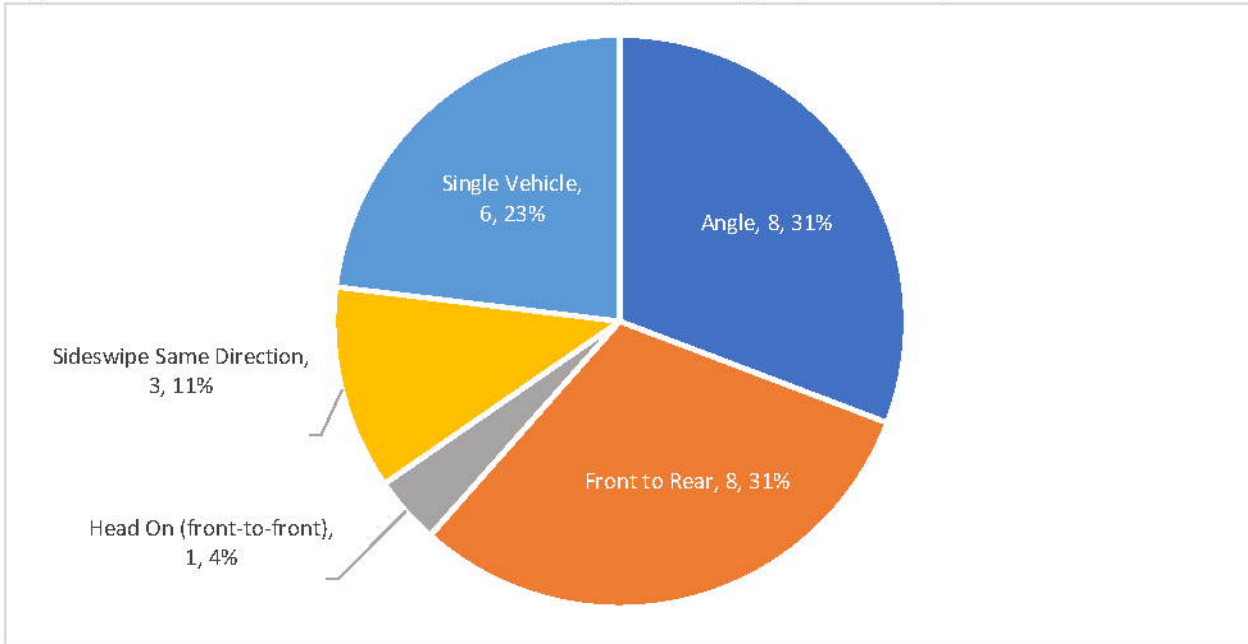


Note: Confidential: This data may be protected under 23 USC 409.

3.4.5 900 East and Birch Lane

There were 26 crashes at this intersection between 2015 and 2017. Figure 3.11 shows crashes by crash type. For this intersection, there was no single predominant crash type with angle, front to rear, and single vehicle crashes accounting for 31 percent, 31 percent, and 23 percent of all crashes respectively. A majority of the front to rear crashes occurred in the southbound direction and are all attributable to distracted driving and following too closely. People coming down the hill at speed, coupled with activity and access to the creamery are probable contributors to the rear-end crashes here. A southbound right-turn lane would help remove vehicles slowing to turn from the through lane, but property constraints here would make adding this infrastructure difficult. There were three bicycle and no pedestrian crashes.

Figure 3.11: 900 East and Birch Lane Crashes by Crash Type (2015-2017)

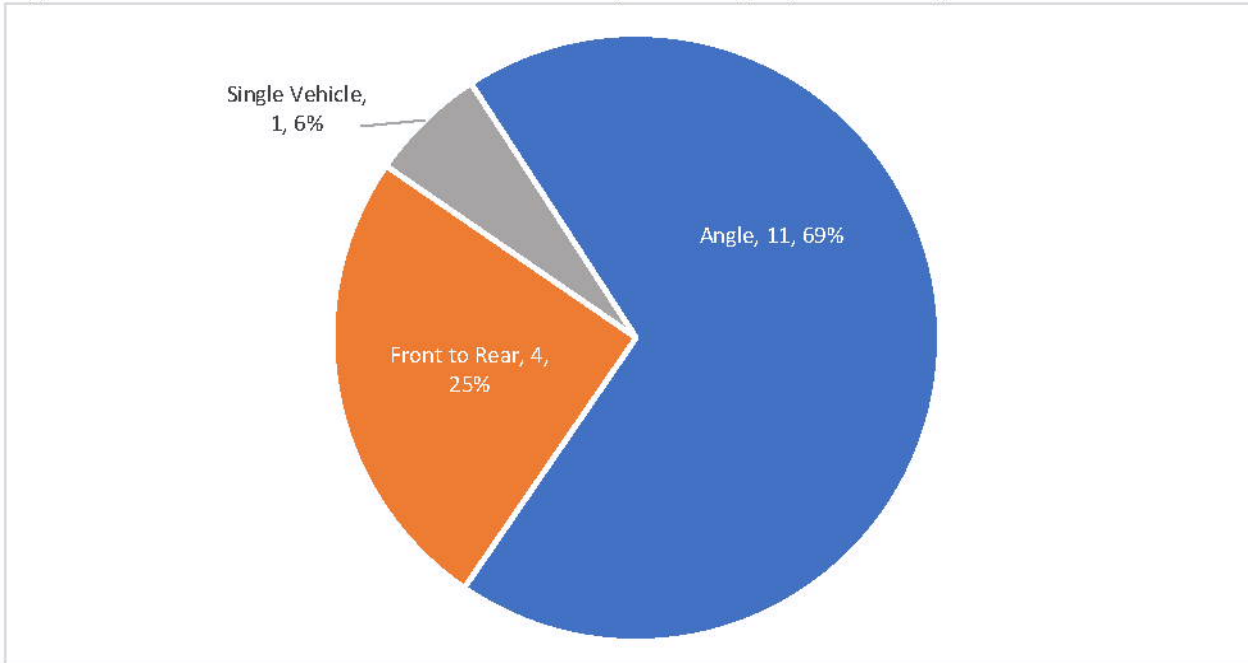


Note: Confidential: This data may be protected under 23 USC 409.

3.4.6 900 East and 820 North

There were 16 crashes at this intersection between 2015 and 2017. Figure 3.12 shows crashes by crash type. Here, angle crashes are predominant with 69 percent of all crashes. This is the only stop-controlled hotspot intersection and the trend here is for crashes resulting in a failure to yield to traffic while crossing or turning onto 900 East, 63 percent of all crashes were of this circumstance. Sight distance challenges, high traffic volumes, and difficulty finding gaps may be contributing to this issue. It is important that care is taken while selecting the appropriate treatment, as to avoid causing other issues, such as increased rear-end crashes stemming from tightly spaced signals. There were no bicycle or pedestrian crashes at this intersection.

Figure 3.12: 900 East and 820 North Crashes by Crash Type (2015-2017)



Note: Confidential: This data may be protected under 23 USC 409.

3.5 Conclusions and Considerations

Vehicle crashes are always of concern to any community, but for Provo City they are particularly concerning given the relatively high rate of fatal and serious injury, bicycle, and pedestrian crashes. The peer comparisons show Provo City has a somewhat higher percentage of fatal and serious injury crashes than Orem City but is similar to Utah County as a whole. The percentage of bicycle-involved crashes and pedestrian-involved crashes is also higher than both Orem City and Utah County. The higher percentage of fatal and serious injury crashes may be related to more frequent bicycle-involved and pedestrian-involved crashes since bicyclists and pedestrians are at higher risk for severe injuries than auto occupants. While most of crashes in Provo are occurring on UDOT facilities, there are areas within Provo City’s jurisdictions where interventions and policies may make positive changes for safety.

3.5.1 Bicycle Considerations

It is evident that there is for a trend of pedestrian and bicycle involved crashes in Provo occurring at a higher rate than both Orem City and Utah County. This could be a reflection of increased pedestrian and bicycle activity in Provo. For bicycles there was a high occurrence of crashes on roads without infrastructure for bicyclists, indicating a need for additional accommodations. A strategic and thoughtful improvement plan for bicycle infrastructure in Provo, with an emphasis on connecting key origin points and destinations will be provided in the Active Transportation Chapter of the TMP.

3.5.2 Pedestrian Considerations

For pedestrians there was a high prevalence of crashes occurring within crosswalks. This can be related to the fact that there is usually more pedestrian activity at crosswalks than away from crosswalks. More pedestrian activity increases the risk of crashes. Additionally, inadequate and/or inappropriate crosswalk infrastructure can contribute to both poor pedestrian and driver compliance. Pedestrians can assume a false sense of security and drivers can be inattentive to crosswalk activity at locations that are not thoughtfully designed. There is a need for an examination of crosswalk standards in the city, to ensure that crosswalks are being implemented in appropriate applications with features and accommodations which suite each specific application. It is important for the city to have a well-defined set of standards to turn to so that well intentioned requests and proposals can be responded in a well informed and intentional manner. The city may want to consider a crosswalk safety study.

3.5.3 Hotspot Intersections

For intersections influenced by upcoming projects, such as buffered bike lanes on Cougar Boulevard and the widening of 2230 North, continued observation and study should be maintained. These changes will likely influence crash patterns and may result in the alleviation of current issues or introduce new problems.

Red light running is a big concern in Provo and particularly along the Freedom Boulevard corridor. The underlying cause is not clear, but a high signal density and driver frustration could be a factor. In addition to increased law enforcement, one potential mitigation for red light running is increasing the visibility of the signal heads, with high-visibility back plates. If driver frustration is the root cause, then a close look at signal timing to reduce red times for east-west travel may be a solution. The city may want to consider performing an intersection hotspot study to identify solutions to intersection hotspot locations.

Chapter 4 – Roadway Network

Provo's roadway system is a vast network that connects places and people within neighborhoods throughout the city. Planners and engineers have developed elements of this network with specific travel objectives in mind. These objectives range from serving neighborhood travel from residential developments to nearby employment, schools, and shopping centers to providing access to local businesses and meeting freight mobility needs. The functional classification of roadways defines the role each element of the roadway network plays in serving these travel needs.

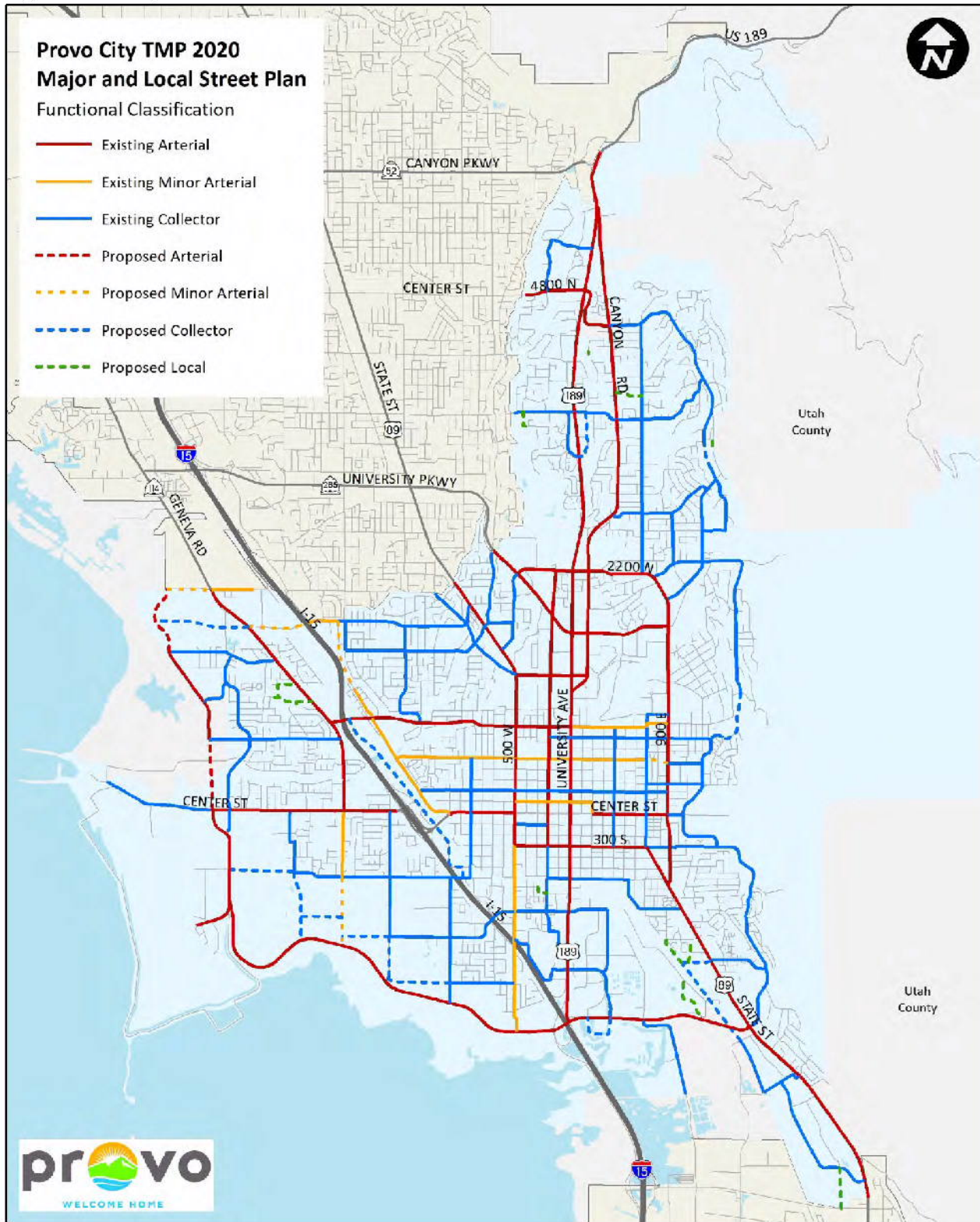
4.1 Functional Classification

Over the years, functional classification has come to assume additional significance beyond its purpose as a framework for identifying the particular role of a roadway in moving vehicles through a network of roadways. Functional classification carries with it, expectations about roadway design, including its speed, capacity, and relationship to existing and future land use development. Federal legislation continues to use functional classification in determining eligibility for funding under the Federal-aid program. Transportation agencies describe roadway system performance, benchmarks and targets by functional classification. As agencies continue to move towards a more performance-based management approach, functional classification will be an increasingly important consideration in setting expectations and measuring outcomes for preservation, mobility, and safety.

Most travel occurs through a network of interdependent roadways, with each roadway segment moving traffic through the system towards destinations. The concept of functional classification defines the role that a particular roadway segment plays in serving this flow of traffic through the network. Roadways are assigned to one of several possible functional classifications within a hierarchy according to the character of travel service each roadway provides. Planners and engineers use this hierarchy of roadways to properly channel transportation movements through a highway network efficiently and cost effectively.

Provo City uses functional classification to define its roadway network with arterials, collectors, and local streets. Distinctions between "major" and "minor" sub-classifications are key considerations when determining the functional classification category to which a particular roadway belongs. The process of determining the correct functional classification of a particular roadway is as much an art as it is science. Figure 4.1 shows the Major and Local Street Plan. For a list of changes to the Major and Local Street Plan, see Appendix B.

Figure 4.1: Major and Local Street Plan



4.1.1 Local Roads

Locally classified roads account for the largest percentage of all roadways in terms of mileage. They are not intended for use in long distance travel, except at the origin or destination end of the trip, due to their provision of direct access to abutting land. Transit bus routes generally do not run on local roads. They are often designed to discourage through traffic. As public roads, they should be accessible for public use throughout the year. Most local roads are often classified by default. In other words, once all arterial and collector roadways have been identified, all remaining roadways are classified as local roads.

The projects in Table 4.1 have been designated by Provo City as important local connections and can be seen as green dotted lines in the Major and Local Street Plan map in Figure 4.1. Because some future local connections are very short, it can be difficult to show on a small map, and therefore these important local connection roadways are listed below.

Table 4.1: Future Local Connections

Street Name/Location	From	To
Sierra Vista Way	SR-75	Mountain Vista Parkway
Colorado Avenue	Lakeview Parkway	1500 South
1080 East	1320 South	1140 South
Tracy Hall Parkway	1320 South	1140 South
300 West	700	750 South
750 South	300 West	Freedom Boulevard
2480 West	960 North	1060 North
1060 North	2670 West	Geneva Road
1170 North	2670 West	Geneva Road
2670 West	1060 North	1180 North
Piute Drive	3300 North	3350 North
Hidden Haven Lane	3540 North	3700 North
3860 North	Canyon Road	650 East
100/200 East	4200 North	4320 North

4.1.2 Collector Roads

Collectors serve a critical role in the roadway network by gathering traffic from local roads and funneling them to the arterial network. Within the context of functional classification, collectors are broken down into two categories: major collectors and minor collectors. The determination of whether a given collector is a major or a minor collector is frequently one of the biggest challenges in functionally classifying a roadway network.

The distinctions between major collectors and minor collectors are often subtle. Generally, major collector routes are longer in length; have lower connecting driveway densities; have higher speed limits; are spaced at greater intervals; have higher annual average traffic volumes; and may have more travel lanes than their minor collector counterparts. Careful consideration should be given to these factors when assigning a major or minor collector designation. Since major

collectors offer more mobility and minor collectors offer more access, it is beneficial to reexamine these two fundamental concepts of functional classification. Overall, the total mileage of major collectors is typically lower than the total mileage of minor collectors, while the total collector mileage is typically one-third of the local roadway network.

4.1.3 Arterial Roads

These roadways serve major centers of metropolitan areas and provide a high degree of mobility. Forms of access for arterial roadways include at-grade access to collector and local roads. In urban areas, there are usually multiple arterial routes serving a particular urban area, radiating out from the urban center to serve the surrounding region. Minor arterials provide service for trips of moderate length, serve geographic areas that are smaller than their higher arterial counterparts and offer connectivity to the higher arterial system. In an urban context, they interconnect and augment the higher arterial system, provide intra-community continuity and may carry local bus routes. The spacing of minor arterial roads may typically vary from one eighth- to one half-mile in the central business district and two to three miles in the suburban fringes. Normally, the spacing should not exceed one mile in fully developed areas.

4.1.4 Expressways, Freeways, and Interstates

Roadways in this functional classification category look very similar to Interstates. While there can be regional differences in the use of the terms 'expressway' and 'freeway', for the purpose of functional classification the roads in this classification have directional travel lanes are usually separated by some type of physical barrier, and their access and egress points are limited to on- and off-ramp locations or a very limited number of grade intersections. Like Interstates, these roadways are designed and constructed to maximize their mobility function, and abutting land uses are not directly served by them.

Interstates are the highest classification of arterials and were designed and constructed with mobility and long-distance travel in mind. Since their construction in the 1950's, the Interstate Highway System has provided a superior network of limited access, divided highways offering high levels of mobility while linking the major urban areas of the United States.

4.2 Roadway Cross-Sections

Considered as a single unit, the cross-section of a road includes some or all of the elements listed below. These cross-section elements define the roadway right-of-way. The right-of-way can be described generally as the publicly owned parcel of land that encompasses some or all of the various cross-section elements. The cross section of a road includes some or all of the following elements:

1. Traveled way (the portion of the roadway provided for the movement of vehicles, exclusive of shoulders).
2. Roadway (the portion of a highway, including shoulders, provided for vehicular use).
3. Median area (the physical or painted separation provided on divided highways between two adjacent roadways).
4. Bicycle and pedestrian facilities.

5. Utility and landscape areas.
6. Drainage channels and side slopes.
7. Clear zone width (i.e., the distance from the edge of the traveled way to either a fixed obstacle or non-traversable slope).

Some decisions about cross-sections are made during project development, such as the capacity and number of lanes for the facility. Other decisions, such as functional classification, are made earlier in the process. Deciding which of the elements to include and selecting the appropriate dimensions within these ranges is the role of the designer that follows currently adopted city standards found in the 2020 Provo Standard Drawing Details published by the Provo City Public Works Department. Further, the City Council adopted the cross-sections in this chapter on May 7, 2019.

In selecting the appropriate cross-section elements and dimensions, designers need to consider a number of factors, including the following:

1. Volume and composition (percent trucks, buses, and recreational vehicles) of the vehicular traffic expected to use the facility.
2. The number of bicyclists and pedestrians will use the route.
3. Climatic conditions (e.g., the need to provide storage space for plowed snow).
4. The presence of natural or humanmade obstructions adjacent to the roadway (e.g., rock cliffs, large trees, wetlands, buildings, power lines).
5. Type and intensity of development along the section of the highway facility that is being designed.
6. Safety of the users.

The most appropriate design for a highway improvement is the one that balances the mobility needs of the people using the facility (motorists, pedestrians, or bicyclists) with the physical constraints of the corridor within which the facility is located. The volume of pedestrian and bicycle traffic is one factor to consider when designing the cross section of a facility.

Provo City Public Works previously designated three local cross-sections, three collector cross-sections, and two arterial cross-sections. After two public open houses, presentations to the Transportation and Mobility Committee (TMAC), Planning Commission, and City Council and coordination with other city departments, the city has simplified and refined this list down to three local cross-sections, one collector cross-section, and two arterial cross-sections. Each cross-section is listed below with a short description.

Lane widths are not included in the drawings below to allow for flexibility when designing the street layout. One pavement width may accommodate multiple street designs with various features such as different bike infrastructure types, median types, and parking orientations.

4.2.1 Local Cross-Sections

Previously, all local cross-sections were oriented with the sidewalks outside the right-of-way. The updated cross-sections now include the sidewalks inside the right-of-way, which has increased local right-of-way widths from 42 feet to 54 feet (Figure 4.2), from 50 feet to 60 feet (Figure 4.3), and from 56 feet to 66 feet (Figure 4.4). Additionally, previous pavement widths of 24, 32, and 38 feet have been updated to 24 feet (Figure 4.2), 30 feet (Figure 4.3), and 36 feet (Figure 4.4).

Figure 4.2: Local Cross-Section 54 Feet Right-of-Way and 24 Feet Pavement

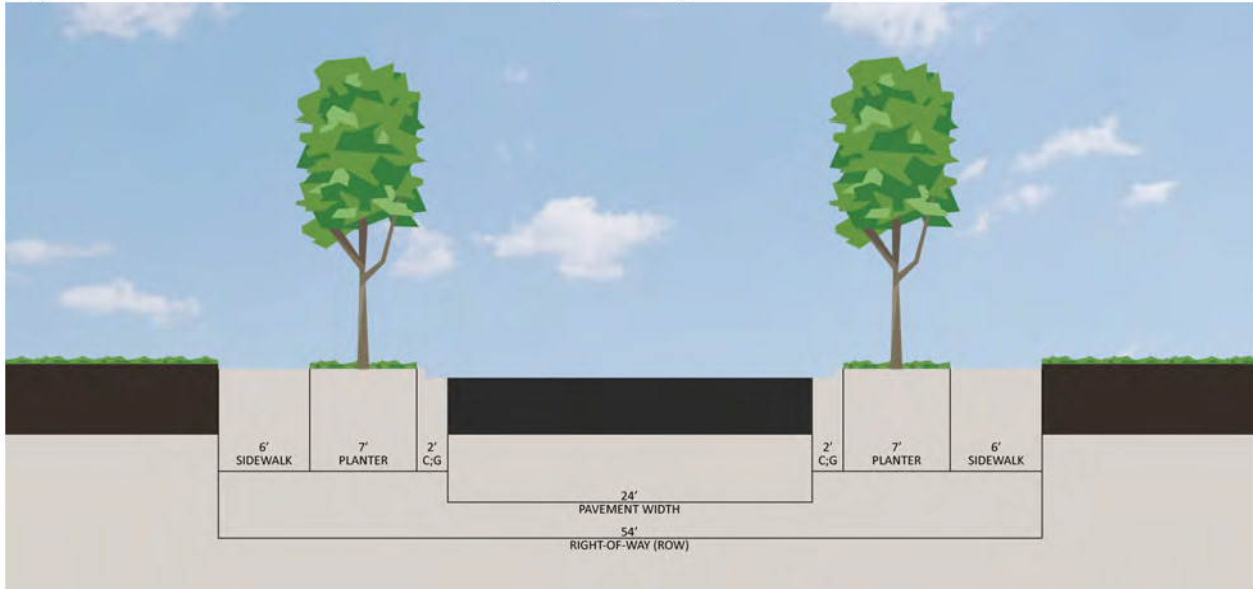


Figure 4.3: Local Cross-Section 60 Feet Right-of-Way and 30 Feet Pavement

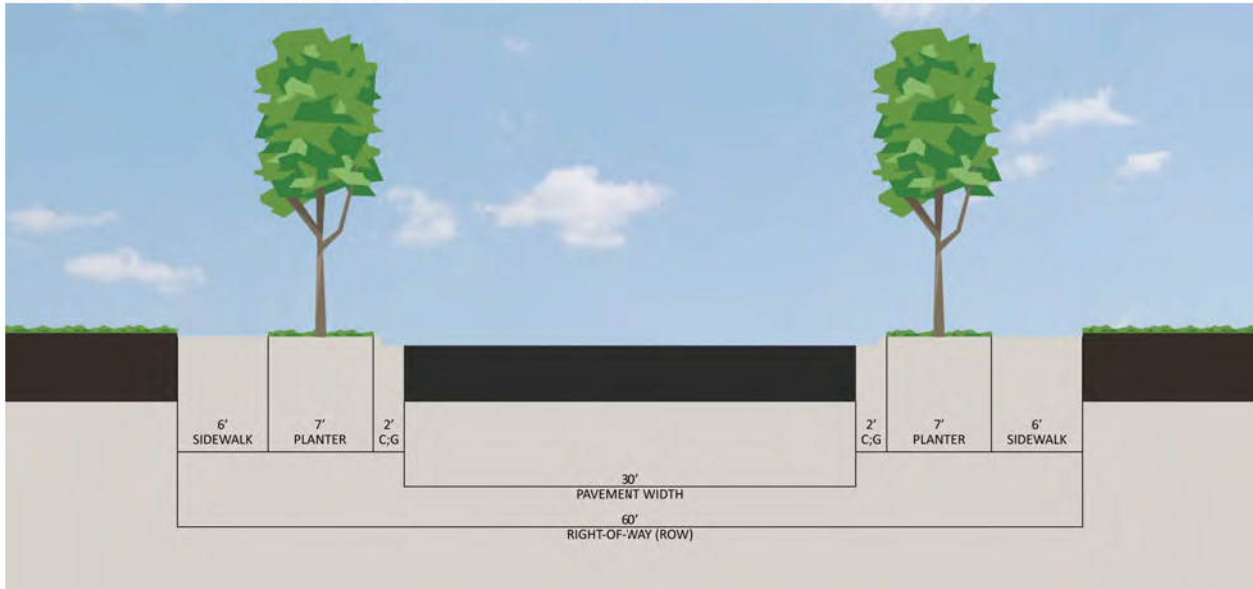
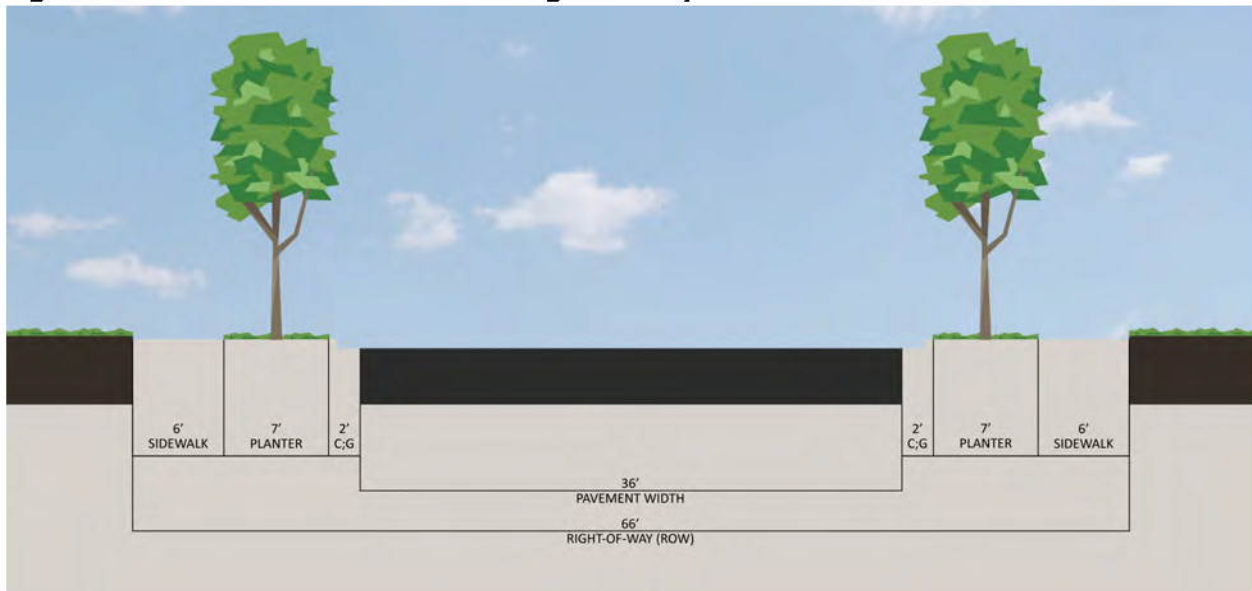


Figure 4.4: Local Cross-Section 66 Feet Right-of-Way and 36 Feet Pavement



4.2.1.1 Local Cross-Section Determination

The three local cross-sections offer similar off-street elements but different roadway widths. The selection of the local cross-section should consider the impact of the roadway width on access, safety, and mobility

For example, narrower pavement widths constrict turning paths for vehicles. Large vehicles will have more difficulty turning in and out of accesses on the narrower local street cross-sections, particularly when there is on-street parking. Areas of commercial or industrial land use, which are more likely to generate truck traffic, should feature the largest local street cross-section.

The two narrowest local cross-sections do not support regular two-way travel when vehicles are parked on both sides of the road. Assuming a typical vehicle width of six feet, vehicles in opposing directions will have less than one foot of clearance to pass one another on the narrowest local street cross-section (24 feet pavement). Two-way travel will be functionally impossible for the 24-foot pavement width when on-street parking is frequent. Under similar assumptions, opposing vehicles will have two to three feet of clearance for the 30-foot pavement width cross-section. While two-way travel is possible, most drivers will find this width of clearance uncomfortable and may slow down or even stop for an oncoming vehicle, essentially making it one lane of travel.

With the 36-foot pavement width cross-section, the average clearance between vehicles will be about four feet. This cross-section will allow for comfortable two-way travel with vehicles parked on both sides.

Long stretches of one-way flow or frequent opposing vehicles for short stretches of one-way travel are likely to lead to frustration and impatience for drivers. This, in turn, leads to aggressive

behavior and increased risk of crashes. The narrowest cross-sections should only be used for short block lengths or areas of lower traffic volume.

Local street pavement width should complement the functional hierarchy of the surrounding roadway. Local streets connecting directly to collectors and arterials are likely to experience higher traffic volumes than local streets connecting only to other local streets. Consequently, the local street intersections with collectors and arterials are more likely to need extra width to support right- or left-turn lanes.

To assist with the implementation of the local cross-sections, Table 4.2 summarizes criteria for selection of the appropriate local street cross-section

Table 4.2: Local Cross-Section Selection Guidelines

Criteria		If <u>any</u> of these conditions are met:	Else, if <u>any</u> of these conditions are met:	Otherwise:
Land Use	Commercial or industrial land uses generate more turning trucks	Commercial or industrial	Primarily residential	Primarily residential
Functional Class Connections	Local roads connecting to arterials or collectors more likely to need right- or left-turn lanes	Connects to arterials	Connects to collectors	Connects to other local roads only
AADT	Higher volumes on roadways that do not support two-way travel increase frustration and aggressive behavior	> 1,400 vehicles/day ¹	> 400 vehicles/day ²	< 400 vehicles/day
Parking	Parking on local roadways	Parking on both sides of roadway	Parking on one or both sides of roadway	No parking or parking on one side of roadway only
Recommended Local Cross-Section Pavement Width		36 feet	30 feet	24 feet

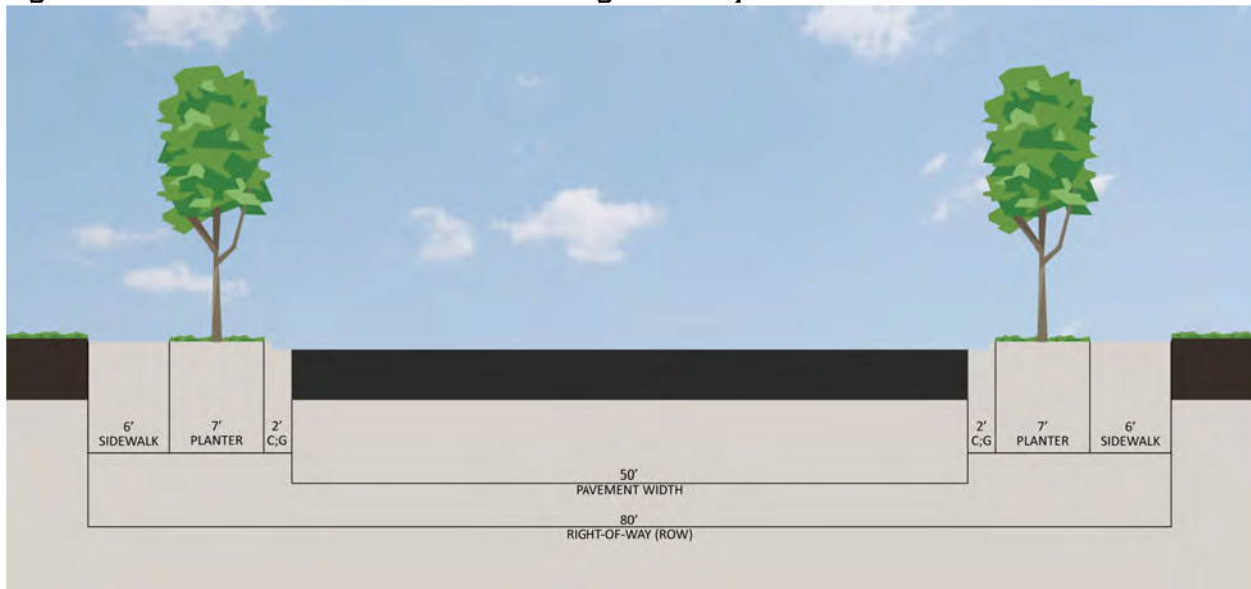
1. 1,400 vehicles/day reflects a reasonable estimate of the high end of traffic volumes likely to be experienced on a local street with primarily multi-family residential land use. A 500-foot Provo City block can support about 112 to 160 multi-family units on both sides of the roadway. However, large multi-family developments are likely to have a second access so about half the units may use a side-street access. Multiplying 56 to 80 units by Provo City’s trip generation rate of 11.4 trips/day and assuming an additional 20-50 percent of pass through traffic results in about 775-1,375 daily trips.

2. Common threshold for residential low-volume road design considerations, see *Guidelines for Geometric Design of Low-Volume Roads*, American Association of State Highway and Transportation Officials (2019)

4.2.2 Collector Cross-Section

Previously, Provo City had designated three different collector cross-sections, with all three sharing the same right-of-way of 72 feet and pavement width of 54 feet but differing in lane orientation. The updated collector has been simplified to a single cross-section (Figure 4.5) consisting of a 80 feet right-of-way with 50 feet of pavement width. Like the local cross-sections, the sidewalks are now included inside the right-of-way instead of the previous orientation in the public utility easement. This change means the pavement width has been reduced from 54 feet to 50 feet with the planter width staying at 7 feet.

Figure 4.5: Collector Cross-Section 80 Feet Right-of-Way and 50 Feet Pavement



4.2.3 Arterial Cross-Sections

Provo City also had designated two different arterial cross-sections – a smaller one and a larger one. The smaller one consisted of 84 feet right-of-way and 66 feet of pavement while the larger one had 120 right-of-way and 90 feet pavement. The new minor arterial cross-section will be 80 feet of right-of-way and 50 feet of pavement (Figure 4.6). The new major arterial cross-section has 128 feet of right-of-way and 78 feet pavement (Figure 4.7). This increase in right-of-way width accommodates a 10 feet buffer on each side of the arterial and seven feet for a planter. The buffer is intended to be a flexible space that can be used for a variety of uses and transportation modes.

Figure 4.6: Minor Arterial Cross-Section 80 Feet Right-of-Way and 50 Feet Pavement



Figure 4.7: Major Arterial Cross-Section 128 Feet Right-of-Way and 78 Feet Pavement



4.3 Bicycle Facilities

The pavement areas of the cross-sections in the previous section have been intentionally left blank to infer that these spaces are flexible, and there are many possible orientations of auto traffic lanes, bicycle facilities and median treatments that can fit in the designated pavement width depending on the functional classification, speed limit, capacity needs, etc.

Generally, the faster moving the automobile traffic on a road, the greater the buffer bicyclists need from traffic to ride comfortably on the road. Sufficient buffering can prevent door zone

conflicts or “dooring” as shown in Figure 4.8. Below are different bicycle facilities, ranging from least infrastructure in Figure 4.9 to most infrastructure in Figure 4.10.

Figure 4.8: Buffered Bike Lane Door Zone



Figure 4.9: Least Infrastructure Bikeway Types

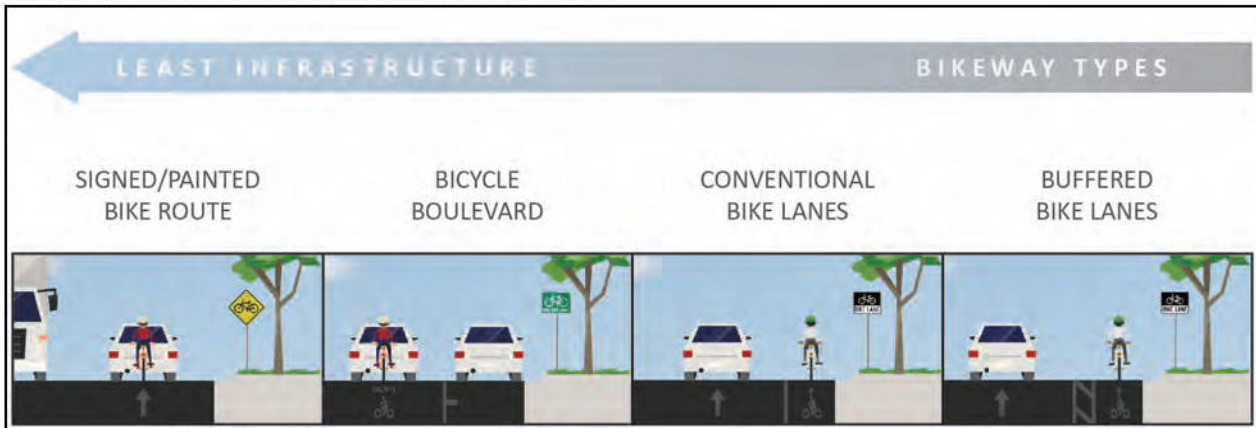
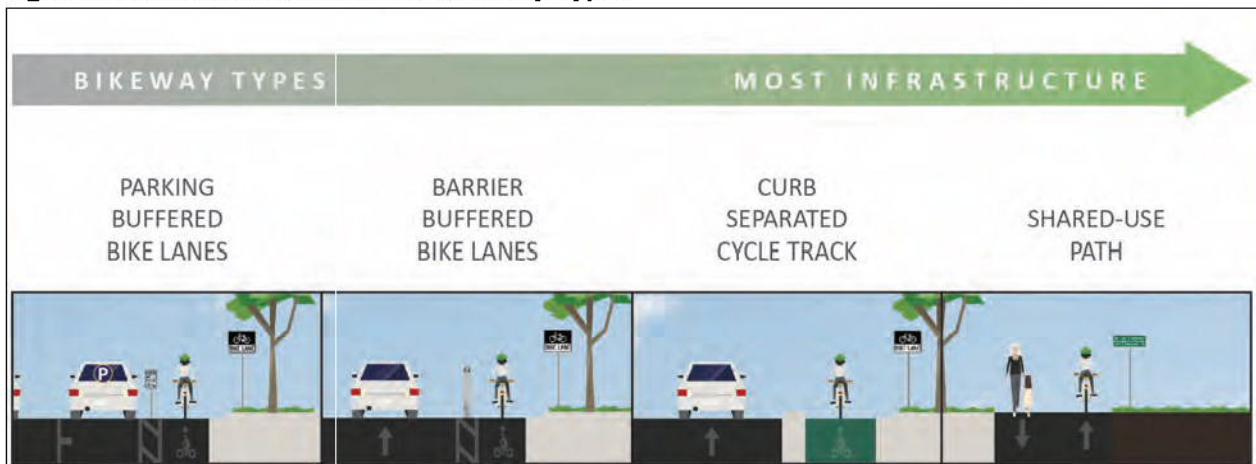


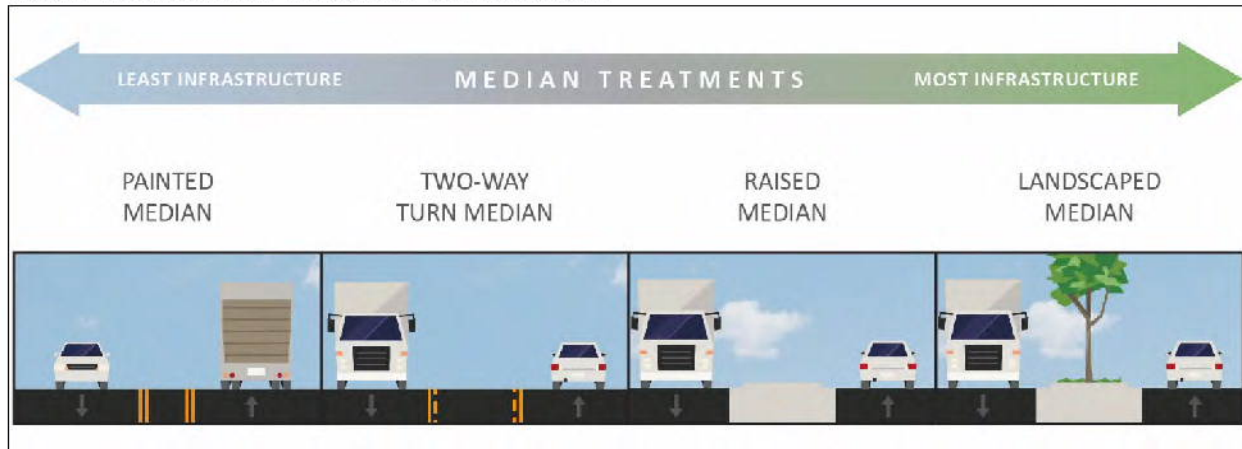
Figure 4.10: Most Infrastructure Bikeway Types



4.4 Median Types

Different median types can be applied depending on the width available on a given road, and/or the function the chosen median is intended to serve. The median treatments shown in Figure 4.11 range from least infrastructure to most infrastructure.

Figure 4.11: Median Treatment Infrastructure



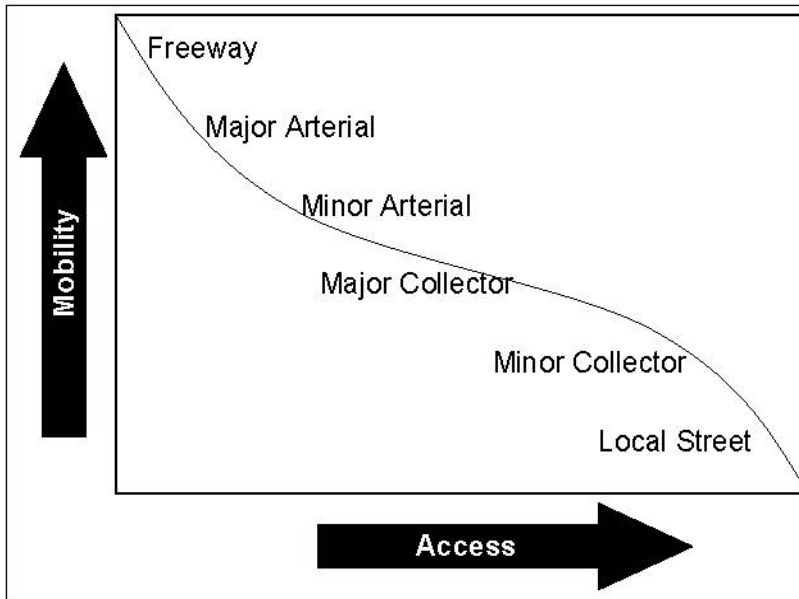
4.5 Access Versus Mobility

This section presents the two primary transportation functions of roadways, namely mobility and access, and describes where different categories of roadways fall within a continuum of mobility and access. Roadways serve two primary travel needs: access to/egress from specific locations and travel mobility. While these two functions lie at opposite ends of the continuum of roadway function, most roads provide some combination of each.

1. Roadway mobility function: Provides few opportunities for entry and exit and therefore low travel friction from vehicle access/egress.
2. Roadway accessibility function: Provides many opportunities for entry and exit, which creates potentially higher friction from vehicle access/egress.

While most roadways offer both "access to property" and "travel mobility" services, it is the roadway's primary purpose that defines the classification category to which a given roadway belongs. Figure 4.12 demonstrates this well.

Figure 4.12: Access and Mobility by Functional Classification



4.6 Hazardous Materials Routes

The fire code authorizes the Authority Having Jurisdiction (AHJ) to determine acceptable hazardous materials routes with the overriding objective being to minimize the risk to the community in the event of an incident. The authorized hazardous materials route applies to all carriers. Drivers of any hazardous materials carriers must obey all traffic regulations. The authorized hazardous materials routes are list below.

4.6.1 Primary Hazardous Materials Routes

The primary hazardous materials routes through Provo City are as follows:

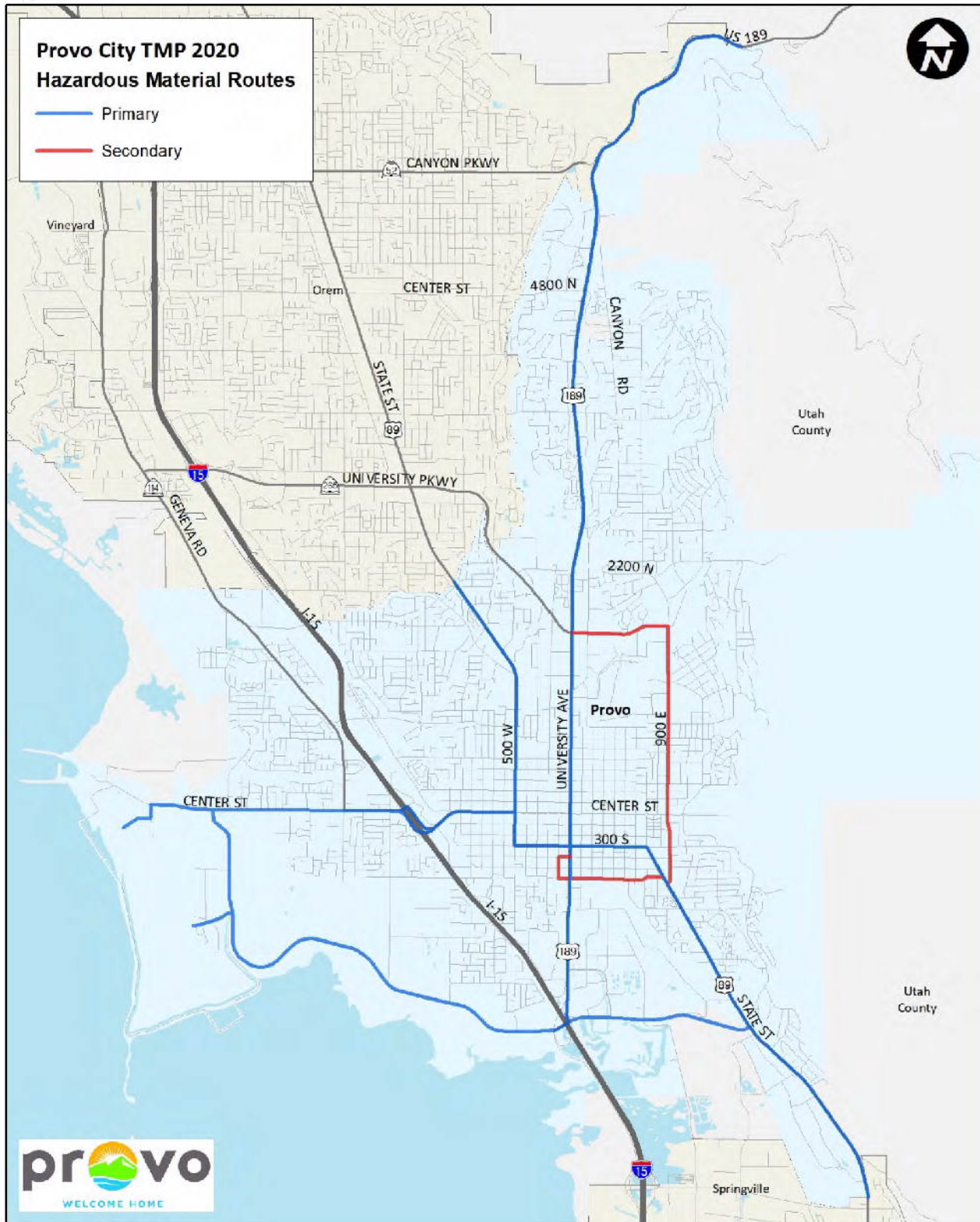
1. US-189 from the Wasatch County Line along University Avenue to Interstate 15.
2. US-89 from the Orem City boundary along 500 West to 300 South, then East to US-89 (South State Street) and south to Lakeview Parkway or continuing south to the Springville City boundary.
3. Center Street from US-89 (500 West) to Interstate 15 then continuing to Duncan Aviation.
4. Lakeview Parkway from US-89 to Mike Jense Parkway, the Provo Airport, and then to Center Street.

4.6.2 Secondary Hazardous Materials Routes

The secondary hazardous materials routes are designed to move carriers as expeditiously as possible with primary hazardous materials with minimal risk to residential neighborhoods. The secondary hazardous materials routes are as follows:

1. 600 South east to US-89, or west to 100 East.
2. 600 South west to 100 West, then north to 400 North and then on to University Avenue.
3. 900 East from US-89 to University Parkway, then west to University Avenue.
4. Other hazardous materials deliveries may circle one block to deliver to gas stations and/or convenience stores, or other receiving businesses.

Figure 4.13: Hazardous Materials Routes



Chapter 5 – Active Transportation

This Active Transportation chapter provides a framework for priority and investment in street infrastructure for walking, bicycling, transit access, and other active transportation modes. This guidance acts as an “umbrella” for the city’s other active transportation policies. It also integrates planning for active transportation with the rest of the TMP.

Streets move people in many ways. Provo City recognizes the necessity of developing a safe, reliable, efficient, and integrated multi-modal transportation network that provides mobility and access for walking and riding. Transportation infrastructure should accommodate all street users, reduce negative environmental impacts, promote healthy living, and advance the well-being of residents and commuters.

More broadly, the shaping of cities begins with the design of streets, as a framework for development and as a public realm. In this way, streets are also critical to enhancing the attractiveness of Provo and fostering healthy economic development. Active transportation relies on quality, human-scaled public space with elements such as vibrant ground-floor land uses, street furniture, greenery, shade, and art.

5.1 Overview

The primary goal of this chapter is to provide high-level guidance to connect Provo City for people on foot, bikes, and other active modes and to create human-scaled places, in a way that is consistent with the overall TMP and other city policies. The chapter seeks to create these connections through the planning of a network with a set of designations. These designations include:

1. Corridors prioritized for active transportation travel and infrastructure.
2. Areas prioritized for active transportation, especially walking.
3. Connections across active transportation barriers.

Consequently, this chapter is focused on a hierarchy of connected corridors, nodes, and areas. Much like the street functional classification system, the Active Transportation Network identifies corridors for different types of travel – whether within a neighborhood or around the city or outside of it. Active transportation needs routes along the busiest corridors in the city, where high capacity transit and activity centers are located. In addition, active transportation also needs “low stress” routes through quieter, lower trafficked areas of the city. Meanwhile, people on foot need not only connections and routes, but also areas that create a quality pedestrian environment with human scale design and a quality public realm.

These corridors and areas are not meant to produce just facilities, but overall quality environments for people-powered transportation and public space. Such environments are composed of many elements, some of which include the character of development on adjacent parcels. Consequently, the guidance of this chapter is intended to apply to all other Provo City policy affecting these corridors and areas.

Each category of corridor or area contains:

1. A summary of the designation.
2. A set of likely tools and strategies to be employed for improvements to it.
3. Narratives of each corridor or area for that designation, what it is, why it is included, and the general vision for its evolution as an active transportation corridor or area.

The chapter also includes a description of each of the tools and strategies toward the end.

Note that exclusion of streets and corridors from the TMP Active Transportation Network does not mean that they should not receive active transportation infrastructure investment. This plan's Active Transportation Network simply conveys the areas of overall citywide priority for multi-modal investment and strategies for creating a connected, citywide network that complements the rest of the TMP.

5.2 Background

The existing Provo City plans and policies relating to active transportation and transit inform and shape this chapter's guidance. Provo's General Plan frames the vital relationship between land use and transportation and notes that the transportation and circulation system in Provo City will be "modified to be more transit-oriented and allow greater options for other modes of travel."

The General Plan provides a snapshot of bicycling and walking in Provo with some recommendations, including:

1. "Conscious efforts should be maintained to continue construction of safer on-street bikeways and separated path and trail systems."
2. "Future bicycle and trail planning should be oriented towards making viable connections into Provo Central Station at 600 South 100 West and other bus-rapid transit stations planned for Provo."
3. "Provo will work towards becoming a gold-level bicycle friendly city as designated by the League of American Bicyclists."
4. "Bicycle commuting should be encouraged through an increased number of bike paths and on-street bike lanes."
5. "Much of the attractiveness for walking as an alternative mode of transportation depends on the sense of safety, convenience, and comfort in the pedestrian environment."
6. "Pedestrian paths within Downtown and adjacent to major transit stations should be enhanced to increase access and the quality of the pedestrian's experience."

Provo's Vision 2030 is a vision document meant to provide consistent long-term direction to municipal decision-making in areas not typically addressed by a general plan or other tools used in Provo's strategic planning. Vision 2030 contains 14 vision topics, and many of them reference active transportation – for example, "Family and Neighborhoods" identifies neighborhood interconnectivity, pedestrian environment, and bike trails and sidewalk networks in its objectives. Vision 2030 emphasizes flexibility in street design to promote livability and support a range of transportation modes.

Provo City has begun to develop a series of neighborhood plans. Those that have been completed are primarily concentrated in the central part of the city – including Franklin, Joaquin, and Maeser. The Southeast neighborhoods also have a completed neighborhood plan. Included in these is the Provo Downtown Master Plan. These plans are helpful to the Active Transportation Network because they identify priority corridors or areas for improvements for active transportation, the pedestrian environment, and placemaking.

5.3 Active Transportation Network

The Active Transportation Network builds from Provo City’s existing policy, as well as the existing conditions of the active transportation environment. The project team overlaid these plans and conditions and then determined a connected network of different types of corridors and areas to achieve the range of active transportation related goals in Provo City policy.

The plan’s Active Transportation Network designates a hierarchy of corridors, nodes, and areas critical to connecting the city for people on foot, bike, and other active modes. Figures 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, and 5.7 show each of these designations and specific corridors, which are summarized in this chapter and include the following:

1. Active Transportation Core Network
2. Active Transportation Citywide Network
3. Active Transportation Neighborhood Network
4. Walkable Activity Centers and Station Buffer Areas
5. Active Transportation Critical Barrier Crossings
6. Active Transportation Safety Hot Spots
7. Active Transportation Phases 1 and 2 Projects
8. Major Transit Investment Corridor Projects

5.3.1 Active Transportation Core Network

The active transportation core network is a multi-modal “trunk” for Provo that connects the primary activity centers, supports the highest bicycle and pedestrian activity in the city, and supports and complements high capacity transit. The overall strategy of the Active Transportation Core Network is to use high quality amenities to move people by all modes. These three routes include portions University Parkway, University Avenue, and Center Street.

Goals:

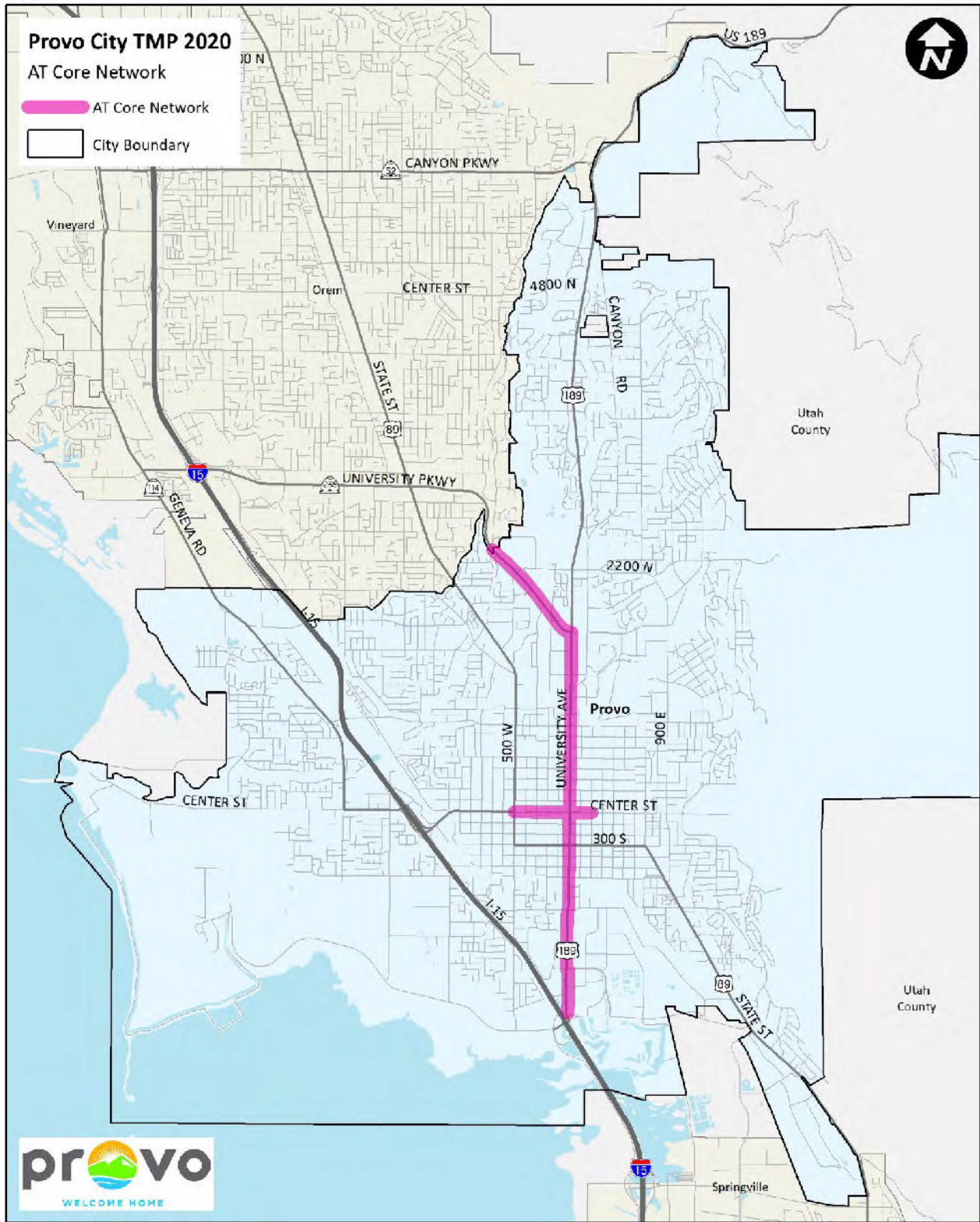
1. Create safe, comfortable, and convenient environments for active travelers in the context of these high-trafficked corridors.
2. Balance traffic needs on these key corridors with those of active transportation.
3. Connect to UVX stops and Provo Central Station.
4. Integrate with Walkable Activity Centers.
5. Connect to Active Transportation Citywide Network.

The Active Transportation Toolkit found in Appendix C presents a range of strategies to apply to improve the elements of the Active Transportation Network. Table 5.1 lists a range of potential strategies that may apply to the Active Transportation Core Network.

Table 5.1: Most Critical Tools for Active Transportation Core Network

List of Tools		
Bike intersection improvements	Pedestrian-activated signals	Streetscape amenities and street furniture
Buffered bike lane	Protected bike lane	Transit stops and stations
Curbside access management	Sidepath	Trees and landscape
High-visibility pedestrian crossings	Sidewalk	Wayfinding
Median refuges	Sidewalk repair	
Parkstrip/furnishing zone	Street network connectivity improvements	

Figure 5.1: Active Transportation Core Network



5.3.1.1 University Parkway (Carterville Road to University Avenue)

University Parkway comprises the north segment of the Active Transportation Core Network. It is the primary northwest connection to Orem and Utah Valley University, and the UVX service follows this route to Utah Valley University. Like University Avenue, University Parkway is vital for regional traffic, and University Parkway presents an even greater challenge for balancing traffic with active transportation. For most of its route through Provo University Parkway is designed as a limited access highway, whose fast traffic speeds present a hazardous environment and major barrier for those on foot and bikes.

However, as part of the Active Transportation Core Network and the UVX route, creating a safe environment for walking and bicycling along University Parkway is vital. University Parkway currently has a sidepath along its north side from University Avenue to and beyond its border with Orem. Because of the high volumes of high-speed traffic on University Parkway, this sidepath is a major asset. The keys are to improve the connections between the sidepath and surrounding neighborhoods, and crossings of University Parkway. Special effort should be made to create safe and convenient environments, crossings, and connections around the University Parkway UVX stations.

5.3.1.2 University Avenue (I-15 to University Parkway)

University Avenue connects Provo's key activity centers of Downtown and BYU and is the major transit link in Provo connecting to Provo Central Station and it is served by the UVX line. While University Avenue is also important for regional traffic, and this plan's projections show traffic capacity challenges, it must balance that role with a quality environment for walking, bicycling, and transit.

The UVX line complicates potential active transportation improvements by using some of the street's right-of-way for dedicated lanes but achieving a pedestrian and bicycle supportive environment on University Avenue remains vital. In addition, special effort should be made to create safe and convenient environments, crossings, and connections around the University Avenue UVX stations.

5.3.1.3 Center Street (500 West to 200 East)

In the downtown area, Center Street is Provo's iconic walkable street, with wide sidewalks, welcoming storefronts, sidewalk dining, large trees, streetscape amenities, a planted median, and diagonal on-street parking. Center Street does not have a bike facility in the downtown core, but the street design encourages slow traffic speeds. The Downtown Plan identifies Center Street as a "green axis" for the downtown area.

5.3.2 Active Transportation Citywide Network

The Active Transportation Citywide Network are corridors that connect Provo's neighborhoods to activity centers, the Active Transportation Core Network, other destinations, and one another for walking, bicycling, and transit. Each has its own balance of walking, bicycling, transit, and autos.

Goals:

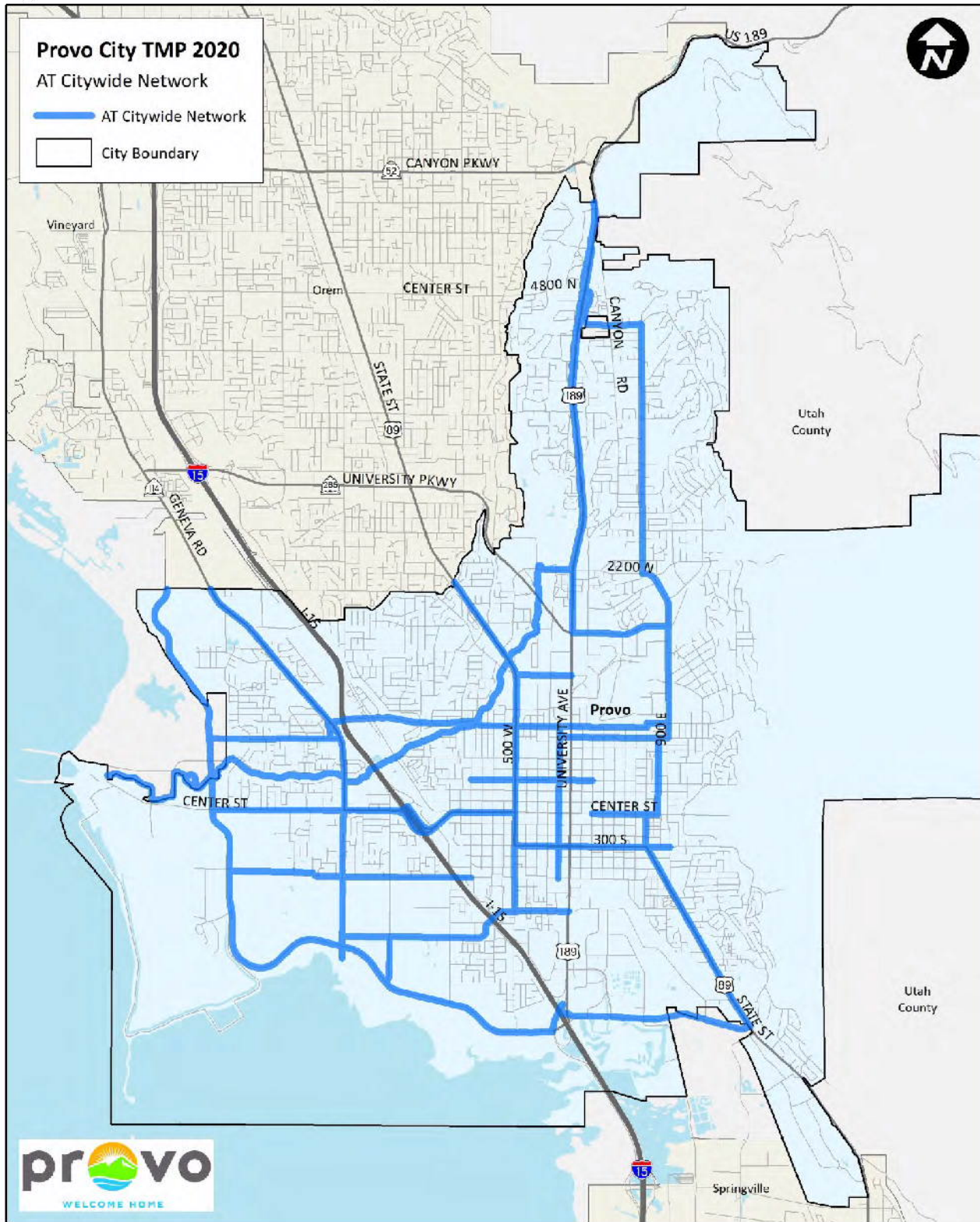
1. Connect Provo neighborhoods to city and regional activity centers for active travelers.
2. Connect people to transit stops and stations.
3. Link active travelers across major barriers.
4. Balance active travelers with motorized traffic needs.

Table 5.2 lists a range of potential strategies that may apply to the Active Transportation Citywide Network.

Table 5.2: Most Critical Tools for Active Transportation Citywide Network

List of Tools		
Bike intersection improvements	Park Strip/furnishing zone	Smaller curb radii
Buffered bike lane	Pedestrian-activated signals	Standard bike lane
Curbside access management	Protected bike lane	Transit stops and stations
Directional curb ramps	Safe routes to school	Trees and landscape
High-visibility pedestrian crossings	Sidepath	Wayfinding
Median	Sidewalk	
Median refuges	Sidewalk repair	

Figure 5.2: Active Transportation Citywide Network



5.3.2.1 University Avenue (north)

North of University Parkway, University Avenue is an active transportation corridor that provides a critical link between Provo's northern neighborhoods and Downtown and BYU. It is also part of the Provo River Parkway Trail, providing the majority of the link between the southern and northern segments along the river.

This corridor is heavily trafficked, and it has several active transportation assets. North of the 2230 North, a sidepath runs all the way to the Riverwoods area and north to Orem (much of it as part of the Provo River Parkway Trail). The roadway also has a buffered bike lane. Improvements to consider are improved crossings and connectivity to surrounding neighborhoods.

5.3.2.2 Center Street

Center Street is the primary east-west corridor for Provo City. It is the heart of downtown Provo and runs out to the surrounding central urban neighborhoods. It connects to I-15, the city's growth areas, and the airport to the west. It connects to the Utah State Hospital in the east. Center Street has bike lanes east of downtown, and west of I-15 past 2050 West.

The largest challenge with Center Street as a citywide active transportation corridor is crossing the barriers of I-15 and the railroad tracks. Currently, Center Street runs under I-15 at an interchange and has a sidewalk on the north side of the bridge over the railroad tracks. However, as important as Center Street is to the Active Transportation Citywide Network, there is no high-quality route for pedestrians and cyclists to cross this compound barrier. Finding a way to make a quality link, either at, above or below grade, is critical to the network.

5.3.2.3 500 West Street

500 West provides an important citywide link among downtown Provo, destinations such as the Utah Valley Hospital and Provo Recreation Center/North Park, the Dixon and Franklin neighborhoods, and northward to State Street and Orem.

500 West is also part of the major State Street regional corridor, one of the historic roads connecting Utah Valley communities. Because of this, it provides key regional access in and out of Provo's activity and employment centers and is heavily trafficked. Like other busy corridors, this emphasis on traffic has led to active transportation challenges. In particular, the Franklin Neighborhood Plan states that 500 West is challenging to cross.

5.3.2.4 300 South Street

300 South provides an important connection among the Maeser and Franklin neighborhoods, the downtown area, and the southeast part of the city. It is served by the 831 Utah Transit Authority (UTA) bus route, which runs through Provo neighborhoods between Provo Central Station and Orem. As an extension of the State Street corridor coming from the south, UDOT manages 300 South and recently reconfigured the street to add four-foot bike lanes and a multi-use path, as well as a bike crossing facility at 200 East.

Existing plans recommend the balancing of the regional traffic role and evolution of the corridor into a vibrant neighborhood commercial gathering place. The Franklin Neighborhood Plan states that 300 South currently “creates a real divide in the neighborhood, even with the UDOT redesign.” The plan recommends that 300 South should “become a place and a destination and not just a thoroughfare dividing the neighborhood,” proposing an artistic theme, art gallery land uses, and “other creative ways to draw people inward and establish sense of belonging so it is no longer perceived as a divider and barrier for the neighborhood.” This corridor should also connect the multi-use path on 300 South with the multi-use path on State Street.

5.3.2.5 700 North/800 North Streets (BYU southern edge)

700 and 800 North streets define the southern edge of BYU and create a seam between the university and the Joaquin neighborhood. It is vital to support pedestrian and bicycle traffic across and along this seam. There is also major opportunity to create great places along these corridors. In addition, UVX runs along 700 North between 700 East and University Avenue.

800 and 700 North Streets are already relatively walkable and bikeable, with sidewalks and park strips, one lane of traffic in each direction, and bike lanes for much of each street. The Joaquin Neighborhood Plan recommends that the design for 800 North should embrace the heavy pedestrian movements along and through the street by implementing some new pedestrian priority features. In addition, there is the opportunity for redevelopment along these corridors, including development spurred by UVX, to create great urban design and pedestrian-oriented public spaces that overall create gathering places for the university community, neighborhood residents, and others from throughout the city and region.

5.3.2.6 900 East Street

900 East forms the eastern boundary of BYU and is an important link among the university, neighborhoods to the north and east, and central Provo. In addition, 900 East is a major transit corridor in Provo, with several bus routes serving it and the UVX line now running along 900 East between 900 North and University Parkway. The 900 East right-of-way is in high demand as the major north/south road east of BYU. Traditional bicycle facilities will be difficult to fit in. Creative approaches may have to be employed to provide quality active transportation environments. Special effort should be made to create safe and convenient environments, crossings, and connections around the 900 East UVX stations.

5.3.2.7 800 East/700 East Streets

800 East is the extension of the 900 East Active Transportation Corridor south of 700 North. At Center Street, the corridor transitions to 700 East to connect to State Street and 300 South corridors.

5.3.2.8 State Street (south)

Provo’s south segment of State Street forms the primary connection of the city’s southeast neighborhoods to the core of the city. State Street is a state highway with high traffic volumes, but a recent project installed a 10-foot multi-use path, street trees, and decorative pedestrian-

scale street lighting on the east side of the street from Slate Canyon Drive to 900 South. A gap from 900 South to 300 South exists and the existing sidewalk needs to be reconstructed to a 10-foot multi-use path.

State Street is the key active transportation link to the communities of southern Utah County. The South Utah County Active Transportation Plan recommends a bike lane/paved shoulder on State Street connecting to Provo from Springville.

5.3.2.9 Timpview Drive

Timpview Drive is a key link through Provo's northern neighborhoods and to the city's key activity centers. It connects the northern part of the city to Timpview High School. It provides a bikeable corridor, with dedicated bike lanes south to 2200 North. Improvements to Timpview Drive should be coordinated with and complement Canyon Road as both streets provide similar access to north side neighborhoods and destinations.

5.3.2.10 820/620 North Street

The 820 North corridor is a vital connector of the east and west parts of Provo. It provides a rare crossing of the I-15 and railroad barriers. 820/620 North has a high-quality active transportation environment for nearly the entire corridor, with consistent bike lanes, a residential setting, and traffic circles. In addition, a trail is planned on the south side of the 820 North from Geneva Road to 500 West.

5.3.2.11 Lakeview Parkway

Lakeview Parkway is a link in the Active Transportation Citywide Network between the southeast, southwest, and northwest neighborhoods that connects to the University Avenue core. East of University Avenue, it is not an ideal corridor for walking and bicycling as it traverses mostly industrial land. It encourages high traffic speeds and the only pedestrian facility is a narrow sidewalk on the north side. But it is an important connection in an area with few of them. Treatments could include a bike lane, or a larger investment addressing both bicycle and pedestrians such as a separate path paralleling Lakeview Parkway, although it would need to cross two sets of railroad tracks.

Lakeview Parkway is a new major street built to serve the growing western neighborhoods of Provo and connect them to I-15 and the rest of the city. Lakeview Parkway has the potential to make this connection for active travelers as well. In addition to an important citywide connection, Lakeview Parkway's shared use path presents opportunities for scenic rides along the shore of Utah Lake. One important asset for the corridor is an existing path that takes active travelers through the I-15 interchange. Care will need to be taken in connecting new development to the Lakeview Parkway corridor in a safe and convenient way.

5.3.2.12 Geneva Road

Geneva Road is an important corridor for much of Utah County. In Provo, it provides a link from the western part of Provo to Orem and Vineyard. It has no pedestrian facility for much of it – it could benefit from a shared use or side path providing a facility for walking and bicycling. This Active Transportation Citywide Network provides a future corridor from Lakeview Parkway to 2000 North.

5.3.2.13 920 South/1150 South/1600 West/2050 West

This corridor connects the University Avenue Core with the Lake View Parkway and provides a critical connection under I-15. East of 1100 West this is a three-lane road with shoulders, while the west side and down 1600 West is a more rural two-lane facility. Wayfinding is the greatest need along this route. As development occurs, 1150 South can be extended from 1600 West to 2050 West to connect to the Active Transportation Neighborhood Network at the new sports park.

5.3.2.14 Provo River Parkway Trail

The Provo River Parkway Trail is one of Provo’s best low-stress bike corridors that all people can enjoy and use for active transportation. The trail is an effective part of the Active Transportation Network because it links many different neighborhoods, runs through a broad swath of the city, and, most importantly, provides a grade-separated connection across the city’s most formidable active transportation barriers. The trail, which varies in width from eight to 16 feet, runs 15 miles from near Utah Lake in the west to Vivian Park in Provo Canyon. The Parkway primarily follows the Provo River with grade-separated crossings of major roads, but a few segments – primarily along University Avenue between 2230 North and 3700 North – are adjacent to surface streets.

One of the key improvements to be considered for the Parkway corridor is the segment of the trail along 2230 North, which is a hot spot for crashes. This is a short missing link in the Provo River Parkway system where trail users must ride on a narrow sidewalk right next to traffic in order to transition from the northern part of the Parkway to the southern part.

5.3.2.15 600 South

From Lakeview Parkway to 1100 West, the corridor will provide for east/west mobility. Consistency with sidewalks, bike lanes or a sidepath will enhance this corridor that connects to three Active Transportation Neighborhood Network routes.

5.3.3 Active Transportation Neighborhood Network

The Active Transportation Neighborhood Network are low-stress routes for people to ride bikes through Provo neighborhoods and to the parks, schools, places of worship, and other destinations within them. These corridors were identified in part because many of them already have bike facilities on them; this designation leverages these existing facilities to integrate them into the Active Transportation Citywide Network.

Goals:

1. Create a network for low-stress bike travel that provides routes throughout the city.
2. Improve pedestrian and bicycle conditions for the widest range of users.
3. Connect to Active Transportation Citywide Network.
4. Connect to neighborhood destinations.
5. Fill in gaps in existing bike facilities along the neighborhood bicycle corridors.
6. Provide wayfinding to neighborhood and citywide destinations.
7. Negotiate topography in hilly areas.

Table 5.3 lists a range of potential strategies that may apply to the Active Transportation Neighborhood Network.

Table 5.3: Most Critical Tools for Active Transportation Neighborhood Network

List of Tools		
Bike boulevard	Marked and shared roadways	Trees and landscaping
Bike intersection improvements	Sidewalk repair	Wayfinding
Flexible residential street design	Standard bike lane	
Marked and shared roadways	Traffic calming elements	

Figure 5.3: Active Transportation Neighborhood Network

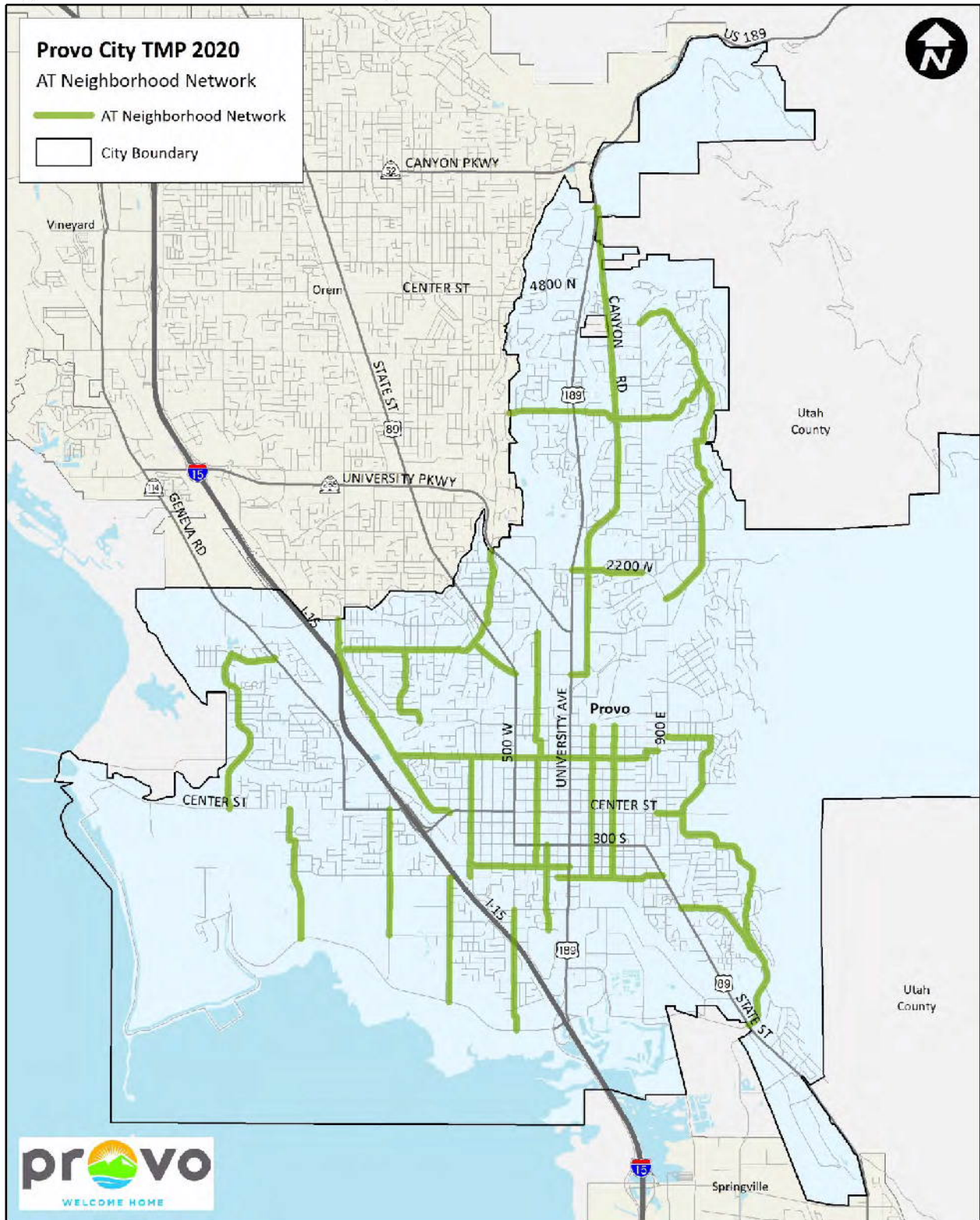
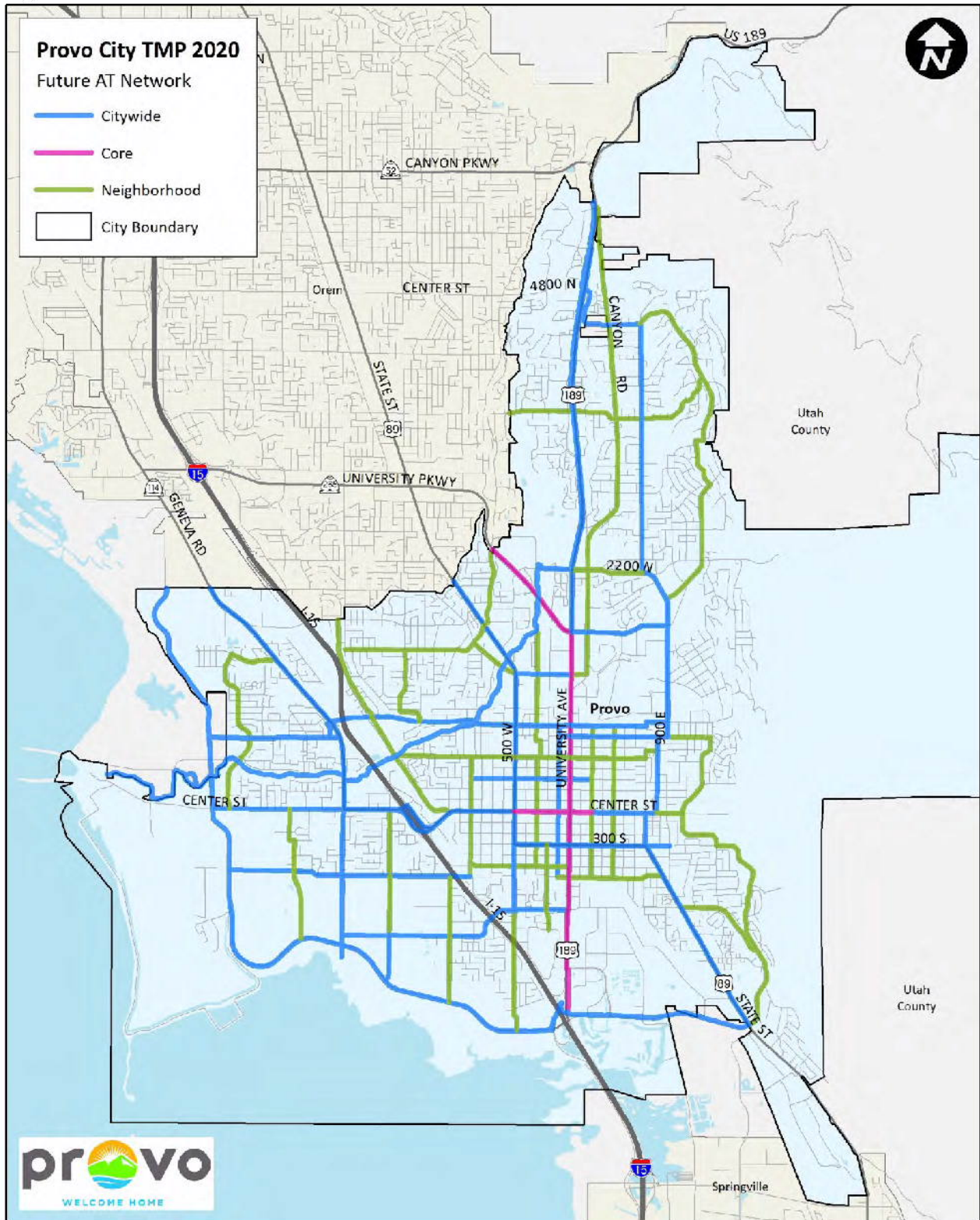


Figure 5.4: Active Transportation Combined Network



5.3.3.1 500/600 South

600 South provides a connection across I-15. When combined with 500 South east of 700 West, it forms a low-stress bike corridor for the west side neighborhoods that also connects to Sunset View Elementary School. Much of the western portion of 600 South has bike lanes, and dedicated lanes should be completed on the entire length of 600 South as it is extended out to meet Lakeview Parkway. As this route follows two different streets, it would benefit from wayfinding.

5.3.3.2 North Lakeview Connection

The extension of Lakeshore Drive into the residential area north of 620 North is a bikeway with dedicated lanes. It connects the neighborhood to Lakeview Elementary School, Lakeview Park, and Provo High School as well as to the Citywide Active Transportation Corridors of 620 North and Geneva Road.

5.3.3.3 Grand View Connection

This route provides a low-stress neighborhood connection through the Grand View neighborhood between the 820 North and State Street active transportation corridors, linking to Westridge Elementary School, Grandview Park, Rotary Park, and Lions Park. The 1460 North segment of this route already has bike lanes; the rest should be filled out with similar facilities and wayfinding.

5.3.3.4 500 North Street

500 North is a connection across the north end of Provo's central neighborhoods, as well as to destinations such as the Provo Recreation Center, Provo City Library, and Timpanogos Elementary School. Implementing high quality crossings of the major streets – 500 West, Freedom Boulevard, and University Avenue – are critical for this corridor. The Joaquin Neighborhood Plan recommends that 500 North become a boulevard with a center landscaped median, in part to improve safety of crossing pedestrians.

5.3.3.5 Foothill Drive

Foothill Drive, Navajo Lane, Iroquois Drive, and Temple View Drive form a bike loop off the Timpview Drive Active Transportation Corridor that weaves through the hilly neighborhoods in the northeast section of Provo. This route already has bike lanes for most of its length.

5.3.3.6 2230 North/2320 North Streets

2230 North provides a critical link in the Provo River Parkway Trail between the Provo River and University Avenue. East of University Avenue, this corridor forks onto 2320 North to access Centennial Middle School and Rock Canyon Elementary School before reaching the Timpview Citywide Active Transportation Corridor.

5.3.3.7 3700 North Street

3700 North is an east-west connection across the northern end of the city, connecting to Timpview High School, Edgemont Elementary School, and into Orem's 800 South corridor to the west. It extends as Quail View Drive to Foothill Drive. It also crosses the barrier of University

Avenue. 3700 North has bike lanes along much of its length, with a key gap between University Avenue and 450 East.

5.3.3.8 Canyon Road

Canyon Road has a long, consistent bike route connecting the northern Provo neighborhoods to the central part of the city.

5.3.3.9 900 West

900 West is a low-stress bike route serving the neighborhoods west of downtown Provo, providing access to Dixon Middle School and connection among the east west active transportation corridors in the area.

5.3.3.10 Independence Avenue

Independence Avenue provides a connection linking the Center Street, Provo River, and 820 North corridors north to Orem and Utah Valley University. There is the opportunity for a multi-use path north to Sandhill Road in Orem as a connection to Utah Valley University.

5.3.3.11 300 West Street

300 West is a low-stress route through the center of the city that complements the Active Transportation Core.

5.3.3.12 200 East Street

The Joaquin and Maeser Neighborhood Plans identified 200 East as a major north-south pedestrian corridor. Provo City recently completed a project from 600 North to 600 South by constructing bulbouts at many intersections, installing a toucan signal at 300 South for bicyclists and pedestrians, installing wayfinding, installing “sharrows” on the pavement, and repainting red curbs. This completed project provides both neighborhoods with a defined Neighborhood Active Transportation Corridor.

5.3.3.13 400 East Street

The Joaquin and Maeser Neighborhood Plans identify 400 East as a major north-south pedestrian corridor. The Joaquin plan states that “future design enhancements will look to strengthen that identity, while also making them safer pathways for all uses.” Recommended improvements include bulbouts to create better lines of sight for people and vehicles, creating safer crossings; street trees to establish an identity to the street and provide shade cover. Also, as repairs are made, antiquated gutters should be updated, and sidewalks widened. In addition, the Plan recommends a bike route to be marked on the street.

5.3.3.14 600 South Street

The Maeser Neighborhood Plan recommends pedestrian improvements to 600 South to promote redevelopment around the corridor. The plan states that “this redevelopment will help the area transition from, manufacturing and non-pedestrian friendly, to a mixed-use/residential corridor that will be a viable route to the transit station.” Improvements to this corridor “will provide a

better appearance and will promote a safer environment for residents, which are needed to help Maeser Park succeed.” Missing sidewalk and park strips along many of the blocks along 600 South can be added to improve this corridor.

5.3.3.15 900 South Street/Nevada Avenue

The Southeast Neighborhood Plan identifies the section of Nevada Avenue from the Slate Canyon Drive intersection to approximately 950 South as an important corridor for walking and bicycling. As the plan states, the original construction of the road was built with insufficient separation for pedestrians to safely utilize. Short-term improvements for this area should include the addition of a pedestrian trail along the west side, separated by a landscape buffer. Striping, signage and “sharrows” can also be added to designate the road as a bicycle priority corridor to reduce the conflicts between frustrated automotive traffic and the necessary connection for safe bicycle traffic. Because topography limits the ability for this road to meet the city standard street cross-sections, the city should work to establish a long-range plan to eventually improve this area with appropriate buffers for multi-modal uses despite the tight corridor constrained by natural grade.

5.3.3.16 1100 West Street

From 560 South to Lakeview Parkway, 1100 West will provide good access north to existing parks and schools and south to Lakeview Parkway Trail. This will provide the Lakewood and Sunset Neighborhoods with active transportation access within the neighborhoods, but also to Lakeview Parkway Trail.

5.3.3.17 1600 West Street

From 1160 South to Center Street, 1600 West will provide good access north to existing parks and schools and south to Lakeview Parkway Trail.

5.3.3.18 2500 West Street

From Lakeview Parkway to Center Street, 2500 West will provide good access to an existing elementary school and to the future sports park.

5.3.4 Walkable Activity Areas

Walkable Activity Areas are major hubs of activity that attract people from throughout Provo and the region. Some are focused on shopping and dining; others on education; others on employment. But each center should be safe, convenient, comfortable, and intuitive for pedestrians. While some areas such as Downtown Provo are already very walkable, others are much less walkable. These less-walkable activity areas may benefit from focused area plans to increase their walkability and increase bicycle access to them. In general, new development and investment in these activity centers should strive to fit this walkable character.

Goals:

1. Create overall human-scale environments.
2. Connect networks of streets and paths.
3. Establish priority for pedestrians.

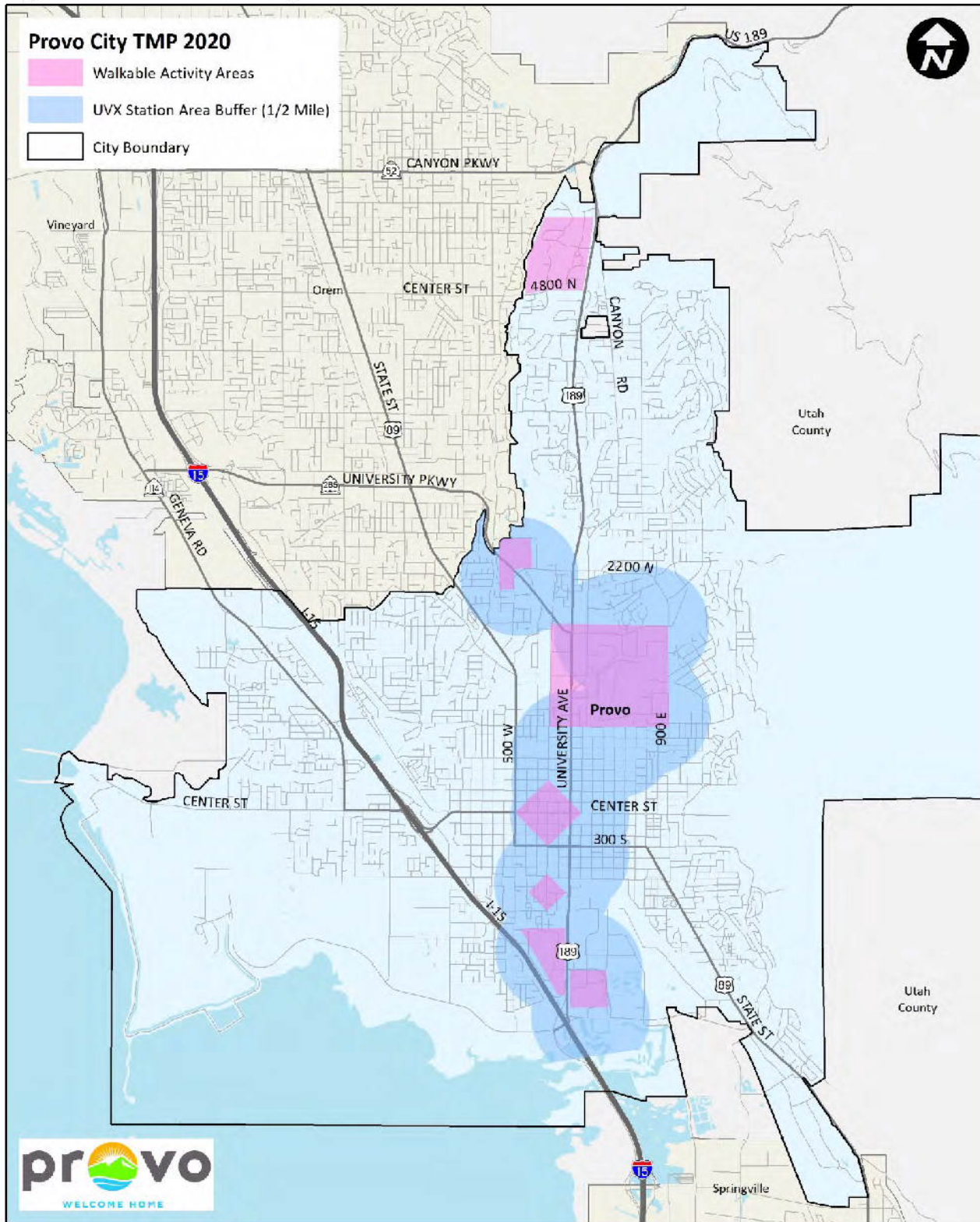
4. Strengthen quality connections to Citywide Active Transportation Corridors.
5. Establish and enhance transit hubs.
6. Create great public spaces of different scales.
7. Establish bike parking.

Table 5.4 lists a range of potential strategies that may apply to Walkable Activity Areas.

Table 5.4: Most Critical Tools for Walkable Activity Areas

List of Tools		
Bulbouts	Park Strip/furnishing zone	Streetscape amenities and street furniture
Curbside access management	Pedestrian oriented street designs	Trees and landscape
Directional curb ramps	Public art	Wayfinding
High-visibility pedestrian crossings	Sidewalk	Whole corner curb ramps
Midblock crossings	Smaller curb radii	
On-street parking	Street network connectivity improvements	

Figure 5.5: Walkable Activity Areas



5.3.4.1 Riverwoods

Riverwoods is a mixed-use area in the far north end of Provo on either side of the Provo River. It is divided into an office park on the west side of the river and an entertainment and retail complex on the east side of the river, with more office buildings to the north.

The office park has a suburban format, with single office buildings typically surrounded by surface parking. The streets have a connected and buffered network of sidewalks that connects to a set of pathways along the Provo River. However, the preponderance of surface parking and single use nature of the park limits the park's walkability. The shopping and entertainment area is focused on a network of pedestrian malls closed to vehicular traffic, surrounded by surface parking areas.

The separated uses and low density of Riverwoods limit its fundamental walkability. Therefore, the current active transportation environments may be nearly maximized, although more connections to surrounding neighborhoods could be considered. In the event of potential redevelopment, a plan should be considered to increase aspects of overall walkability and bikeability, such as small blocks, a connected street network, a wide pedestrian realm, street trees and pedestrian amenities, and welcoming building frontage.

5.3.4.2 The Mix/Parkway Village

The Mix and Parkway Village areas along University Parkway have been and are going through redevelopment. Most of the currently development is shopping with restaurants and entertainment surrounded by large surface parking.

In the event of potential redevelopment, a plan should be considered to increase aspects of overall walkability and bikeability, with more focus on street trees, pedestrian amenities, and welcoming building frontage.

5.3.4.3 Brigham Young University

As a university campus, BYU is perhaps the most pedestrian-heavy part of Provo. Much of the campus is characterized by a connected network of pedestrian and bicycle paths with few major street crossings. However, there are some key internal active transportation barriers in the BYU campus – Cougar Boulevard and Campus Drive are both wide roadways with infrequent crossings that provide the primary access to campus parking.

The other key aspect of the university concerning the citywide active transportation network is the perimeter, where BYU interfaces with the rest of the Provo community. Some of the BYU perimeter is delineated by a major street, such as 800 North, 900 East, and University Parkway. These streets must strike a careful balance between the necessary movement of traffic and frequent and safe pedestrian and cyclist crossings – all are included in the citywide active transportation network.

Other areas of the BYU perimeter are characterized by a transition zone. Streets such as 1060 North (owned by BYU) and 150 East (owned by both BYU and Provo) are critical access streets that run in and out of campus and provide important threads for access between the campus and surrounding areas.

5.3.4.4 Downtown

With its small blocks, connected streets, wide sidewalks, street trees, mix of land uses, and cafes and restaurants opening onto the sidewalk, Downtown Provo is already a walkable district of the city, and it also has the highest rates of walking and bicycling. Yet it is this high demand for active transportation that creates the impetus for an even better pedestrian environment.

The Downtown Plan identifies ways to increase this walkability, including replacement of street furniture; use of water-wise landscaping to green the district; adding more public art; continued refinement of building design standards to engage with people on foot; adding bulb-outs; identifying and marking gateways and focal points; and increasing outdoor dining.

The Downtown Plan proposes some specific active transportation and walkable place improvements.

1. Pedestrian trails along 600 South, 500 West, and Center Street, which should connect with the existing Provo River Trail and other pedestrian routes to create a working trail network through Downtown Provo.
2. Enhancing 100 West as a highly landscaped pedestrian connection between North Downtown, Central Downtown and Provo Central Station (see Active Transportation Core).
3. Reconfiguration of 100 South to two general-purpose lanes to create a pedestrian promenade on the north side, with features such as an intermittent stream water feature fed by irrigation water and street runoff; seat walls; multiple rows of trees; benches and movable seating all along a corridor marked by special paving, pedestrian crossings, and enhanced street furnishings.
4. A new pedestrian way running from 600 South to 200 South mid-block between University Avenue and 100 West. This mid-block walkway will align with the walkways on the Provo City Center Temple block and end near the Church of Jesus Christ of Latter-day Saints Provo City Center Temple.

Evolution of the land uses of Downtown Provo is also an important consideration of the district's walkability. More residential, commercial, and mixed-use redevelopment in Downtown and the districts to the north and south have the potential to continue to increase vitality and improve walkability in the area if well planned and designed.

5.3.4.5 Provo Towne Centre/East Bay

Provo Towne Centre shopping mall and East Bay Technology Park comprise a commercial center at the southern end of the city. Both are suburban-style, single use developments with large areas of surface parking. Provo Towne Centre is an indoor mall whose walkability is focused inside the

mall. Likewise, East Bay is a campus style office park whose walkability is focused in a park area on the interior. However, both are “islands” to active travelers due to the barriers that surround them, such as University Avenue and I-15. However, as redevelopment of this area occurs, a plan should be considered to increase aspects of overall walkability and bikeability, such as small blocks, a connected street network, a wide pedestrian realm, street trees and pedestrian amenities, and welcoming building frontage – as well as better connections across University Avenue.

5.3.4.6 UVX Station Areas

Utah Valley Express station areas comprises of the one-half mile buffer surrounding each station, which represents approximately 20 percent of urbanized Provo. While one-half mile represents the practical walking distance for the average person, the walkable area surrounding each station is greatly impacted by existing barriers and connectivity issues. This area should be the focus of investments to increase walkability and connectivity to best leverage the existing UVX infrastructure.

5.3.5 Critical Barriers and Safety Hotspots

Critical Barrier Crossings are locations where major active transportation barriers are crossed by the different routes identified above and Safety Hotspots are areas identified with a relatively high prevalence of bicycle and pedestrian involved crashes. Major active transportation barriers include the I-15 freeway, other major roads with long sections without safe crossings, railroad tracks, the Provo River, and large properties creating a barrier. Safety Hotspots require additional study and should be incorporated into either spot improvement projects, capital facility plan projects, or active transportation plan projects.

Goals:

1. Enhance and maintain safe crossings of roadways.
2. Ensure high visibility for at-grade roadway crossings.
3. Make crossings as direct, short, and convenient as possible.
4. Create comfortable crossing experiences, including resting places where appropriate and hospitable and safe corner environments at at-grade roadway crossings.
5. Clarify and mark areas of conflict between cyclists and autos as appropriate.

Table 5.5 lists a range of potential strategies that may apply to the Critical Barrier Crossings.

Table 5.5: Most Critical Tools for Critical Barrier Crossings and Safety Hotspots

List of Tools		
Bike intersection improvements	Median refuges	Smaller curb radii
Bulbouts	Midblock crossings	Street network connectivity improvements
Directional curb ramps	Pedestrian-activated signals	
High-visibility pedestrian crossings	Safe routes to school	

Figure 5.6: Active Transportation Critical Barrier Crossings

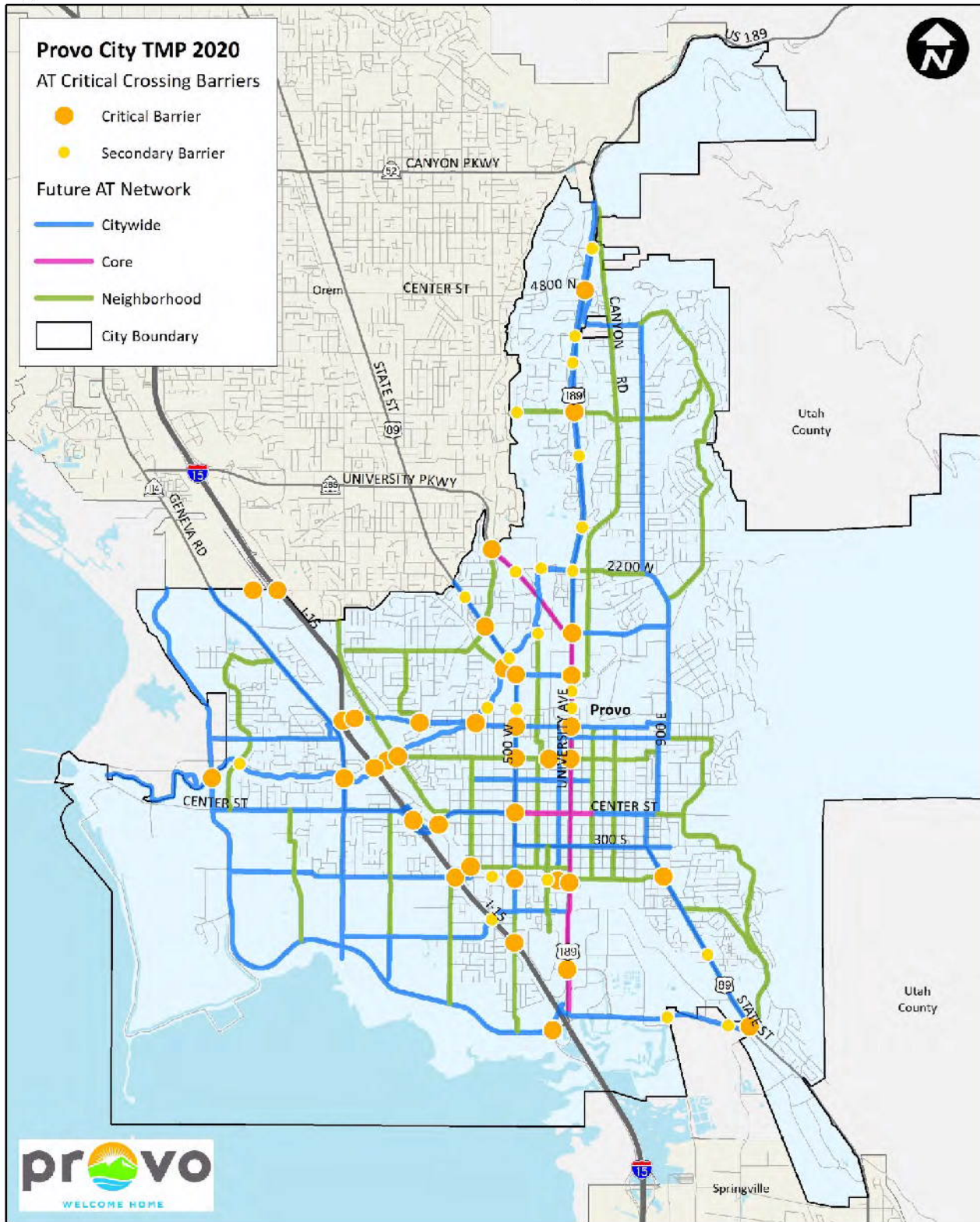
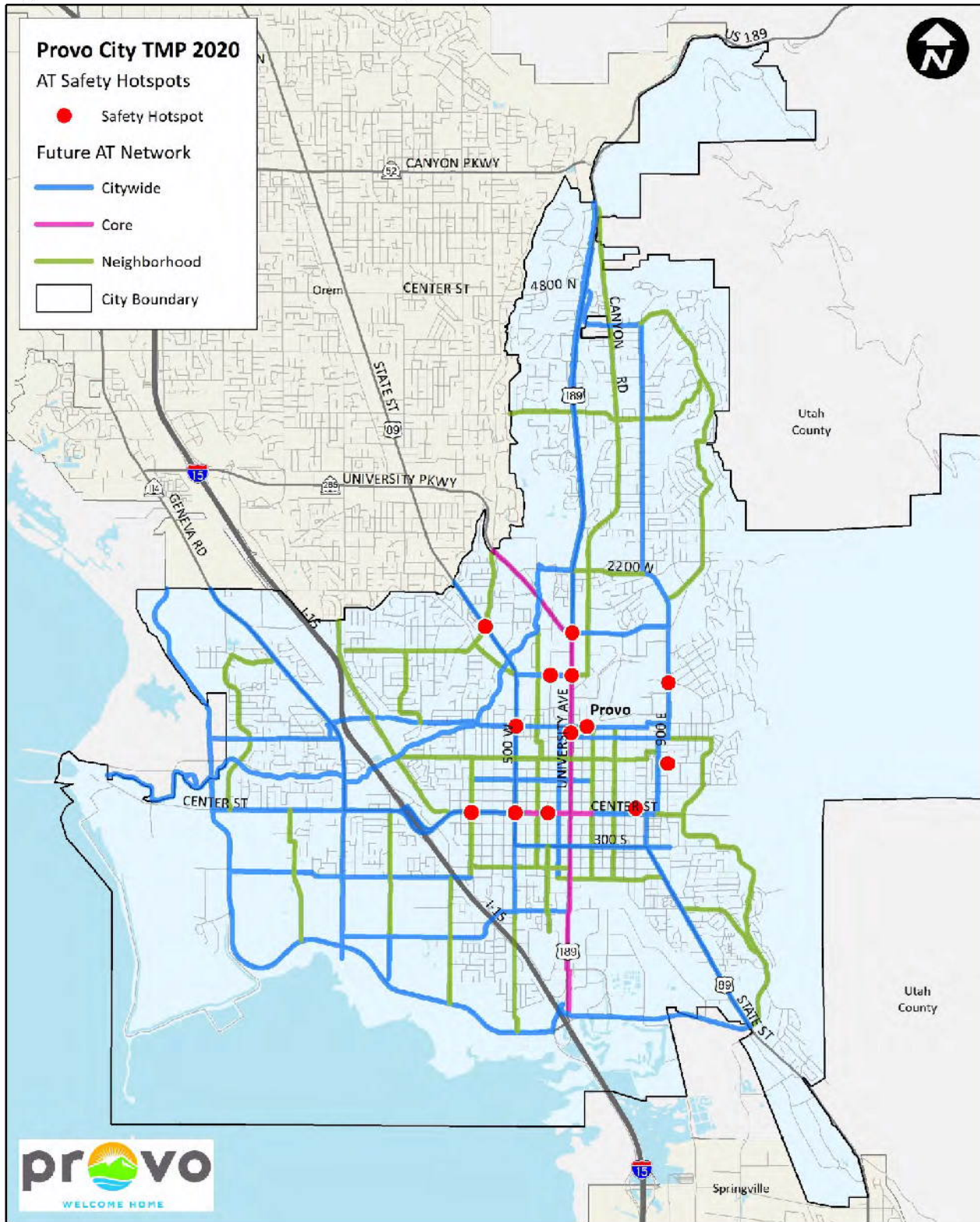


Figure 5.7: Active Transportation Safety Hotspots



5.4 Active Transportation Priority Projects

The identified priority Active Transportation Network of Core, Citywide, and Neighborhood facility types were compared against existing infrastructure within the city to identify gaps in the network. These gaps were then compiled and separated into a two-phased priority project list. Projects were prioritized based upon consistency with the Capital Facilities Plan and how well they complement existing infrastructure, completing corridors, and filling gaps in the system. Parallel routes and redundancies, while important to a healthy network, were given less priority. Projects were not prioritized within the individual Phase 1A, 1B, 2A, or 2B. Tables 5.6 and 5.7 list the priority projects for Phase 1 and tables 5.8 and 5.9 list the priority projects for Phase 2.

Table 5.6: Phase 1A CFP Concurrent Active Transportation Priority Projects

Street/Corridor	From	To	Type
1600 West	1150 South	Lakeview Parkway	Citywide
2050 West	600 South	Lakeview Parkway	Citywide
2230 North/2200 North	University Avenue	Timpview Drive	Neighborhood
Independence Avenue	1720 North	820 North	Neighborhood
Lakeview Parkway	470 North	Center Street	Citywide

Table 5.7: Phase 1B Active Transportation Priority Projects

Street/Corridor	From	To	Type
1390 North	Geneva Road	2770 West	Neighborhood
2230 North	University Avenue	Provo River Parkway Trail	Neighborhood
3700 North	50 West	100 East	Neighborhood
700 East/State Street	Center Street	Slate Canyon Drive	Citywide
800 East	700 North	Center Street	Citywide
900 East	700 North	900 North	Citywide
900 East	University Parkway	Timpview Drive	Citywide
920 South/1150 South	Freedom Boulevard	1600 West	Citywide
Canyon Road	5400 North	University Avenue	Neighborhood
Carterville Road	University Parkway	1720 North	Neighborhood
Center Street	Lakeshore Drive	2770 West	Citywide
Center Street	Geneva Road	200 East	Citywide
Geneva Road	620 North	Center Street	Neighborhood
Grandview Lane	Carterville Road	Columbia Lane	Neighborhood
Lakeview Parkway	560 South	Center Street	Citywide
Navajo Lane	Iroquois Drive	Cherokee Lane	Neighborhood
State Street/500 West	2100 North	300 South	Citywide
Timpview Drive	2200 North	2270 North	Citywide
University Avenue	500 South	I-15	Core
University Avenue	2230 North	2400 North	Citywide

Figure 5.8: Active Transportation Plan Phase 1 Projects

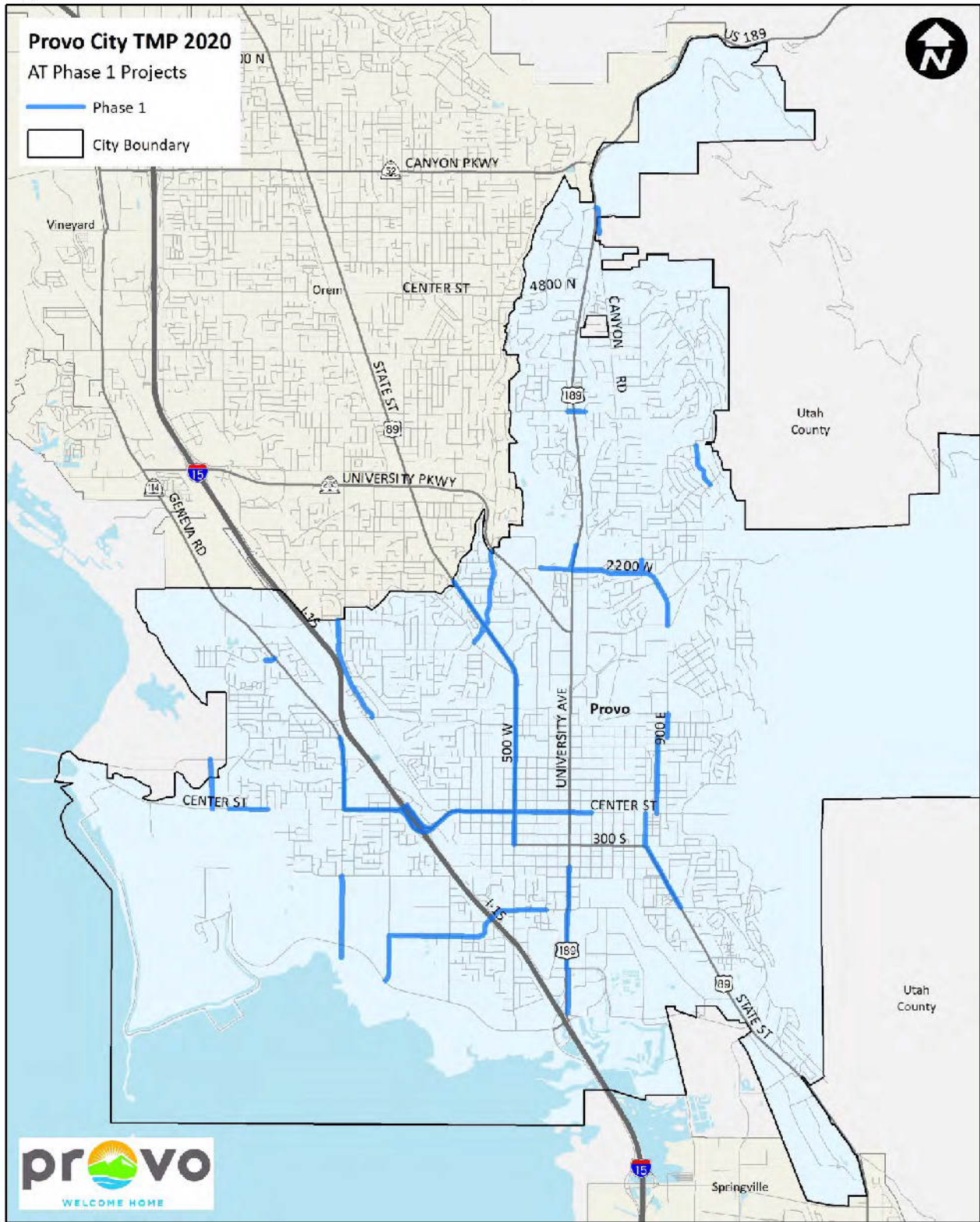


Table 5.8: Phase 2A CFP Concurrent Active Transportation Priority Projects

Street/Corridor	From	To	Type
500 North	Independence Avenue	600 West	Neighborhood
500 North	Freedom Boulevard	700 East	Neighborhood
560 South/600 South	Lakeview Parkway	1100 West	Citywide
Columbia Lane	Grandview Lane	500 West	Neighborhood
2500 West	Lakeview Parkway	Center Street	Neighborhood

Table 5.9: Phase 2B Active Transportation Priority Projects

Street/Corridor	From	To	Type
100 West	600 South	800 North	Citywide
1500 West	1460 North	900 North	Neighborhood
300 North	900 West	200 East	Citywide
300 South	500 West	University Avenue	Citywide
300 West	500 South	1500 North	Neighborhood
400 East	600 South	500 North	Neighborhood
500 South	900 West	University Avenue	Neighborhood
600 South	700 East	State Street	Neighborhood
600 South	100 West	100 East	Neighborhood
700 East	800 North	820 North	Citywide
700 East	500 North	560 North	Neighborhood
700 North	100 West	University Avenue	Citywide
820 North	700 East	900 East	Citywide
900 South/Nevada Avenue	State Street	Slate Canyon Drive	Neighborhood
900 West	500 North	600 South	Neighborhood
Canyon Road	Cougar Boulevard	Foothill Drive	Neighborhood
560 North	700 East	800 East	Neighborhood
Geneva Road	1800 North	820 North	Citywide
1150 South	1600 West	2050 West	Citywide
1100 West	560 South	Lakeview Parkway	Neighborhood

Figure 5.9: Active Transportation Plan Phase 2 Projects

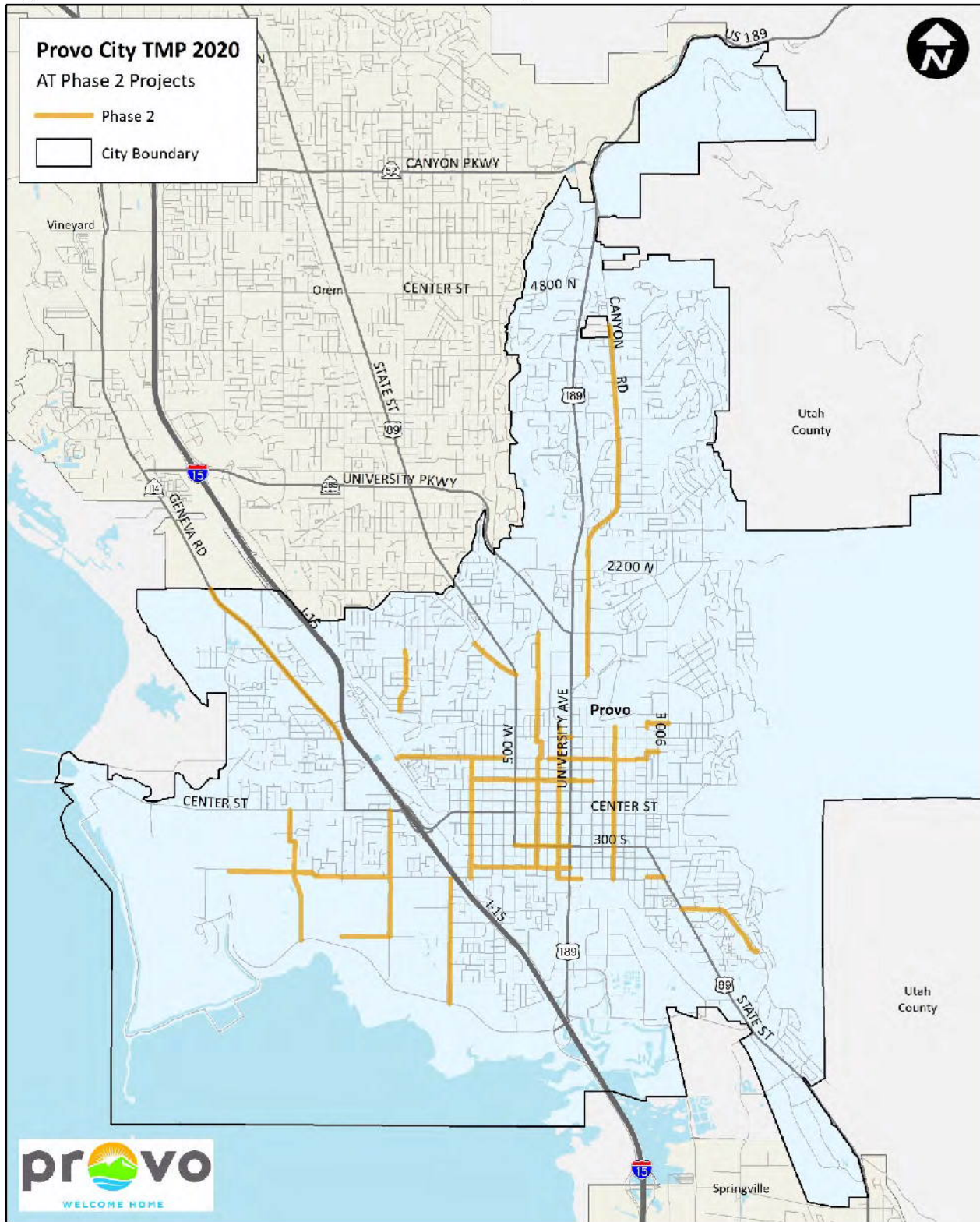
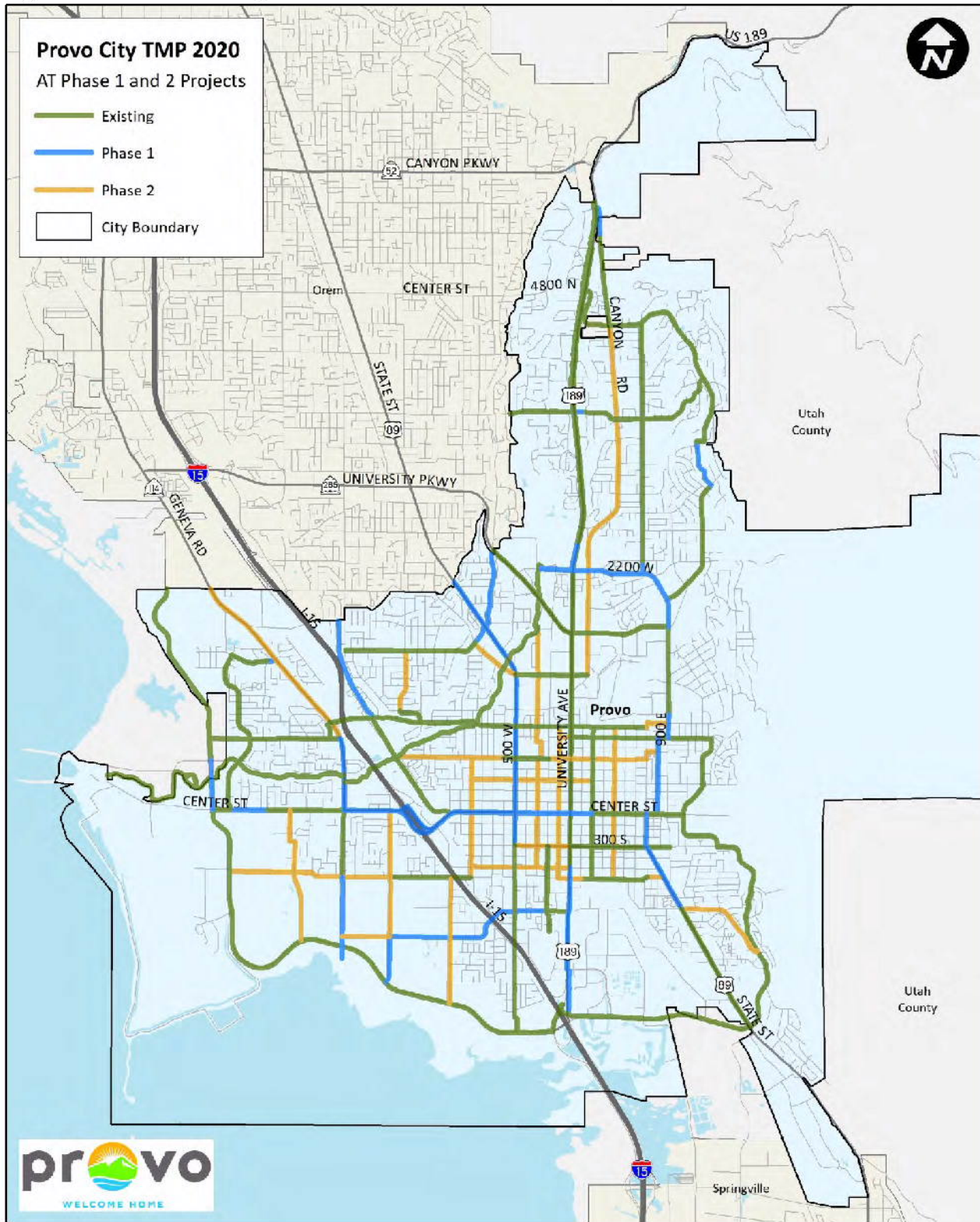


Figure 5.10: Active Transportation Plan Phases 1 and 2 Projects



5.5 Major Transit Investment Corridors

Provo is currently home to two major transit investment corridors, FrontRunner (commuter rail) and UVX (bus rapid transit). In the future these major investment corridors will be complimented by additional infrastructure, culminating in a robust multi-modal transportation system. TransPlan50 is the draft regional transportation plan for urbanized Utah County, produced by MAG. The plan consists of a coordinated system of capital-intensive roadway projects, transit improvements, and pedestrian/bicycle facilities programs over the next thirty years. TransPlan50 includes several projects with significant impacts to Provo, including FrontRunner improvements, light rail, bus rapid transit, and core bus routes. Recognizing that UTA works with MAG and local government in the planning of transit, mode types, and connections, Provo City is desirous to explore transit connectivity from the Provo Intermodal Center to the Provo Airport. Table 5.10 and Figure 5.11 document the projects with direct impacts to Provo City.

Table 5.10: TransPlan50 Transit Projects in Provo

MAG ID	Project Name	Need Phase	Fund Phase	Cost
1	North Commuter Rail Intermittent Double Track	1	2	\$113M
2	South Commuter Rail - Payson to Provo	1	1	\$252M
5	State Street Bus Rapid Transit - State Street; Provo to American Fork	1	1	\$313M
7	Maple Core Bus Route - Spanish Fork to Provo	1	1	\$39M
8	Nebo Core Bus Route - Payson to Provo	1	2	\$69M
11	North Commuter Rail Electrification and Double Track - Provo to Salt Lake County	2	Unfunded	\$689M
12	Central Light Rail Line - Provo to American Fork	2	Unfunded	\$1.1B
13	South Light Rail Line - Spanish Fork to Provo	3	Unfunded	834M

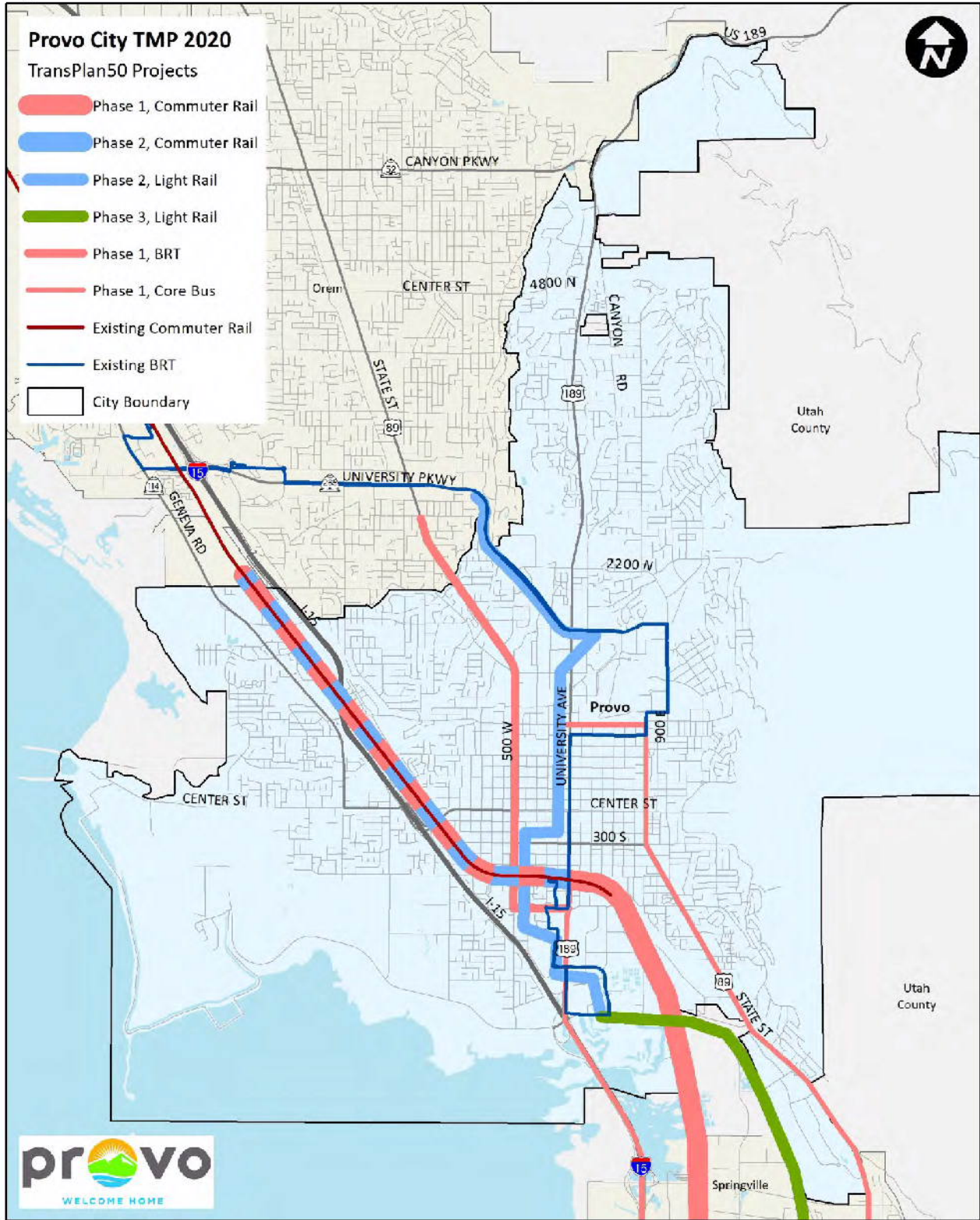
5.6 Micro-mobility

On August 8, 2019, Provo City launched its first shared electric scooter pilot program. The city also expects to launch a docked bikeshare program within a few months. The city has spearheaded this project to bring shared scooters and shared bikes to Provo. The main goal of this project is to reduce reliance on automobile use and provide additional options for first and last mile travel. This may decrease air pollution, decrease vehicle miles traveled, increase physical activity, and provide additional connectivity to UVX.

5.7 Previous Provo Bicycle Master Plan

The Provo Bicycle Master Plan completed in 2013 was a collaborative process that created a good bicycle plan. Much has been done to implement the concepts and projects from that plan over the past seven years. Chapter 5 – Active Transportation of the Provo City TMP 2020 includes all forms of active transportation (including bicycle, pedestrian, transit, and micro-mobility). However, the Provo Bicycle Master Plan continues to have value and will be utilized as an important reference in the implementation of Chapter 5 of the TMP.

Figure 5.11: Major Transit Investment Corridor Projects



Chapter 6 – Capital Facilities Plan

The Capital Facilities Plan (CFP) was created in a multi-faceted and iterative process, largely informed by existing plans, public input (see Appendix A), travel demand forecasts, and close coordination between the consultant team and city staff. The CFP identifies projects that are anticipated to be needed by a particular time, along with a planning level cost estimate for each improvement. The recommended improvements are separated into Phase 1 (2018 - 2024 years) and Phase 2 (2025 - 2040). These improvements are for collector streets and above. Local street improvements that may be required are not included in the CFP. Trails and pedestrian improvements are also not included in the CFP. Further, maintenance projects are also not included in the CFP but are often addressed in roadway reconstruction, which may accompany road widening or other improvements. Priorities and phases defined by this plan are provided for information only and the city may accelerate or decelerate transportation improvements as necessary to reflect the continuous adjustment of priorities and budget constraints. The CFP was adopted by the City Council on December 11, 2018 in connection with the Impact Fee Analysis and Impact Fee Facilities Plan.

6.1 Capital Facilities Plan

The CFP is structured into two phases, Phase 1 with projects programmed through 2024 and the Phase 2 with projects planned from 2024 to 2040. This two-phased approach, rather than the more traditional three, allows for more flexibility in prioritizing long-range projects.

Planning level cost estimates were produced for all CFP projects. Phase 1 project estimates were produced through a context-based approach including a detailed accounting of various activities, elements, materials, and right-of-way acquisition. Right-of-way acquisition costs were produced through a GIS analysis of parcel data, project limits, and land values. Phase 2 project estimates were produced in a similar, but less detailed approach.

Figure 6.1 shows the location of CFP Phase 1 projects while Table 6.1 provides project details and costs for Phase 1 projects.

Figure 6.1: Capital Facilities Plan Phase 1 Projects

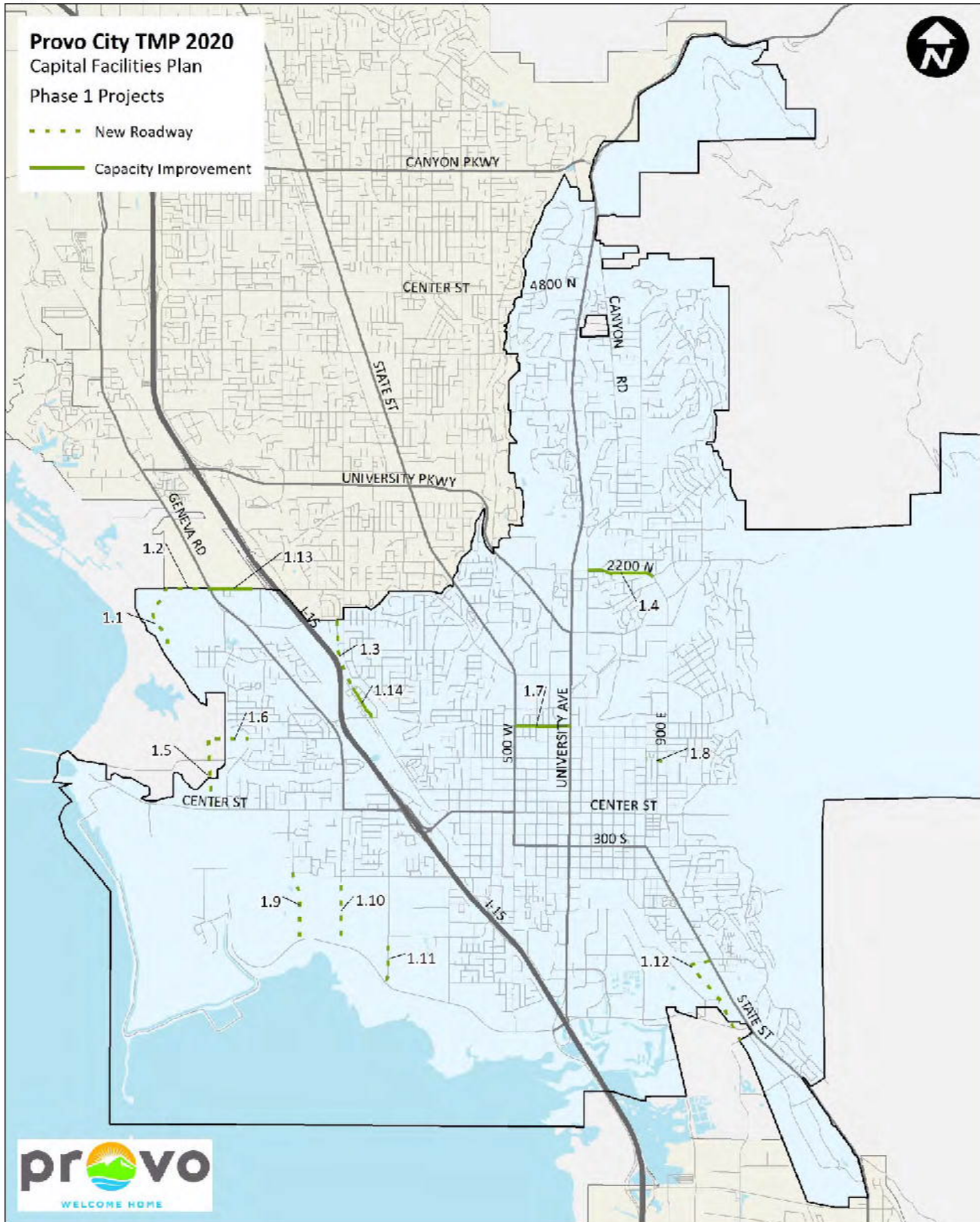


Table 6.1: Capital Facilities Plan Phase 1 Projects (2018-2024)

No.	Street Name	From	To	Notes	Estimated Cost
1.1	Lakeview Parkway	1280 North	2000 North	New 5-lane arterial	\$3,500,845
1.2	2000 North	Lakeview Parkway	Geneva Road	New 3-lane minor arterial	\$2,955,184
1.3	Independence Avenue	1150 North	1700 North	New 3-lane minor arterial	\$4,656,431
1.4	2230 North	Canyon Road	900 East/North Temple	Capacity and Safety Improvements	\$3,284,897
1.5	Lakeview Parkway	Center Street	620 North	New 5-lane arterial	\$18,784,996
1.6	620 North	Lakeshore Drive	Lakeview Parkway	New 3-lane collector	\$2,294,409
1.7	820 North	500 West	University Avenue	Widen to 5-lane arterial	\$4,877,470
1.8	500/450 North	700 East	900 East	New/widen to 3-lane minor arterial	\$7,994,928
1.9	2500 West	560 South	Lakeview Parkway	New 3-lane collector	\$3,732,099
1.10	2050 West	600 South	Lakeview Parkway	New 3-lane minor arterial	\$3,651,102
1.11	1600 West	Lakeview Parkway	1150 South	New 3-lane collector	\$2,433,775
1.12	Tracy Hall Parkway	1320 South	2000 South	New 2-collector	\$4,974,429
1.13	2000 North	Geneva Road	West Railroad Crossing	Widen to 3-lane minor arterial	\$3,506,223
1.14	Independence Avenue	820 North	1150 North	Restripe to 3-lane minor arterial	\$86,401
Total Phase 1 Cost					\$66,733,188

6.2 Phase 1 Project Detail

Phase 1 projects are schedule to be completed by 2024. This very short horizon window means that Phase 1 projects are nearing reality. Because of this, brief project descriptions for Phase 1 are provided below.

6.2.1 Lakeview Parkway, 1280 North to 2000 North

The project of the CFP is the northern extension of Lakeview Parkway from 1280 North. The alignment for this three-lane arterial goes through mostly undeveloped land to 2000 North, west of Geneva Road. The northern terminus connects to a new extension of 2000 North, providing connectivity across I-15. The purpose of this project is to provide westside infrastructure and connectivity.

6.2.2 2000 North, Lakeview Parkway to Geneva Road

This project extends 2000 North west of Geneva Road to a new section of Lakeview Parkway. The alignment includes a rebuild of an approximately 700 feet of an existing roadway immediately west of Geneva Road in a three-lane minor arterial section, continuing west along parcel lines to an existing dirt road which extends northwards. The purpose of this project is to provide westside infrastructure and connectivity.

6.2.3 Independence Avenue, 1150 North to 1700 North

Independence Avenue currently extends north from 820 North and dead ends at approximately 1150 North. This project extends north from the existing terminus to 1700 North. The alignment follows some of an existing dirt track and improves an existing section of 2200 West, where it extends south from 1700 North.

6.2.4 2230 North, Canyon Road to 900 East/North Temple

This segment is an existing pinch point where a five-lane section narrows to 3-lanes, and then back up to five-lanes. This is a capacity and safety improvement project, increasing capacity of 2230 North from Canyon Road east to Temple View Drive with a yet-to-be-defined modified arterial cross-section. In addition, yet-to-be-defined safety improvements will be needed for bicyclists and pedestrians.

6.2.5 Lakeview Parkway, Center Street to 620 North

This project fills the gap between the two existing sections of Lakeview parkway from 620 North south to Center Street.

6.2.6 620 North, Lakeshore Drive to Lakeview Parkway

This project is now completed by extending 620 North from Lakeshore Drive to Lakeview Parkway.

6.2.7 820 North, 500 West to University Avenue

This is a capacity improvement project to alleviate forecasted congestion problems on 800 North between 500 West and University Avenue by 2024. The project will widen the approximately one-half mile length of arterial from 2- to 5-lanes.

6.2.8 500/450 North, 700 East to 900 East

This project provides additional east-west connectivity, joining 500 North to 450 North, spanning from 700 East to 900 East. The alignment of this new 3-lane minor arterial will have impacts on

several properties, bisecting multiple residential properties, and commercial development along 900 East.

6.2.9 2500 West, 560 South to Lakeview Parkway

This project helps to build out the westside network, connecting the existing system to Lakeview Parkway. The alignment extends from the intersection of 2470 West and 560 South southwards, connecting to Lakeview Parkway at approximately 2500 West.

6.2.10 2050 West, 600 South to Lakeview Parkway

Paralleling 2500 West, this project also serves to connect the existing network to Lakeview Parkway. The alignment extends from the existing terminus of 2050 West at 600 South and follows an existing dirt road to Lakeview Parkway.

6.2.11 1600 West, Lakeview Parkway to 1150 South

The third of three new north-south facilities on the westside, this new roadway continues the existing paved section of 1600 West, south from 1150 South to Lakeview Parkway.

6.2.12 Tracy Hall Parkway, 1140 South to 2000 South

This new facility extends existing Tracy Hall Parkway north from 2000 South to 1140 South. This project provides additional connectivity and access west of State Street in southern Provo, servicing light industrial and other uses in that area.

6.2.13 2000 North, Geneva Road to West Railroad Crossing

This project widens the existing section of 2000 North, from Geneva Road to the railroad crossing, to a three-lane minor arterial. This, along with project 2, will provide a consistent three-lane minor arterial section from Lakeview Parkway to the railroad crossing.

6.2.14 Independence Avenue, 820 North to 1150 North

The project re-stripes the existing section of Independence Avenue, north of 820 North, to three-lanes. This, along with project 3, will provide a consistent three-lane minor arterial cross section from 1700 North to 820 North.

6.3 Phase 2 Project Detail

Phase 2 is from 2025-2040 and consists of 19 projects totaling more than \$95 million. Many of these projects are located on the west side Provo and in the center of the city. The projects on the west side include new roadways accommodating growth and connecting existing streets. The projects located in the center of Provo are widening projects to accommodate growth. Figure 6.2 shows the location of CFP Phase 2 projects while Table 6.2 provides project details and costs for Phase 2 projects. Project descriptions are not provided until they reach Phase 1.

Figure 6.2: Capital Facilities Plan Phase 2 Projects

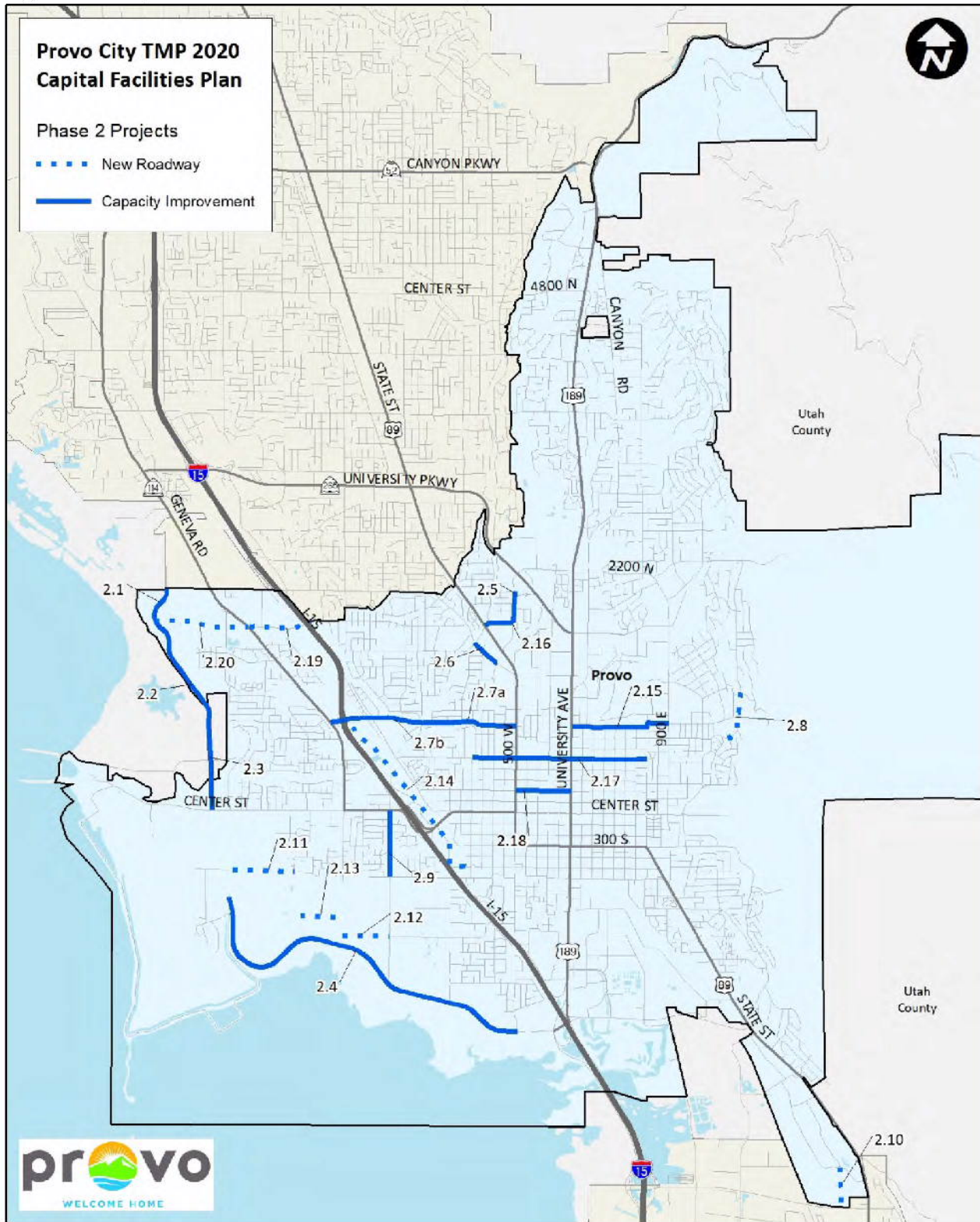


Table 6.2: Capital Facilities Plan Phase 2 Projects (2025-2040)¹

No.	Street Name	From	To	Notes	Estimated Cost
2.1	Lakeview Parkway	1280 North	2000 North	Widen from 3-lane to 5-lane arterial	\$4,079,407
2.2	Lakeview Parkway	620 North	1280 North	Widen from 2-lanes to 5-lane arterial	\$1,610,335
2.3	Lakeview Parkway	Center Street	620 North	Widen from 3-lane to 5-lane arterial	\$2,835,417
2.4	Lakeview Parkway	500 West	Mike Jense Parkway	Widen from 2-lanes to 5-lane arterial	\$6,379,666
2.5	550 West	1720 North	1975 North	Widen from 3-lane to 5-lane collector	\$1,924,707
2.6	Columbia Lane	Riverside Avenue	Grandview Lane	Widen from 3-lane to 5-lane collector	\$1,606,704
2.7a	820 North	950 West	800 West	Replace bridge and interim approaches	\$12,700,000
2.7b	820	Geneva Road	500 West	Capacity, safety, and active transportation improvements	To be determined by future studies ²
2.8	Seven Peaks Boulevard	700 North	1000 North	New 2-lane collector	\$1,215,675
2.9	1600 West	Center Street	600 South	Widen to 3-lane collector	\$2,027,475
2.10	Sierra Vista Way	Mountain Vista Parkway	SR-75	New 2-lane local	\$1,505,598
2.11	600 South	2470 West	Lakeview Parkway	New 3-lane collector	\$2,203,885
2.12	1150 South	1600 West	2050 West	New 3-lane collector	\$1,628,476
2.13	1000 South	2050 West	2500 West	New 3-lane collector	\$1,475,392
2.14	Draper Lane	820 North	600 South	New 3-lane collector	\$9,690,398

Provo City Transportation Master Plan 2020

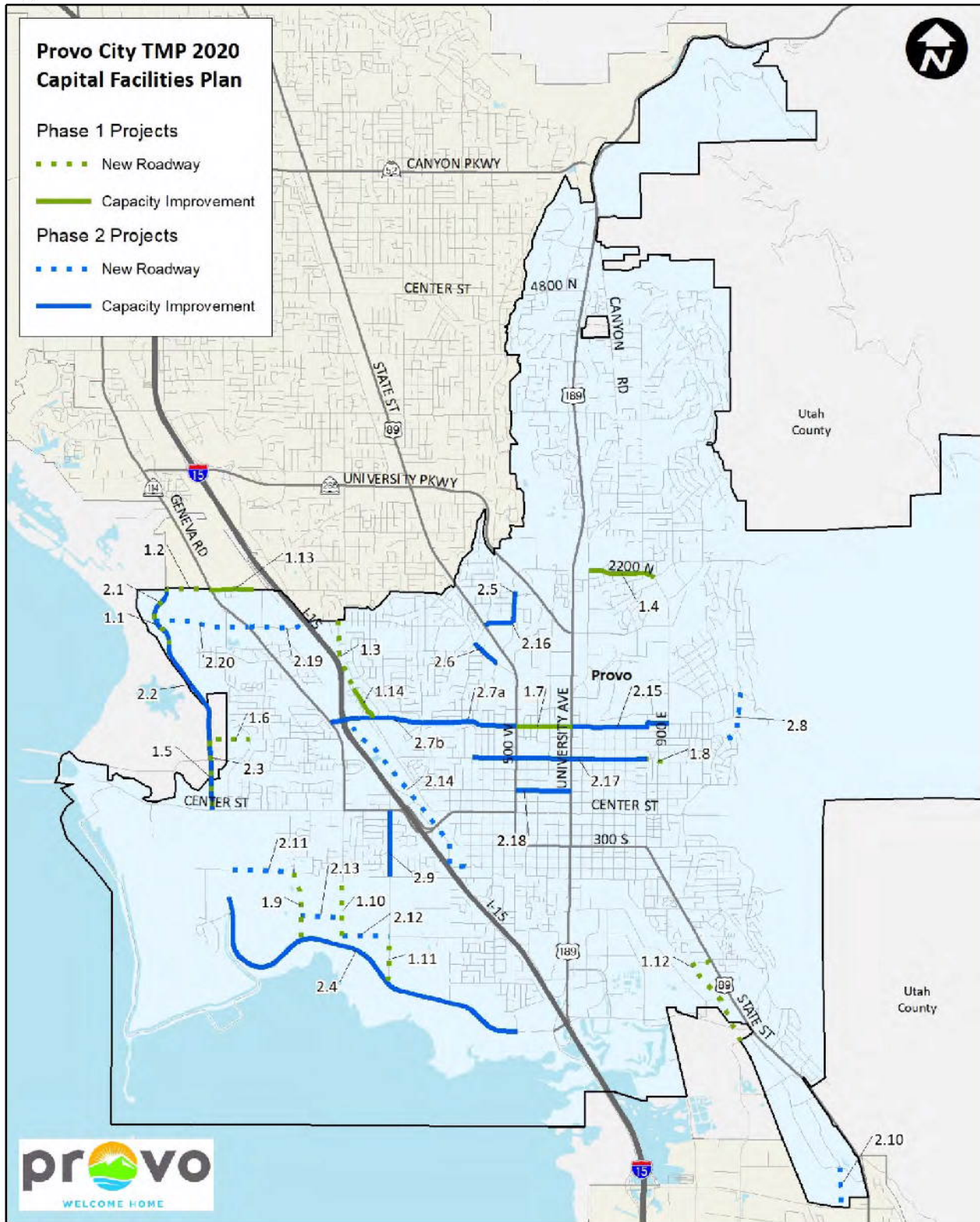
2.15	800 North	University Avenue	900 East	Widen from 2/3-lane to 3-lane arterial	\$4,686,761
2.16	1720 North	State Street	Riverside Avenue	Widen from 2-lanes to 3-lane collector	\$2,663,730
2.17	500 North	900 West	700 East	Widen from 2-lanes to 3-lane minor arterial	\$12,662,123
2.18	200 North	500 West	University Avenue	Widen from 2-lanes to 3-lane collector	\$2,453,696
2.19	1700 North	Sandhill Road	Geneva Road	New 3-lane collector	\$8,542,304
2.20	1680 North	Lakeview Parkway	Geneva Road	New 3-lane minor arterial	2,950,485
Total Phase 2 Cost					\$84,842,234

¹All projects require the expenditure approval of the Provo City Council before moving to Phase 1 (2018-2024).

²Defined by future studies.

Figure 6.3 shows the combined Phases 1 and 2 projects in the CFP.

Figure 6.3: Capital Facilities Plan Phases 1 and 2 Projects



6.4 Context Sensitive Design and Context Sensitive Solutions

6.4.1 Context Sensitive Design (CSD)

Context Sensitive Design is design process that not only considers physical aspects or standard specifications of a transportation facility, but also the economic, social, and environmental resources in the community being served by that facility. A CSD approach helps to ensure projects:

1. Are safe for all users.
2. Use a shared stakeholder vision as a basis for decisions and for solving problems that may arise.
3. Meet or exceed the expectations of both designers and stakeholders, thereby adding lasting value to the community, the environment, and the transportation system.
4. Demonstrate effective and efficient use of resources.

6.4.2 Context Sensitive Solutions (CSS)

The Context Sensitive Solutions process is a collaborative, interdisciplinary, and holistic approach to the development of transportation projects. The CSS process involves all stakeholders, including community members, elected officials, interest groups, and affected local, state, and federal agencies. The CSS process values equally the needs of agency and community, considering all trade-offs in decision-making. The CSS process is guided by four core principles:

1. A shared stakeholder vision to provide a basis for decisions.
2. A comprehensive understanding of contexts.
3. Continuing communication and collaboration to achieve consensus.
4. Flexibility and creativity to shape effective transportation solutions, while preserving and enhancing community and natural environments.

The CSS process considers a range of goals that extend beyond the transportation problem. Such goals often include livability, sustainability, active transportation and placemaking. The CSS process allows for the identification and evaluation of diverse objectives early, thus allowing greater participation by affected stakeholders. When the CSS process is employed the outcome is often greater consensus and streamlined project development and delivery.

The CSS process is most effective when employed throughout the project lifecycle, beginning with problem definition, continuing through design and construction, and concluding with addressing questions about maintenance and operation. The CSS process can be applied at any scale from small projects, to corridor strategies, and long-range transportation plans.

6.5 Future Transportation Studies

The Provo TMP is developed to meet the travel demand of Provo's growing population and includes modes for roadway, transit, and active transportation facilities paired with land use. Transportation master plans are regularly updated – usually every five years. During that time transportation projects are designed and constructed. In addition, transportation studies are usually developed and completed as well. These transportation studies include a variety of scope

and size ranging from regional studies to signal warrant studies. Table 6.3 Future Transportation Studies includes a list of possible transportation studies between TMP updates.

Table 6.3 Future Transportation Studies

Study Name	Description	Agency
I-15 Provo North Interchange Study	This study will identify long term mobility needs with possible interchange(s) along I-15 from Provo Center Street to University Parkway.	UDOT
Provo Travel Demand Modeling Study	This study could perform travel demand modeling and alternatives for connectivity in areas of central-west, central-south, and southeast Provo (e.g. 500 North, 600 South, 900 South).	Provo
2230 North Corridor Study	This study could identify capacity and safety improvements from University Avenue to 900 East to University Parkway.	Provo
820 North Railroad Crossing Study	This study could look at delay and demand of grade separating the UTA railroad tracks and the Union Pacific Railroad tracks.	Provo

Chapter 7 – Emerging Technologies

Current and emerging technologies will have far-reaching impacts on the shape of Provo and how people travel within the city. Although timing the widespread adoption of fully autonomous vehicles is uncertain, it is conceivable that it will begin occurring within the planning horizons of this document. It is important to consider how current manifestations of these technologies – vehicle-to-vehicle and vehicle-to-infrastructure communication – will begin to impact transportation system in Provo.

The United States Department of Transportation (US DOT) encourages governmental entities to explore new and emerging technology that will affect the need to retrofit or otherwise modify and/or expand existing infrastructure. Autonomous and connected vehicles are included in this emerging technology and are predicted by some to be a disruptive force. These emerging technologies have the capacity to impact safety and efficiency of traffic movement. In addition, some applications of new technology are already being implemented while others undergo prototype testing by manufacturers and departments of transportation.

Other topics of consideration include possible technology impacts specific to complete streets, government regulation, first/last mile, big data, parking requirements, urban design, and expected vehicle traffic patterns.

7.1 Autonomous Vehicles

Society of Automotive Engineers (SAE) International has identified six levels of vehicle automation to categorize autonomous vehicles. This categorization schedule has become an industry standard and was recognized by the American Transportation Research Institute (ATRI). The National Highway Traffic Safety Administration has also adopted SAE International automation levels (<https://www.sae.org/news/3550/>).

Most current vehicles generally operate at Level 0 – No Automation. Recent additions of adaptive cruise control or other safety-enhancing technologies have brought some vehicles to Level 1 – Driver Assistance. Prototypes of autonomous and connected vehicles, with varying levels of automation are currently being tested and some features are becoming more readily available on new vehicles. These prototypes operate at Level 2 and Level 3. Some prototype testing features include vehicle platooning, adaptive cruise control, automatic emergency braking, and lane-departure monitor. Figure 7.1 provides a summary description of automation type for on-road vehicles.

Figure 7.1: SAE International’s Level of Driving Automation for On-Road Vehicles

SAE level	Name	Narrative Definition	Execution of Steering and Acceleration/Deceleration	Monitoring of Driving Environment	Fallback Performance of Dynamic Driving Task	System Capability (Driving Modes)
Human driver monitors the driving environment						
0	No Automation	the full-time performance by the <i>human driver</i> of all aspects of the <i>dynamic driving task</i> , even when enhanced by warning or intervention systems	Human driver	Human driver	Human driver	n/a
1	Driver Assistance	the <i>driving mode</i> -specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	Human driver and system	Human driver	Human driver	Some driving modes
2	Partial Automation	the <i>driving mode</i> -specific execution by one or more driver assistance systems of both steering and acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	System	Human driver	Human driver	Some driving modes
Automated driving system (“system”) monitors the driving environment						
3	Conditional Automation	the <i>driving mode</i> -specific performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> with the expectation that the <i>human driver</i> will respond appropriately to a <i>request to intervene</i>	System	System	Human driver	Some driving modes
4	High Automation	the <i>driving mode</i> -specific performance by an automated driving system of all aspects of the <i>dynamic driving task</i> , even if a <i>human driver</i> does not respond appropriately to a <i>request to intervene</i>	System	System	System	Some driving modes
5	Full Automation	the full-time performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> under all roadway and environmental conditions that can be managed by a <i>human driver</i>	System	System	System	All driving modes

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Monitoring trends in vehicle automation and technology is important to transportation planning. US DOT also identified potential impacts to transportation plans from connected and autonomous vehicles (<https://rosap.ntl.bts.gov/view/dot/31397>):

1. Planning agencies must assess the need for and feasibility of incorporating Dedicated Short-Range Communications (DSRC) technology into corridor improvement projects. Depending on the proposed timeframe for implementation, planners will have to develop alternative scenarios for such deployments. DSRC is a two-way, high-speed, short-range communications platform and its intended uses include traffic signal control and monitoring, toll collection, signal preemption for emergency vehicles, and others.
2. Planners will need tools to evaluate the impact of vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) technologies on operational efficiency and commercial vehicle safety. Models will be needed that can assess the impacts of vehicle platooning and partial automation on throughput and safety.
3. Connected/autonomous vehicle (C/AV) technology provides opportunities to improve air quality through reductions in vehicle delays and idling. Planners will need both analytical tools and new data collection efforts to evaluate these impacts and account for them in air quality improvement programs.

4. Today's autonomous vehicle technology operates best on high quality infrastructure. Proper road striping, signage, geometries and pavement conditions all help facilitate autonomous vehicle use. Additionally, V2I technology will enable vehicles to communicate with traffic lights and other aspects of the infrastructure. Thus, while automated vehicles will not improve the infrastructure, the technology used by autonomous vehicles might necessitate infrastructure investment.
5. Implementation of C/AV-related safety investments, particularly those involving security or V2I strategies, will require a greater level of cooperation between MPO member municipalities since consistency is critical to realizing safety benefits. This may widen the range of municipal officials who are involved in the transportation planning process, such as IT personnel.
6. New stakeholders, many of whom are private-sector entities as yet unknown (e.g., national phone carriers such as Verizon or AT&T who deploy new and different wireless networks), must be brought into the planning process in order to understand how the C/AV technology will operate and what ongoing relationships are required between the public and private sectors.

Developing transportation plans for the coming decades face an additional complicating factor: the rate of adoption by the traveling public of these emerging technologies. Infrastructure will need to be simultaneously “compatible” with human drivers and vehicles featuring varying degrees of autonomy. How can infrastructure accommodate both early adopters and those who cannot afford to adopt AVs? At what point will the significant traffic safety benefits of AV technology collide with the governmental mandate to protect the health, safety, and welfare of the community? When discussing innovative technologies, is it important to remain cognizant of these forthcoming ethical dilemmas related to equity and access.

7.2 Intelligent Transportation Systems

Intelligent transportation systems (ITS) are the predecessor to the current beginnings of a connected vehicle movement. ITS broadly describes technology that enhances the efficiency, capacity, and/or safety of surface transportation systems and/or reduces environmental impact by capturing real-time data and incorporating a systems approach to inform management decisions. Such applications rely on vehicle detection systems and communications systems.

7.2.1 Integrated Corridor Management

Another application of ITS is integrated corridor management (ICM) which uses a multi-jurisdictional, multi-modal systems approach to manage shared corridors and accessory roads that are effectively corridor components. Since ICM is rooted in a collaborative effort, transportation networks may be optimized by coordinating strategy and technology for independently managed corridor facilities and will allow jurisdictions to capitalize on underutilized capacity. Integration may include institutional integration, operations integration, and technical integration. According to US DOT, applications have focused on the movement of people with two pilot projects in existence. ICM strategies for Provo could focus on integrating

active transportation plans throughout neighboring jurisdictions, fostering complementary transportation networks instead of competing transportation networks.

7.2.2 Vehicle-to-Infrastructure

Finally, ITS presently serves as a catalyst for V2I communication technology, which is part of the broader purview of autonomous and connected vehicles (<https://www.its.dot.gov/strategicplan.pdf>) V2I communications use external infrastructure that function as a communication facilitator between vehicles and/or infrastructure. V2I communications technology include DSRC and LTE (Long-Term Evolution). LTE is the communications platform that most smartphones use (<http://atri-online.org/wp-content/uploads/2016/11/ATRI-Autonomous-Vehicle-Impacts-11-2016.pdf>). As of writing, UDOT is currently testing V2I technology at certain locations on state highways. If these pilot projects provide benefits, it is likely that this technology will be implemented on other roadways within the state.

7.2.3 Vehicle-to-Vehicle

DSRC utilizes a portion of spectrum set aside by the Federal Communications Commission in 1999 as part of US DOT's national ITS program ([https://transition.fcc.gov/Bureaus/Engineering Technology/News Releases/1999/nret9006.html](https://transition.fcc.gov/Bureaus/Engineering%20Technology/News%20Releases/1999/nret9006.html)). DSRC is positioned to complement autonomous vehicle positioning systems and other safety applications. Its high-speed capability provides a reliable platform for V2V communications. As DSRC is a short-range frequency, wayside transceivers are needed at approximately quarter-mile intervals to provide effective coverage beyond close-range V2V communications, thus also supporting V2I communications.

3G/4G/5G LTE potentially serve both V2I and V2V communications without the high-speed capability of DSRC. V2V communications do not rely on wayside or external infrastructure to facilitate communication between vehicles and operate over broader ranges than DSRC range. US DOT indicates DSRC is more reliable for critical safety communications applications and LTE may be best utilized in "data dumps" associated with autonomous and connected vehicles (https://ntl.bts.gov/lib/60000/60200/60295/FHWA-JPO-16-281_Final.pdf).

The role of mapping will remain integral to the safe operation of automated vehicles. Historically, analog and digital maps display locations of roads, or an approximation. High-definition digital maps can hold much greater detail in a model of road features that include lane locations, curbs, designated crosswalks, and other features. Conventional GPS is generally accurate to a few feet, plus or minus. However, when integrated with wayside DSRC components, GPS accuracy is within a range of inches instead of feet. These technologies will aid the safe movement of vehicles (automated and not automated) in poor driving conditions.

7.3 Land Use and the Sharing Economy

Different land use types and configurations have a dramatic impact on how a population moves. As land-use plans are typically a local product, regional agencies, such as MPOs and county governments, may guide coordination between local plans. The built environment of cities is significantly determined by planning and engineering for privately owned automobile traffic. Roadway geometry, parking, traffic signals, signage, building setbacks, and architecture are all largely shaped by the needs of privately-owned automobiles being driven by humans. Communities of the future will be similarly shaped by the advent of automation and growth in the sharing economy.

The “sharing economy” is redefining notions of private ownership in transportation as well as other sectors. When this force combines with greater vehicle automation, many current land use regulations will be rendered obsolete. It is conceivable that large parking lots will become an anachronism as more people are dropped-off at a destination by ridesharing services. How will traffic be impacted when increasing numbers of spectators at LaVell Edwards Stadium are dropped off rather than parking? Will the maintenance of large parking lots continue to be in the public’s interest in a scenario involving declining rates of vehicle ownership? How will traffic be impacted if most cars are shared?

Vehicle parking requirements form a large determining factor in many land use regulations. It is feasible to expect that if vehicle ownership rates decline, there will be less demand for parking spaces. In this scenario, it is likely that parking standards will need to be revised as attention shifts to pickup/drop off facilities that do not interfere with the flow of traffic. Smaller parking lots will have the additional benefit of opening up large portions of underutilized real estate for development.

7.4 Shared Mobility

Shared mobility is the umbrella term for docked and dockless, bicycle, e-bicycle, and e-scooter sharing systems. Services in operation along the Wasatch Front currently include: GREENbike (docked bikeshare), Bird (dockless electric scooter sharing service), Lime (dockless bicycle, electric bicycle, SPIN (dockless electric scooter sharing service) and electric scooter sharing service). The success of these services in Salt Lake County indicates that these services are likely to expand into neighboring counties and other urbanized areas throughout Utah. Provo City, being the third largest in the state, should anticipate the expansion of shared mobility and plan accordingly.

Currently, restrictions on the use of e-scooters and electric assisted bicycles, which are common to shared mobility services, are defined under two sections of the Utah Code. E-scooters are regulated as motor assisted scooters under section 41-6a-1115; restrictions include:

1. Individuals under the age of 15 may not operate a motor assisted scooter without direct supervision of parent or guardian.
2. Individuals under the age of eight may not operate a motor assisted scooter on any public property, highway, path, or sidewalk.

3. A person may not operate a scooter:
 - a. In a public parking structure.
 - b. On public property posted as an area prohibiting skateboards.
 - c. On a highway with four or more travel lanes.
 - d. On a highway with a speed limit of greater than 25 miles per hour.
 - e. While carrying more persons than the vehicle is designed for.
 - f. That has been altered from the original manufacturers design

E-bikes are regulated as Electric assisted bicycles under section 41-6a-1115.5; restrictions include:

1. Unless otherwise specified, electric assisted bicycles are subject to provisions for bicycles.
2. A local authority may adopt an ordinance or rule to regulate or restrict the use of an electric assisted bicycle, or a specific classification of an electric assisted bicycle, on a sidewalk, path, or trail within the jurisdiction of the local authority or state agency.
3. Individuals under the age of 14 may not operate an electric assisted bicycle on any public property, highway, path, or sidewalk without direct supervision of parent or guardian
4. Individuals under the age of eight may not operate and electric assisted bicycle on any public property, highway, path, or sidewalk.

The 25 mph or less and less than four lanes operating restrictions have been found to be extremely limiting for the use of e-scooters, and because of this and the prevalence of e-scooters in areas where sharing services operate, compliance is low. Because of this, a bill titled Motor Assisted Transportation Amendments (SB0139S02) was passed in the 2019 General Session of the Utah Legislature and signed by the Governor on March 27, 2019 that addresses the following issues:

1. addresses definitions, including the definition of low-speed vehicle;
2. prohibits certain activities with regard to an alcohol product and a motor assisted scooter;
3. clarifies that a motor assisted scooter is a vulnerable user of a highway;
4. provides that a motor assisted scooter is subject to provisions for a bicycle, and not a moped or a motor-driven cycle;
5. addresses operation of a motor assisted scooter;
6. exempts motor assisted scooters with respect to certain equipment required on vehicles;
7. addresses scooter-share programs;
8. addresses local ordinances regulating motor assisted scooters; and
9. makes technical and conforming amendments.

Because of the potentially disruptive nature of these services on existing transportation infrastructure, roadway users, and pedestrians, it is important for cities to govern their usage through operating agreements and/or city ordinances. The agreements are to be renewed and updated as needed. Things to consider when controlling the use of shared mobility included fleet size, parking restrictions, equipment standards, fees, business operation requirements, and data sharing.

7.5 Multi-Modal Streets

Utah municipalities are experiencing an increased demand for active transportation facilities. A community's movement may be impacted when new facilities are built, or existing facilities are expanded without intentional integration. Street design policies that include all modes of transportation and active transportation plans present opportunities to facilitate collaborative street design between stakeholders to enhance safety for all users. Coincidentally, design considerations for freight may also apply to transit vehicles (e.g., buses), thereby offering broader design impacts such as additional acceleration/deceleration and larger intersection turning-radii in certain locations. Multi-modal street plans that effectively engage stakeholders will be more likely to produce context-sensitive designs that enable:

1. Greater freedom of movement for all family members including kids and grandparents.
2. Higher, more resilient real estate values through improved quality of life.
3. Economic development opportunities for new or relocated businesses.
4. Infrastructure maintenance savings through less wear and tear on roadways.
5. Lower rates of heart disease, obesity, and diabetes leading to greater healthcare savings.

7.6 Government Regulation

US DOT is in the process of developing preemptive rules for autonomous vehicles. Current regulation related to autonomous vehicles varies by state. Utah previously passed House Bill (H.B.) 280 Autonomous Vehicle Study in 2016, which outlines requirements for certain state agencies to study autonomous vehicle technology and also grants authority for agencies to partner with other entities (H.B. 280 Autonomous Vehicle Study, 2016). In addition, Utah enacted H.B. 373 Connected Vehicle Testing in 2015 ([H.B. 373 Connected Vehicle Testing, 2015](#)). It authorizes UDOT to conduct connected vehicle technology testing outside of urban areas in the state. More recently, during the 2019 legislative session, H.B. 101 Autonomous Vehicle Regulations further advanced regulations to accommodate these new vehicles. The bill legalizes autonomous operation, amends portions of traffic laws, establishes protocol in the event of a crash, and preempts local regulations.

7.7 Last Mile Delivery

Crowd-sourcing and peer-to-peer services are becoming more commonplace in many industries. These services also have disruptive potential. Amazon is offering Amazon Flex, a package delivery service, in about 11 U.S. markets with expansion planned for many more. Amazon Flex seems familiar as operational characteristics are similar to Lyft/Uber with contracted workers or "partners" that are paid based on deliveries. In addition, companies like Amazon are exploring a reduction in reliance on outside providers by bringing more operations in-house. Other startups offer full delivery services to individuals with pickup and delivery or connecting shippers to travelers with extra space.

7.8 Big Data

The term big data is somewhat ubiquitous as of late and is fairly obscure in its definition. It is, however, integral to the operation of emerging travel technologies. big data refers to a dataset that may not only be large in size – as many include with a component-based definition – but also

pertains to the composite makeup and sourcing of a particular dataset as well as the usefulness of a dataset beyond standard descriptive statistics. Big data offers the potential to extract unique insight and useful information from multiple sources that is capable of informing better decisions ([Forbes, 2014](#)).

Provo's role in big data is not to be a driver in the process, but rather to function in a supportive position that enables access to more valuable information. This information may include the basics that may already be available: route information, road conditions, infrastructure quality, or traffic congestion, as well as information sourced from operators: geographic needs, excess capacity, etc.

Appendix A – Public Involvement

Public involvement was a key part of developing the TMP. Provo residents have a vested interest in the future mobility in their community. As users of the current transportation network in Provo, residents also have firsthand experience with mobility challenges that exist. Thus, the public are important stakeholders to include in this process who possess valuable insights. Open house style meetings were the primary and most direct means for Provo residents to influence the direction of the new TMP. The input of the public was also present in this plan through the participation of Provo City’s Transportation Mobility Advisory Committee, Planning Commission, and City Council. Whether direct or indirect, public involvement was of crucial importance in developing this plan.

A.1 Direct Public Involvement

Provo citizens directly influenced the TMP through two open house meetings that occurred at the Provo City Recreation Center on Thursday, April 19, 2018 from 5:00 pm to 8:00 pm and on Thursday, November 15, 2018 from 5:30 pm to 8:00 pm. Although broadly similar in structure, each open house had a distinct role to play in the development of this plan.

A.2 April 19, 2018 Public Open House

The public open house offered the community opportunities to learn more about the planning process, provide input on transportation concerns, and interact with project staff. At this very well attended meeting, approximately 100 community members provided 184 written comments and highlighted 264 locations in Provo that had good or poor conditions related to transportation.

Boards were displayed that provided an overview of the planning process and existing transportation plans and conditions. Large format maps laid out on tables were the primary focus of activity at this event. Each of the maps focused on a different City Council district. Participants were provided with several ways to provide feedback at this meeting, each involving greater depth.

Good and poor conditions were highlighted using green and red stickers respectively. These stickers featured different modes of transportation. Thus, at a quick glance it was possible to spot obstacles to mobility for a diversity of modes. Conversely, it was also easy to identify existing popular areas that can serve as a template for future changes elsewhere in the city.

Directly marking on maps and sticky notes formed the second approach to providing feedback. Participants highlighted areas of concern through directly drawing and writing notes on the map. More information often supplemented these comments—as well as the good/poor condition stickers—using the provided sticky notes. Finally, handwritten comments were collected using comment cards that were deposited in a comment box.

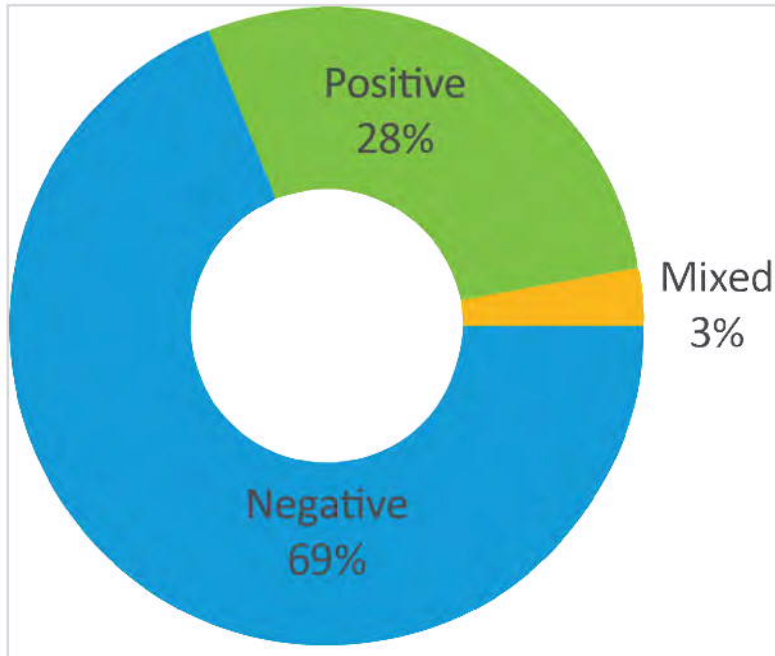
Transforming this wealth of insight into actionable results was accomplished by transcribing the feedback, categorizing it, and attaching an address to each comment. The text-based comments were reviewed and coded by common thematic tags. Often the comments touched on multiple topics. This enabled a summary of concerns to be generated for each City Council district, since different areas of the city have unique needs. Concerns in one area may be addressed through enhanced vehicle-speeding enforcement or traffic calming while other areas may benefit more from capital investments in infrastructure upgrades.

The inclusion of spatial data in the form of a relevant address enabled the comments to be mapped and analyzed for clustering patterns. Results of this analysis were converted to a rainbow “heat map” to show locations with a high incidence of comments. The contents of these concentrations were then examined to understand common concerns/themes for these areas. Since feedback was also categorized by transportation mode, the community could highlight the mobility challenges that users of different modes face.

A.2.1 Public Open House Results

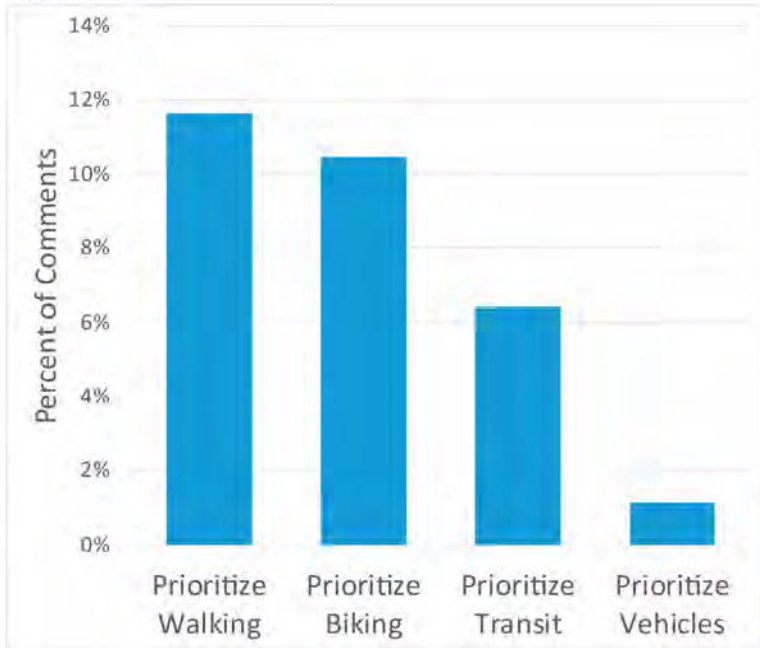
Generally, open house participants like certain locations in their community and have ideas for how they would like to see further improvement. Approximately 28 percent of comments mentioned a good condition, 21 percent of comments mentioned poor pedestrian conditions, and 16 percent mentioned poor bicycle conditions.

Figure A.1: General Opinion of Comments Received During November Open House



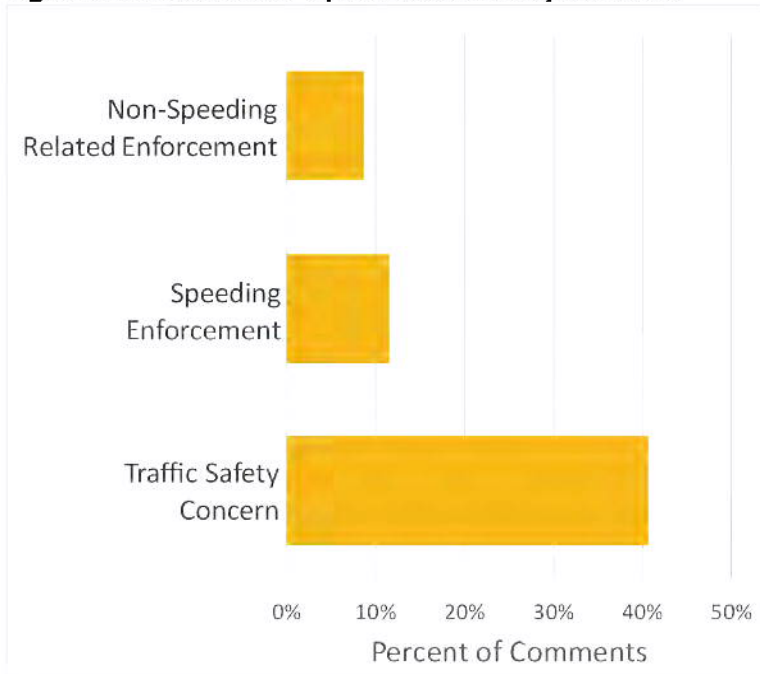
When it comes to mode priorities, 28 percent of comments requested a greater priority and consideration be given to transit users, bicyclist, or pedestrians. While 12 percent advocated specifically for active transportation to accommodate all modes.

Figure A.2: November Open House Feedback Mode Priorities



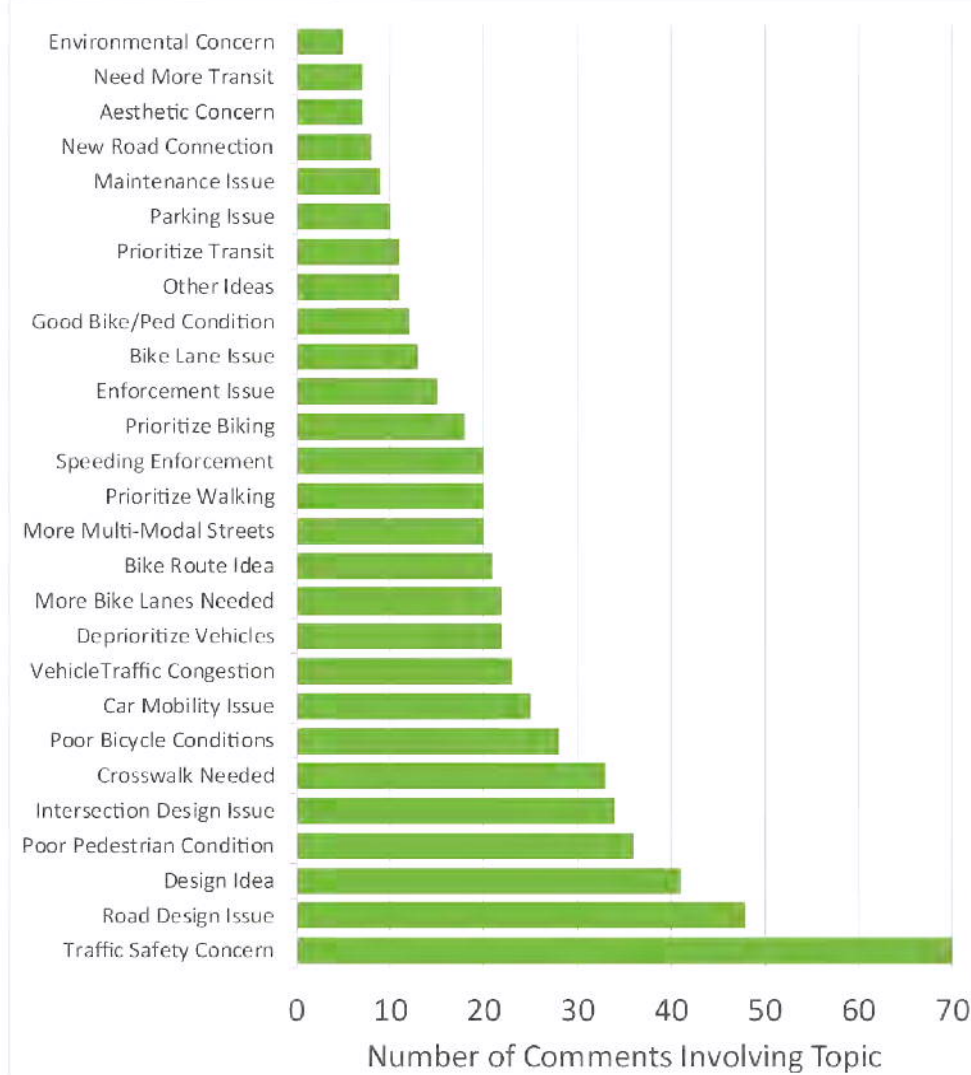
Another major priority running through comments is traffic safety: almost two-thirds of comments mention a vehicle traffic-related safety concern. These concerns can often be addressed through roadway design changes and greater law enforcement.

Figure A.3: November Open House Safety Concerns



It is worth mentioning that often comments involved multiple topics at a time. The chart below summarizes the topics that had at least five mentions. The most frequently mentioned topics were traffic safety concerns and issues involving road design. However, Provo residents are proactive in suggesting ideas for how to address issues through design ideas.

Figure A.4: November Open House Feedback Topics with at least 5 Mentions



Different modes of transportation have different concerns and highlight different areas. For example, a vehicle driver may bemoan traffic congestion on a given street while a pedestrian may wish to see additional crossing opportunities on the same road. Thus, concentrations of problem/concern areas in Provo, were analyzed based on the mode of transportation involved.

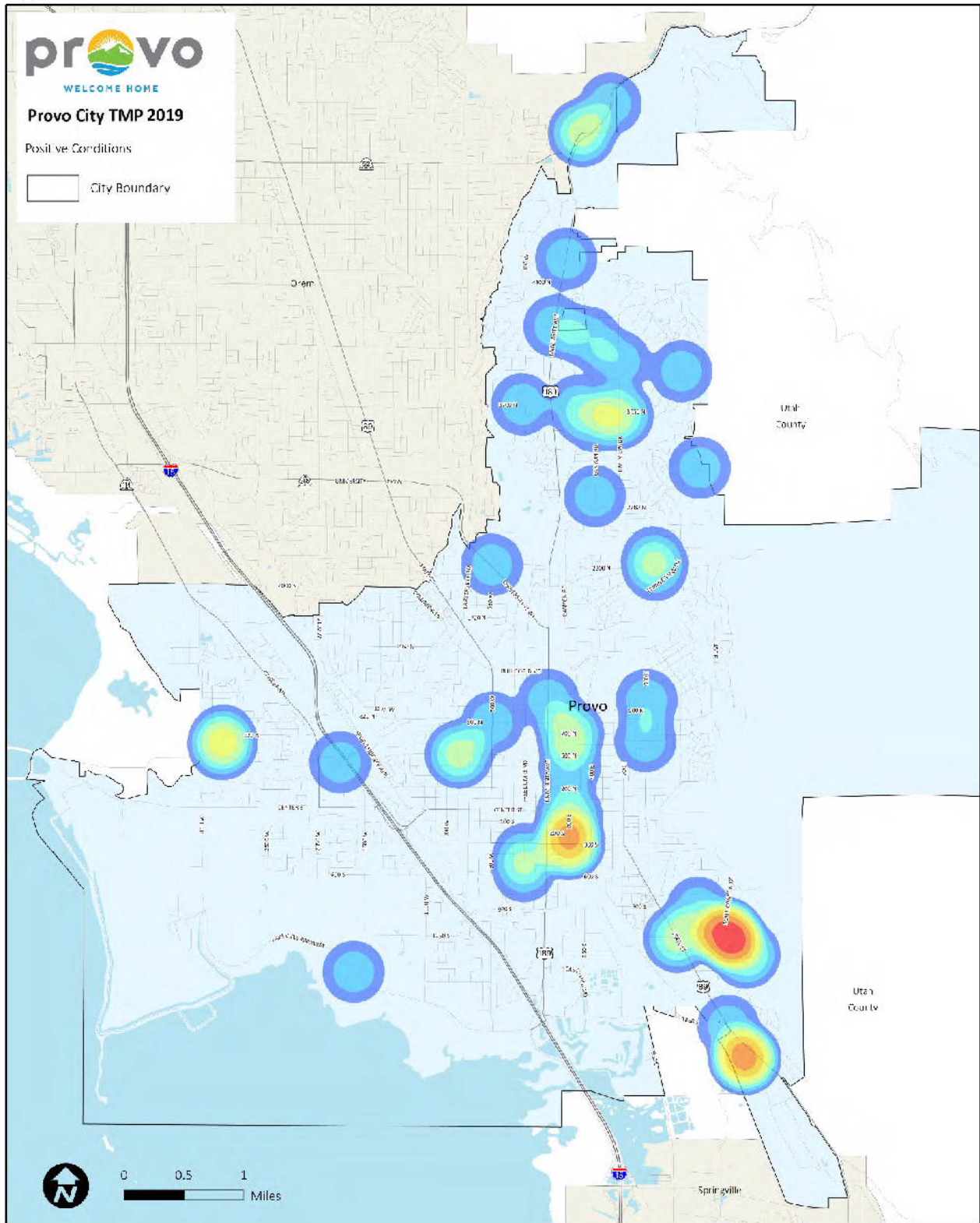
For the most part, positive conditions included:

1. Bicycling on 200 East is very popular, particularly the protected bicycle crossing on 300 South.

Provo City Transportation Master Plan 2020

2. The bicycle lanes and pedestrian conditions on Slate Canyon Drive are quite popular.
3. Mountain Vista Lane was mentioned as positive for pedestrians, bicyclists, and drivers.

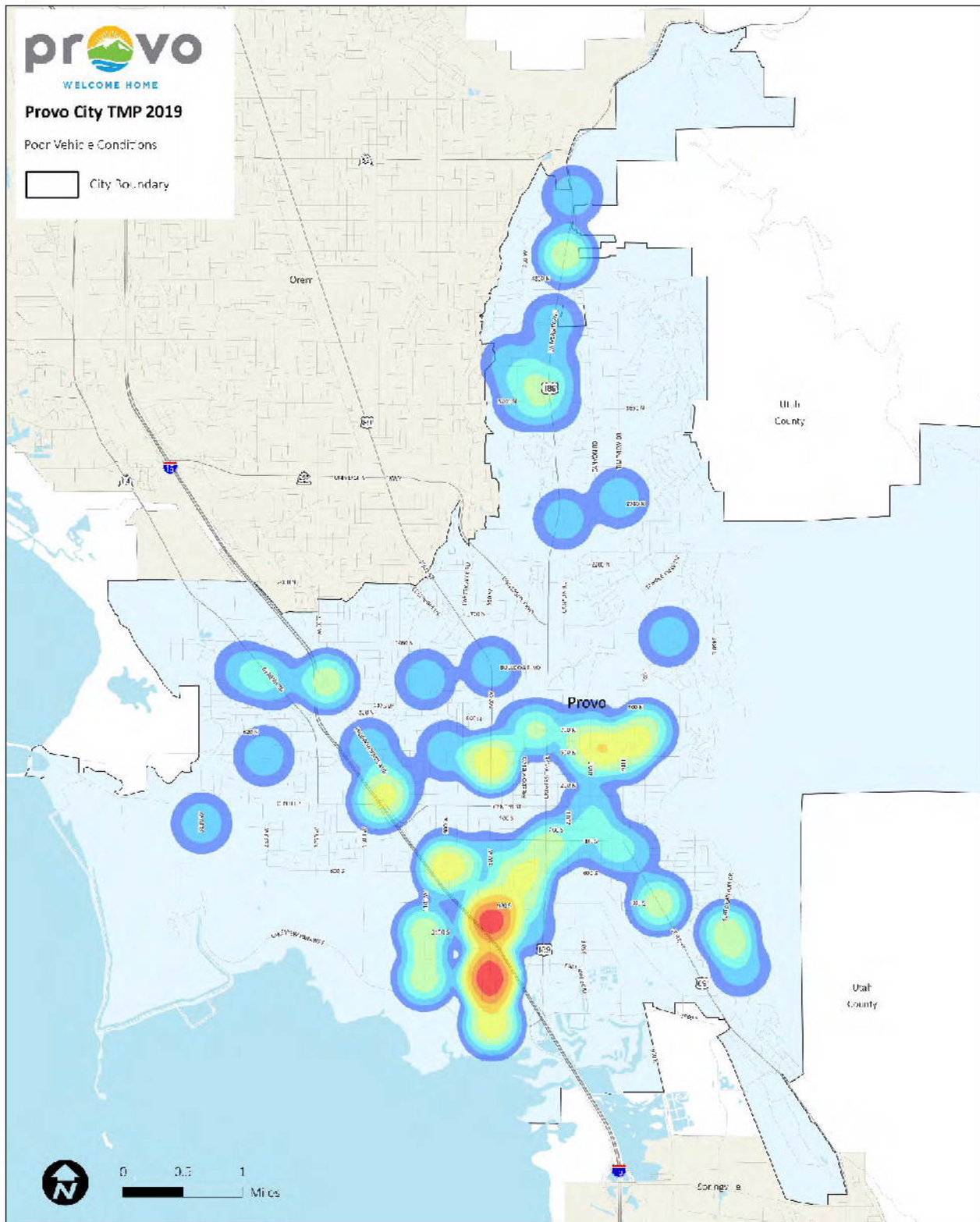
Figure A.5: November Open House Location of Positive Conditions Comments



Vehicle traffic can create a challenge for drivers and non-drivers alike. The public highlighted the following places requiring some type of improvement or enforcement:

1. Traffic congestion on 500 West from 300 South to Provo/Orem boundary and speeding on 500 West from 920 South to Lakeview Parkway.
2. It is challenging to turn from 700 North onto other streets, especially at 900 East and Freedom Boulevard.
3. Traffic congestion on 500 North from 900 West to 700 East. Accessibility could be improved to connect to 900 East and Geneva Road.
4. There is much auto/pedestrian conflict on 500 North from University Avenue to 700 East.
5. Center Street and I-15 Interchange is congested.
6. Safety concerns on State Street from 400 South to 900 South caused by pedestrians and bicyclists crossing without a crosswalk and challenging left-turns by vehicles.
7. Narrow roadways combined with curb parking and speeding are sources of concern on Slate Canyon Drive.
8. Drivers and pedestrians have some dangerous interactions on 1100 West between 1150 South and 1500 South due to infrequent crosswalks.
9. Traffic safety is a concern on University Avenue from Canyon Road to 3700 North.

Figure A.6: November Open House Location of Poor Vehicle Conditions Comments



Pedestrians and bicyclists alike tend to favor roads with lower vehicle speeds, less traffic, and safe crossings. Nevertheless, bicyclists and pedestrians focused on different problem areas. Bicyclists highlighted the following locations as challenging to their mobility:

1. Freedom Boulevard north of 300 South.
2. Center Street from 500 West to 200 East.
3. Difficult to cross 300 South/State Street and needed shoulder maintenance south of 300 South on State Street.
4. 500 North needs more bicycle amenities.
5. University Avenue is a barrier and in need of maintenance.
6. I-15 is another major barrier.

Comments were also received about pedestrian issues at the following locations as a concern to limiting pedestrian mobility:

1. Difficulty crossing State Street was the most often mentioned challenge that pedestrians experience.
2. Infrequent crossings on 300 South are a challenge and causes dangerous jaywalking.
3. 500 West is another challenging street to cross and would benefit from traffic calming measures.
4. 500 North has large numbers of pedestrians but limited infrastructure for them.
5. Access near the Provo Central Station needs to be improved.
6. Crosswalks on 800 North and on Center Street need either improved visibility or maintenance.

Many of these roads are state-owned and maintained. University Avenue (US-189), State Street (US-89), as well as segments of 300 South and 500 West (US-89), and of course I-15. Provo City Engineering staff communicates regularly with UDOT and the above roads and issues will need to be discussed with UDOT.

The following two heat maps below show the location of the comments received about poor bicycle and pedestrian conditions. Yellow and red colors indicate a higher number of comments for a particular location.

Figure A.7: November Open House Location of Poor Bicycle Conditions Comments

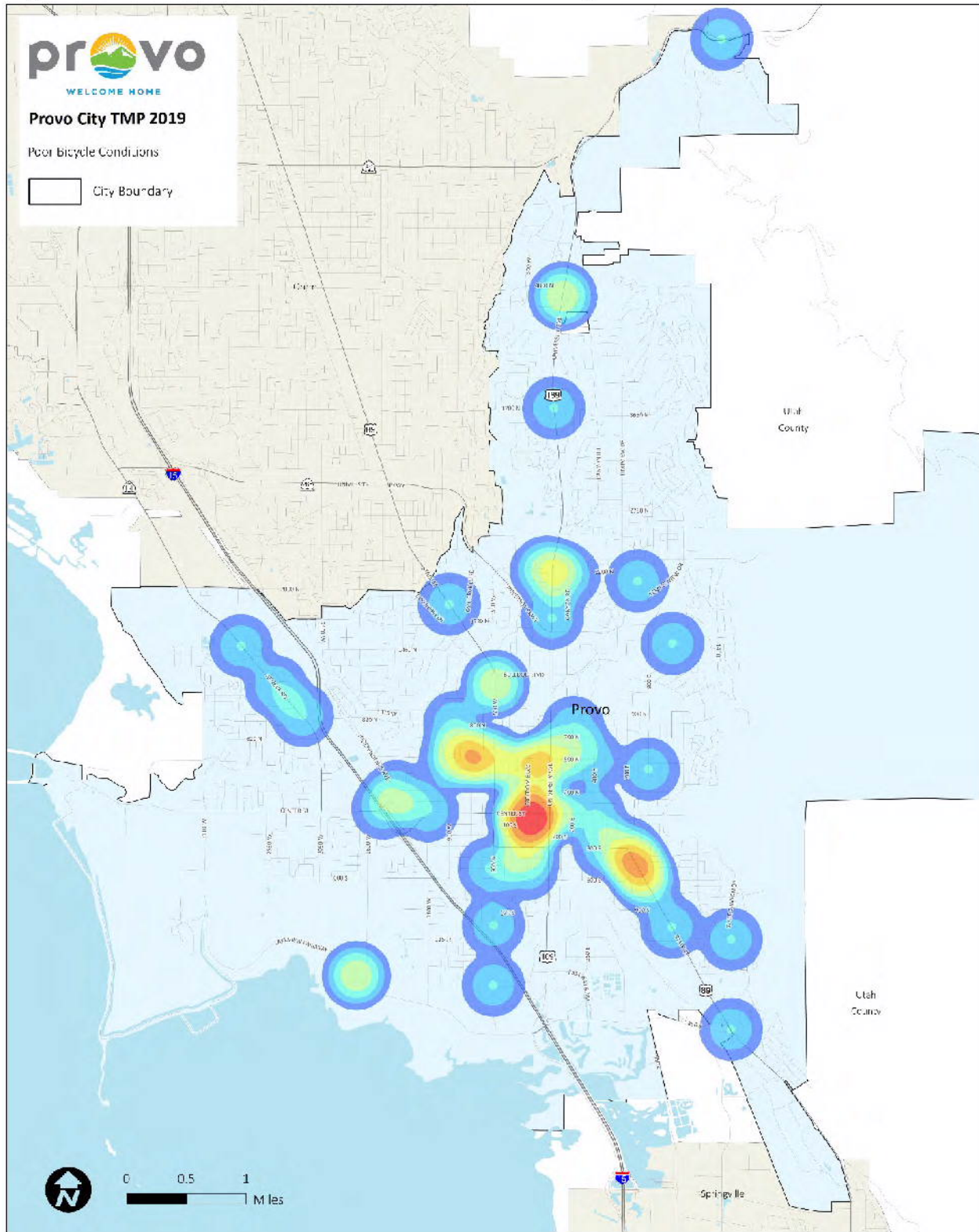
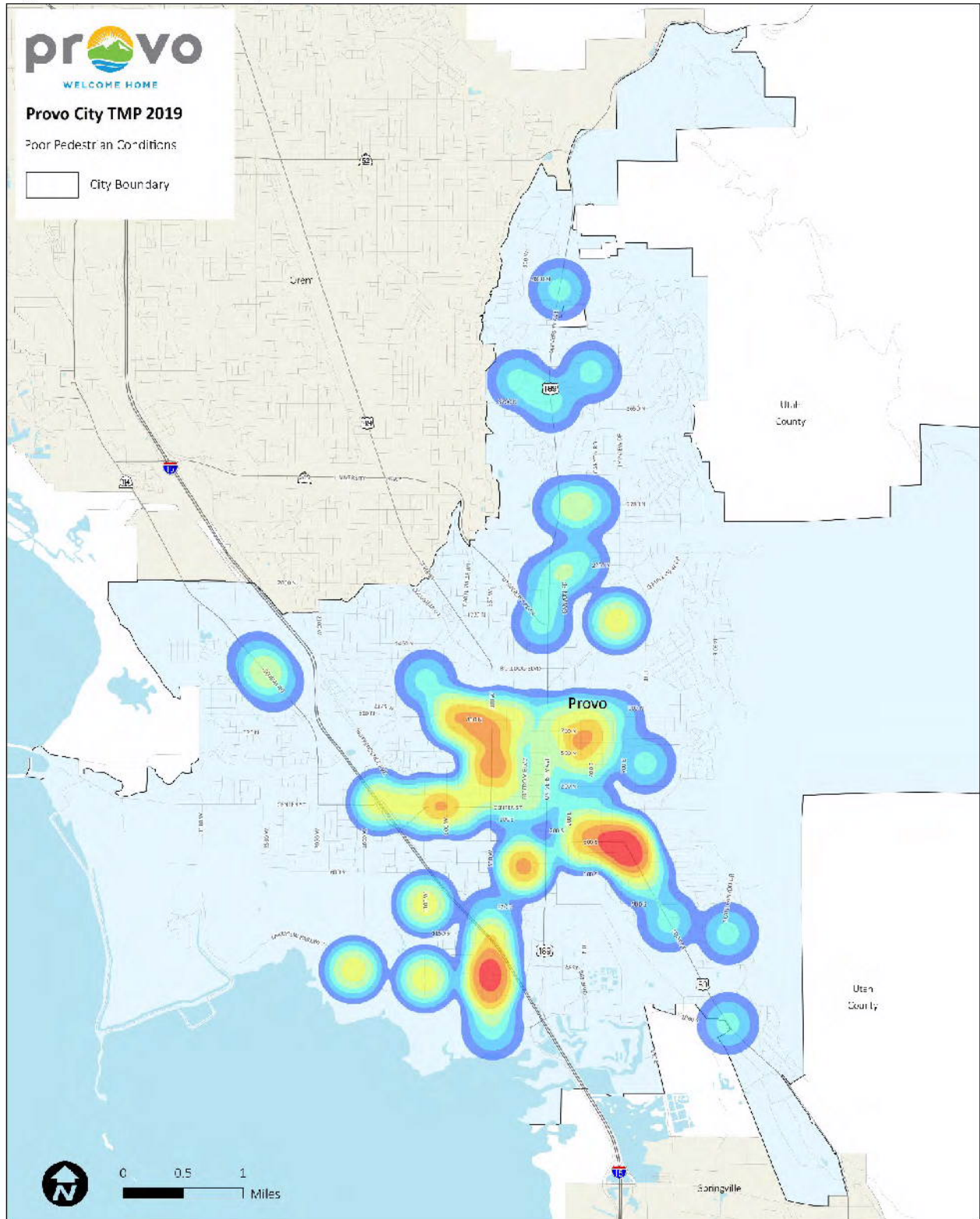
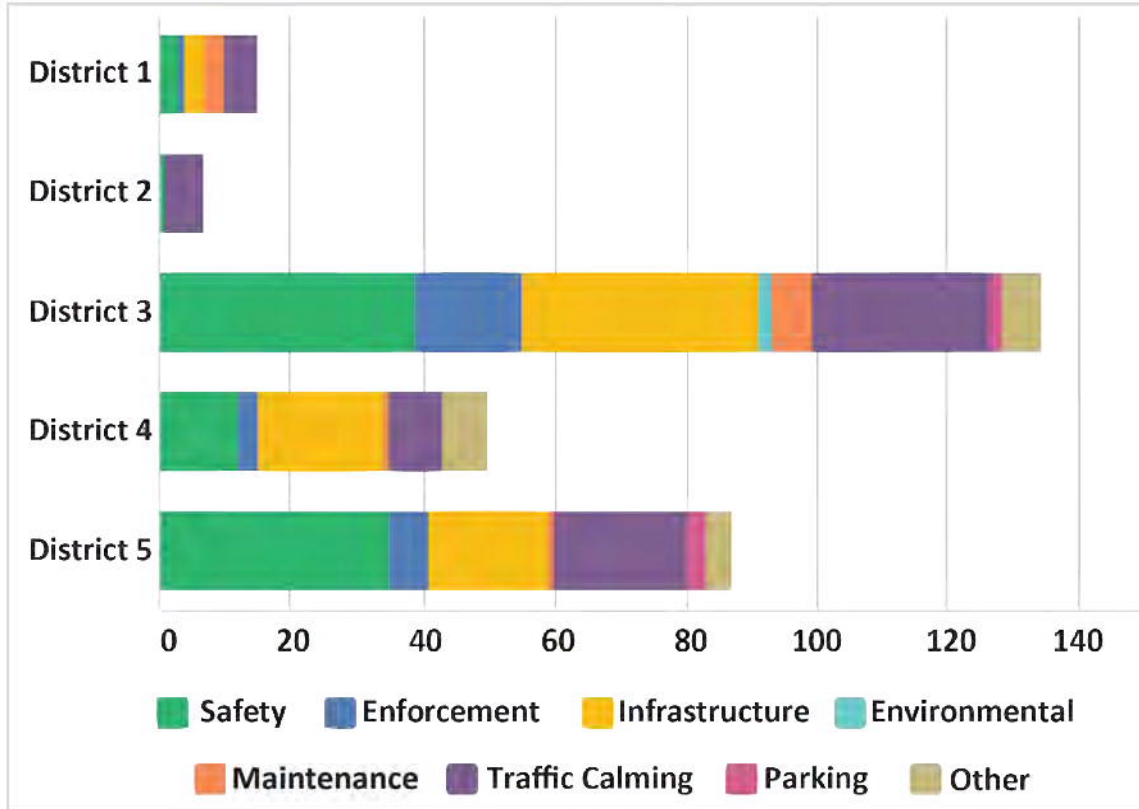


Figure A.8: November Open House Location of Poor Pedestrian Conditions Comments



As previously mentioned, transportation infrastructure needs and priorities vary in different areas within Provo. City Council districts offer helpful shorthand as sub-areas within the city’s boundaries. It is worth mentioning that comments often touched on multiple topics at a time.

Figure A.9: November Open House Comments by Category and City Council District



A.3 November 15, 2018 Public Open House

The primary purpose of the second open house was to receive feedback on the draft contents of the TMP. This was accomplished through a through a series of boards concerning a diversity of topics such as:

1. Traffic safety/crash history.
2. Proposed changes to street right-of-way widths and cross-section standards.
3. Current and future vehicle traffic under different scenarios.
4. Draft vehicle and active transportation networks.
5. Typologies of bicycle infrastructure and median treatments.
6. Capital Facilities Plan and future project lists by phase.
7. Roadway functional classification with proposed changes.
8. Current and future transit routes.
9. Summarizing the public input received at the first open house.

In addition to the boards, a smaller table-top map was available to highlight any additional poor conditions in need of improvement. Approximately 73 individuals attended this meeting.

A.3.1 Public Open House Results

For the most part, these comments did not vary significantly from the more prominent long-form comments received. This public open house received 25 long-form comments from the provided forms at the open house. Two of the comments reflected positively on the plan, appreciating efforts to improve bicycle infrastructure and general good work. One comment reflected mixed sentiments about the plan, pleased with integration of west Provo, but wanting more specificity about transit improvements. Two comments were generally negative about the plan/open house citing insufficient consideration of future growth, boards insufficiently explained plan, inordinate focus given to bicyclists given their limited numbers. One negative comment observed a disconnect between the fervent desire for non-automobile access provided at the April open house and a perceived absence of this stated desire in the draft plan.

Around 18 comments mentioned specific locations in Provo. They are as follows:

1. Center Street, 820 North, and 2200 North were the most mentioned streets in these comments.
2. Three comments mentioning 2200 North involve the need for more crosswalks.
3. Five comments mentioned Center Street in a positive light. These comments generally celebrated the current multi-modal access on the street and would like to see continued efforts to deemphasize automobile traffic on this street.
4. Five comments mentioned 820 North, four negative and one positive. Opposition to the proposed I-15 interchange was the most pronounced as well as concerns related to driveway access, cut-through traffic, student safety, and adequate compensation for eminent domain actions. One comment appreciated the greater incorporation of west Provo through the 800/820 North expansion.
5. Comments involving the 2200 North project were primarily related to traffic safety concerns related to the additional traffic volumes caused by road widening.

A.4 February 20, 2020 Public Open House

The primary purpose of the third open house was to show the public the final draft of the TMP highlighting Active Transportation and the Major and Local Street Plan. This was accomplished through a through a series of boards concerning a diversity of topics such as:

1. Active Transportation Complete Network map.
2. Active Transportation Phased Project map.
3. Active Transportation Project lists.
4. Major and Local Street Plan map.
5. Capital Facilities Plan map.
6. Capital Facilities Plan Project lists.

In addition to the boards, a smaller table-top map was available to show the connectivity of the Active Transportation plan. Approximately 78 individuals attended this meeting.

A.5 Other Public Involvement

Beyond these meetings, the interests of the public were also promoted by three entities within Provo City, the Transportation and Mobility Advisory Committee, Planning Commission, and City Council. Each of these entities played an important role in developing the TMP.

A.5.1 Provo Bicycle Committee

Input was also provided by the current and former chairs of the Provo Bicycle Committee on August 17, 2018. Valuable feedback was provided regarding existing and future bike corridors citywide and specific to individual neighborhoods. Concepts and ideas were discussed to improve active transportation and accommodate more users and to promote healthy lifestyles.

A.5.2 Transportation and Mobility Advisory Committee

The TMAC is a group of Provo citizens appointed by the Mayor with the consent of the City Council. This group hosts monthly public meetings and makes recommendations regarding amendments to transportation and planning documents, such as the TMP.

The development of this plan included meeting with the TMAC nine times on the dates of February 13, 2018, September 11, 2018, January 15, 2019, April 9, 2019, June 18, 2019, November 11, 2019, December 10, 2019, January 14, 2020, and February 11, 2020. Presentations were provided and valuable feedback received at each of the TMAC meetings. The following topics were presented and discussed:

1. Travel demand modeling for current and future traffic conditions.
2. Safety and crash history analysis for auto, bike, and pedestrians.
3. Active transportation, transit, and complete streets.
4. Street right-of-way widths and cross-sections.
5. Active transportation concept of core, citywide, and neighborhood.
6. Review and comments of first draft of Provo TMP.
7. Review and comments of second draft of Provo TMP.
8. Address comments from the TMCA.
9. Request a recommendation from the TMAC to the Planning Commission.

A.5.3 Planning Commission

The Planning Commission also played an important role in the development of the TMP. This group of Provo residents are appointed by the Mayor and not only hears development applications, but also provides recommendations to the City Council. The development of this plan included meetings with the Planning Commission at pre-meetings on August 23, 2018, January 23, 2019, and March 27, 2019 and a regular meeting and April 24, 2019. In coordination with the Public Work Department and the Community Development Department, the Planning Commission will play a key role in the implementation of the TMP. The public can provide feedback during the regular public meetings hosted by the Planning Commission on individual implementation of the TMP. The Planning Commission made a positive recommendation to the City Council, with some minor amendments to the Active Transportation Chapter, on February 26, 2020.

A.5.4 City Council

The City Council are local elected officials that form the legislative branch and policy making body of Provo City. Upon completion of the TMP, they will oversee the adoption of this plan as an official city document. The City Council oversees the implementation of policies that advance the goals and objectives contained within the plan. They also approve the annual budget, an essential step in transforming the contents of this document from paper into reality. The development of this plan included meetings with the City Council on April 9, 2019 (work meeting), May 7, 2019 (regular meeting), March 10, 2020 (work meeting), March 10, 2020 (regular meeting), March 31, 2020 (work meeting), April 14, 2020 (work meeting), and April 14, 2020 (regular meeting). The Provo City Council adopted the Provo City Transportation Master Plan on April 14, 2020 by a unanimous vote of 7-0.

Appendix B – Major and Local Street Plan Changes

Provo's roadway system is a vast network that connects places and people within neighborhoods throughout the city. Planners and engineers have developed elements of this network with specific travel objectives in mind. These objectives range from serving neighborhood travel from residential developments to nearby employment, schools, and shopping centers to providing access to local businesses and meeting freight mobility needs. The functional classification of roadways defines the role each element of the roadway network plays in serving these travel needs.

B.1 Functional Classification

Over the years, functional classification has come to assume additional significance beyond its purpose as a framework for identifying the particular role of a roadway in moving vehicles through a network of roadways. Functional classification carries with it, expectations about roadway design, including its speed, capacity, and relationship to existing and future land use development. Federal legislation continues to use functional classification in determining eligibility for funding under the Federal-aid program. Transportation agencies describe roadway system performance, benchmarks and targets by functional classification. As agencies continue to move towards a more performance-based management approach, functional classification will be an increasingly important consideration in setting expectations and measuring outcomes for preservation, mobility, and safety. See Figure 4.1 Provo City Major and Local Street Plan for its defined functional classification.

Most travel occurs through a network of interdependent roadways, with each roadway segment moving traffic through the system towards destinations. The concept of functional classification defines the role that a particular roadway segment plays in serving this flow of traffic through the network. Roadways are assigned to one of several possible functional classifications within a hierarchy according to the character of travel service each roadway provides. Planners and engineers use this hierarchy of roadways to properly channel transportation movements through a highway network efficiently and cost effectively.

Provo City uses functional classification to define its roadway network with arterials, collectors, and local streets. Distinctions between "major" and "minor" sub-classifications are key considerations when determining the functional classification category to which a particular roadway belongs. The process of determining the correct functional classification of a particular roadway is as much an art as it is science. Provo titles its functional classification system as the Major and Local Street Plan as found in Provo City Code. There are many factors in determining the classification of a particular roadway. They may include such things as the following:

1. Active transportation infrastructure
2. Connectivity
3. Level of service
4. Median type (flat, raised, landscaped, etc.)
5. Number of driveway accesses

6. Number of lanes
7. Number of street accesses
8. Speed limit
9. Traffic signal spacing (distance)
10. Traffic type
11. Traffic volume

The following tables list the changes to the Major and Local Street Plan and are separated by listings for local, collector, minor arterial, and arterial.

Table B.1: Major and Local Street Plan Changes to Local

Major and Local Street Plan Changes to Local				
Street Name	From	To	Old Designation	New Designation
100 South (west)	Freedom Boulevard	100 West	Collector	Local
100 South (east)	University Avenue	200 East	Collector	Local
200 East	100 South	Center Street	Collector	Local
Center Street	University Avenue	200 East	Arterial	Local
Lakeshore Drive (cul-de-sac)	Dead-end	Lakeshore Drive	Collector	Local
South Frontage Road	770 West	500 West	Collector	Local

Table B.2: Major and Local Street Plan Changes to Collector

Major and Local Street Plan Changes to Collector				
Street Name	From	To	Old Designation	New Designation
1320 South	Tracy Hall Parkway	State Street	Local	Collector
Mountain Vista Parkway	State Street	Ironton Boulevard	Local	Collector
Ironton Boulevard	Tracy Hall Parkway	State Street	Local	Collector
Tracy Hall Parkway (existing)	Ironton Boulevard	200 South	Local	Collector
Tracy Hall Parkway (new)	2000 South	1320 South	Local	Collector
2470 West	560 South	280 South	Local	Collector
280 South	2530 West	2470 West	Local	Collector

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2530 West	280 South	Center Street	Local	Collector
1560 South	1600 West	500 West	Local	Collector
700 North	400 East	900 East	Arterial	Collector
400 East	700 North	800 North	Arterial	Collector
Riverside Avenue	State Street	1720 North	Local	Collector
1680 North (new)	Lakeview Parkway	Geneva Road	Local	Collector
East Bay Loop (new)	Novell Place	East Bay Boulevard	Local	Collector

Table B.3: Major and Local Street Plan Changes to Minor Arterial

Major and Local Street Plan Changes to Minor Arterial				
Street Name	From	To	Old Designation	New Designation
2000 North	Lakeview Parkway	UTA West Railroad Tracks	Collector	Minor Arterial
1730 North	East Union Pacific Railroad Tracks	Independence Avenue	Collector	Minor Arterial
1680 North	Geneva Road	East Union Pacific Railroad Tracks	Local	Minor Arterial
800/820 North	400 East	900 East	Local	Minor Arterial
700 East	800 North	820 North	Collector	Minor Arterial
500 North	Independence Avenue	900 East	Collector	Minor Arterial
100 North (west)	500 West	University Avenue	Collector	Minor Arterial
100 North (east)	University Avenue	200 East	Collector	Minor Arterial
200 East	Center Street	100 North	Local	Minor Arterial
Independence Avenue	Center Street	1730 North	Collector	Minor Arterial
2050 West	Lakeview Parkway	Center Street	Collector	Minor Arterial
500 West	Lakeview Parkway	300 South	Collector	Minor Arterial

Table B.4: Major and Local Street Plan Change to Arterial

Major and Local Street Plan Change to Arterial				
Street Name	From	To	Old Designation	New Designation
Center Street	Lakeview Parkway	Lakeshore Drive	Collector	Arterial

Appendix C – Active Transportation Toolkit

The Active Transportation Toolkit presents a range of strategies to apply to improve the elements of the Active Transportation Network. As identified above, each type of corridor or area emphasizes a different mix of these tools. This toolkit is intended to be a summary of each tool – they do not include design guidelines, which can be found elsewhere, in a range of manuals and guides, including the National Association of City Transportation Officials Urban Street Design Guide and Urban Bikeway Guide, the AASHTO Guide for the Planning, Design, and Operation of Bicycle Facilities, and the Institute of Transportation Engineers’ (ITE) Design Walkable Urban Thoroughfares: A Context Sensitive Approach. It is not intended that all of these be adopted as design manuals, but rather as resources for items to be considered.

C.1 Pedestrian Realm

The pedestrian realm describes the area of a street cross section designated to pedestrians, which is typically outside of the paved roadway and behind the curbs. The most important element of the pedestrian realm is the sidewalk, but park strips, street trees next to sidewalks, street furniture, and even pedestrian-oriented areas of adjacent properties are also pedestrian realm elements that provide several benefits. Together, they can help create a human-scale environment for people on foot.

One can think of the pedestrian realm in terms of different “zones” that serve different functions – the “through” zone for walking and the “furnishings” zone for amenities such as street trees, lighting, and street furniture are the most typical, but the pedestrian realm can also include the “frontage” zone, where properties abutting the sidewalk can use pedestrian space for dining, gathering, or display; and the “edge” zone, which provides space to interface with the roadway for activities such as getting in and out of vehicles. The edge zone can also encompass the character of the outside lane of the roadway, whether a parking lane, bike lane, bus lane, or general-purpose lane, all of which affect the pedestrian realm.

The design of the pedestrian realm, its width and the elements that are included, is context dependent. For example, a sidewalk that may be comfortable to use on a residential street is less appropriate next to a 40 mile-per-hour arterial street, and vice-versa. A main street in a downtown district likely needs a very wide sidewalk for high volumes of pedestrians, people having social interactions, and sidewalk dining and other business uses.

Finally, the design of the pedestrian realm (and roadway crossings) must consider the needs of people with disabilities. The Americans with Disabilities Act (ADA) provides minimum standards for wheelchair access and other aspects, but the needs of people with disabilities should be a consideration integrated with all aspects of street design.

C.1.1 Sidewalk

Sidewalks are the most basic and important type of a pedestrian facility. For the purposes of this toolbox, sidewalk refers to the portion of the pedestrian realm used for walking and other

pedestrian through movement, as well as social interactions. The sidewalk typically also encompasses the “frontage zone” where the adjacent uses can place seating, plantings, display items, tables or other items related to their business. The “through zone” of the sidewalk should be able to accommodate wheelchairs passing, and, depending on the environment and amount of pedestrians, people or pairs of people walking past one another.

C.1.2 Park Strip/Furnishing Zone

The furnishing zone, often known as the “park strip,” where it is planted with lawn or other landscape, is a space acting as a pedestrian buffer from moving traffic and space for amenities such as benches and other street furniture and lighting and utility poles. The furnishings zone can be hardscape (paved) or landscaped, depending on the context.

C.1.3 Bulbouts

Bulbouts are extensions of the pedestrian realm at specific spots. Bulbouts serve a variety of purposes: they extend the space allotted to pedestrians within the street environment; they reduce the length of pedestrian crossings; and they can calm traffic.

C.2 On-Street Bike Facilities

The following are summaries of on-street bike facilities.

C.2.1 Standard Bike Lane

A bike lane is a portion of the roadway designated by striping, signage, and pavement markings for the preferential or exclusive use of bicyclists. Bike lanes create a visual separation between bicycle and automobile facilities, thereby increasing bicyclists’ comfort and confidence. Bike lanes are typically used on major through streets with average daily traffic (ADT) counts of 3,000 or higher and should be one-way facilities (on each side of the streets) that carry bicycle traffic in the same direction as motor vehicle traffic.

C.2.2 Protected Bike Lane

Protected bike lanes combine the off-street separation of shared-use paths with on-street elements of bike lanes. Between intersections, they provide the greatest amount of separation between cars and bicyclists of any on-street bikeway type. However, intersections must be treated at a very high level in order to safely transition protected bike lanes through. The distinguishing characteristic of a protected bike lane is some form of barrier between moving cars and bicycles. Less-experienced bicyclists often prefer protected bike lanes over other bikeway types because of the separation from car traffic. In snowy climates such as Provo, care must be taken to design protected bike lanes to facilitate snow removal. Smaller plows or the use of removable bollard posts are ways to construct cycle tracks that can be cleared of snow in the winter. Protected bike lanes may also require frequent sweeping to keep the pavement clear and safe for bicycle travel.

While protected bike lanes are a relatively new facility type in Utah, they have become more common and may be good solutions for some of the Citywide Active Transportation Corridors. Currently, they can be found in Salt Lake City and Ogden.

C.2.3 Buffered Bike Lane

Buffered bike lanes use a painted buffer to separate auto traffic from the bike lane. People who do not like to bicycle near traffic usually prefer buffered bike lanes to standard bike lanes. Like protected bike lanes, buffered bike lanes may require more frequent sweeping than auto travel lanes. Autos in adjacent traffic lanes tend to kick rocks into the buffered bike lanes. As a result, they accumulate debris without regular sweeping. Buffered bike lanes have become an increasingly common bike facility type in Utah.

C.2.4 Bike Boulevards

See the section 5.6.8.3 Bike Boulevards for a summary of bike boulevards.

C.2.5 Marked Shared Roadways

Marked shared roadways are typically implemented in corridors where dedicated space for higher-level treatments cannot be allocated, or where traffic speeds and volumes dictate that a higher-level facility is not warranted. This treatment should not be used on any roadways with a speed limit in excess of 35 mph. It is preferable to limit them to roads with speed limits of 30 mph or less. Unless speeds and volumes are low, many people will not feel comfortable riding on a road with this treatment. However, in instances where a higher-level facility is not technically or politically feasible, they can serve as valuable treatments to legitimize experienced riders who choose to bicycle there. The markings can be accompanied by optional signage that further notifies automobile drivers that bicyclists should be expected to ride in the lane where the markings are placed.

C.2.6 Signed Shared Roadways

Signed shared roadways do not have any dedicated roadway space for bicycles. They simply provide signage designating the road as a bike route. Signed shared roadways can be created on roads with or without shoulders as well as with or without parking. It is a particularly effective treatment on roads with wide shoulders where parking is permitted but is infrequently used. In these instances, the shoulders behave like de-facto bike lanes for long stretches. Care should be taken when considering implementing this type of bikeway on roads with little or no shoulder, or on roads with heavy parking volumes. In those cases, a marked shared roadway may be a better option as long as the speed limit does not exceed 35 mph.

C.3 Multi-use pathways

C.3.1 Shared Use Paths

Shared-use paths are paved facilities separated from motor vehicles. They provide space for bicyclists, pedestrians, and other non-motorized forms of transportation. Shared-use paths are typically located in rights-of-way (such as canals, streams, and utility corridors) that are independent of roads. The Provo River Parkway is the main example of shared-use paths in Provo.

Shared-use paths are the facility of choice for many people who wish to avoid bicycling near traffic. However, they are also the most expensive bikeway type, may not serve transportation purposes as well as on-street facilities, and have limited opportunities for development due to the scarcity of non-roadway rights-of-way. Shared use paths are typically 10' wide or greater and can be constructed of asphalt or concrete.

C.3.2 Sidepaths

Sidepaths are similar to shared-use paths. Their distinguishing characteristic is that they parallel roadways and frequently encounter intersections and driveways, whereas shared-use paths travel for long distances without encountering vehicle crossings and generally cross roads at right angles. Interactions between sidepath users and drivers may be complex, particularly when bicyclists ride in the direction opposite the traffic flow.

Sidepaths can be useful for pedestrians as well as children and adults who bicycle slowly. However, they are not a good alternative for faster or more experienced bicyclists because they place bicyclists in places where drivers may not expect them. In situations where a shared-use path is preferred but not feasible, short stretches of sidepath can be used to connect shared-use paths on both ends of the sidepath.

The sidepath along University Parkway is the longest and most visible sidepath in Provo. It was developed to link BYU to Utah Valley University in Orem. This path, in combination with other bike lanes and shared-use path segments, also connects Provo's Rock Canyon to Orem's Lake Park. Some long stretches of this path are free of driveway and intersection crossings, which allows it to function more like a shared-use path at times.

C.4 Roadway Crossings and Intersections

Making the places where pedestrians and cyclists cross roadways safer, more comfortable and convenient is often the most effective way to improve an active transportation corridor or network. Roadway crossing tools emphasize visibility of crossing people, mitigating the crossing's length and/or duration, marking special conflict areas, and reducing conflict frequency and severity. In addition to the crossing itself is the character of the intersection, which can contribute or detract from place or corridor's support of active travelers.

Most fundamentally, roadway crossings should be frequent, maintaining network connectivity. The frequency of pedestrian crossings should be planned with the overall street network. Pedestrian crossings should be as short as possible within the context of a particular roadway corridor.

C.4.1 High-visibility Pedestrian Crossings

Pedestrian crossings of roadways should be as visible as possible. The most visible marking is a continental-style crosswalk marking. For crosswalks in mid-block locations, advance warning striping can also be used to increase visibility of the crossing.

C.4.2 Pedestrian-Activated Signals

Pedestrian-activated signals are traffic signals activated by pedestrians wishing to cross the roadway, by a push button or other mechanism. There is a range of types of pedestrian-activated signals, including half signals, which act as a regular traffic signal for mid-block crossing; HAWK signals, which only turn on when a red “stop” light is activated by a pedestrian crosser; and rapid rectangular flashing beacons, which do not mandate traffic stops, but simply alert motorists to crossing pedestrians through a flashing light.

C.4.3 Midblock Crossings

Midblock crossings are marked (and sometimes signalized by pedestrian activated signals) crossings of roadways in locations not at intersections. Midblock crossings are typically used in places with longer blocks and/or places with more intensive pedestrian activity. Downtown Salt Lake City, which has both of these, is an example of an area with many mid-block crossings. Midblock crossings are not usually encouraged but may have an application in certain situations.

C.4.4 Median Refuges

Median refuges provide safe places for pedestrians to rest or stop on particularly wide roadway crossings. Refuges are areas along a crosswalk, usually between the two directions of traffic, protected by a curb. Median refuges are also an urban design strategy to reduce the scale of the roadway to more of a human scale.

C.4.5 Smaller Curb Radii

A smaller curb corner radius creates more space for pedestrians on a corner and reduces the speed of turning vehicles. Like other aspects of street design, the curb radius design should be context-based – on the type of street, the need for large vehicles such as trucks and buses to turn, and on the type of neighborhood or district. High-pedestrian-volume areas or those aimed to be especially walkable should prioritize smaller curb radii.

C.4.6 Directional Curb Ramps

Curb ramps should be aligned in the direction of travel for pedestrians. Directional curb ramps arrange two curb ramps in each direction for the two directions of travel from the corner.

C.4.7 Whole Corner Curb Ramps

In areas with high pedestrian volumes and at intersections where a high degree of urban design is desired, curb ramps can take the form of covering the entire corner. This creates a better “flow” of the sidewalk into the crosswalk.

C.4.8 Bicycle Intersection Improvements

Bicyclists benefit from striping, signage, and other infrastructure specifically designed to increase visibility of cyclists, highlight conflicts between cyclists and motorists or other users, facilitate easier crossings, and separate or protect cyclists from motor vehicle traffic. These tools include conflict area markings at right turns; conflict area markings in intersections; bike boxes and stage

lefts; and bike signals. An example in Provo of a bicyclist intersection improvement is the bike signal on 200 East.

C.5 Roadway Features and Traffic Calming

The configuration of infrastructure in the roadway can have a major impact on the pedestrian and bicyclist experience. The following are tools used within the roadway that serve to alter how motorists drive or park, thereby influencing the environment for active travelers.

C.5.1 Medians

Medians are planted or paved areas that separate the two directions of traffic in a street. Medians serve a variety of purposes: they manage traffic flows and access to properties to reduce conflicts and keep traffic moving; they also improve the urban design of an area by adding trees, landscaping, lighting, signage, public art, and other elements, and reduce the scale of roadways to a more human scale.

C.5.2 Traffic Calming Elements

Traffic calming elements in the roadway come in two primary types: horizontal deflections and vertical deflections. Horizontal deflections are roadway elements that slow traffic by either forcing the need to navigate a curving travel lane or respond to a narrowed traffic channel. These include traffic circles, chicanes, bulbouts, edge islands, pinch points, and others.

Vertical deflections are roadway elements that slow traffic by elevating the pavement in spots. These include speed humps, speed tables, elevated crosswalks and elevated intersections. Implementation of these elements should consider bicyclists' need to pass around them.

C.5.3 Curbside Access Management

Managing vehicle access by reducing the number of "curb cuts" along a street reduces the number of conflicts between traffic and active travelers. Reducing curb cuts can be achieved by having commercial properties or tenants share curb cuts or by providing rear access through alleyways.

C.5.4 On-Street Parking

Including on-street parking in a street's cross section is a roadway element that benefits pedestrians by creating a buffer between people on foot and moving traffic. On-street parking also provides a shared parking resource in a district and in general gets more people walking on the street between their cars and destinations, making for a more vital pedestrian realm.

Note that, for bicyclists, on-street parking can be a challenge, as opening car doors can cause collisions with cyclists. Especially on bicycle corridors, extra buffer between a bike facility and parked cars should be included if possible.

C.6 Streetscape

Streetscape elements help create a street environment hospitable to people by providing a number of different characteristics, including greenery, shade, seating, mobility, media, directions, and art.

C.6.1 Trees and Landscape

As the Maeser Neighborhood Plan observes, tree lined streets add a lot to the physical environment of a neighborhood. Trees add more green-space to a neighborhood or district, and they conserve city resources while reducing impervious surfaces. Trees help to create the architecture of the public realm, creating outdoor “rooms” that, through provision of shade, create comfort for people on foot. Landscaping complements trees or can provide greenery where trees are infeasible.

C.6.2 Streetscape Amenities and Street Furniture

There is a wide range of streetscape amenities that serve to increase pedestrian comfort, convenience and safety in the pedestrian realm. These include street furniture such as benches, pedestrian-scale lighting, trash receptacles, and newsstands.

C.6.3 Transit Stops and Stations

Transit stops and stations are a basic component of the transit network but are also a critical part of the streetscape. Transit stops and stations should address the full range of transit passenger needs, such as seating, shelter, information, and security. Comprehensively providing these services to transit passengers improves the overall pedestrian environment because most transit passengers access stops on foot.

C.6.4 Wayfinding

Wayfinding refers to streetscape elements – primarily signage – that guide people around an area or to specific destinations. In a streetscape setting, wayfinding is typically implemented as a system of signs and other elements that include signs oriented to people on foot and bicycle. Wayfinding systems typically have a unified branding and add to the urban design of a streetscape.

C.6.5 Public Art

The streetscape is a major opportunity for public art. Public art in the streetscape can also be functional, serving functions such as shade, seating, landscaping, and community information.

C.7 Street Network

C.7.1 Street Network Connectivity Improvements

Active transportation is one of the largest beneficiaries of a connected street network. A connected street network is one that has a high ratio of streets to intersections and dead ends; has small blocks and frequent intersections; serves all modes; and connects people to popular destinations. Provo’s neighborhoods and districts range in their connectivity – from the central

city grid of relatively small blocks to the long, winding blocks and cul-de-sacs of the eastern part of the city.

Provo is largely built-out; some of the most critical connectivity improvements will be small projects to better link pedestrians and bicyclists through neighborhoods and districts and to destinations. These could include “pass-throughs” at the ends of cul-de-sacs, pass-throughs between subdivisions and major streets, and safe connections across major barriers such as large roads or railroads. In new development and redevelopment areas, it is important to require that the street networks built are connected both internally and externally.

The Utah Street Connectivity Guide is a resource for improving street connectivity in the full range of Utah community, neighborhood and district types. It is available at: <https://www.mountainland.org/utah-street-connectivity-guide>

C.8 Flexible Street Design

C.8.1 Flexible Residential Street Design

Some Provo plans and policies have considered ways to make residential streets safer and more comfortable for residents. Flexibility in residential street design could include flexibility in the roadway width, the sidewalk and park strip width, and provision of traffic calming elements.

C.8.2 Pedestrian Oriented Street Designs

Some designs of streets have been developed specifically to address the needs of pedestrians. For example, a multi-way boulevard, with separated lanes for slower, local traffic, is a way to build a major street that carries high volumes of higher-speed traffic that is also comfortable to pedestrians. A shared street is a street built for pedestrians that also allows vehicles but as “guests.” These street designs are often challenging for communities to build because street standards do not account for them.

C.8.3 Bike Boulevards

Bike boulevards take advantage of low-speed, low-traffic streets where many people prefer to bicycle. Typically, these types of streets work well for bicyclists for a few blocks at a time but pose a challenge as soon as the street intersects a larger or higher speed road. Key components of bike boulevards are intersection improvements such as median islands and signage that allow bicyclists to safely cross busy streets. Bike boulevards are not typically installed on collector or arterial roads because dedicated space (such as a bike lane) is not provided on bike boulevards to separate bicycles from cars. Neighborhood traffic circles, curb extensions, and other traffic calming measures often accompany bike boulevards in order to keep traffic volumes and speeds low. Maintenance requirements for bike boulevards are generally limited to necessary upkeep of neighborhood traffic circles or intersection treatments.

Within the Active Transportation Network, bicycle boulevards are good solutions for the Neighborhood Active Transportation Corridors.

C.9 Programs

C.9.1 Sidewalk Maintenance

One of the most basic pedestrian improvements is ensuring that the network of sidewalks is complete and in good repair. Provo City allocates a specific budget towards sidewalk repair or replacement on an annual basis. This includes a rating system applied to missing sections of sidewalks and sidewalks that need repair with priorities given to school routes, known routes of and to areas identified for users with known physical disabilities (ADA ramps) as well as areas where damaged sidewalks create trip hazards for pedestrians. The majority of the sidewalk repair and replacement is currently accomplished through spot improvements. In situations where property owners are willing to participate in the cost for sidewalk replacement, Provo City will advance the priority for sidewalk replacement by having city crews remove damaged sidewalk with the property being responsible to replace the sidewalk.

C.9.2 Neighborhood Traffic Management Program

Some communities have implemented a neighborhood traffic management program. The Neighborhood Traffic Management Program is for local residential streets represents a city's commitment to the safety and livability of residential neighborhoods. The program provides a process for identifying and addressing problems related to speeding, excessive traffic volume, and safety on streets classified as "local residential streets." Under the program, the engineering department works with residents within neighborhoods to evaluate the type and severity of traffic problems. If the required approval by residents and the city is obtained, the city will install traffic management devices, such as traffic circles, diverters, traffic signs, crosswalks and speed humps, to manage the pattern and flow of neighborhood traffic.

C.9.3 Safe Routes to School

One of the major traffic safety concerns in Provo is the safety of children to and from school. For students who walk or bike to school, state law requires cities to provide school crosswalks, warning lights and/or crossing guards under very specific state standards.

Under Utah law, consideration for school crossings, crossing guards and other safe school strategies begins with each school's Community Council. The Community Council begins the process by defining a child access routing plan. The Utah Department of Transportation has an easy to use software program called SNAP that helps Community Councils develop a map showing the best walking and biking routes for students to take. The Council prepares the map annually showing from where walking students come and how they should get to school as safely as possible. This routing plan will also identify possible interventions needed like new crosswalks, crossing guards, sidewalks or other safety enhancements.

Each Community Council then submits its proposed routing plan to the School District's Transportation department, which then collects, analyzes and puts together the routing plans into an overall district-wide approach. When the District is ready to proceed, they contact the Provo City Mayor's Office and the city's Safe School Route Committee is convened with representatives from the school district, the police department and the city engineer, who will

evaluate and make final decisions about placement of these proposed improvements. The city plans to hold the Safe School Route Committee meetings early each spring for the next school year. That way, decisions made can be budgeted for and improvements made prior to the start of the school year in August. Find more information at: <https://www.provo.org/about-us/current-issues/safe-school-routes>

Appendix D – Provo City Traffic Analysis Zones

Figure D.1: Traffic Analysis Zones

