Existing Transportation System Performance
Rapid City Area MPO

This existing system performance document focuses on how various elements of the transportation system currently operate. The assessment is multimodal in nature, addressing current performance of vehicular movement, bicycle and pedestrian system, transit, and multimodal safety. Understanding current system performance ultimately supports the Rapid City Area MPO's goal of meeting performance measurement requirements.

Planning-Level Traffic Operations

A planning-level volume-to-capacity analysis was conducted to evaluate the traffic operations of the regional roadway network. The analysis included all functionally classified streets within the Rapid City Area MPO boundaries. The Planning-Level Traffic Operations analysis used available average daily traffic (ADT) volumes provided by the MPO to estimate typical peak hour levels of service (LOS).

The volume-to-capacity approach is based on the methodology found in the Highway Capacity Manual. Capacity is defined as the maximum number of vehicles that can pass through a given point or segment in a given amount of time (typically hourly or daily), and accounts for roadway conditions such as the number of lanes and intersection control / signalization conditions. Level of service for a given segment can be assessed by comparing the segment's traffic volume and its estimated capacity. In most urban corridors, signalized intersections (rather than the segment itself) are the factor that determines a corridor's vehicular capacity. **Table 1** provides the LOS criteria and descriptions for signalized intersections.

Table 1. Level of Service Delays and Flow Descriptions for Signalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)	Draft Rapid City Volume-to-Capacity Ratio	General Description
A	≤10	0.7	Free Flow
B	>10 – 20		Stable Flow (slight delays)
C	>20 – 35	0.71-0.8	Stable flow (acceptable delays)
D	>35 – 55	0.81-0.9	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 – 80	0.91-1.0	Unstable flow (intolerable delay)
F	>80	> 1.0	Forced flow (congested and queues fail to clear)

Sources: Highway Capacity Manual 2010, Highway Capacity Manual volume 6, HDR.

The daily capacities used in the analysis (shown in **Table 2**) are adapted from data available from the Florida DOT for urban areas. The FDOT methodology is rooted in the Highway

Capacity Manual, and provides planning-level estimates for daily arterial and freeway capacities. HDR provided some refinements of that data for minor arterials and collectors. The capacities are organized to provide general daily volumes:

- By functional class, with the assumption that higher-class facilities get more green time at traffic signals and thus have more capacity
- By general number of lanes, including adjustments for the presence of left-turn lanes

Table 2. Draft Daily Capacities by Facility Type, Rapid City Area

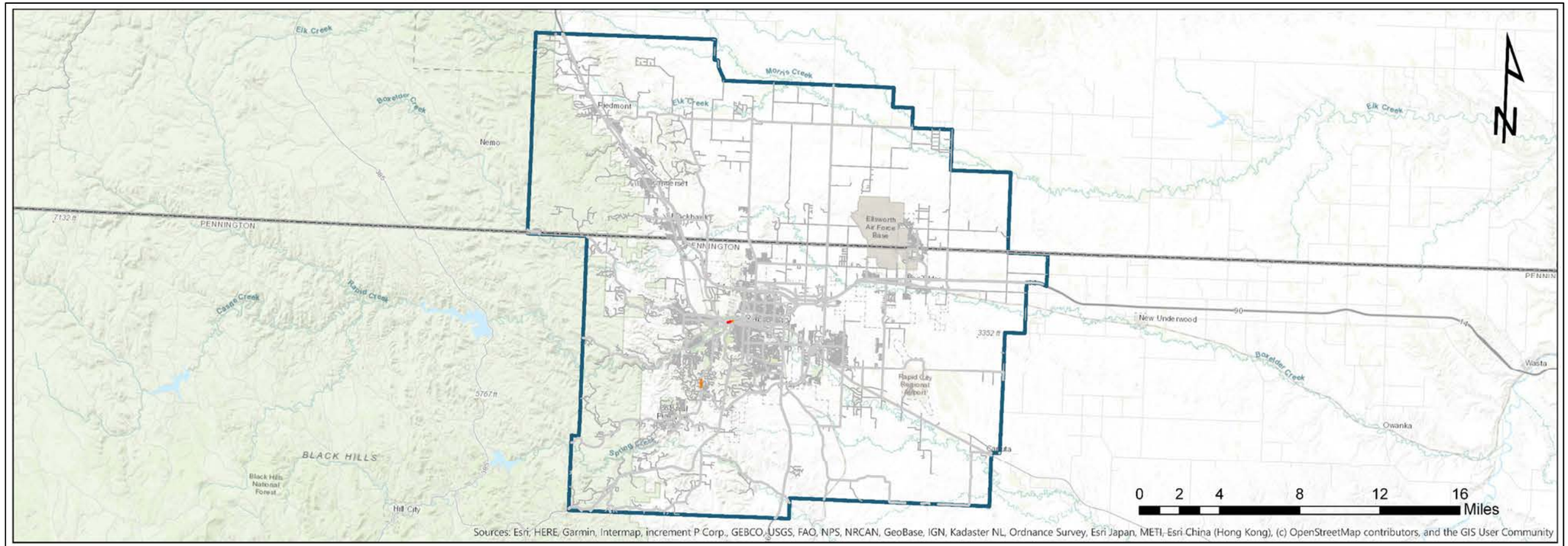
Facility Type	Cross-Section	LOS E/F Daily Capacity
Interstate	4-lane	84,600
	6-lane	130,600
	8-lane	176,600
Principal Arterial	2-lane	14,160
	2-lane with LTs	17,700
	4-lane	29,850
	4-lane with LTs	39,800
	6-lane with LTs	59,900
Minor Arterial	2-lane	12,744
	2-lane with LTs	15,930
	4-lane	26,865
	4-lane with LTs	35,820
	6-lane with LTs	53,910
Collector / Local	2-lane	9,600
	2-lane with LTs	12,000
	4-lane	20,237
	4-lane with LTs	26,983

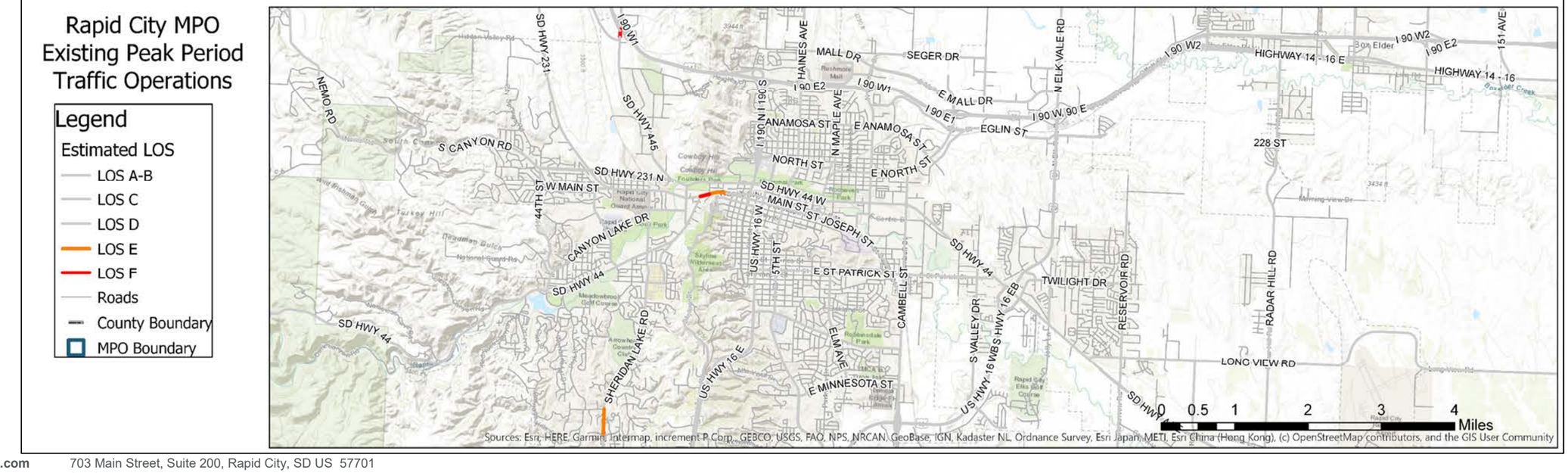
Sources: 2012 Florida DOT Quality/Level of Service Handbook Tables, HDR

It should be noted that while this methodology is appropriate for a planning-level, regional analysis, several factors such signal density, freeway merging / diverging, and unique temporal traffic patterns are not well-captured with this methodology. As such, adjustments can be made to provide corridor-specific corrections to the capacities shown in **Table 2**.

The intent of this planning-level approach is to highlight roadway corridors that likely experience recurring congestion during peak hours. **Figure 1** displays the results of the volume-to-capacity analysis.

Figure 1. Estimates of Existing (2018) Peak Period Traffic Operations





As illustrated in **Figure 1**, the roadways experiencing significant congestion in the Rapid City MPO area are:

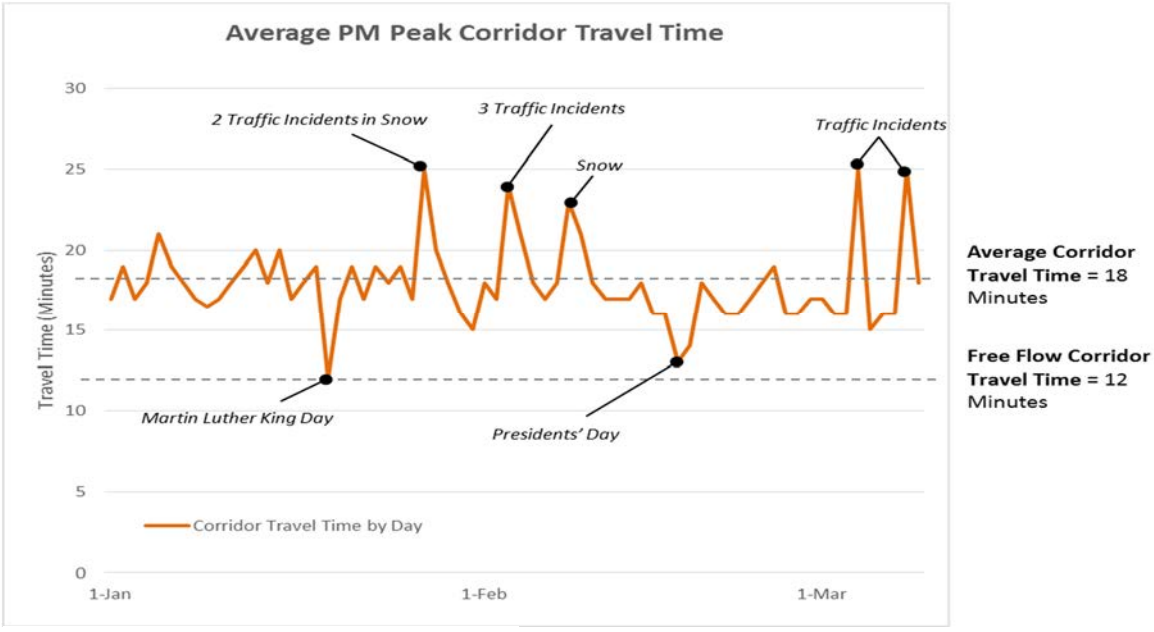
- Sheridan Lake Road, from Chateau Ridge to Corral Drive
- West Main Street, from Jackson Boulevard to St. Joseph Street
- Deadwood Avenue, from Universal Drive to the I-90 ramp

Travel Reliability

Recurring, peak period congestion has traditionally been a focus of transportation plans and studies. Travel reliability has become a bigger focus area for state DOTs and MPOs with the introduction of Federal performance measures, and the recognition of the role system reliability plays in the modern economy. The FHWA definition of travel reliability is "the consistency or dependability in travel times, as measured from day-to-day and/or across different times of the day"[1] and this concept is illustrated for an example corridor in **Figure 2** below. In the example corridor:

- The typical free flow (uncongested) travel time is 12 minutes.
- The typical peak period (congested) travel time averages 18 minutes during PM peak hours.
  As shown, on days when traffic collisions and weather phenomena occur, the average corridor travel time of 18 minutes can rise to a peak of 25 minutes.

Figure 2. Illustration of Travel Reliability in a Corridor



Source: FHWA

[1] Federal Highway Administration, https://ops.fhwa.dot.gov/perf_measurement/reliability_measures/index.htm

- The occasional holiday also impacts travel times when fewer people commute, resulting in peak travel times below the average corridor travel time of 18 minutes.

The figure illustrates how travel times can vary over a peak period, and more specifically how non-recurring travel delays can ultimately lead to travel in a corridor being deemed unreliable.

A travel reliability analysis evaluates Interstate and non-Interstate NHS corridor travel times across the Rapid City Area MPO roadway network to assess how much travel times typically change day-by-day. Reliability is important because beyond its impact to traffic flow, it can adversely impact freight and commerce activities in the Rapid City Area MPO region. The travel reliability analysis looks at individual corridors and summarizes them into the travel reliability of the entire system. Corridors with poor travel reliability can thus be identified through this process, and potential improvements can be considered that might improve corridor reliability.

Federal Performance Measures—Travel Reliability

To evaluate travel time reliability for the Rapid City Area MPO region, the National Performance Management Research Dataset (NPMRDS) was used. The use of this data allowed the identification of how the National Highway System roadway network performs in terms of travel reliability as well as delineating corridors that are unreliable.

The FHWA maintains specific performance measures for reporting travel reliability at the state and MPO level. These Federal Travel Reliability Performance Measures are:

- Percentage of person-miles traveled on the Interstate that are reliable.
- Percentage of person-miles traveled on the non-Interstate NHS that are reliable.

The metric used to report travel reliability is Level of Travel Time Reliability (LOTTR). LOTTR is defined as a ratio of longer travel times (80^{th} percentile) to a normal travel time (50^{th} percentile). The travel times are compared for 15-minute intervals across the year. The LOTTR is calculated for four analysis periods: Morning Weekday, Midday Weekday, Afternoon Weekday, and Weekends. A segment is deemed unreliable if any of these four time periods has a LOTTR of 1.50 or higher.

Comparing the LOTTR data for 2017 and 2018 indicate the following patterns:

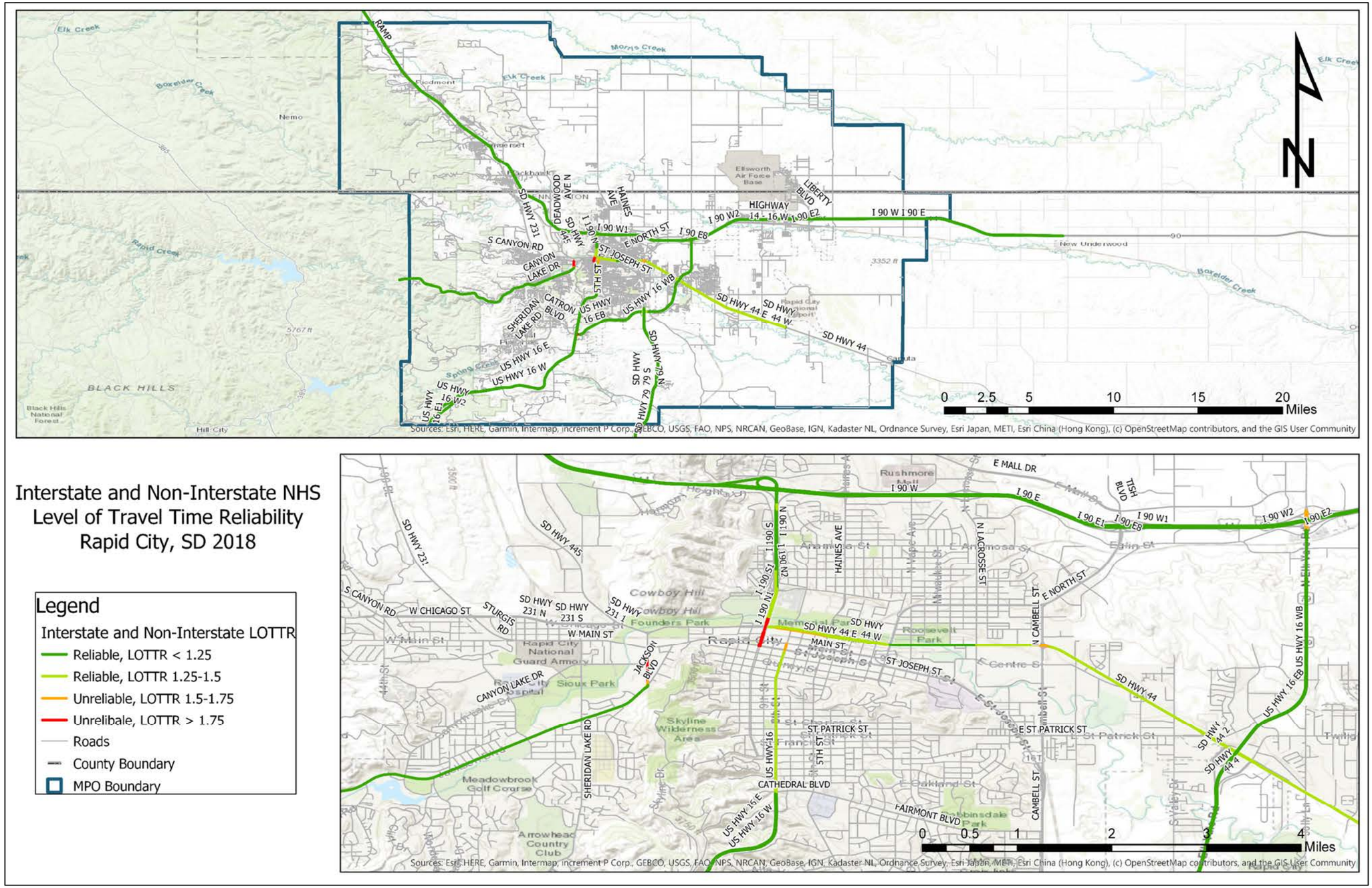
- AM travel reliability has increased slightly from 2017 to 2018 for several corridors.
- PM travel reliability has decreased slightly in some corridors from 2017 to 2018.

The corridors where the LOTTR analysis indicates travel reliability issues (LOTTR ≥ 1.50) for 2018 are:

- Mountain View Rd, from Jackson Blvd to W Main St
- Mount Rushmore Rd from St. Joseph St to Main St
- West Blvd from St. Joseph St to I 90
- N Elk Vale Rd at I 90

Figure 3 displays the LOTTR for 2018 for the worst period.

Figure 3. LOTTR for 2018 with the least reliable period shown.



As the NPMRDS data indicates, the Rapid City Area MPO meets the federal targets for travel reliability for both the Interstate system and the non-Interstate NHS. To meet these targets, the percentage of person-miles traveled with LOTTRs below 1.50 must be 90% or above on the Interstate System and 85% or above on the non-Interstate NHS.[2] The South Dakota Department of Transportation has established statewide targets for travel reliability and the Rapid City Area MPO has elected to support the statewide target for travel reliability in lieu of establishing a separate target.

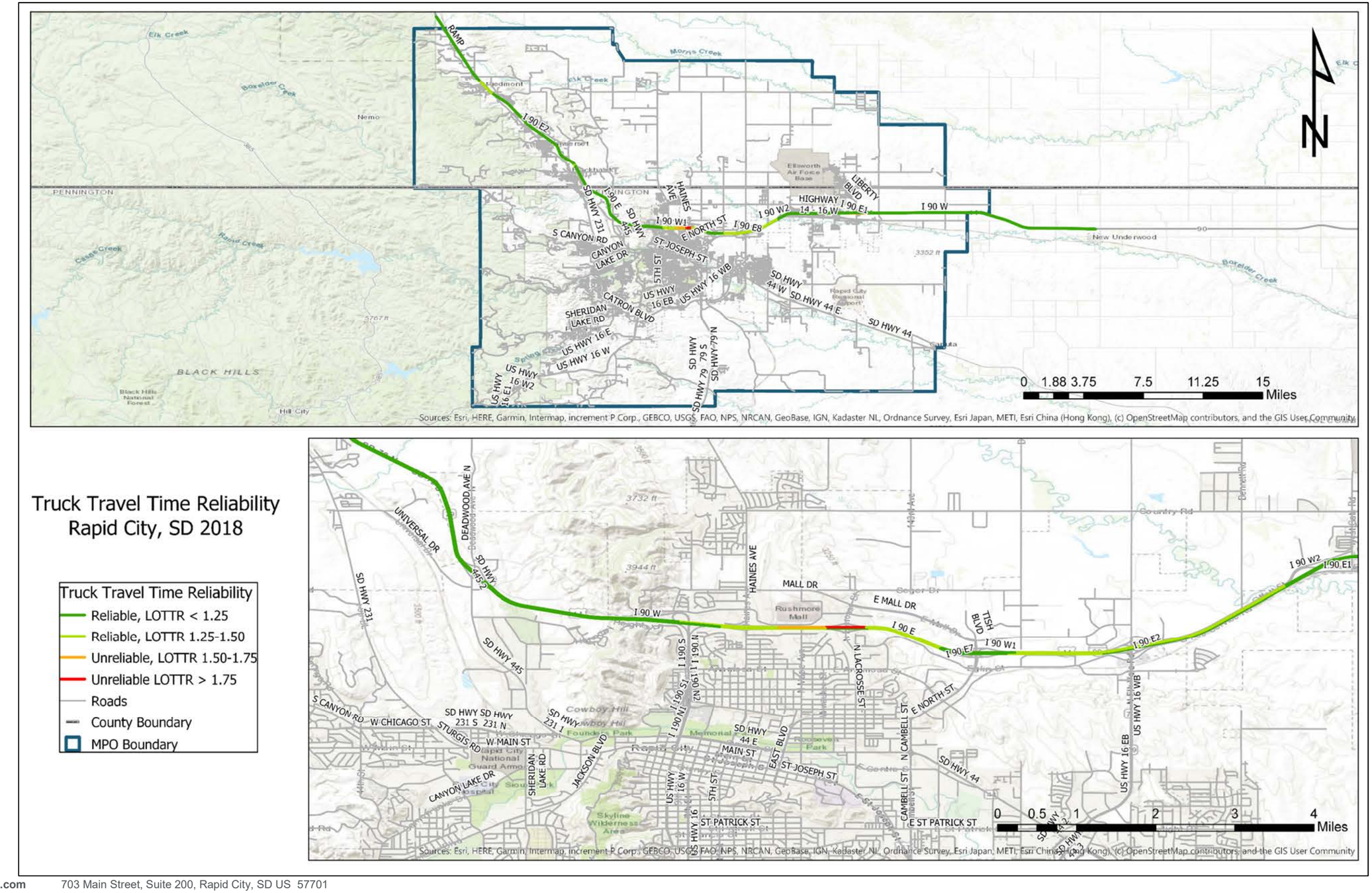
Freight Reliability

The Federal performance measure related to freight is the Truck Travel Time Reliability (TTTR) metric. This metric is only reported on the Interstate system, and compares the compares the ratio of longer truck travel times (95th percentile) to a normal travel time (50th percentile). Similar to the LOTTR, the travel times are compared for 15-minute intervals across the year. The TTTR is calculated for five analysis periods—Morning Weekday, Midday Weekday, Afternoon Weekday, Overnight, and Weekends. The Rapid City Area MPO has set a target of 1.50 or lower, so a segment is deemed TTTR unreliable if any of these five time periods has a TTTR of more than 1.50. The South Dakota Department of Transportation has established statewide targets for freight reliability and the Rapid City Area MPO has elected to support the statewide target for freight reliability in lieu of establishing a separate target.

Based on the NPMRDS data, the segment of interstate in the Rapid City Area MPO boundaries with the least reliability is I-90 west bound between Haines Ave and N Lacrosse St. **Figure 4** displays the LOTTR for 2018 for the worst period.

[2] Rapid City Area Transportation Improvement Program (Fiscal Years 2019-2022), Final, August 2018.

Figure 4 shows the TTTR for 2018 with the least reliable period shown.



Traffic Safety

A traffic safety analysis was conducted with crash data sourced from the South Dakota Department of Public Safety (SD DPS)[3]. The data includes all motor vehicle crashes—including motor vehicle crashes with pedestrians and bicyclists—that occurred over a 5-year period, from 2014-2018. For the purpose of this analysis, several variables were identified based on Federal safety performance measures, which are discussed below. The analysis consists of three elements:

1. Crash Frequency—total number of crashes occurring at intersections within the Rapid City Area MPO region
2. Crash Rates—the number of crashes occurring at intersections per million entering vehicles
3. Overview of the 2014 South Dakota Strategic Highway Safety Plan (SHSP)

Based on the analysis of these elements, specific intersections of safety concern were identified so that the Rapid City Area MPO can plan appropriate improvements to enhance traffic safety for all road users. An overview of bicycle and pedestrian crash incidences are also presented for this purpose.

Federal Performance Measures for Traffic Safety

This analysis was framed to assist the MPO in addressing the required Federal safety performance measures. By identifying intersections with the highest amount of crashes, the region can focus on improvements in these critical locations that can improve overall regional safety. Those Federal performance measures are[4]:

- **Number of Fatalities**: The total number of persons suffering fatal injuries in a motor vehicle crash during a calendar year.
- **Rate of Fatalities**: The ratio of total number of fatalities to the number of vehicle miles traveled (VMT, in 100 Million VMT) in a calendar year.
- **Number of Serious Injuries**: The total number of persons suffering at least one serious injury in a motor vehicle crash during a calendar year.
- **Rate of Serious Injuries**: The ratio of total number of serious injuries to the number of VMT (in 100 Million VMT) in a calendar year.
- **Number of Non-motorized Fatalities and Non-motorized Serious Injuries**: The combined total number of non-motorized fatalities and non-motorized serious injuries involving a motor vehicle during a calendar year.

The South Dakota Department of Transportation has established statewide targets for traffic safety and the Rapid City Area MPO has elected to support the statewide target for traffic safety in lieu of establishing a separate target.

[3] South Dakota Department of Public Safety, *Office of Accident Records,* 2014-2018

[4] Federal Highway Administration Safety Performance Management, https://safety.fhwa.dot.gov/hsip/spm/

Crash Frequency

To delineate areas of traffic safety concern within the Rapid City Area MPO region, the most frequent crash intersections were identified. Based on the crash data available, the top 20 highest crash frequency intersections from the 5-year period were determined. **Crash frequency** is defined as the total number of crashes that occurred at an intersection. Crash frequency is important as it indicates locations of the Rapid City Area MPO region that record frequent crash events, but it does not consider traffic exposure which can lead to an under-emphasis of intersections with lower volumes and an overemphasis of intersections with higher traffic volumes. The highest crash frequency intersections are presented in **Figure 5**.

Table 3 is a crash frequency ranking that identifies the top 20 crash frequency intersections, and shows the crashes at those top 20 intersections by injury severity. Injury severity is delineated into[2]:

- **Fatal Injury**: An injury resulting in death, or an injury caused death occurring within 30 days of the crash.
- **Incapacitating Injury**: Any injury, other than fatal, that prevents the injured person from walking, driving, or continuing the activities they were capable of performing prior to the crash.
- **Non-Incapacitating Injury**: Any injury, other than a fatal or incapacitating injury, that is evident to observers at the crash scene.
- **Possible Injury**: Any injury reported that is not a fatal injury, incapacitating injury, or non-incapacitating injury.
- **Property Damage Only**: A reported crash with no injuries.

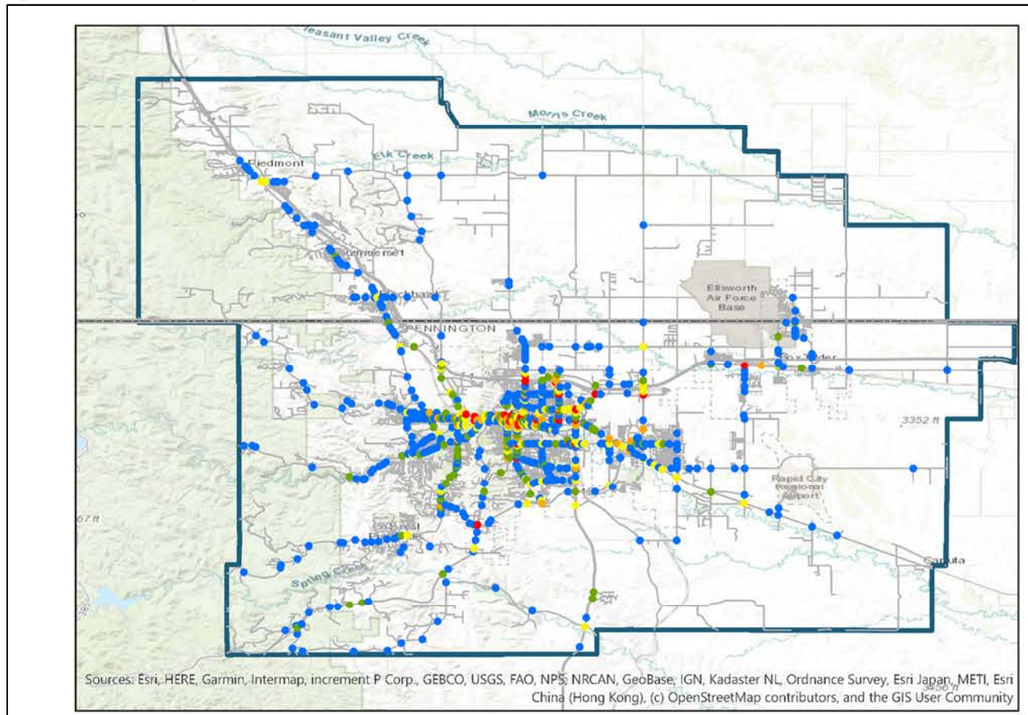
[2] KABCO Injury Classification Scale and Definitions by State, https://safety.fhwa.dot.gov/hsip/spm/conversion_tbl/pdfs/kabco_ctable_by_state.pdf

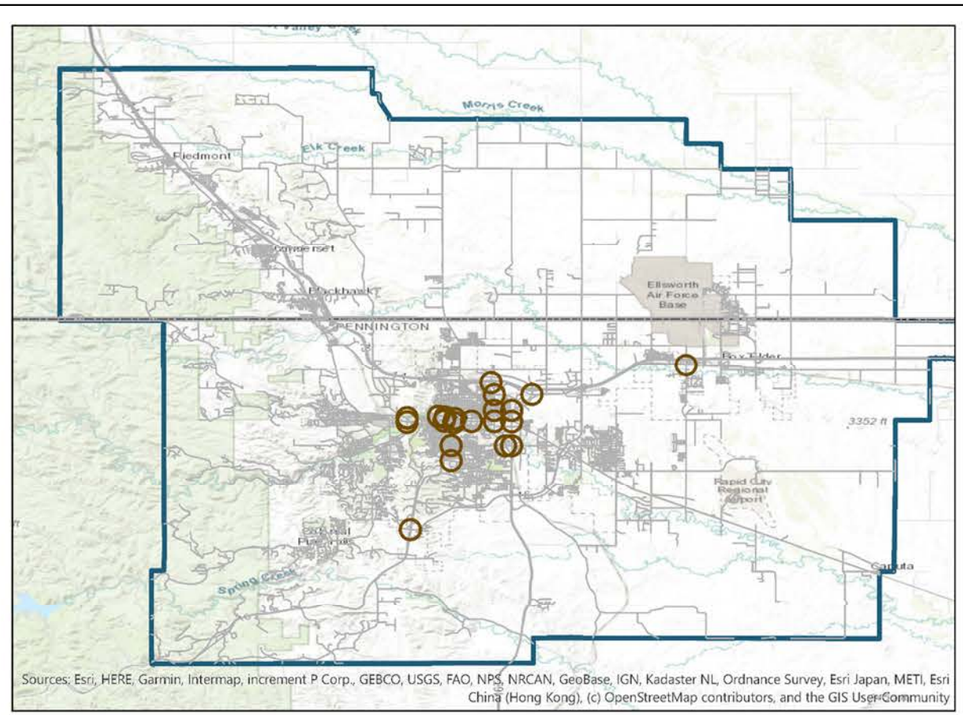
Table 3: Crash Frequency Rankings for Rapid City Area MPO Intersections, 2014-2018

Rank	Intersection	Crashes (5 years) Total	Fatal Injury	*Major Injury	*Minor Injury	Possible Injury	Property Damage Only	Daily Entering Volume	Crash Rate (Crashes / MEV*)
1	Cambell St & Omaha St	98	0	2	12	21	63	45,659	1.176
2	North St & Cambell St	93	0	0	7	13	73	36,875	1.382
3	5th St & Main St	83	0	1	12	10	60	31,942	1.424
4	Catron Blvd & US Hwy 16	80	0	2	14	18	44	19,285	2.273
5	5th St & Omaha St	78	0	0	14	11	53	51,453	0.831
6	Mountain View Rd & W Main St	70	0	0	9	15	45	39,867	0.962
7	Main St & Mount Rushmore Rd	69	0	1	6	10	52	28,689	1.318
8	Omaha St & Mountain View Rd	64	0	0	5	10	49	31,883	1.1
9	E North St & Lacrosse St	64	0	0	10	14	40	32,619	1.075
10	Omaha St & West Blvd	62	0	0	9	8	44	50,606	0.671
11	St Patrick St & St Joseph St	57	0	1	7	11	38	22,239	1.404
12	5th St & St Patrick St	54	0	0	7	8	39	28,129	1.052
13	E North St Eglin St	54	0	2	6	10	36	28,842	1.026
14	Cambell St & St Patrick St	53	0	2	4	11	36	35,259	0.824
15	East Blvd & Omaha St	52	0	1	10	8	33	34,191	0.833
16	I 90 ramp terminal & Lacrosse St	51	1	0	9	8	33	16,491	1.695
17	Omaha St & Mount Rushmore Rd	50	0	1	9	8	32	41,376	0.662
18	Lacrosse St & Omaha St	48	0	0	12	5	31	28,783	0.914
19	5th St & Cathedral Blvd & Fairmont Blvd	47	0	3	8	8	28	25,985	0.991
20	Anamosa St & Lacrosse St	47	0	3	9	4	31	30,769	0.837

***Incapacitating injuries are referred to as Major Injury, non-incapacitating injuries are referred to as Minor Injury

Figure 5: Highest Frequency Crash Intersections

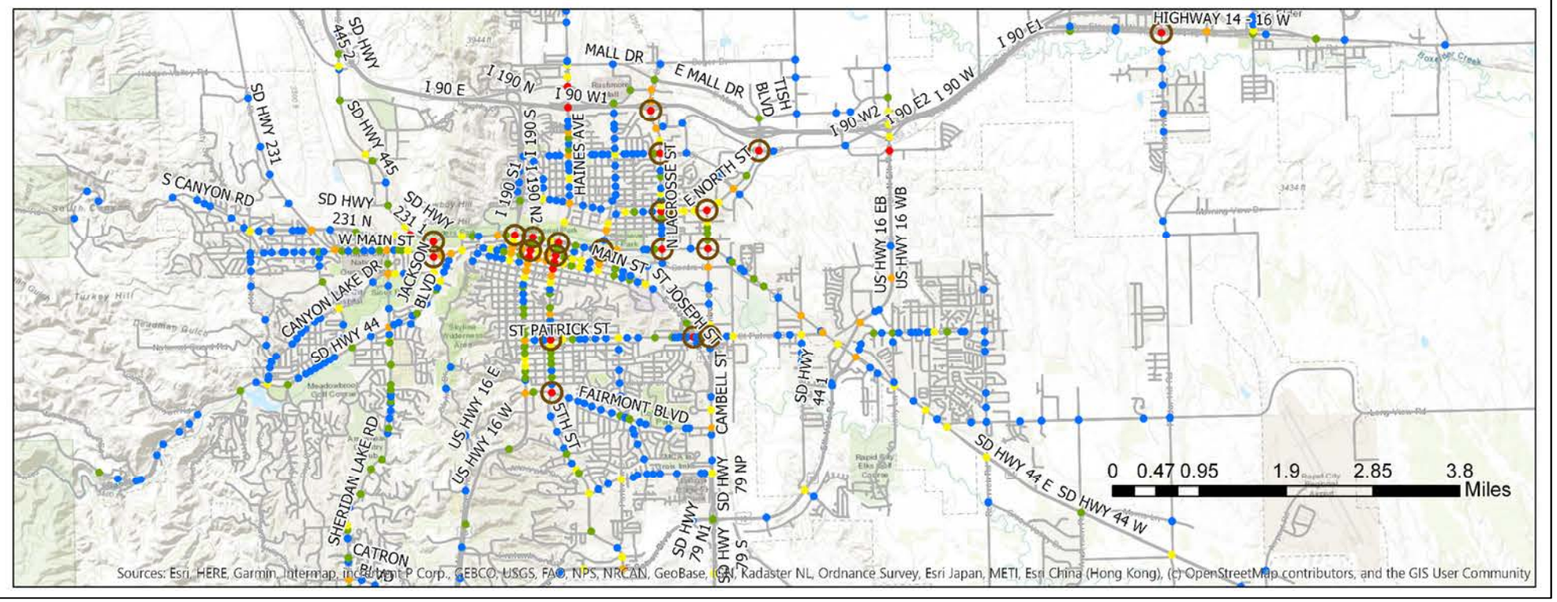




Highest Crash Frequency Intersections, 2014-2018

Legend

- 20 Highest Crash Frequency Intersections
- 5 or Fewer Crashes
- 6 to 10 Crashes
- 11 to 20 Crashes
- 21 to 40 Crashes
- More than 40 Crashes
- Roads
- Roads_Labels_For_Maps
- County Boundary
- MPO Boundary



Fatal and Incapacitating Crashes

Figure 6 presents the locations of all crashes over the 5-year time period of 2014-2018 that had an injury severity recorded as “Fatal” or “Incapacitating.” Based on the data sourced from the SD DPS, 34% of all crashes resulting in fatal injuries occurred on roads functionally classified as arterial while 41% of all crashes resulting in incapacitating injuries also occurred on arterial roads. 80% of the crashes with injury severity of either fatal or incapacitating injury occurred on roads functionally classified as collector or above. **Table 4** shows the summary of fatal and incapacitating injuries by functional classification.

Table 4: Functional Classifications of Roadways with Fatal and Incapacitating Injuries

	Local Road	Collector Road	Arterial	Interstate	Total
Fatal Injury	9	7	17	16	49
Incapacitating Injury	68	54	148	86	356

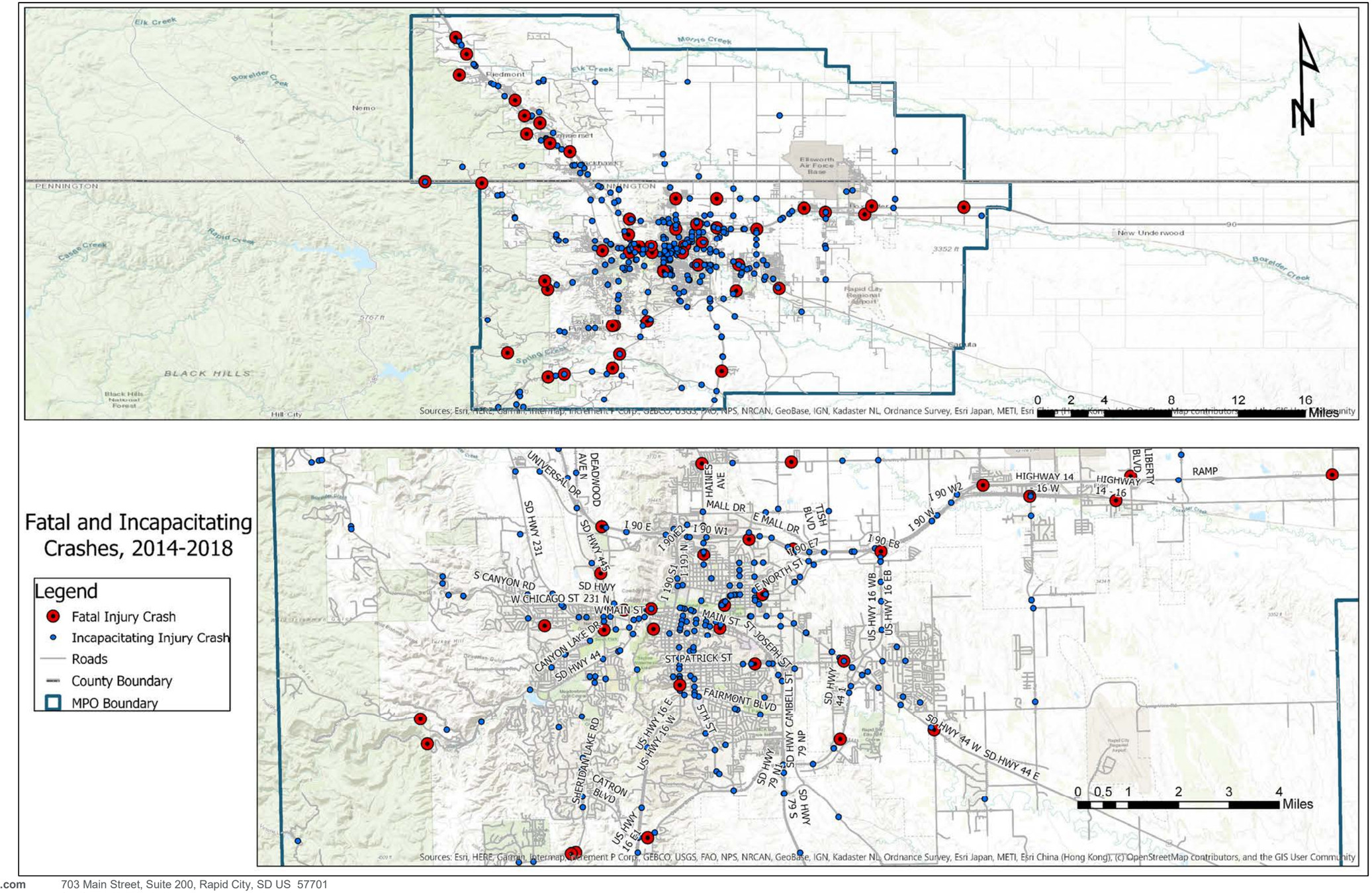
Crashes by Year and Injury Severity

All crashes occurring between 2014 and 2018 are categorized by year and injury severity in **Table 5**. The bulk of crashes recorded over the 5-year period resulted in no injury, while a possible injury occurred in roughly 14% of all crashes.

Table 5 Rapid City Area MPO Vehicular Crashes by Year and Severity

Year	Fatal	Incapacitating Injury	Non-Incapacitating Injury	Possible Injury	No Injury	Unknown	Total
2014	13	92	256	268	1,451	1	2,081
2015	9	84	276	259	1,332	0	1,960
2016	7	57	286	252	1,211	0	1,813
2017	11	67	256	295	1,361	0	1,990
2018	9	56	211	290	1,546	0	2,112
Total	49	356	1,285	1,364	6,901	1	9,956

Figure 6: Fatal and Incapacitating Injury Crashes



Highest Crash Rate Intersections

A crash rate was calculated to further assess traffic safety conditions within the Rapid City Area MPO boundaries. **Crash rate** is the calculation of the number of vehicular crashes per million entering vehicles and normalizes crash frequencies based on traffic exposure. The method used for calculating crash rates utilized the crash data sourced from SD DPS, roadway data including traffic counts for functionally classified roads from the Rapid City MPO and the South Dakota Department of Transportation (SDDOT) when MPO traffic counts were not available. Intersections along roadways classified collector, arterial, and Interstate ramps were included. For urban local roads without available traffic counts, traffic volumes were estimated to be 1,500 ADT.

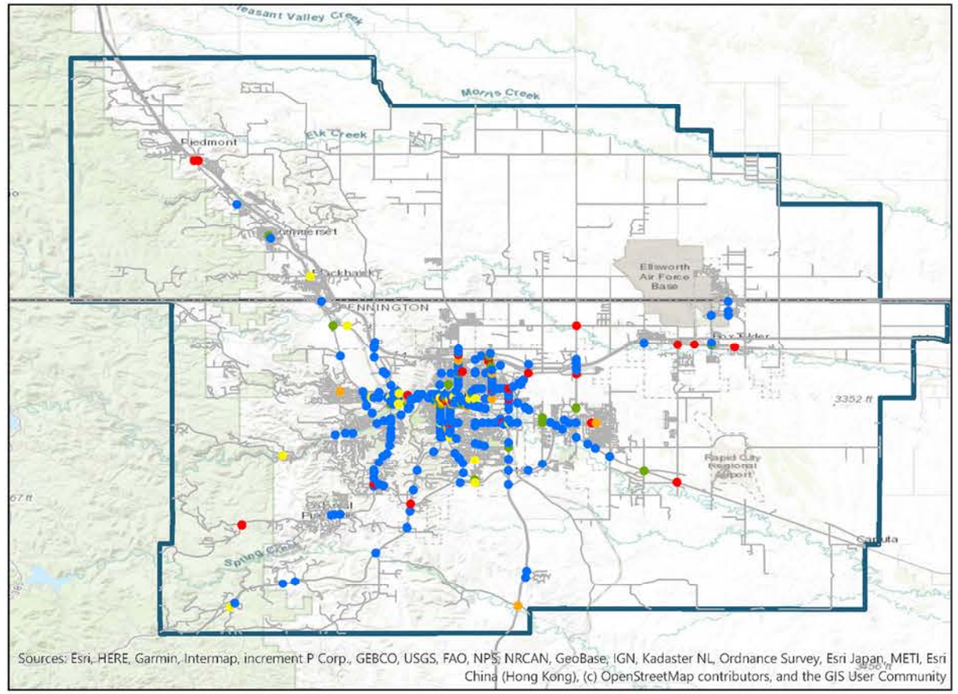
Crash rates are based on the daily entering volumes at each intersection, which were estimated based on the data discussed above. The daily entering volumes that were calculated give insight into roadway usage and the average number of vehicles using each intersection during typical weekday travel. This high-level overview provides a snapshot of traffic safety and its relationship with roadway usage throughout the Rapid City Area MPO boundaries in normal conditions. **Table 6** shows the highest 20 intersections for crash rate, and **Figure 7** illustrates crash rate by intersection. The average crash rate for all functionally-classified intersections during the 5-year analysis timeframe was 0.72 crashes / MEV.

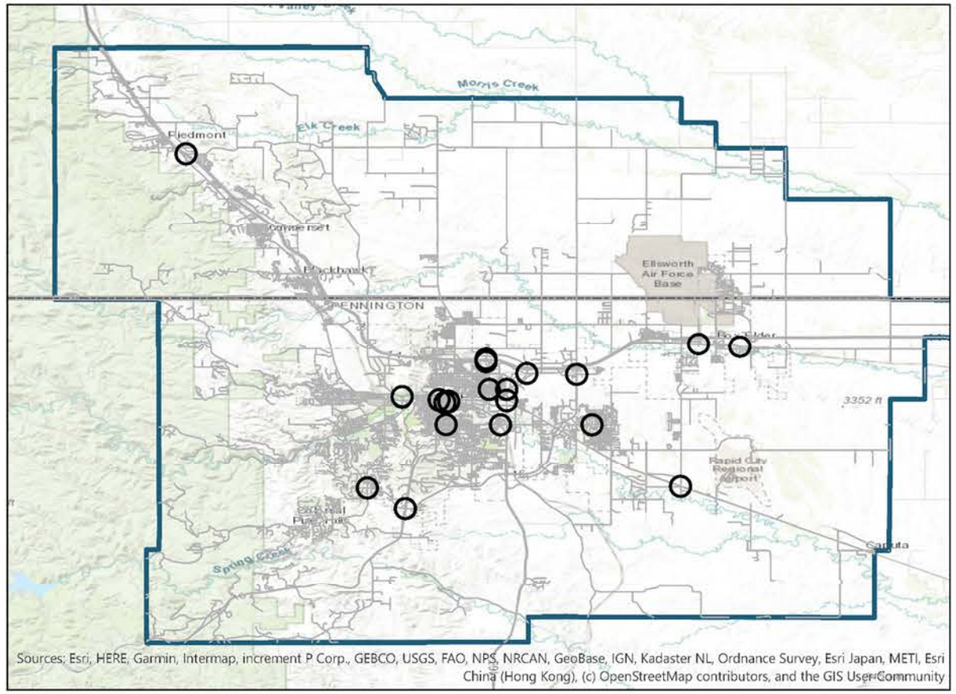
Table 6: Intersection Crash Rates at Functionally-Classified Intersections

Crash Rate Rank	Intersection Name	Crashes	Daily Entering Volume	Crash Rate (Crashes / MEV*)
1	Catron Blvd & US Hwy 16	80	19,285	2.273
2	Service Rd & Elk Creek Rd	14	4,325	1.774
3	N Lacrosse St & I-90 Ramp S	51	16,491	1.695
4	SD Hwy 1416 & Cottonwood Dr	7	2,450	1.566
5	SD Hwy 1416 & Southgate Dr	31	11,057	1.536
6	Main St & 5th St	83	31,942	1.424
7	E St. Patrick St & E St. Joseph St	57	22,239	1.404
8	N Cambell St & E North St	93	36,875	1.382
9	SD Hwy 44 & Radar Hill Rd	11	4,470	1.348
10	N Lacrosse St & I-90 Ramp N	39	15,917	1.343
11	Twilight Dr & Degeest Dr	12	4,908	1.340
12	Main St & Mount Rushmore Rd	69	28,689	1.318
13	Cambell St & E Omaha St	98	45,659	1.176
14	Sheridan Lake Rd & Catron Blvd	25	12,063	1.136
15	E North St & N Lacrosse St	64	31,883	1.100
16	W Omaha St & Mountain View Rd	64	32,619	1.075
17	E North St & Eglin St	54	28,129	1.052
18	Cheyenne Blvd & Eglin St	46	23,983	1.051
19	St. Joseph St & 6th St	31	16,411	1.035
20	St. Patrick St & 5th St	54	28,842	1.026

*MEV= million entering vehicles

Figure: 7 Intersection Crash Rates for the Rapid City Area MPO Region

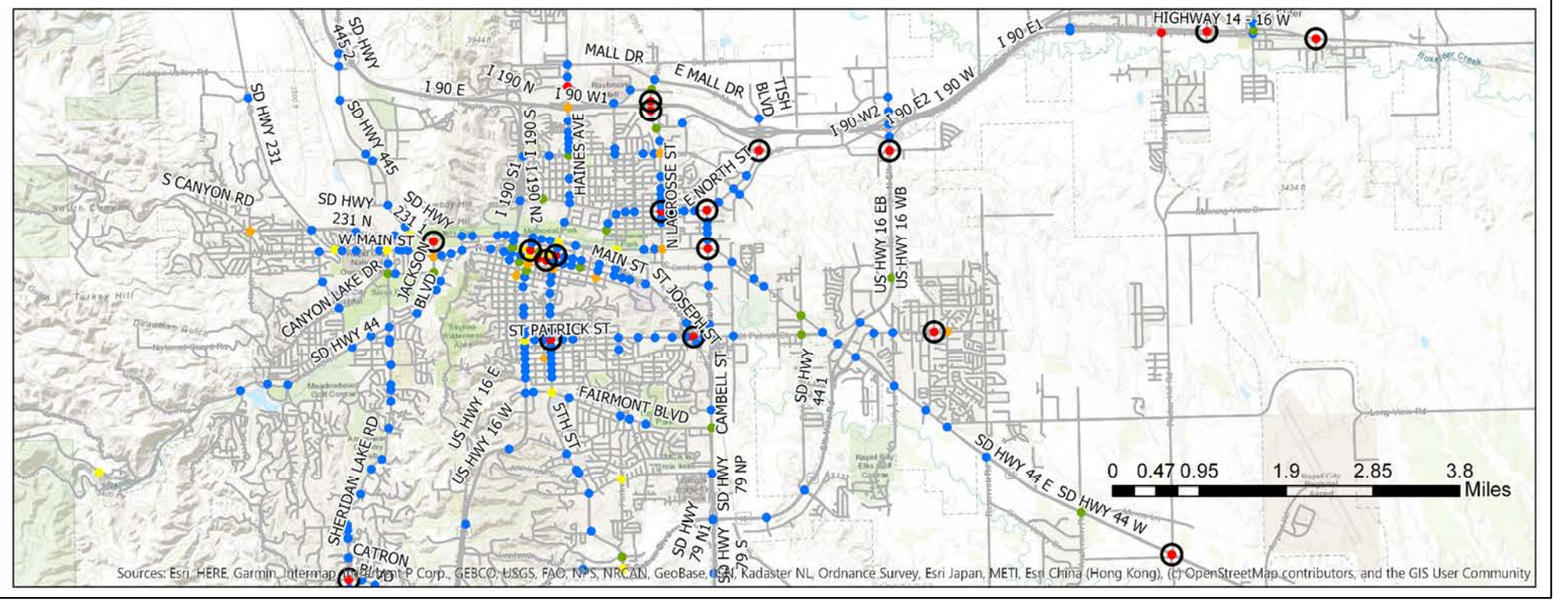




Highest Crash Rate Intersections, 2014-2018

Legend

- 20 Highest Crash Rate Intersections
- Less than 0.7 Crash / MEV
- 0.7 - 0.8 Crash / MEV
- 0.8 - 0.9 Crash / MEV
- 0.9 - 1.0 Crash / MEV
- More than 1.0 Crash / MEV
- Roads
- Roads_Labels_For_Maps
- County Boundary
- MPO Boundary



Bicycle and Pedestrian Crashes

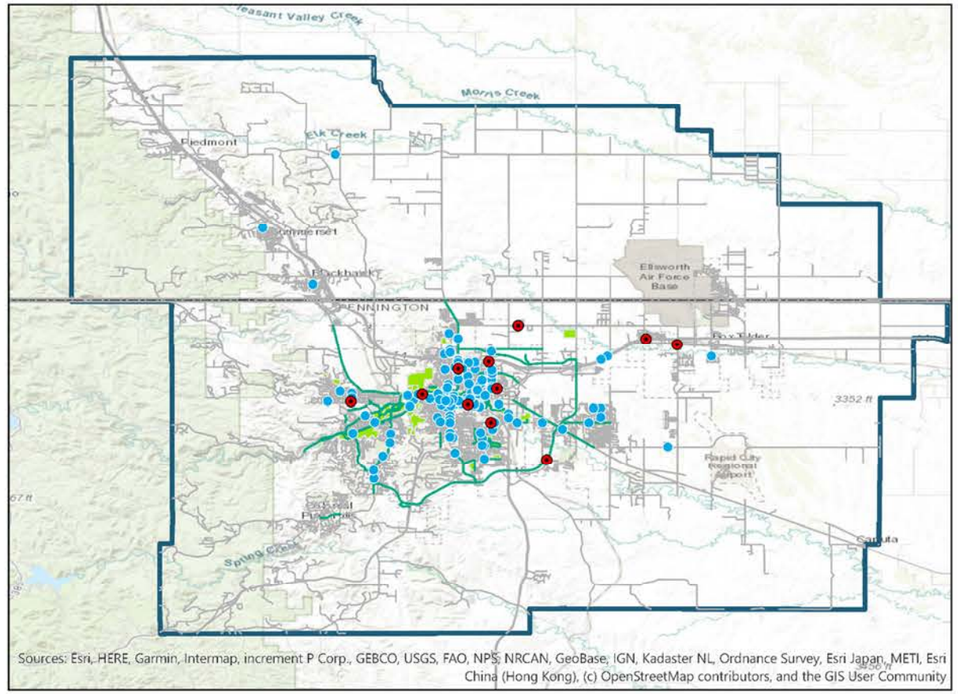
Table 7 presents the numbers of bicycle and pedestrian crashes by injury severity for the 5-year period of 2014-2018. As indicated by the table, the majority of bicycle and pedestrian crashes resulted in non-incapacitating injuries, while the total number of crashes involving bicyclists and/or pedestrians was 221. **Figure 8** below displays the locations of all bicycle and pedestrian crashes recorded from 2014-2018. This figure indicates that a substantial amount of bicycle and pedestrian crashes resulting in fatal or incapacitating injuries occurred in the downtown area of Rapid City.

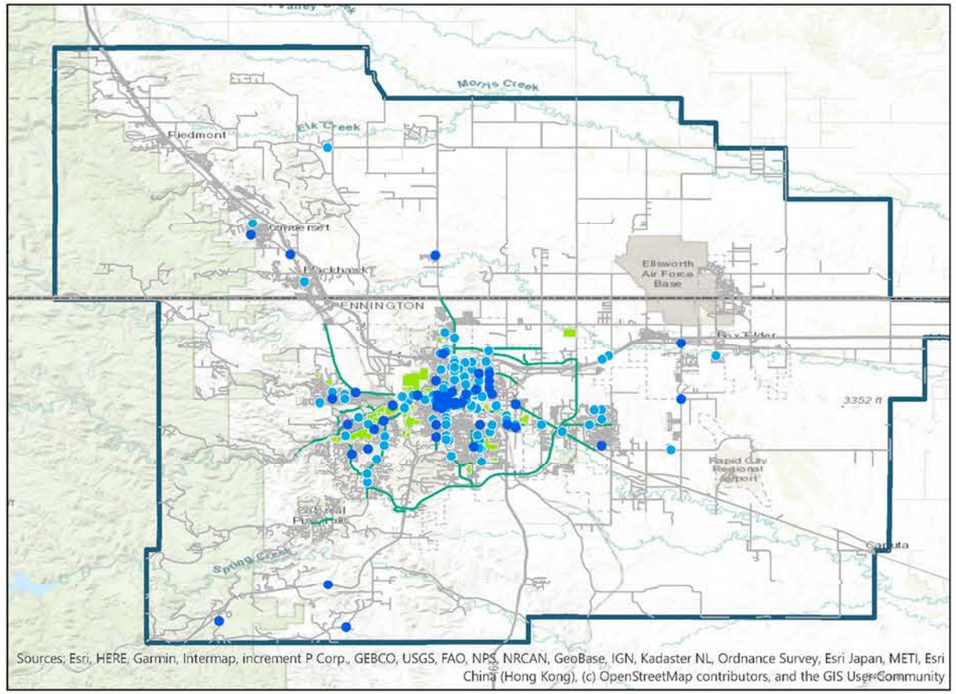
Table 7: Rapid City MPO Bicycle and Pedestrian-Related Crashes by Injury Severity

Year	Fatal	Incapacitating	Non-Incapacitating	Possible	No Injury	Unknown	Total
2014	1	12	18	12	1	0	44
2015	3	9	15	7	0	0	34
2016	2	8	23	10	0	0	43
2017	3	8	27	12	1	0	51
2018	2	10	21	16	0	0	49
Total	11	47	104	57	2	0	221

Source: South Dakota Department of Public Safety, Office of Accident Records, 2014-2018

Figure 8: 5-year Bicycle and Pedestrian Crashes





Bicycle and Pedestrian Related Crashes, 2014-2018

Legend

Injury Severity
- Fatal Injury
- Incapacitating Injury
- All Other Bike and Ped Crashes

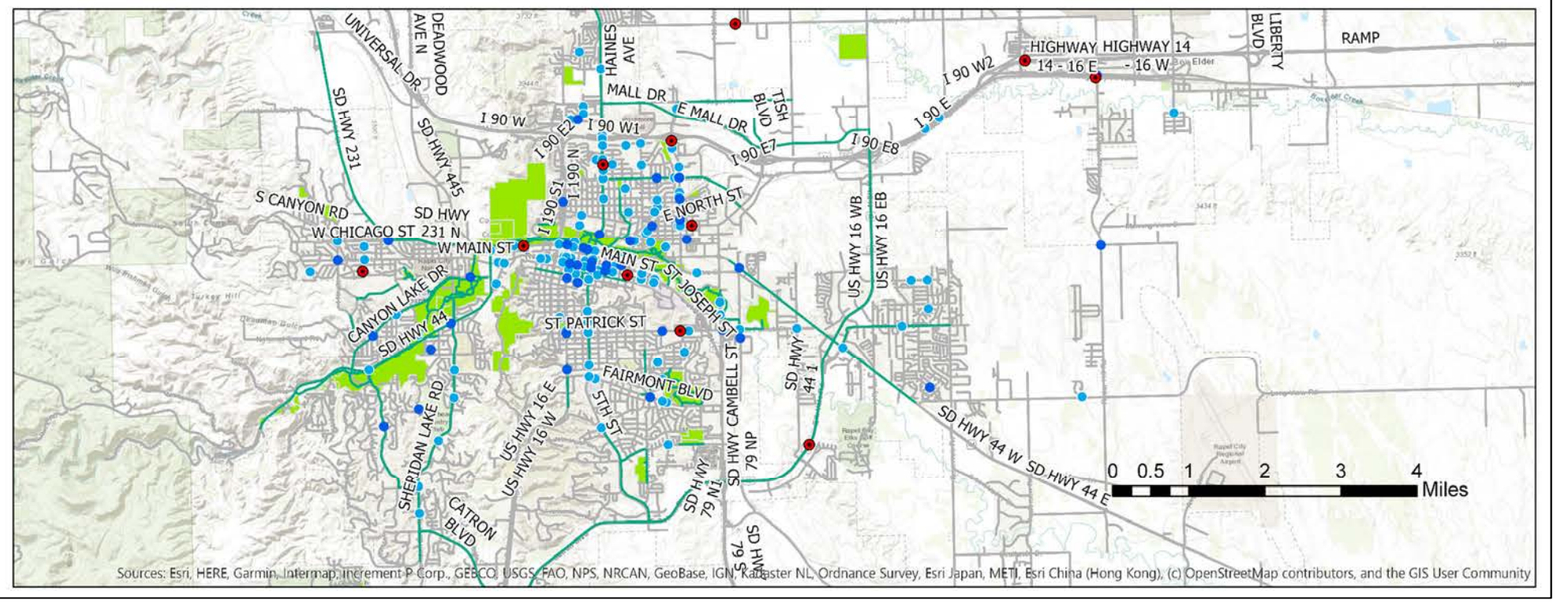
Bike Facilities

Roads

Rapid City Parks

County Boundary

MPO Boundary



South Dakota Strategic Highway Safety Plan

The Metropolitan Transportation Plan will incorporate the goals and direction provided by South Dakota's Strategic Highway Safety Plan (SHSP). Pursuant to FHWA's Highway Safety Improvement Plan (HSIP) guidelines, state departments of transportation are required to develop a statewide plan that establishes goals, objectives, and key areas of emphasis for highway safety. South Dakota's most recent SHSP, published in 2014, identifies various strategies and options aimed at reducing the fatal and serious injury crash rate 15% by the year 2020. The SHSP is guided by the safety vision statement *Every Life Counts: Partnering to Save Lives* and delineated key strategies to accomplish the 15% reduction and reach the safety vision mentioned above:

EDUCATION

- Improve driver education and awareness
    - *Stay in Your Lane*, DUI, motorcycle awareness, seatbelt awareness, statewide and local speeding education, young driver education

ENFORCEMENT

- Enforcing traffic safety laws and support effective arrest and prosecution of offenses
    - Fund the South Dakota Department of Public Safety a chemist position for testing DUI blood samples at the state health laboratory
    - Review options for creating a Tribal Law Enforcement or Traffic Liaison to address drinking and driving on tribal lands
    - Fund a Department of Public Safety mobile courtroom and blood testing facility
    - Consider use of safety funding to support additional prosecutors for DUI cases

ENGINEERING

- Implement infrastructure safety improvements that have demonstrated effectiveness at reducing and preventing lane-departure and intersection-related crashes
    - Improved shoulder treatments, curve delineations, pavement markings, and centerline and edge line rumble strips
    - Innovative intersection design and traffic signal modifications
    - User friendly roadway design, traffic controls, and construction and maintenance policies to reduce motorcycle crash frequencies
    - Provide roadway design and traffic controls that support appropriate vehicle speeds
    - Review transportation plans for new and expanding high schools; provide or update School Zone signs

EMERGENCY MEDICAL SERVICES

- Provide timely and professional emergency response and trauma care to crash victims

- Support rural emergency response to maintain staff level resources and training
- Provide adequate signing for local roads to enhance/sustain response times

PROJECT PLANNING PARTNERSHIPS

- Capitalize on multidisciplinary safety knowledge at the federal, state, local, and tribal government levels to develop safety projects
  - Establish a Fatal Crash Investigation Team
  - Develop tribal partnerships to collaborate on funding enforcement activities on reservations, conducting regional roadway safety inspections, roadway safety audits, county signing projects, and tribal safety summits
  - Plan multi-state peer exchange for DOT, LTAP, and FHWA traffic safety personnel for developing ideas for planning, selecting, and constructing safety projects as well as using HSIP monies
  - Establish local safety system partnerships
  - Utilize Safetravelusa.com/511 to provide data feeds to Dynamic Message Signs
  - Develop aps for additional mobile devices
  - Provide more environmental sensor/cameras for traveler information
  - Develop alternate methods of reporting roadway conditions

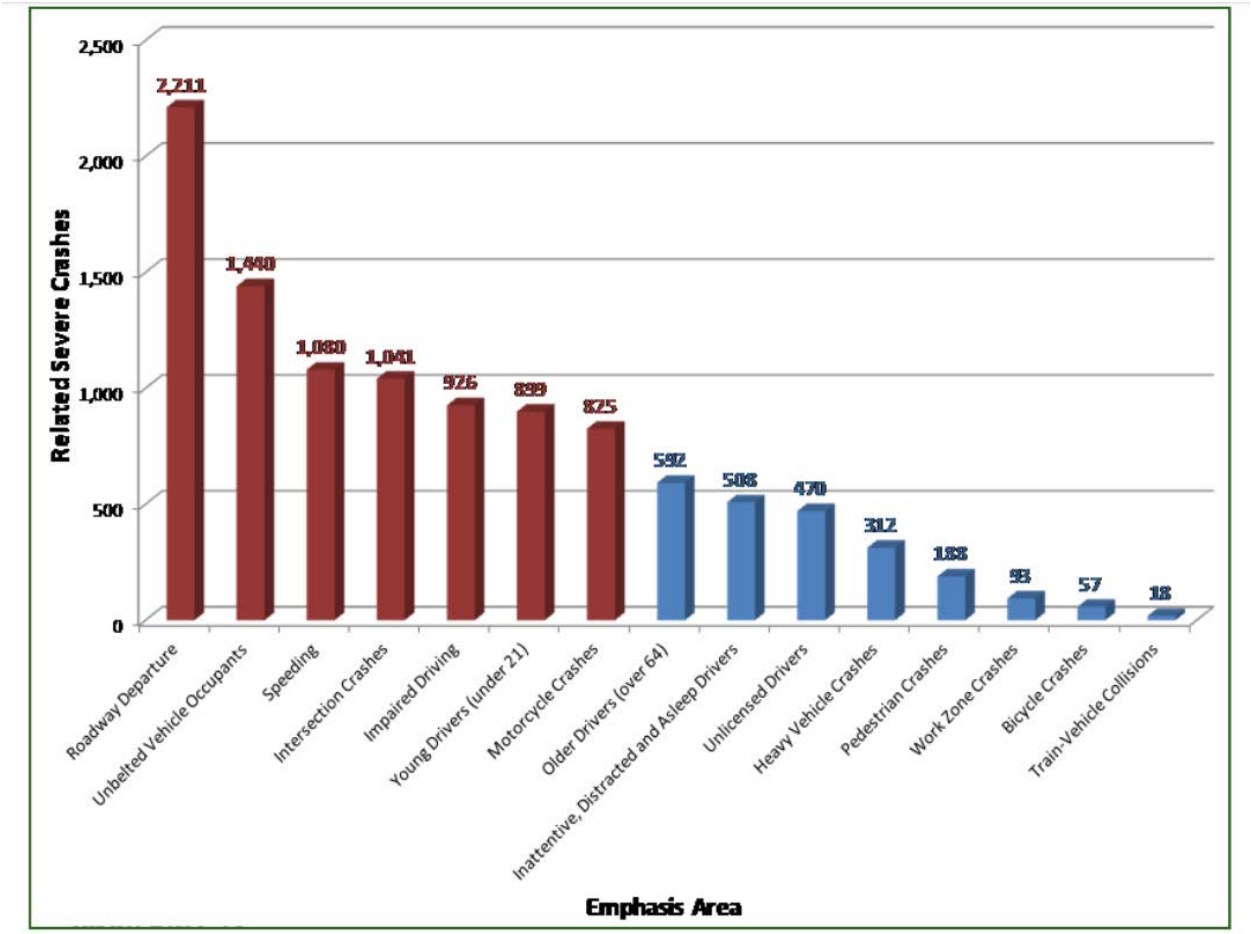
RESEARCH AND DATA

- Improve crash data analysis for more complete problem identification
  - Conduct research and data to identify common attributes of crash causal factors related to crashes and their severity
  - Conduct factual research related to public attitudes towards safety issues and legislative initiatives

South Dakota Statewide Fatal and Incapacitating Injury Crash Emphasis Areas

The South Dakota DOT analyzed fatal and incapacitating injury crashes across the state based on 5-year data starting in 2007. The compiled fatal and incapacitating injury crash data indicates the 7 highest emphasis areas for this severity of crashes statewide are: Roadway Departures, Intersections, Motorcycles, Unbelted Vehicle Occupants, Speeding-Related, Drug-and Alcohol-Related, and Young Drivers. **Figure 9** below presents all key emphasis areas identified by SDDOT as part of the SHSP.

Figure 9: South Dakota Fatal Crashes and Key Emphasis Areas



Source: South Dakota DOT, Office of Traffic Safety, Feb. 2014

Transit System Overview

Transit service for the Rapid City Area MPO is offered by two public providers—Rapid Transit and Prairie Hills Transit. Rapid Transit operates fixed route and demand response services within the City of Rapid City. Rapid Transit also operates a seasonal “City View Trolley” that provides seasonal tours of points of interest in Rapid City. Prairie Hills Transit offers a hybrid deviated fixed route/demand response within its service area comprised of Meade County, from Sturgis and Piedmont to Rapid City. Prairie Hills Transit also serves western Pennington County.

- Rapid Transit’s six fixed routes operate Monday through Friday from 6:20 AM to 5:50 PM and Saturdays from 9:50 AM to 4:40 PM.
- Demand response services operate Monday through Friday from 6:20 AM 5:50 PM and Saturdays from 8:00 AM to 6:00 PM.
- Rapid Transit’s seasonal trolley serves riders from 10:00 AM to 5:00 PM June through August.
- Prairie Hills Transit hours of operation are from 7:00 AM to 5:00 PM on Monday, Tuesday, Wednesday, and Friday.

Table 8 displays key performance measures of Rapid Transit’s fixed route service from 2013 to 2017. Between 2013 and 2017, the number of passenger trips taken on fixed routes experienced an overall decline from 2013 to 2016 and then saw a significant increase of nearly 50,000 trips between 2016 and 2017. Operating revenues increased gradually, with a peak of just over $1 million in 2015, while passenger revenues for fixed route service decreased between 2013 and 2017.

Table 9 displays key performance measures for Rapid Transit’s demand response services for the years 2013 to 2017. The number of demand response trips taken between 2013 and 2017 increased from slightly. Operating expenses for demand response service fluctuated during this 5-year period, with annual expenses rising to a peak of $1.1 million in 2016 and then declining to $1.04 million in 2017. Passenger revenues followed this trend, seeing an increase each year from 2013 to 2016, then declining in 2017.

Table 10 displays key performance measures for Prairie Hills Transit’s demand response service for the years 2013-2017. As shown, the number of trips taken between 2014 and 2017 increased by nearly 1,000 between 2014 and 2015 before a significant decrease in 2016; by 2017, the number of trips increased substantially. The four year period saw an overall decrease in operating expenses from a high of $1.5 million in 2014 to a low of $1.306 million in 2016. Passenger revenues for Prairie Hills Transit declined each year from 2014 to 2016, with a low of $65,526 in 2016 before increasing to $80,824 in 2017.

Table 8: Fixed Route Operating Statistics, Rapid Transit[5]

Measure	2013	2014	2015	2016	2017
Passenger Trips	304,599	287,623	291,206	295,060	348,210
Revenue Hours	20,328	19,490	19,452	19,755	21,043
Revenue Miles	294,439	294,080	290,101	289,699	289,031
Operating Expense	941,516	986,199	1,009,286	988,280	997,384
Passenger Revenue	239,430	251,235	229,542	226,710	174,897

Table 9: Demand Response Service Operating Statistics, Rapid Transit

Measure	2013	2014	2015	2016	2017
Passenger Trips	83,572	79,261	84,594	87,280	87,409
Revenue Hours	25,785	25,750	25,655	22,148	22,056
Revenue Miles	279,165	247,369	268,521	271,425	269,557
Operating Expense	1,061,779	1,112,051	1,115,526	1,107,993	1,042,327
Passenger Revenue	187,160	176,674	192,552	207,756	203,037

Table 10: Demand Response Service Operating Statistics, Prairie Hills

Measure	2013	2014	2015	2016	2017
Passenger Trips	Data not available	94,520	95,503	91,176	106,875
Revenue Hours		36,073	32,569	32,208	37,844
Revenue Miles		496,092	483,407	493,658	567,266
Operating Expense		1,515,874	1,381,181	1,306,132	1,317,406
Passenger Revenue		89,784	74,329	65,526	80,824

In addition to the public transit providers, there are several private non-profit organizations offering transit services in the Rapid City Area MPO boundaries. These providers include:

- **Chair Lift**: A relatively new demand response service in the Rapid City area that runs Monday through Friday, opened to any resident age 65 or older. The service offers accessible vehicles and does not require 24 hour notice for rides.

[5] National Transit Database (NTD), Federal Transit Administration.

- **Black Hills Works**: Program-specific transportation service offered Monday through Sunday, 24 hours a day
- **The Club for Boys**: Program-specific service from Rapid City schools to the Club for Boys facility
- **YMCA**: Program-specific service from the majority of Rapid City public schools to the YMCA facility
- **Youth and Family Services**: Program-specific transportation to and from home and school, with the primary users being low-income children
- **Senior Companions**: Demand response service for seniors and low-income residents age 55 or older. Senior Companions is operated on a volunteer basis and utilizes volunteer's personal vehicles for service

Recent MPO Transit Studies

The Rapid City Area MPO completed a transit feasibility study in 2018 in order to determine if an expansion of the existing transit service is necessary to support residents as well as exploring which types of transit services and programs would best fit the needs of the region. In addition to the transit feasibility study, the MPO also published a Coordinated Public Transit Human Services Plan in March 2019. This plan identified transit issues facing the community and provided a series of recommendations for increasing residential mobility and accessibility. Both the transit feasibility study and coordinated public transit human services plan identified specific gaps in the existing transit system, which are presented below:

- Limited transit service
- High demand for service later at night, on Sundays, and to areas outside of Rapid City limits
- Transit service is too expensive for many of the area's residents

Current Transit System Opportunities and Alternatives

Based on the findings and public input presented in the Transit Feasibility Study and Coordinated Public Transit Human Services Plan, there are a series of opportunities available for the Rapid City Area MPO in fostering a more efficient and equitable transit system. These opportunities and alternatives include:

OPPORTUNITIES

- Implementing ride matching, carpools, and vanpools amongst public, private, and nonprofit organizations for longer distance commutes across the MPO region
- Voucher programs administered by public and/or private organizations to subsidize travel costs for lower income residents, providing more mobility options for work commutes and errands

ALTERNATIVES

- Special group trips that link popular destinations, such as local supermarkets or employment centers, to expand transit service in the area
- Lifeline services that provide transit in rural areas that currently have little or no transit service

- Expanding the current demand-response service, either through a Dial-a-Ride arrangement or traditional on-demand bus service
- Commuter express bus routes that provide transit service between an origin and major employment center destination
- Expansion of the regional service region by providing new routes

Bicycle and Pedestrian

The adoption of a Bicycle and Pedestrian Master Plan in 2011 formalized the Rapid City Area MPO's intent to develop an efficient network of facilities for pedestrians and cyclists, offering alternatives to vehicle travel through enhanced connections to destinations and promoting improved public health through activity-based transportation in the region.

Currently, the bicycle and pedestrian network maintains numerous bicycle and pedestrian facilities, including sidewalks, cycle tracks, shared-lanes, and dedicated bicycle lanes. Continued investment in these facilities can aid the MPO in maintaining a welcoming environment for both pedestrians and bicyclists, and benefit the overall transportation system by allowing residents ample opportunity to take trips utilizing these modal options instead of a private vehicle.

While the Black Hills region offers myriad recreational opportunities for bicyclists, the use of this transportation mode for commuting purposes remains low, as American Community Survey (ACS) data for 2017 indicates that 0.4% of Rapid City residents commute to work via this mode. Compared with walking, which comprised 3.7% of work commutes, and transit, with 0.6% of work commutes in 2017, bicycling was the least utilized mode for completing these types of trips.

Current Bicycle and Pedestrian Facilities

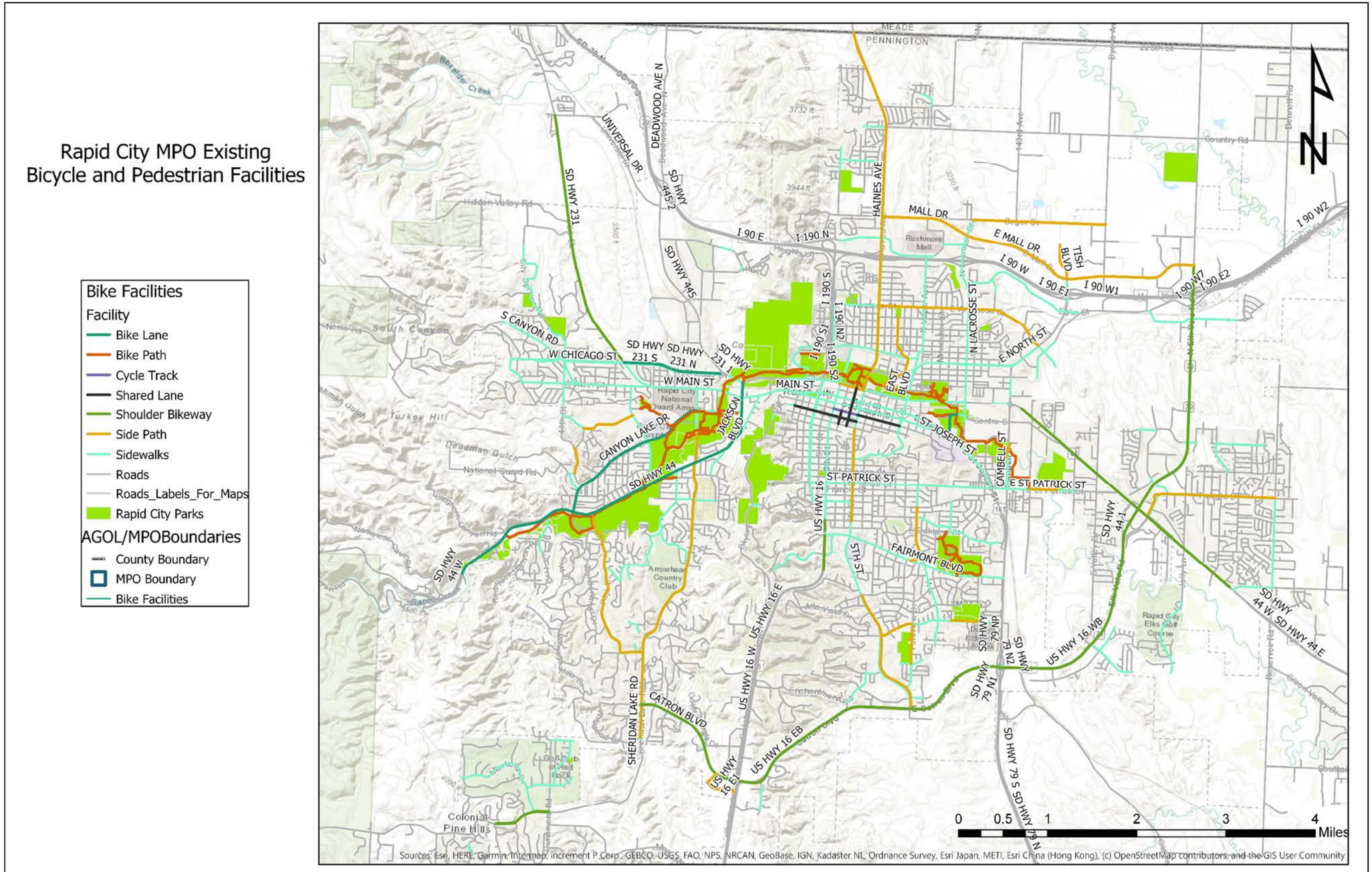
The bulk of existing bicycle facilities in the Rapid City Area MPO boundaries are side paths, which total 26.33 miles. These facilities are separated from roadways, and offer both bicyclists and pedestrians a wider path and increased safety due to the separation from motor vehicles. The total number of miles of shoulder bikeways is 18.47, and these facilities are the second most common. Regarding planned investments in bicycle facilities, the MPO has identified 28.25 miles of bike lanes and an additional 28.01 miles of shared used path. One type of bicycle facility that is planned for but does not yet exist in the area is a signed shared roadway, with 15.24 miles identified. **Table 11** displays the breakdown of all existing and proposed bicycle facilities in the Rapid City Area MPO region.

Table 11: Existing Bicycle Facilities and Length

Facility Type	Length
Bike Lane	9.68
Bike Path	16.42
Cycle Track	0.28
Shared Lane	1.79
Shoulder Bikeway	18.47
Side Path	26.33
Total Existing Mileage	72.97

Sidewalks are a critical facility for any urban transportation network as they allow for pedestrian connections and encourage active transportation, connecting the other modes of transportation. Furthermore, sidewalks have shown to generate increased economic activity in commercial and mixed-use areas as they facilitate increased foot traffic. Currently, there are 97.2 miles of sidewalk in the Rapid City MPO area on arterial and collector streets, with 61.01 miles being on both sides of their corresponding road, and 36.19 miles being on only one side of their corresponding road. Sidewalk data for local streets is not currently tabulated. **Figure 10** displays the locations of these facilities.

Figure 11: Existing Bicycle and Pedestrian Facilities



Intercity Transportation

In addition to the highway links that connect the Rapid City area to other parts of the state and country, there are additional modes of travel for intercity travel to and from the Rapid City area.

Aviation

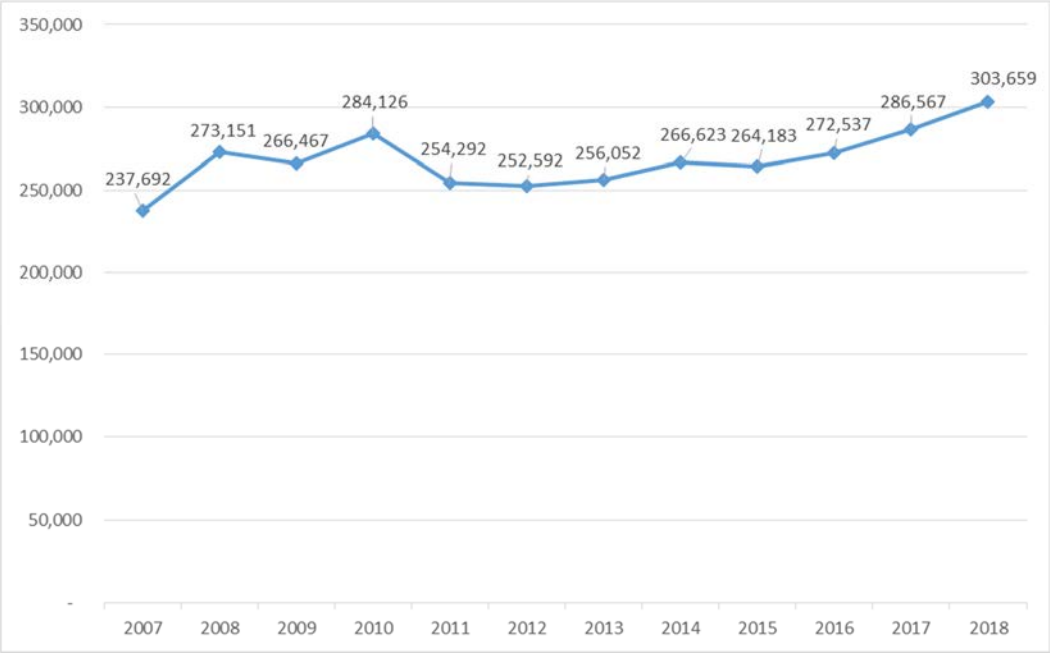
The Rapid City Regional Airport is the home of commercial and general aviation within the Rapid City MPO area and is the second largest airport in the state. The airport plays a fundamental role in the region's transportation network, connecting travelers with the Black Hills and other major tourist sites in Western South Dakota.

The airlines currently operating out of the Rapid City Regional Airport are:

- Allegiant Air: Flights to Las Vegas, NV and Phoenix, AZ
- American Airlines: Flights to Charlotte, NC, Chicago, IL, Dallas, TX, and Phoenix, AZ
- Delta Airlines: Flights to Atlanta, GA, Minneapolis, MN, and Salt Lake City, UT
- United Airlines: Flights to Chicago, IL, Denver, CO and Houston, TX[6]

Figure 11 displays the annual enplanements at Rapid City Regional airport for the period 2007-2017. As indicated by the figure, annual enplanements grew from a 2007 level of 237,692 to 303,659 in 2018. The general trend shows overall growth, with a fluctuation in enplanements from year to year.

Figure 11: Annual Enplanements for the Rapid City Regional Airport, 2007-2018[7]



[6]Seasonal flights to Newark, NJ, Los Angeles, CA, and San Francisco, CA

[7] Federal Aviation Administration, Air Carrier Activity Information System (ACAIS) data

Intercity Bus Service:
The Rapid City Area MPO region's intercity bus service is operated by Jefferson Lines, with passenger pick-ups and drop-offs conducted at the Milo Barber Transportation Center in downtown Rapid City. Jefferson Lines serves as the regional intercity bus carrier, connecting Rapid City with other communities in South Dakota, such as Pierre, Sioux Falls, and Brookings, as well as Gillette, WY and Billings, MT. Jefferson Lines main service area includes the central and northwest United States, from Arkansas to Washington state.

Freight System

Freight activities play an important role in the Rapid City area regional economy and facilitating an efficient movement of goods on local and national highways is of paramount importance. To gain a better understanding of how highway freight volumes are expected to change in the Rapid City Area MPO boundaries over the next 25 years, freight forecast data was obtained from the Federal Highway Administration's Freight Analysis Framework (FAF) database. This data estimates the movement of commodities on the national highway system by using average truck payloads and assigning them to individual highways for forecasting purposes. Additional data points used by the FAF include functional classifications, number of lanes, and other pertinent highway characteristics to project future increases in tonnage moving along U.S. highways.

The results of the assessment of the FAF data for the region found that:

- Truck volumes are predicted to increase substantially over the planning horizon. FAF data indicate a predicted 125% increase in truck vehicle miles traveled (VMT) between 2012 and 2045. **Figure 12** illustrates current truck volumes from FAF.
- Commodity tonnage increases are predicted to also increase over the planning horizon. FAF data predict a 66% increase in commodity tonnage between 2012 and 2045. **Figure 13** illustrates current commodity flows from FAF.

This marks a significant increase in freight activity traveling along highways in the region, and has implications on public expenditures related to roadway maintenance and expansion, as well as the operational capabilities of the roadway network to support this increased amount of traffic.

Figure 12: Estimated Truck Flows through the Rapid City MPO Region, 2012

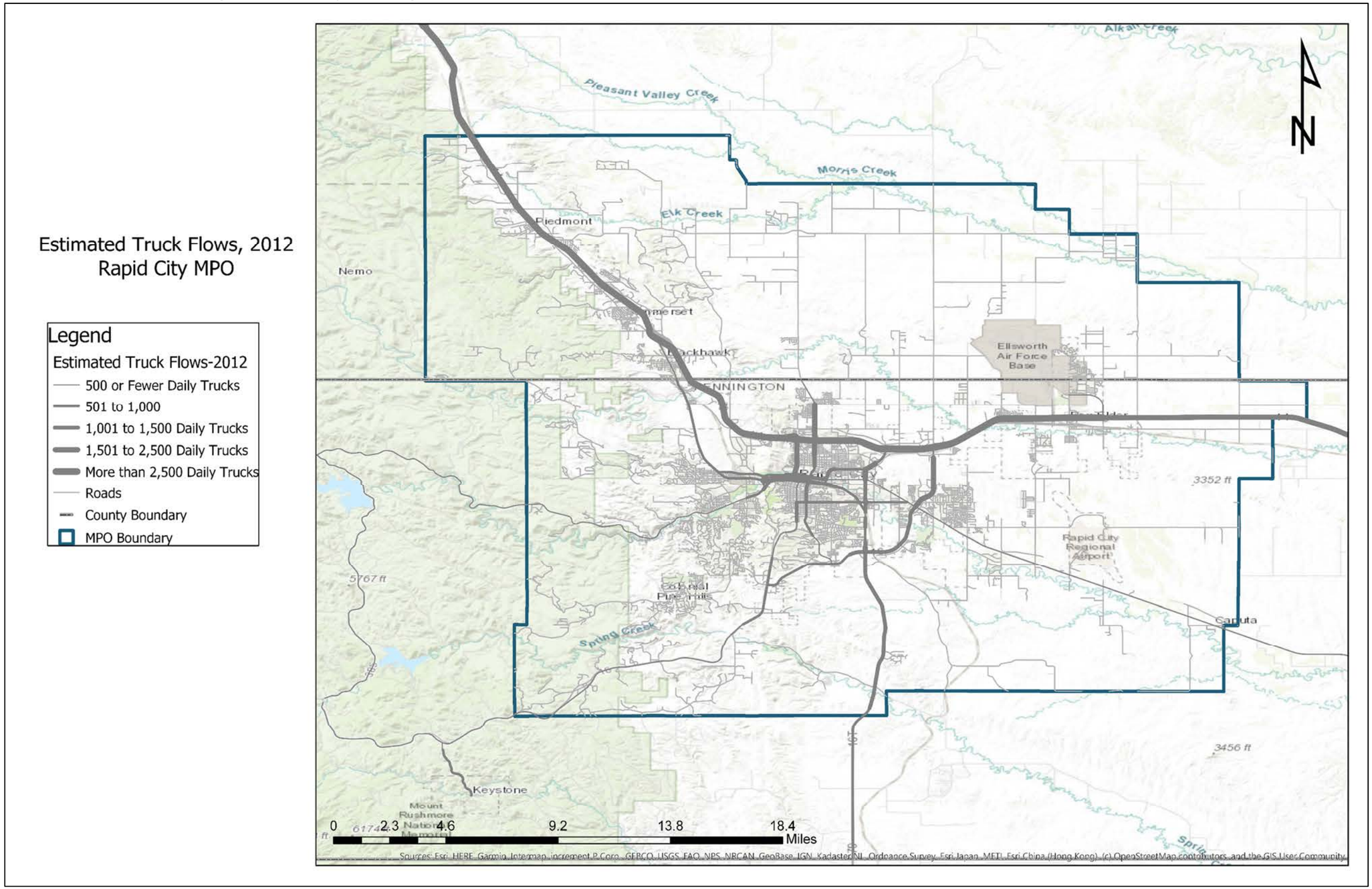


Figure 13: Estimated Highway Freight Tonnage Flows for the Year 2045