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# MEMORANDUM

DATE: December 20, 2022

TO: HDR, Inc.

FROM: Parametrix

SUBJECT: Kimball Junction EIS Existing and 2050 No Action Mobility Memo

PROJECT NUMBER: PIN 19477; Project No. S-0224(50)12

PROJECT NAME: Kimball Junction EIS

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This memorandum documents the mobility conditions for existing and 2050 no action scenarios to support the Kimball Junction Environmental Study. Results include a discussion of traffic conditions, active transportation, and transit service in the study area.

## STUDY AREA

The study area expands on the analysis area defined by the Kimball Junction Area Study (2020) which consisted of the I-80/Kimball Junction interchange area, including the three signalized intersections along SR-224 (I-80 Single-Point Urban Interchange (SPUI), Ute Boulevard, Olympic Parkway) as well as the stop-controlled intersection of SR-224/Rasmussen Road. This effort also includes four roundabouts immediately east and west of SR-224 at Ute Boulevard/Landmark Drive, Olympic Parkway/Landmark Drive, Ute Boulevard/Uinta Way, and Newpark Boulevard/Uinta Way.

Within the analysis model, the SR-224 corridor was extended over two miles to the south of the Olympic Parkway intersection near Canyons Resort Drive to allow for accurate representation of vehicle queueing. In addition to SR-224, traffic operations on I-80 were modeled from approximately milepost 141 to milepost 147. This allowed for inclusion of the Jeremy Ranch interchange on the western extent and the I-80 eastbound off-ramps to US-40 and the westbound on-ramps from US-40. The I-80 interchanges adjacent to the Kimball Junction interchange are not a focus of the study but are included in the model network to support any potential future coordination with the Federal Highway Administration (FHWA).

## ANALYSIS TIMEFRAME

The analysis timeframe for the study was coordinated with the Utah Department of Transportation (UDOT) and Summit County staff to reflect known, regularly occurring traffic concerns on the corridor not influenced by extreme or outlier events, such as crashes, inclement weather, holidays or special events. Twelve months of traffic data (April 2021 to April 2022) on SR-224 were obtained from UDOT to investigate traffic data seasonality. The data consisted of speed data from vehicle probe data within UDOT's ClearGuide platform and traffic volume data from sensors on I-80 and SR-224 within UDOT's PeMS platform.

The 12-month data illustrated that winter months (Dec-Mar) on SR-224 experience higher volumes and much more variation in vehicle travel times than the rest of the year. Additionally, the worst congestion on SR-224 is much more likely to occur on winter weekdays than winter weekends. Though winter weekends can feature greater skier traffic demand, the mixture of regular commuter traffic, school traffic, and skier traffic on winter

weekdays results in overall higher demand. For the study analysis, it was determined to model AM and PM peak period conditions representing the 85th percentile highest travel times during the winter. The study team determined this appropriately captured traffic concerns without being influenced by outlier events that often coincide with the highest 15 percent of travel times. It should also be noted that the AM and PM peak period 85th percentile travel times for winter reflect the AM and PM peak period 95th percentile travel times across the entire 12-month dataset meaning only 5 percent of days for the whole year have higher travel times than the analysis timeframe. Supporting data for the analysis timeframe selection is contained in the Appendix.

# EXISTING CONDITIONS

To support analysis, traffic data was collected within the study area to determine existing traffic volumes, traffic composition, and travel patterns. Traffic operations were evaluated using a microsimulation VISSIM model expanded and modified from the Kimball Junction Area Study. The model was calibrated using the existing traffic data collected for the project.

## Vehicle Traffic Data

Data was collected within the study area and used to evaluate existing conditions. The following sections describe the collection of data and how it was developed for use in the existing conditions analyses.

### Traffic Volumes

The traffic volumes used for the project were developed using intersection turning movement counts, freeway detector volume data, and information from previous studies conducted in the study area. Traffic counts were collected within the study area in January 2021 at the following intersections as part of the SR-224 Bus Rapid Transit (BRT) Environmental Assessment (2022):

- SR-224/Rasmussen Road
- SR-224/I-80 SPUI
- SR-224/Ute Boulevard
- SR-224/Olympic Parkway
- Ute Boulevard/Landmark Drive
- Olympic Parkway/Landmark Drive

Additional traffic counts were collected March 2022 to capture driveway activity on Ute Boulevard and Olympic Way as well as the two roundabouts east of SR-224:

- Ute Boulevard/Uinta Way
- Newpark Boulevard/Uinta Way

Traffic volume data from permanent sensors on SR-224 and I-80 were used to adjust volumes from turning movement counts to reflect conditions associated with the winter 85th percentile travel times. This was done by comparing SR-224 and I-80 volumes for the days of data collection to the days similar to the winter 85th percentile travel time. Generally, this resulted in an increase of 100-200 vehicles per hour on SR-224 for AM and PM peak hours. The same data comparison was used to adjust I-80 volumes gathered for the Kimball Junction Area Plan to represent conditions associated with winter 85th percentile travel times. The Jeremy Ranch interchange roundabout volumes were also obtained from the Kimball Junction Area Study. Weekday AM peak hour traffic volumes are shown in Figure 1 with weekday PM peak hour traffic volumes shown in Figure 2.

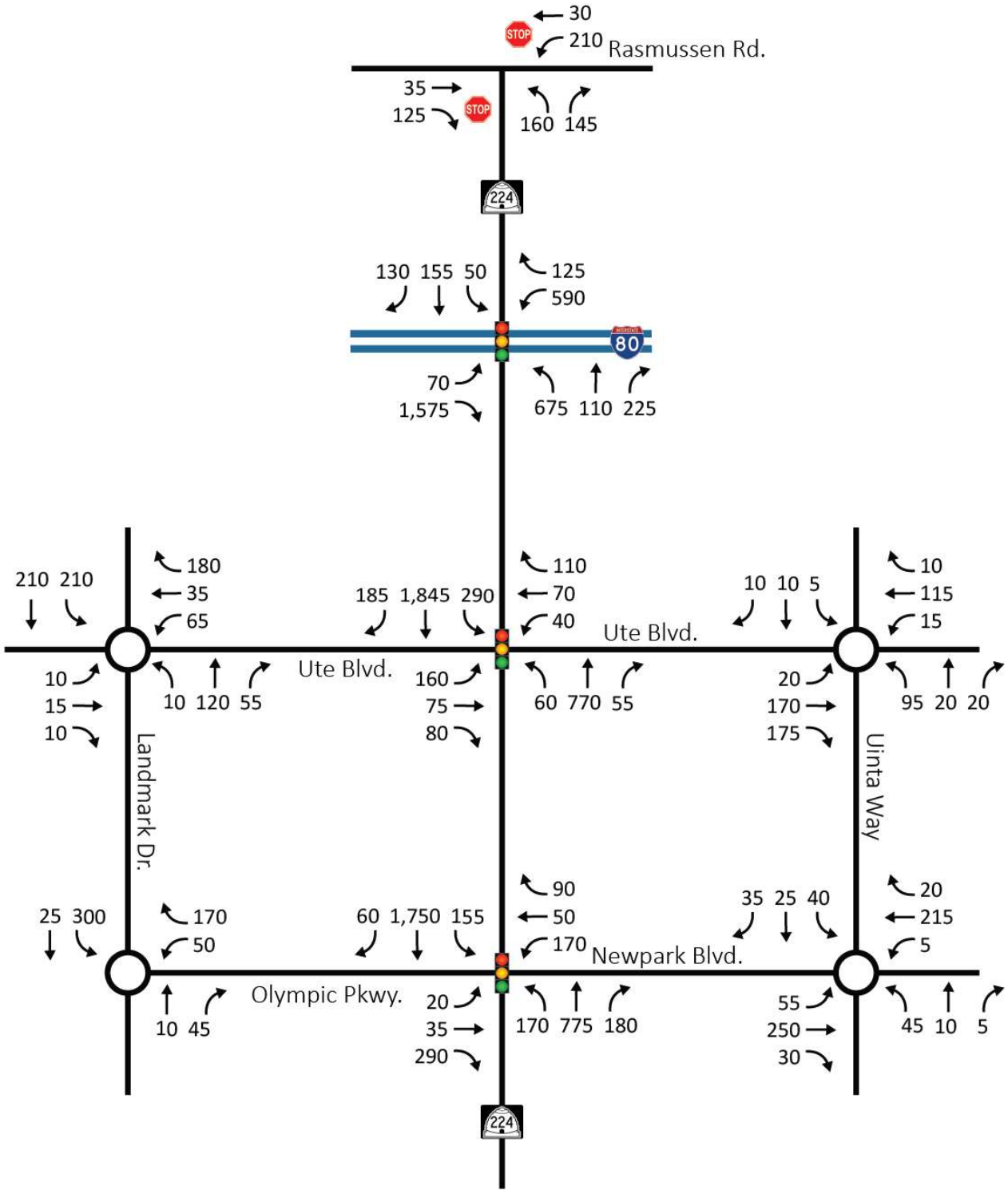



**Figure 1: Weekday Existing AM Peak Hour Traffic Volumes**

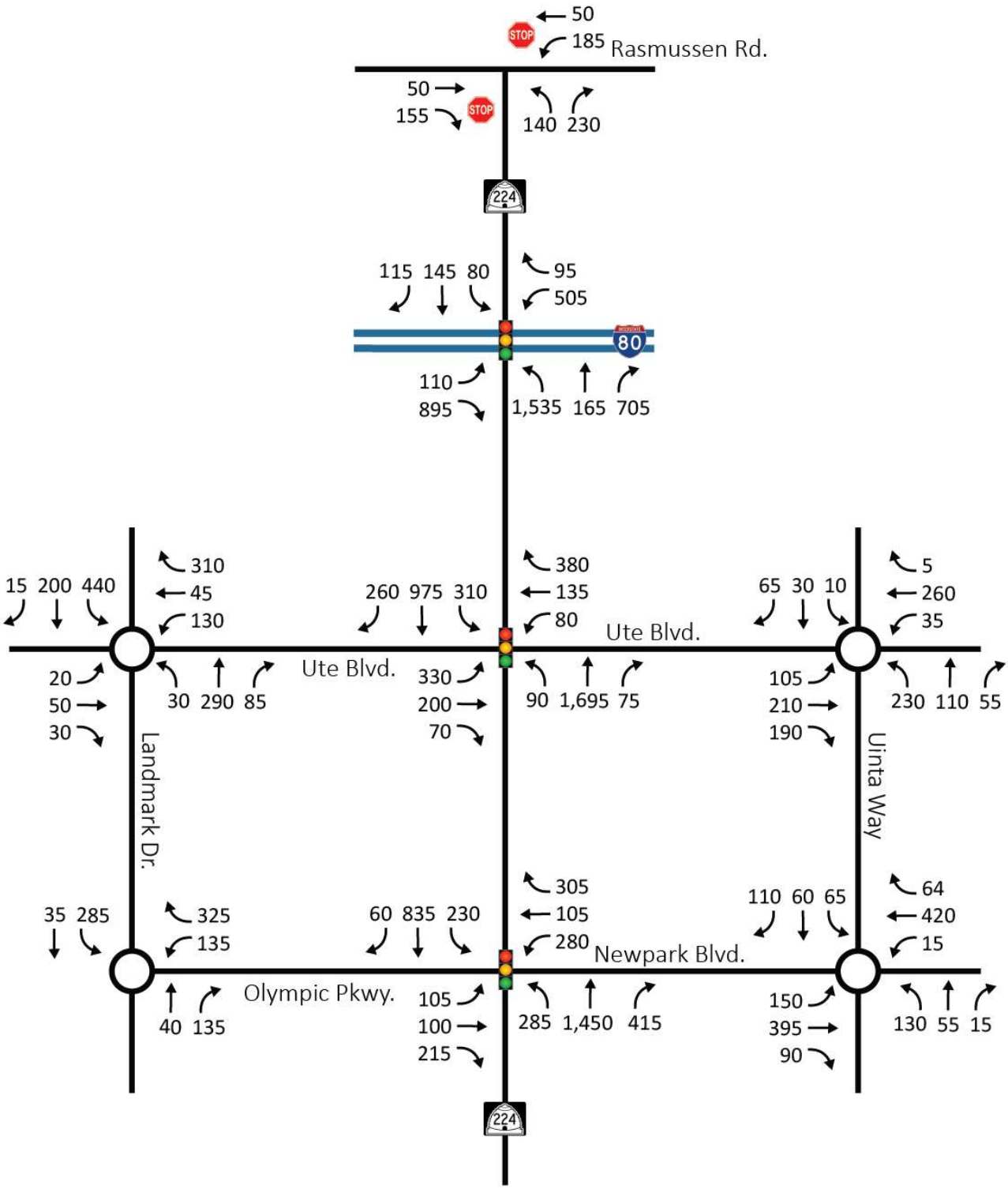



**Figure 2: Weekday Existing PM Peak Hour Traffic Volumes**

## Traffic Composition

Within the study area, I-80 is a major freight corridor and a higher percentage of heavy vehicles were added to the VISSIM network to properly account for the vehicle mix on the road. Heavy vehicle counts obtained during the Kimball Junction Area Study from UDOT's Powderwood Road traffic camera and UDOT detector data along I-80 at the Kimball Junction interchange were reviewed to determine the approximate mix of different vehicle classifications traveling on the corridor. Based on the peak hour, the vehicle inputs along I-80 were used as shown in Table 1 to allow for a higher percentage of heavy vehicles traveling through the model along I-80 than occur in the default VISSIM vehicle composition.

**Table 1: Existing VISSIM I-80 Vehicle Composition Percentages**

| Location | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|---|---|---|---|---|---|---|
| | Cars | HGV Single | HGV Combo | Cars | HGV Single | HGV Combo |
| I-80 Eastbound | 81% | 11% | 8% | 88% | 6% | 6% |
| I-80 Westbound | 76% | 6% | 20% | 88% | 4% | 8% |

The aerial drone video along SR-224 was also reviewed to determine if the default vehicle composition for arterials should be modified. Based on a review of the video, it was determined that during the weekday peak hours, the vehicles observed on the corridor justified reducing the amount of heavy trucks for the default arterial composition. The single-unit truck composition was reduced from four percent to two percent and the combination truck composition was reduced from two percent to one percent.

## Vehicle Travel Times

Travel time data along the corridor was gathered for two routes that reflect major traffic issues faced during AM and PM peak periods. The first travel time route is from the eastbound I-80 off-ramp gore to southbound SR-224 approximately 1,100 feet south of Olympic Parkway. The route captures the congestion experienced during AM peak periods when large amounts of vehicles exit I-80 and travel south on SR-224 towards ski resorts and employment destinations in Park City. The second travel time route begins on northbound SR-224 just north of Canyons Resort Drive and continues north to the I-80/SR-224 interchange. This route captures the reverse traffic pattern in the PM when vehicles travel north from ski resorts and other destinations towards I-80.

The travel time data was obtained via UDOT's ClearGuide platform which aggregates vehicle probe data. Table 2 summarizes the AM peak hour, PM peak hour, and midday average travel time for the two routes of interest during the winter season. As mentioned previously, the travel time data for these routes was used to identify the analysis timeframe for the study.

**Table 2: Weekday AM and PM Peak Hour Travel Times**

| Travel Time Segment | | Time Period | Average Travel Time (min) |
|---|---|---|---|
| From | To | | |
| I-80 EB off ramp Gore | SB SR-224 approx 1,100 ft south of Olympic Pkwy | AM Peak Hour | 5:30 |
| | | Midday | 2:30 |
| | | PM Peak Hour | 2:45 |
| NB SR-224 at Canyons Resort Drive | SR-224/I-80 SPUI | AM Peak Hour | 4:00 |
| | | Midday | 4:15 |
| | | PM Peak Hour | 11:45 |

## Traffic Operations

Traffic operations along the corridor were evaluated using a VISSIM v2022 microsimulation traffic model. The VISSIM model was used due to the close proximity of intersections within the study area, queuing which spills back through multiple intersections in the existing condition, and the need to evaluate transit and active transportation operations. In addition, the microsimulation model allowed for evaluation of the I-80 mainline, on- and off-ramps and arterial street systems and the interactions between them. The VISSIM model was modified from the models used for the Kimball Junction Area Study. The following sections discuss the methods used to build the traffic operations model and the results from the existing weekday AM and PM peak hour analyses.

### Signal Timing

Existing signal timing plans for the three signalized intersections in the study area (SR-224/I-80 SPUI, SR-224/Ute Boulevard, SR-224/Olympic Parkway) were obtained from the UDOT Signal Desk in February 2020 as part of the Kimball Junction Area Plan. Then, data from the UDOT Automated Traffic Signal Performance Measures (ATSPM) online database was gathered to confirm timing plans are still accurate and to compare timing plans to actual performance.

### Vehicle Routing

Vehicle routes were assigned on a corridor-wide basis for the entire network. Route beginnings and endings were located near vehicle input locations and on I-80 on- or off-ramps. This allowed for vehicles to navigate smaller areas and corridors on a single route which resulted in fewer last-minute lane changes. Additionally, the possibility of vehicles driving in circuitous directions is eliminated while avoiding the need for more complicated network-wide routing. Relative vehicle routing in the model is representative of the number of vehicles in the model along each route.

### Model Calibration

All model data results were based on an average of 10 simulation runs. A seeding period of 15 minutes was used to populate the model. The AM model was coded to record results for a three-hour period (7:00 AM – 10:00 AM) to capture the build-up and dissipation of congestion. Likewise, the PM model was coded to record results for a four-hour period (3:00 PM to 7:00 PM). For both AM and PM models, results were recorded in 15-minute intervals.

The model was calibrated to ensure study area traffic volumes, travel times, and queuing reasonably represent AM and PM peak hour conditions for the analysis timeframe. As such, modifications were made to factors for the Wiedemann 74 car following model within the VISSIM model. Specifically, the additive and multiplicative parts of the safety distance were modified according to Table 3.

**Table 3: Modifications to Wiedemann 74 Car Following Model**

| Factor | Default Value | Modified Value |
|---|---|---|
| Additive part of safety distance | 2.0 | 2.3 |
| Multiplicative part of safety distance | 3.0 | 3.3 |

### Intersection Level of Service

Vehicle level of service (LOS) was calculated for each of the intersections using the intersection node data. Node data was collected in 15-minute increments to determine average vehicle delay at each intersection during the busiest hour of the model (peak hour). The peak hour of the AM model was 8:00 AM – 9:00 AM and the busiest hour of the PM model was 4:00 PM – 5:00 PM.

Using the average vehicle delay, level of service was determined using the Highway Capacity Manual 6$^{th}$ edition (HCM) thresholds for unsignalized and signal-controlled intersections. Table 4 summarizes the HCM thresholds.

As shown in Table 4, unsignalized intersection LOS is defined according to a different scale than signalized intersections and is also defined by the worst-performing approach rather than the average vehicle delay for the entire intersection. The unsignalized methodology applies to roundabouts as well as stop-controlled intersections.

**Table 4: Intersection LOS Definition**

| LOS | Unsignalized Intersection Average Delay (sec/veh)[1] | Signalized Intersection Average Delay (sec/veh) |
|---|---|---|
| LOS A | 0 -10 | 0 - 10 |
| LOS B | 10 - 15 | 10 – 20 |
| LOS C | 15 – 25 | 20 – 35 |
| LOS D | 25 - 35 | 35 – 55 |
| LOS E | 35 - 50 | 55 – 80 |
| LOS F | > 50 | > 80 |

1. Reported for the worst stop or yield-controlled approach
Source: HCM 6th Edition

Table 5 summarizes the results of the existing conditions traffic operations. As shown in Table 5, LOS E or F is experience at several intersections during the AM and PM peak hours. During the AM peak hour, the SR-224/I-80 SPUI operates at LOS F. Though the other two signals on SR-224 appear to operate at LOS C during the AM peak hour, the reported delay is likely underrepresented because of the congestion at the interchange. Specifically, vehicles on the eastbound I-80 off ramp and are unable to efficiently turn onto SR-224 during the AM peak period. This limits the flow rate at which vehicles reach Ute Boulevard and Olympic Parkway. If the bottleneck associated with the interchange were relieved, it is likely that measured performance of Ute Boulevard and Olympic Parkway would degrade. A similar pattern is observed with the PM performance results. Northbound traffic on SR-224 is congested at Olympic Parkway producing long northbound queues and intersection delay at Ute Boulevard and SR-224/I-80 SPUI is likely underrepresented.

Traffic performance at the unsignalized intersections is generally acceptable other than LOS F for the northbound approach at the Ute Boulevard/Landmark Drive roundabout. The heavy southbound left-turn volumes from Landmark Drive onto eastbound Ute Boulevard leave few gaps for northbound traffic to enter the roundabout. Additionally, queues along Ute Boulevard from the SR-224 signal occasionally interfere with performance of the roundabout.

**Table 5: Existing Peak Hour Intersection Vehicle Delay and LOS**

| Location | Control Type | Vehicle Delay (sec / veh) | LOS (Worst Approach) |
|---|---|---|---|
| *AM Peak Hour* | | | |
| SR-224/Rasmussen Rd | Stop-Controlled | 11 | B (WB) |
| SR-224/I-80 SPUI | Traffic Signal | >100 | F |
| SR-224/Ute Blvd | Traffic Signal | 29 | C |
| SR-224/Olympic Pkwy | Traffic Signal | 30 | C |
| Ute Blvd/Landmark Dr | Roundabout | 3 | A (NB) |
| Olympic Pkwy/Landmark Dr | Roundabout | 2 | A (SB) |
| Ute Blvd/Uinta Way | Roundabout | 3 | A (EB) |
| Newpark Blvd/Uinta Way | Roundabout | 4 | A (EB) |
| *PM Peak Hour* | | | |
| SR-224/Rasmussen Rd | Stop-Controlled | 12 | B (WB) |
| SR-224/I-80 SPUI | Traffic Signal | 25 | C |
| SR-224/Ute Blvd | Traffic Signal | 53 | D |
| SR-224/Olympic Pkwy | Traffic Signal | >100 | F |
| Ute Blvd/Landmark Dr | Roundabout | 56 | F (NB) |
| Olympic Pkwy/Landmark Dr | Roundabout | 2 | A (WB) |
| Ute Blvd/Uinta Way | Roundabout | 5 | A (EB) |
| Newpark Blvd/Uinta Way | Roundabout | 19 | C (SB) |

## Vehicle Travel Times

Travel time collection points were placed in the VISSIM traffic model to represent the same locations used to obtain travel time data from the UDOT ClearGuide platform. Table 6 summarizes the AM and PM peak hour travel times from the VISSIM simulation model for respective the travel paths. UDOT ClearGuide travel times for the same peak hour from a day manifesting conditions similar to the winter 85$^{th}$ percentile travel time are shown for comparison. The VISSIM simulation peak hour travel times are within 15 seconds of the ClearGuide data.

**Table 6: Existing AM and PM Peak Hour Travel Times**

| Travel Time Segment | | Time Period | Average Travel Time (min) | |
|---|---|---|---|---|
| From | To | | VISSIM Model | UDOT ClearGuide Platform |
| I-80 EB off ramp Gore | SB SR-224 approx 1,100 ft south of Olympic Pkwy | AM Peak Hour | 5:30 | 5:30 |
| | | PM Peak Hour | 2:15 | 2:45 |
| NB SR-224 at Canyons Resort Drive | SR-224/I-80 SPUI | AM Peak Hour | 3:45 | 4:00 |
| | | PM Peak Hour | 12:00 | 11:45 |

## Queuing

Vehicle queuing was measured using queue counter data collected from the VISSIM simulation model for the areas with the most significant queuing: the eastbound off-ramp in the AM peak hour and northbound SR-224 in the PM peak hour. These movements have the highest traffic volumes and were observed in the field and through drone footage collected during the Kimball Junction Area Study to have the longest queues (Figure 3). The queue data for the AM and PM peak hours were calculated for the average and 95$^{th}$ percentile queue lengths as shown in Table 7.

As shown in Table 7, queue lengths reflect the poor LOS and poor travel times experienced during the AM and PM peak hours. The 95th percentile queue length at the eastbound I-80 off ramp during the AM peak hour is ½ mile. This approaches the end of the off-ramp and results in slow speeds and some queuing on I-80 mainline. During the PM peak hour, the 95th percentile northbound queue on S.R. 224 at Olympic Parkway is 1.9 miles which extends past Bear Hollow Drive.

**Table 7: Weekday AM and PM Peak Hour Vehicle Queues**

| | Average Queue (feet) | 95th Percentile Queue (feet) |
|---|---|---|
| AM Peak Hour | | |
| I-80 eastbound off ramp queue | 1,900 ft (0.4 mi) | 2,600 ft (0.5 mi) |
| **PM Peak Hour** | | |
| S.R. 224 northbound queue at Olympic Parkway | 8,100 ft (1.5 mi) | 9,600 ft (1.8 mi) |

**Figure 3: Northbound SR-224 Weekday PM Peak Hour Queues, Looking South from 850 Feet North of Bear Cub Road**

## Transit

The Kimball Junction area is well served by regional and local transit. The Kimball Junction Transit Center is on the west side of SR-224 and accessed via Ute Boulevard and Landmark Drive. The transit center has a small park-and-ride area and is served by High Valley Transit, Park City Transit, and Utah Transit Authority (UTA).

High Valley Transit is operated by Summit County and is free fare which can incentivize shorter trips or chained trip to be taken via transit versus private vehicle. A description of the different transit routes serving the transit center are included in Table 8.

**Table 8: Kimball Junction Transit Center Bus Service**

| Route (Agency) | Service Period | Vehicle Headways | Description/Destinations |
|---|---|---|---|
| Route 101 (High Valley Transit) | 5:45 a.m. to 11:35 p.m. | 15 min | SR-224 Local, Jeremy Ranch Park & Ride/Snow Park Lodge & Deer Valley Resort |
| Route 103 (High Valley Transit) | 9 a.m. to 10:00 p.m. | 20 min | Operates in a loop around the Kimball Junction area |
| Route 104 (High Valley Transit) | 6 a.m. to 11:30 p.m. | 15 min | Bitner Shuttle Full Loop |
| Route 10 (Park City Transit) | 6:40 a.m. to 11:10 p.m. | 15 min | Electric Express / Kimball Junction, Canyons Village, Park City Old Town |
| PC-SLC Connect (UTA) | 6 a.m. to 6 p.m. | 8x daily | Downtown SLC / Kimball Junction |

As shown, the Kimball Junction area is well-served by transit with service that accesses destinations on all sides. Frequent transit is available via Route 10 to Park City Old Town area with 15-minute headways throughout the day. People are also able to access the Kimball Junction Area via transit from the Ecker Hill Park and Ride with transit service operating on approximately 15-minute headways using bus route 101. The 104 Bitner Shuttle operates in a larger, further east-reaching loop than the Kimball Junction Circulator and it has a 15-minute frequency, from 6 am to 11:30 pm. The loop begins and ends at the Kimball Junction Transit Center. Kimball Junction can be also accessed by Route 103, which operates in a loop around the Kimball Junction area in 20-minute frequencies, from 9 am to 10 pm. Finally, High Valley Transit operates on-demand micro-transit that covers Kimball Junction and other areas.

Summit County and Park City are planning to convert the Route 10 into a BRT by adding dedicated transit lanes in each direction on most of SR-224. The transit lanes would begin and end south of the Olympic Parkway intersection and will provide some capacity improvements to the intersection. Funding may allow the project to be constructed within the next five years.


**Figure 4: Existing Bus Service**

## Active Transportation

The Kimball Junction area includes infrastructure to enable people to walk and bicycle within and to and from the area (see Figure 5). Along SR-224, buffered multi-use trails, approximately eight feet wide, are included on the east side of the road from Ute Boulevard south through Kimball Junction area and extends nearly to Kearns Boulevard with multiple connections to the other regional trails. On the west side of SR-224, a similar multi-use

trail buffered by landscaping from the roadway runs continuously throughout the Kimball Junction area. To the north, this trail provides connections to the active transportation bridge crossing I-80 as well as trails paralleling both sides of I-80 towards the east and west. South of Kimball Junction, the multi-use trail extends to Bear Hollow Drive and provides access to unpaved recreational trails on the west side of Kimball Junction.


**Figure 5: Existing Active Transportation Facilities**

Intersection crossings for the multi-use trails in the Kimball Junction area are typically provided via people-actuated crosswalks at existing traffic signals. However, several grade-separated crossings are also provided in the study area. As mentioned prior, a non-motorized bridge crosses I-80 approximately 800 feet west of the Kimball Junction SPUI. This bridge provides a connection from the retail and commercial space on the south side of I-80 to the neighborhoods on the north side of I-80 and Rasmussen Road. An undercrossing of I-80 also exists approximately one-half mile east of the SPUI. Along SR-224, an undercrossing of the highway is located approximately 200 feet south of the Olympic Boulevard intersection which connected trails along Bitner Road to Highland Road adjacent to the Swaner Nature Preserve. This provides for a connection between the retail and residential uses on the south side of the Redstone Center to the trails and open space on the west side of SR-224. These crossings help facilitate safe movements for people bicycling and walking across the major highways within the study area. However, they can also require out of direction travel for people which could result in lower use compared to the at-grade crosswalks at Ute Boulevard or Olympic Parkway or along SR-224 crossing the SPUI.

Within the study area, Summit Bike Share provides short term bicycle rental at several stations in Kimball Junction along with others in the Canyons area, Park City, and other locations in the Basin. In Kimball Junction, bicycle rental stations are included by the Basin Recreation Field House and the Newpark Plaza on the east side of SR-224. On the westside of SR-224, bicycle rental stations are located at the Outlets, along Landmark Drive, and at the Kimball Junction Transit Center. All Summit Bike Share bikes are electric bikes with single-ride fares of $3.50 for a 30-minute ride and monthly and annual memberships are available. Due to the amount of snowfall received in the Park City area, bicycles are typically available from late spring to late fall and are removed during the winter months for safety and to preserve the equipment.

During winter months, snowfall can cause inaccessible conditions for the multi-use trails and sidewalks. Snow is typically plowed from the roads in the area onto the shoulders and adjacent landscaping. This can include onto sidewalks which can discourage use. Snow is typically cleared from sidewalks following the removal of snow from all streets in the area.

Pedestrian and bicycle data crossing data was collected and synthesized for the SR-224/Ute Boulevard and SR-224/Olympic Parkway intersections as well as the SR-224 undercrossing south of Olympic Parkway. The data was a mixture of the following:

- AM and PM peak hour pedestrian crossing data from the January 2021 intersection turning movement volume counts
- Pedestrian push button data from ATSPM online database
- Daytime pedestrian and bicycle counts at both signals and the undercrossing from October 2022
- A seven-month count summary of the SR-224 undercrossing from 2016

Comparing daytime and peak hour count data to corresponding daily ATSPM push button data at Ute Boulevard and Olympic Parkway, an estimate of summer daily pedestrian crossings at both signals was developed. It should be noted that this method counted cyclists riding through intersection crosswalks as pedestrians. Then, the daytime October 2022 pedestrian and bicycle counts at the undercrossing were factored to a summer daily volume using the seven-month count data from 2016 (see Figure 6).

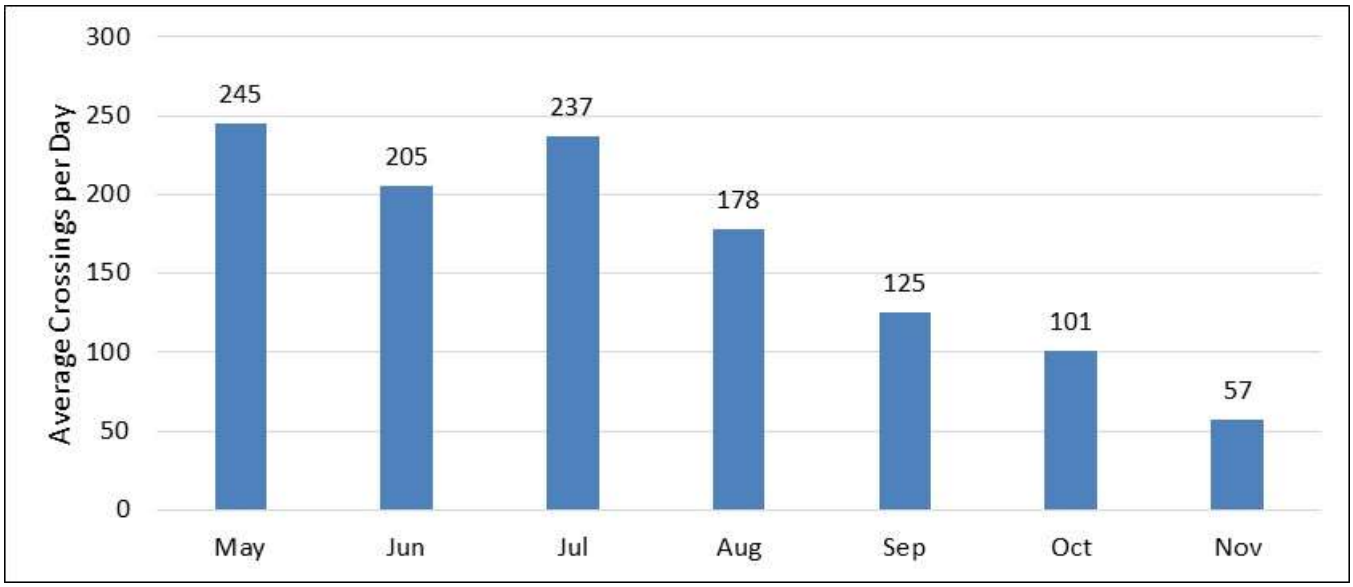



**Figure 6: Seven-month Count Summary of SR-224 Undercrossing (2016)**

Table 9 summarizes the daily volume estimate for each location. The SR-224 undercrossing experiences the highest estimated daily usage at nearly 600 crossings per day. The Ute Boulevard intersection has consistent usage whereas the Olympic Parkway intersection sees the fewest crossings. Additionally, east-west crossings comprise 80 percent of total crossings at the Ute Boulevard intersection but only 25 percent of total crossings at the Olympic Parkway. Both these patterns are likely due to its proximity to the SR-224 undercrossing to Olympic Parkway and fewer developed destinations on the west side of SR-224 by Olympic Parkway.

**Table 9: SR-224 Intersection and Undercrossing Volume Summary**

| Location | Metric | Summer Volume Estimate | Percent East-West Crossings | East-West Crossings |
|---|---|---|---|---|
| Ute Boulevard Intersection | Daily Pedestrian Crossings (all directions)[1] | 250 | 80% | 200 |
| Olympic Parkway Intersection | Daily Pedestrian Crossings (all directions) [1] | 50 | 25% | 15 |
| SR-224 Undercrossing south of Olympic Parkway | Daily Pedestrian and Bicycle Crossings (east-west) | 580 | 100% | 580 |

1. Cyclists riding on the sidewalk and crosswalk counted as pedestrians

## Safety

Crash analysis was conducted with the most recently available three years of crash data (2019-2021) from the UDOT Traffic & Safety Division for roadways in the vicinity of Kimball Junction. This included SR-224 from Rasmussen to Olympic Parkway and the I-80 on/off ramps. There were approximately 215 total crashes over the three-year period, with one fatal crash, and eight serious injury crashes. There were two crashes involving a pedestrian and zero crashes involving cyclists. The two pedestrian-involved crashes accounted for the one fatal crash and one of the serious injury crashes in the analysis area. Crashes at the three signalized intersections accounted for 158, or nearly 75 percent, of the total crashes.

**Table 10: Crash Summary 2019-2021**

| Year | Total Crashes | Fatal | Serious Injury | Pedestrian-involved | Bicycle-Involved |
|---|---|---|---|---|---|
| 2019 | 74 | 0 | 2 | 0 | 0 |
| 2020 | 67 | 0 | 1 | 0 | 0 |
| 2021 | 74 | 1 | 5 | 2 | 0 |
| **Total** | **215** | **1** | **16** | **2** | **0** |

For the last several years, UDOT has focused on reducing statewide fatal and serious injury crashes. There was one fatal crash and eight serious injury crashes within the analysis area for the three-year period 2019 to 2021. As mentioned, the one fatal crash in the analysis area involved a pedestrian. A vehicle on SR-224 ran the red light at Ute Boulevard and collided with other vehicles as well as a pedestrian standing on the raised median between northbound and southbound lanes.

Of the eight serious injury crashes, four occurred at the SR-224/Ute Boulevard intersection, one occurred at the SR-224/Olympic Parkway intersection and three on SR-224 south of Olympic Parkway. Five of the eight serious injury crashes were angle crashes. The serious injury crash involving a pedestrian occurred at the SR-224/Ute Boulevard intersection when a vehicle turning right collided with a pedestrian entering the crosswalk.

Figure 7 through Figure 9 present crash diagrams for the three signals in the analysis area. The diagrams label each crash by the year the crash occurred and indicate the direction and movements of the vehicles involved. Several patterns are evident from the diagrams. First, at the I-80 interchange SPUI, there are frequent rear-end collisions at the eastbound off-ramp. Rear-end crashes at an off-ramp are usually correlated with ramp congestion which matches observation and traffic data at this location.

Second, there are frequent angle crashes at the SR-224/Ute Boulevard intersection particularly involving southbound vehicles turning left onto Ute Boulevard colliding with northbound through vehicles on SR-224. Roadways with heavy left-turn volumes and opposing through volumes tend to see high amounts of left-turn crashes, especially when permitted left-turn signal phasing is present. The SR-224/Ute Boulevard and SR-224/Olympic Parkway intersections both operate with protected-permitted left-turn phasing for left turns from SR-224. Lastly, there are frequent rear-end collisions on northbound SR-224 at both Ute Boulevard and Olympic Parkway. Again, this is likely a reflection of the congestion experienced on SR-224 at these signals.

UDOT currently has a planned project in 2025 to install dual northbound/southbound left-turn lanes on SR-224 at Ute Boulevard. These left-turn lanes will add capacity but also convert the phasing to protected only. The protected-only phasing is likely to help mitigate the strong pattern of angle crashes at the intersection.

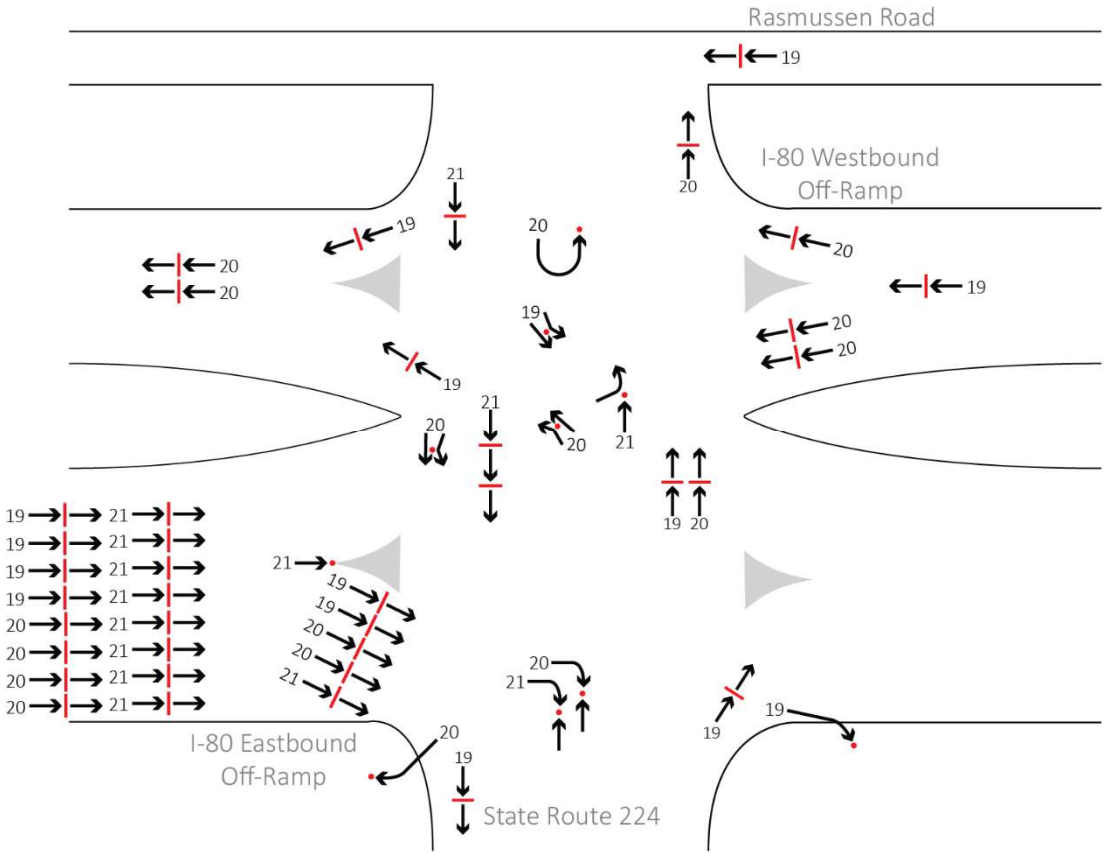



**Figure 7: SR-224/I-80 SPUI and SR-224/Rasmussen Road Crash Diagram**

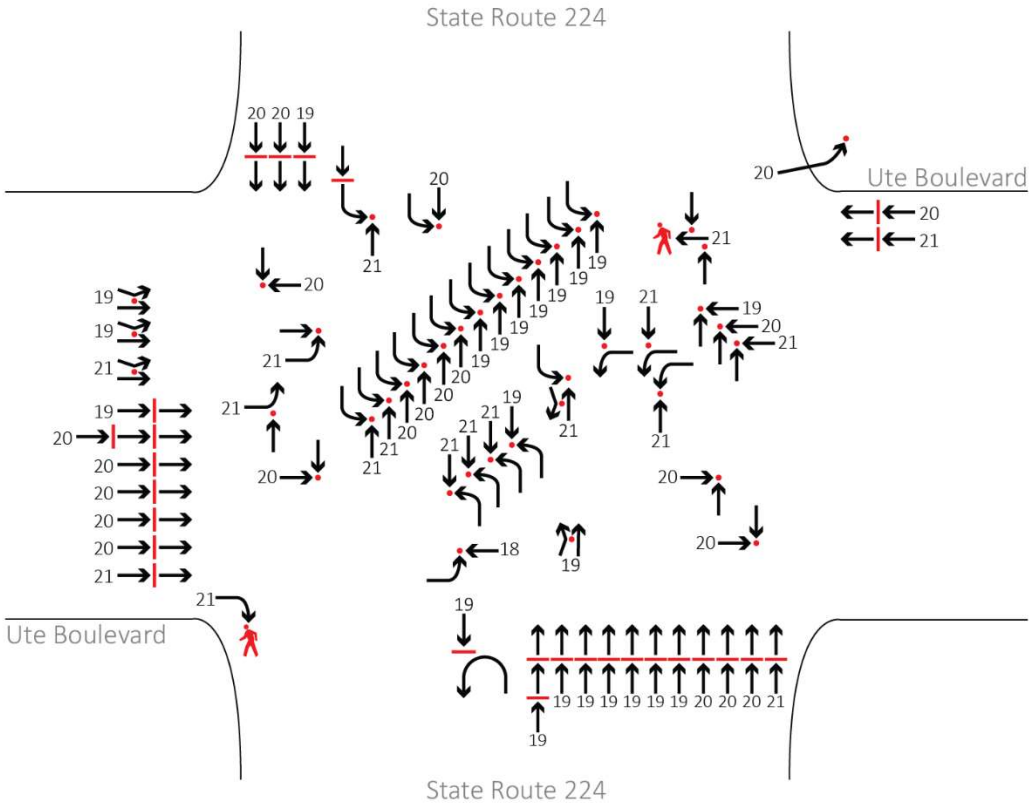



**Figure 8: SR-224/Ute Boulevard Crash Diagram**

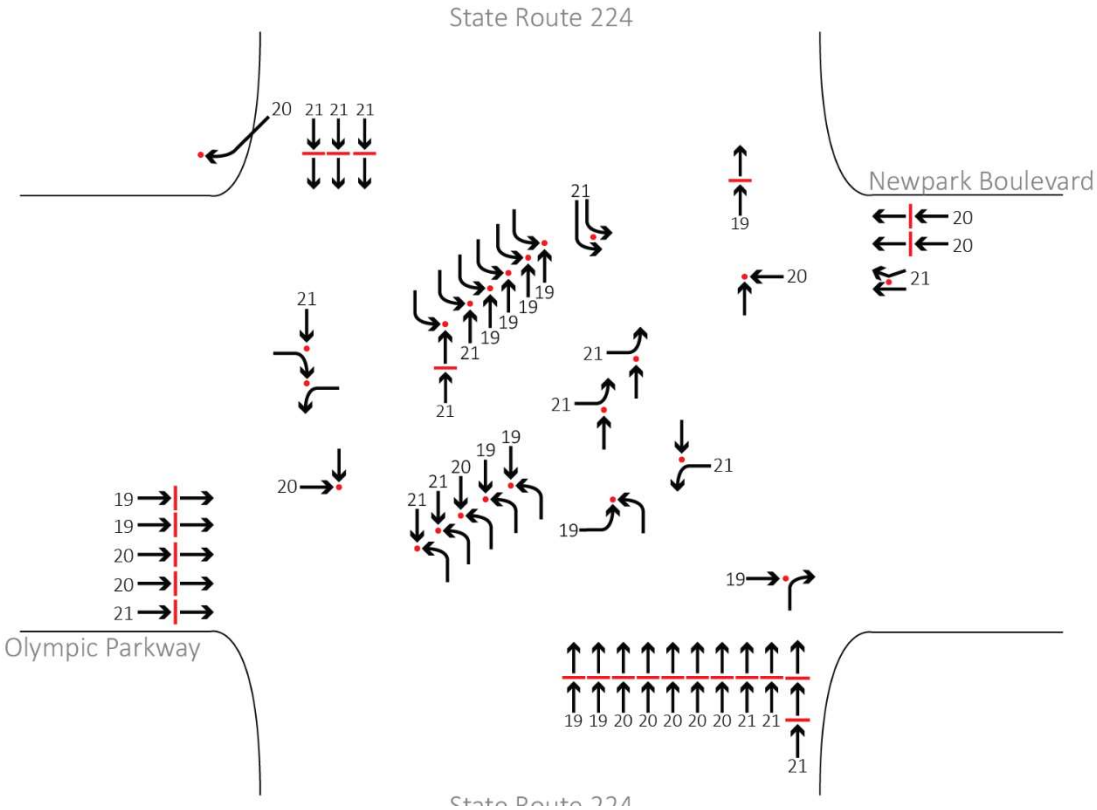



**Figure 9: SR-224/Olympic Parkway Crash Diagram**

# 2050 NO ACTION TRAFFIC CONDITIONS

## Travel Demand Modeling

The Summit County/Wasatch County travel demand model (v1 - 2020-06-10) (referred to as the Summit County model in this document) was used for the purposes of generating 2050 no action traffic forecasts for use in the VISSIM traffic simulation model. The model is a traditional four-step travel demand model consisting of trip generation, trip distribution, model split, and trip assignment.

This version of the Summit County model incorporated the model refinements to socioeconomic (SE) data and network structure identified through the Kimball Junction Area Plan. As such, no other model refinements were conducted. The following sections document the modeling methods and forecasts.

### Model Results

#### 2050 No Action Forecasts

2050 no action conditions were modeled using the revised Kimball Junction model. Figure 10 shows the 2050 Kimball Junction no action forecasts.

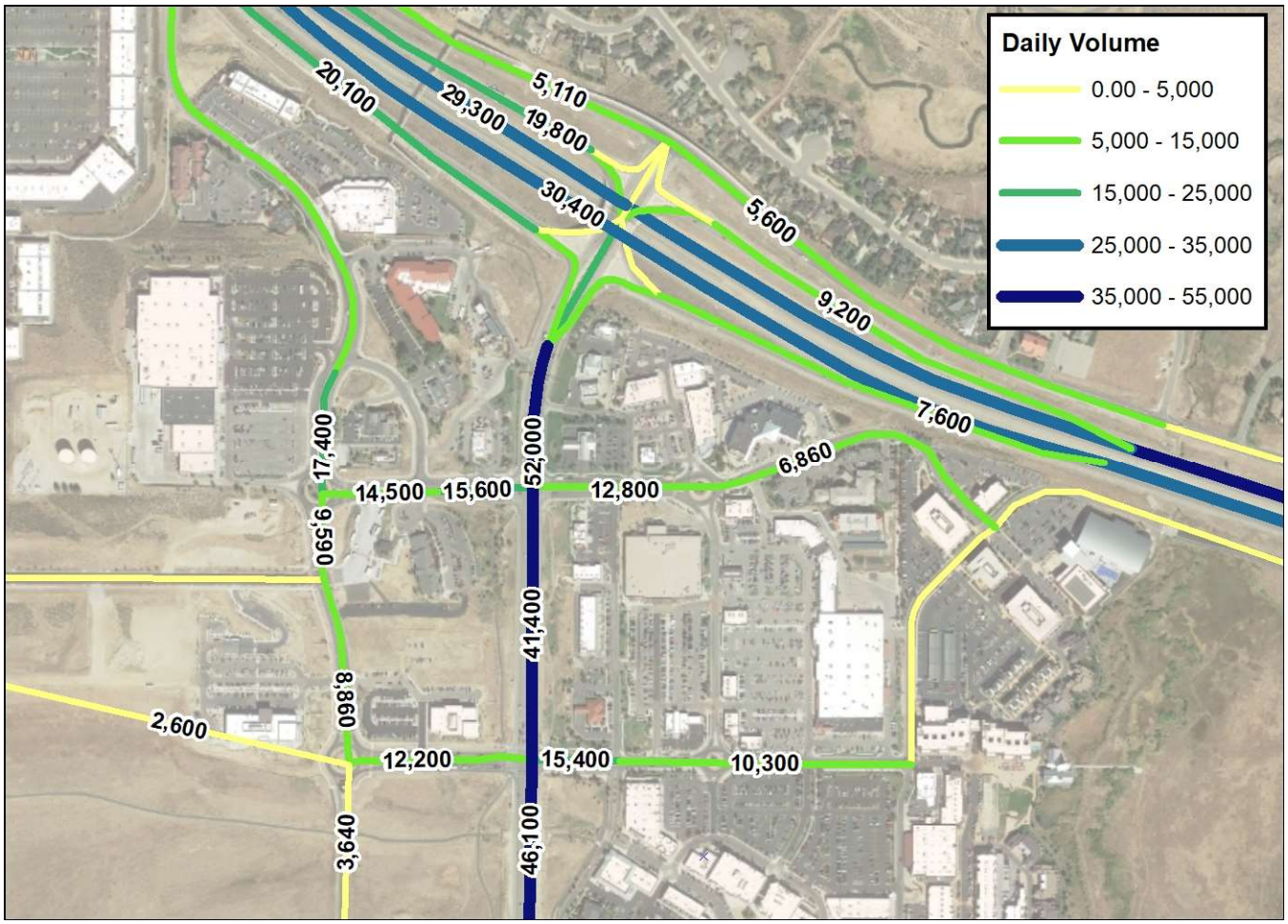
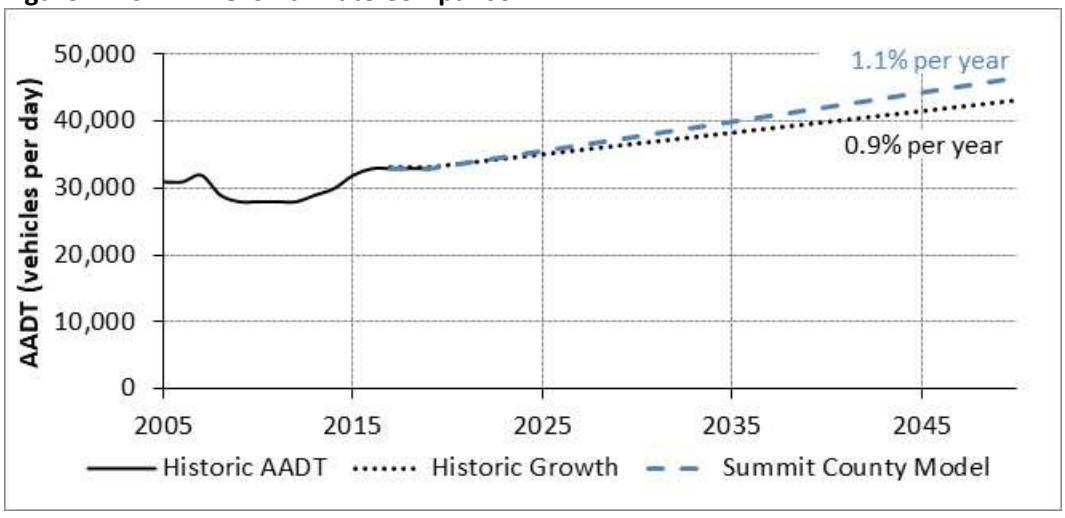



**Figure 10: 2050 No Action Modeled Volumes**

Figure 11 compares the forecasted growth on SR-224 from the Summit County model with historic traffic volumes. As seen in Figure 11, the annual growth rate from the Summit County model (1.1% per year) is similar to the historic growth rate (0.9% per year). This indicates that the forecasts are reasonably in line with historic trends. Historic growth trends and traffic modeling for the 2050 no action condition forecasts an average daily volume of over 40,000 vehicles per day, or about a 30%-40% increase over existing conditions.

**Figure 11: SR-224 Growth Rate Comparison**



## Traffic Data

The results from the Summit County travel demand model were used to develop the 2050 no action traffic volume forecasts for the study area. As described previously, the travel demand model accounts for traffic volumes growth attributed to changes in both regional land uses as well as local land uses. The future 2050 no action traffic volumes are shown in Figure 12 for the weekday AM peak hour and Figure 13 for the weekday PM peak hour.

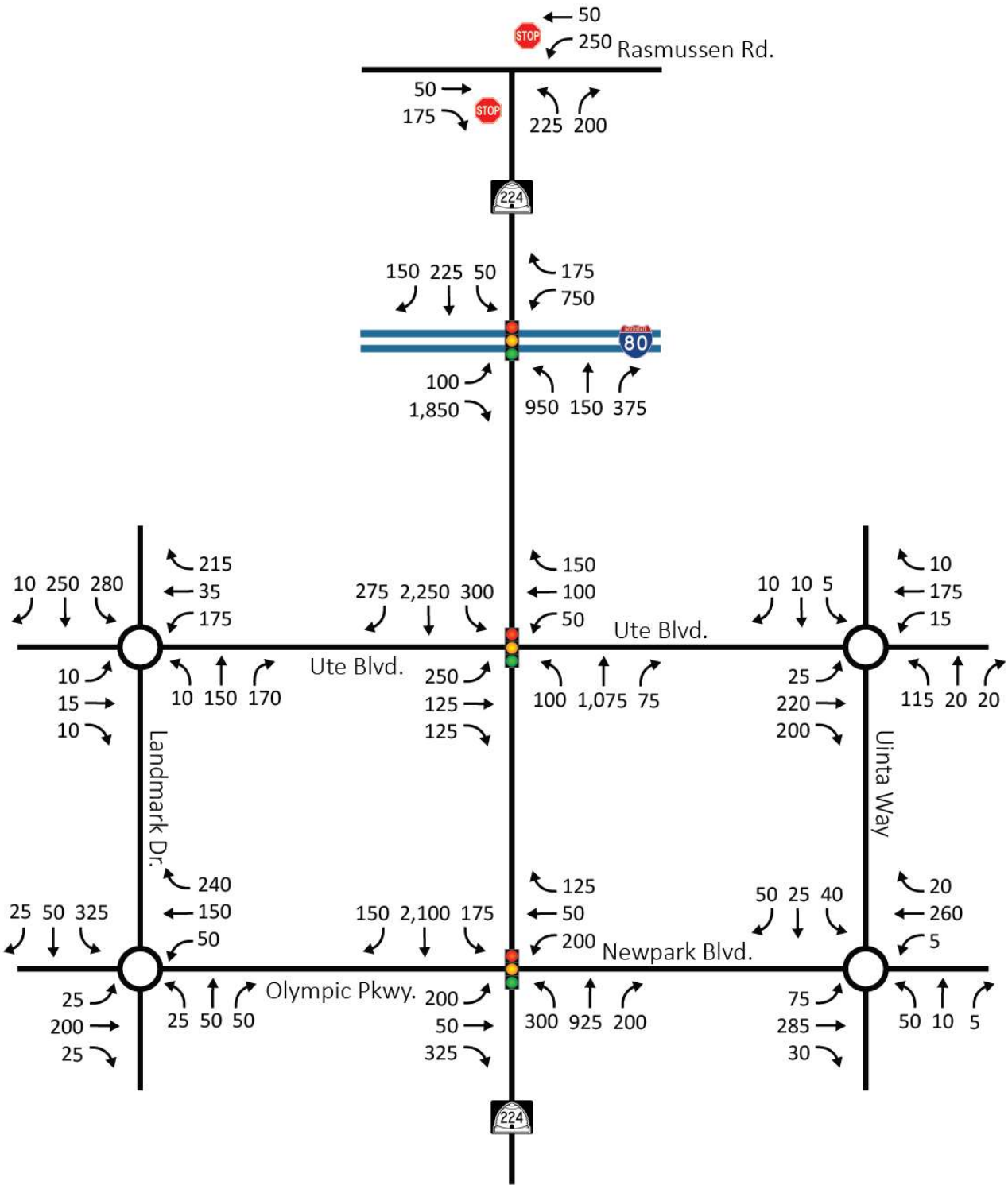



**Figure 12: No Action (2050) Weekday AM Peak Hour Traffic Volumes**

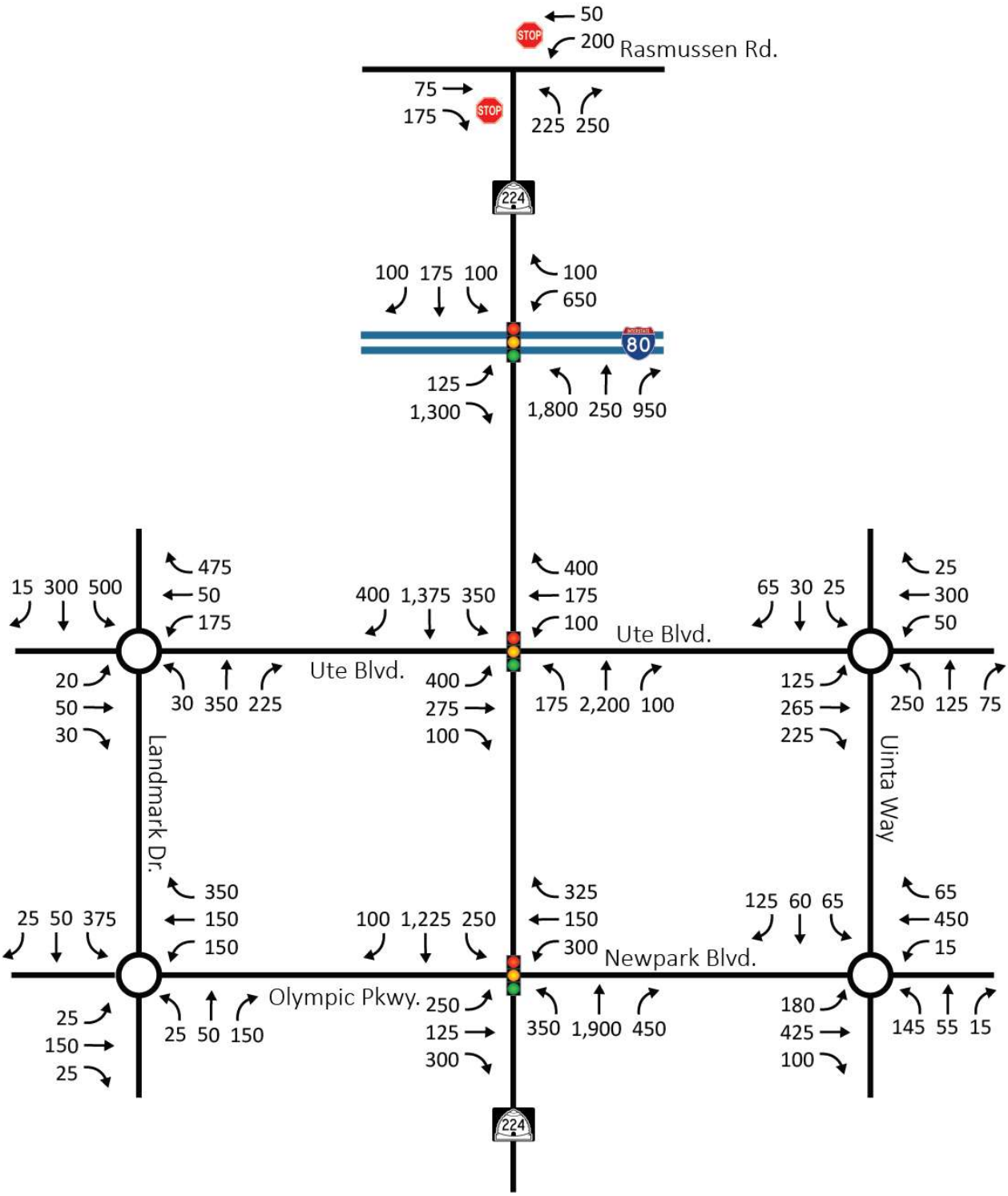



**Figure 13: No Action (2050) Weekday PM Peak Hour Traffic Volumes**

## Traffic Operations

Traffic operations along the corridor were evaluated for the 2050 no action conditions using the same VISSIM microsimulation traffic model which was used for existing conditions. This allows for a comparison between the existing and 2050 no action conditions to determine relative changes in traffic operations. Future improvements within the Kimball Junction area were included in the model to accurately represent 2050 conditions. This included installation of northbound and southbound dual left-turn lanes at the SR-224/Ute Boulevard intersection, which are programmed for construction in 2025. Additionally, the planned SR-224 BRT project was included as per the preferred alternative in the SR-224 environmental study. The elements of the BRT project that affect the study area include converting Route 10 to the BRT, modifying the Route 10 circulation pattern through the Kimball Junction Transit Center, adding transit-only lanes on the outside of SR-224 south of Olympic Parkway, adding dual northbound left-turn lanes and a transit-only westbound right-turn lane to the SR-224/Olympic Parkway intersection. Finally, signal timing cycle lengths, phase lengths, and offsets along the corridor were optimized to efficiently meet the changes in traffic demand during the weekday AM and PM peak hours.

### Traffic Operations

Vehicle level of service (LOS) was calculated for each of the intersections using the intersection node data. Node data was collected in 15-minute increments to determine average vehicle delay at each intersection during the peak hour of each model. The peak hour of the AM model was 8:00 AM – 9:00 AM and the peak hour of the PM model was 4:00 PM – 5:00 PM. Using the average vehicle delay, level of service was determined from the HCM thresholds for unsignalized and signal-controlled intersections.

Table 11 summarizes the results of the existing conditions traffic operations. Results from the existing traffic operations analysis are also included for comparison. As mentioned previously, unsignalized intersection LOS is defined on a separate scale than signalized intersections and is reported for the worst-performing approach rather than the intersection as a whole. Additionally, for this study, when intersections exceed the LOS F threshold by a significant margin, the average delay is reported as >100 seconds per vehicle for signalized intersections and >80 seconds per vehicle for unsignalized intersections.

As shown in Table 11, overall conditions worsen from existing conditions with the increase in traffic volumes in the area. Every signalized intersection operates at LOS E or LOS F in at least one peak hour. When signalized intersections show better than LOS E or LOS F, it is likely due to upstream bottlenecks metering the traffic flow as discussed previously. As mentioned with existing conditions, due to the overcapacity conditions occurring at Olympic Parkway, vehicles at the intersections to the north are being artificially metered and are not serving the actual demand volumes. By remediating the traffic issues solely at the Olympic Parkway intersection, it is likely that the congestion points would be moved to either the Ute Boulevard or I-80 SPUI.

Traffic performance at the unsignalized intersections is generally acceptable other than the delay for the northbound approach at the Ute Boulevard/Landmark Drive roundabout worsening from existing conditions. Again, the heavy southbound flow into the roundabout and queues along Ute Boulevard from the SR-224 signal are the key contributors to congestion at this location.

**Table 11: Existing and 2050 No Action Peak Hour Intersection Vehicle Delay and LOS**

| Location | Control Type | Existing Conditions | | 2050 No Action Conditions | |
|---|---|---|---|---|---|
| | | Vehicle Delay (sec / veh) | LOS (Worst Approach) | Vehicle Delay (sec / veh) | LOS (Worst Approach) |
| *Weekday AM Peak Hour* | | | | | |
| SR-224/Rasmussen Rd | Stop-Controlled | 11 | B (WB) | 14 | B (WB) |
| SR-224/I-80 SPUI | Traffic Signal | >100 | F | >100 | F |
| SR-224/Ute Blvd | Traffic Signal | 29 | C | 37 | D |
| SR-224/Olympic Pkwy | Traffic Signal | 30 | C | 36 | D |
| Ute Blvd/Landmark Dr | Roundabout | 3 | A (NB) | 9 | A (NB) |
| Olympic Pkwy/Landmark Dr | Roundabout | 2 | A (SB) | 6 | A (SB) |
| Ute Blvd/Uinta Way | Roundabout | 3 | A (EB) | 5 | A (EB) |
| Newpark Blvd/Uinta Way | Roundabout | 4 | A (EB) | 3 | A (EB) |
| *Weekday PM Peak Hour* | | | | | |
| SR-224/Rasmussen Rd | Stop-Controlled | 12 | B (WB) | 12 | B (WB) |
| SR-224/I-80 SPUI | Traffic Signal | 25 | C | >100 | F |
| SR-224/Ute Blvd | Traffic Signal | 53 | D | 63 | E |
| SR-224/Olympic Pkwy | Traffic Signal | >100 | F | >100 | F |
| Ute Blvd/Landmark Dr | Roundabout | 56 | F (NB) | >80 | F (NB) |
| Olympic Pkwy/Landmark Dr | Roundabout | 2 | A (WB) | 8 | A (SB) |
| Ute Blvd/Uinta Way | Roundabout | 5 | A (EB) | 16 | C (WB) |
| Newpark Blvd/Uinta Way | Roundabout | 19 | C (SB) | 38 | E (WB) |

## Travel Times

Using the same travel time segments and parameters in the existing peak hour VISSIM models, vehicular travel times for the 2050 no action were analyzed. Table 12 summarizes the AM and PM peak hour travel times from the VISSIM simulation model. Travel times for 2050 no action nearly double from existing conditions as congestion increases. This is anticipated due to the large increase of vehicles on the northbound approach traveling from the Canyons and Park City to I-80 as well as increases anticipated on the east and west side of SR-224 at Kimball Junction.

**Table 12: Existing and 2050 No Action AM and PM Peak Hour Travel Times**

| Travel Time Segment | | Time Period | VISSIM Average Travel Time (min) | |
|---|---|---|---|---|
| From | To | | Existing | 2050 No Action |
| I-80 EB off ramp Gore | SB SR-224 approx 1,100 ft south of Olympic Pkwy | AM Peak Hour | 5:30 | 11:00 |
| NB SR-224 at Canyons Resort Drive | SR-224/I-80 SPUI | PM Peak Hour | 12:00 | 23:30 |

## Queues

The weekday AM and PM peak hour vehicle queues were analyzed for the 2050 no action scenario. The queues were analyzed using the same methodology as was used for the existing weekday AM and PM peak hour conditions. Average and 95$^{th}$ percentile vehicle queues are reported in Table 13. The existing weekday AM and PM peak hour queues are also included to provide a comparison of the relative change expected between existing and 2050 no action conditions.

For 2050 no action conditions, the AM peak hour eastbound off ramp queues extend on the I-80 mainline well past the Jeremy Ranch interchange. The PM peak hour queues extend past Canyons Resort Drive. The PM average queue and 95$^{th}$ percentile queue lengths are similar because the PM peak hour queues show no dissipation during the PM peak hour.

**Table 13: Existing and 2050 No Action AM and PM Peak Hour Vehicle Queues**

| | Existing | | 2050 No Action | |
|---|---|---|---|---|
| | Average Queue (ft) | 95$^{th}$ Percentile Queue (ft) | Average Queue (ft) | 95$^{th}$ Percentile Queue (ft) |
| **AM Peak Hour** | | | | |
| I-80 eastbound off ramp queue | 1,900 ft (0.4 mi) | 2,600 ft (0.5 mi) | 12,300 ft (2.3 mi) | 19,400 ft (3.7 mi) |
| **PM Peak Hour** | | | | |
| S.R. 224 northbound queue at Olympic Parkway | 8,100 ft (1.5 mi) | 9,600 ft (1.8 mi) | 12,400 ft (2.4 mi) | 12,400 ft (2.4 mi) |

## Transit

Within the Kimball Junction Area, transit service is expected to maintain an important role in moving people to and through the area. Existing levels of transit service in the Kimball Junction Area are anticipated to be maintained or expanded in order to provide frequent and reliable service connecting the surrounding area. As previously mentioned, the SR-224 BRT is planned to be constructed within the next five years. Successful implementation of this project could lead to a higher percentage of users choosing transit as an option to navigate throughout the SR-224 corridor, including the Kimball Junction Area.

## Active Transportation

With the planned development of vacant land uses in the Kimball Junction Area, it is likely that the area could become more walkable as potential destinations will be located closer together and there will be a higher density of complementary land uses. Similar to existing conditions, it will be important to determine where the desire paths are for people walking and to make sure these are constructed and maintained throughout the year to create a well-connected network for people walking and bicycling in the neighborhood on both sides of SR-224.

# CONCLUSIONS

This memorandum documents traffic conditions for existing and the 2050 no action scenario to support the Kimball Junction Environmental Study. The conclusions of the analysis are:

## Traffic

Existing traffic conditions exhibit traffic operational concerns during the winter AM and PM peak hours. Several of the study intersections operate at LOS E or LOS F which indicates heavy vehicle delays with long queues and extended travel times. Traffic volume growth is expected along the SR-224 corridor and on both sides of the Kimball Junction neighborhood by 2050. In the 2050 no action conditions, severe congestion is anticipated to occur, particularly for the I-80 eastbound off ramp during the AM peak hour and the northbound direction of SR-224 during the weekday PM peak hour. Average vehicle delay, vehicle travel times, and queue lengths are all anticipated to grow from existing to 2050 no action conditions. Travel times during peak hours for key movements are anticipated to nearly double from existing conditions for vehicles traveling northbound on SR-224 to I-80.

## Transit

Transit service within the Kimball Junction area is concentrated around the Kimball Junction Transit Center on the west side of SR-224. This center is served by multiple, local fixed routes and on-demand micro-transit service. A regional connection to Salt Lake City is also available. Within five years, the Route 10 is expected to be converted into a BRT with the construction of transit-only lanes on the sides of SR-224. As vehicle volumes and travel times within the Kimball Junction area and along the SR-224 corridor are anticipated to increase by the 2050 horizon year, it is important to find alternative ways to move people more efficiently using less space throughout the basin.

## Active Transportation

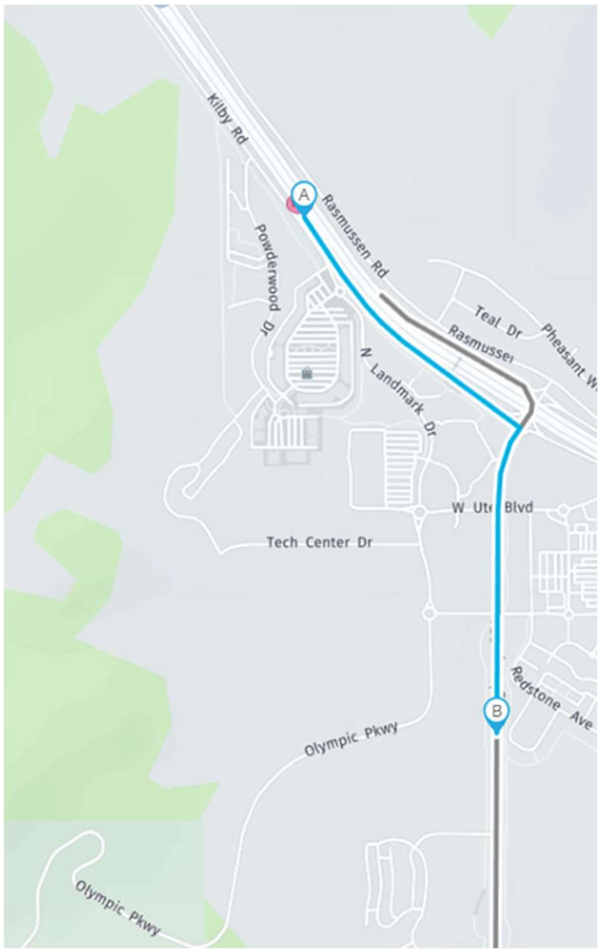
The Kimball Junction area currently has a robust network of multiuse paths on both sides of SR-224 providing access throughout the basin as well as to multiple recreational opportunities. Within the Kimball Junction area, there are two grade separated crossings of I-80 as well as one grade-separated crossing of SR-224 and two signalized at-grade pedestrian crosswalks. As the Kimball Junction area continues to develop and densify, it is likely that walking and bicycling to different uses could become a more attractive transportation option. There will be increased demand to cross SR-224 by active transportation users.

# APPENDIX A: ANALYSIS TIMEFRAME CONTEXTUAL DATA

The following represents data used to identify the analysis timeframe for the study. It is a compilation of travel time, flow, and speed data obtained from the UDOT ClearGuide and PeMS platforms.

Clearguide travel time and speed data were gathered for a southbound route and northbound route as shown in Figure A-1. Vehicular travel times and speeds were analyzed for the time period from April 1, 2021 to April 1, 2022. Figures A-2 and A-3 show the average southbound travel times during the AM peak period (7:00 AM to 10:00 AM) for a 12-month period and a four-month winter time period. Figure A-4 illustrates the relationship between travel times and flow rates for the four-month winter time period. The four-month winter 85$^{th}$ percentile travel time is noted in Figure A-3 and A-4. Figures A-5 to A-8 summarize daily speed contours for each winter month. Figures A-9 through A-15 present similar information for the northbound route.

Southbound Route




Northbound Route

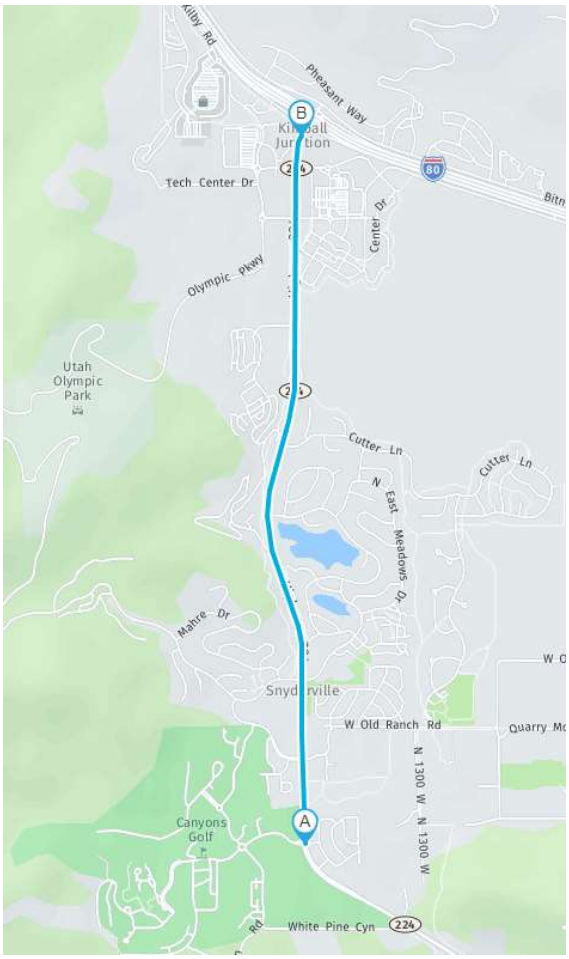



Figure A-1: ClearGuide Travel Time Routes

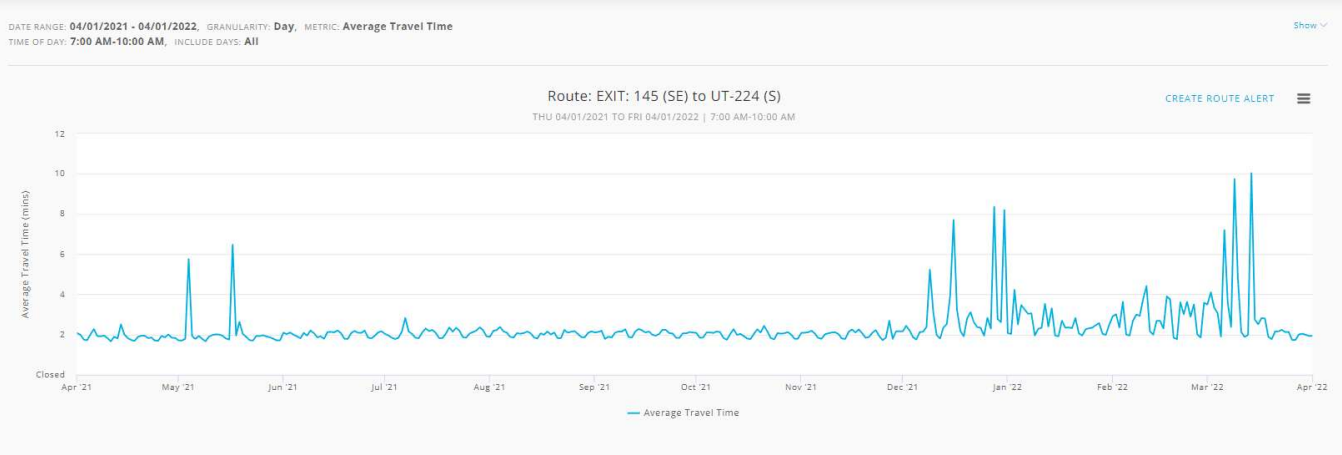



Figure A-2: Southbound AM (7:00-10:00 AM) Average Travel Times April 1, 2021 to April 1, 2022

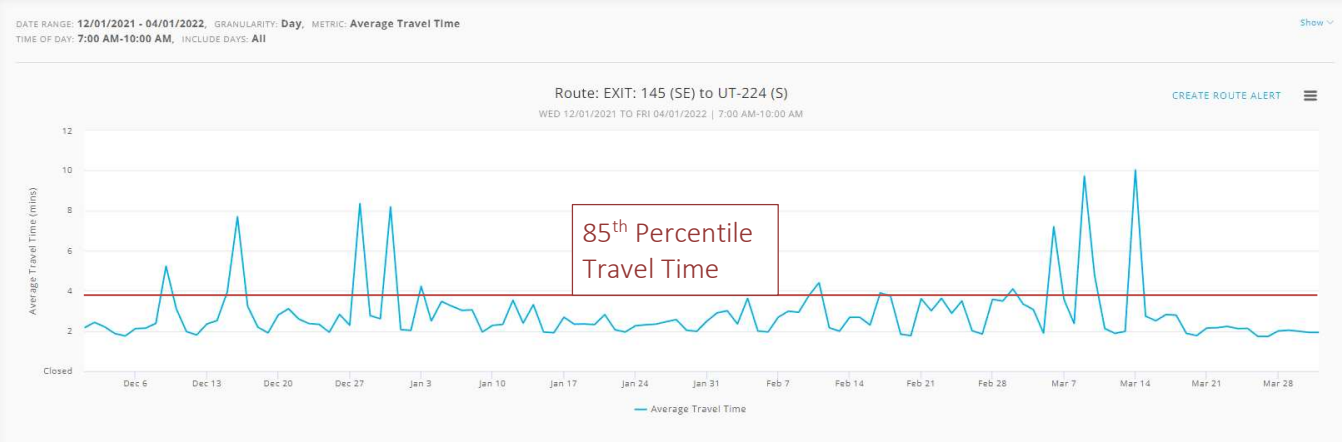



Figure A-3: Southbound AM (7:00-10:00 AM) Average Travel Times Dec 1, 2021 to April 1, 2022

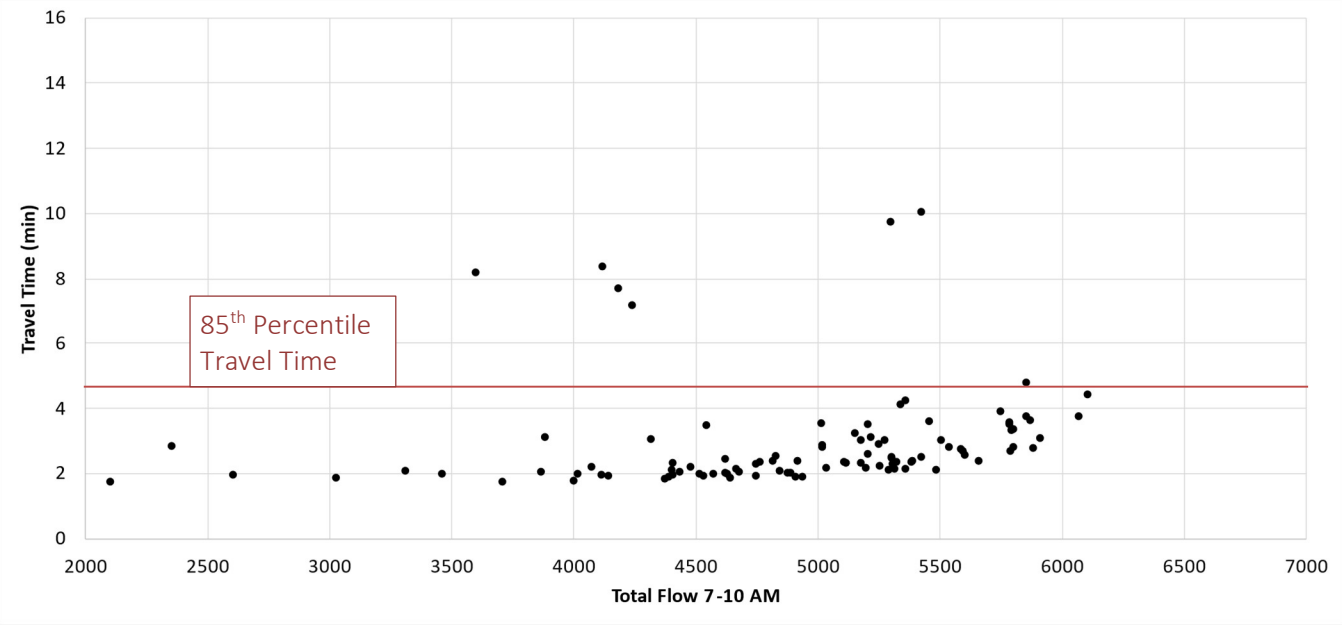



Figure A-4: Southbound AM (7:00-10:00 AM) Average Travel Time Versus Total Flow Dec 1, 2021 to April 1, 2022


Figure A-5: Southbound Daily Speed Contours December 2021

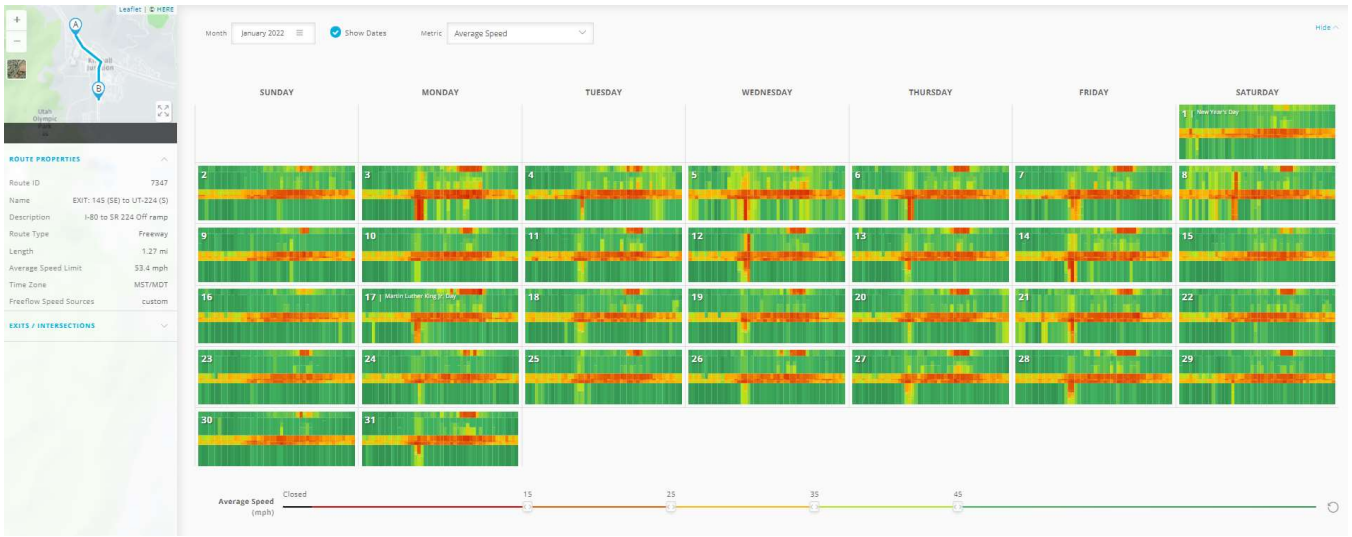



Figure A-6: Southbound Daily Speed Contours January 2022


Figure A-7: Southbound Daily Speed Contours February 2022


Figure A-8: Southbound Daily Speed Contours March 2022

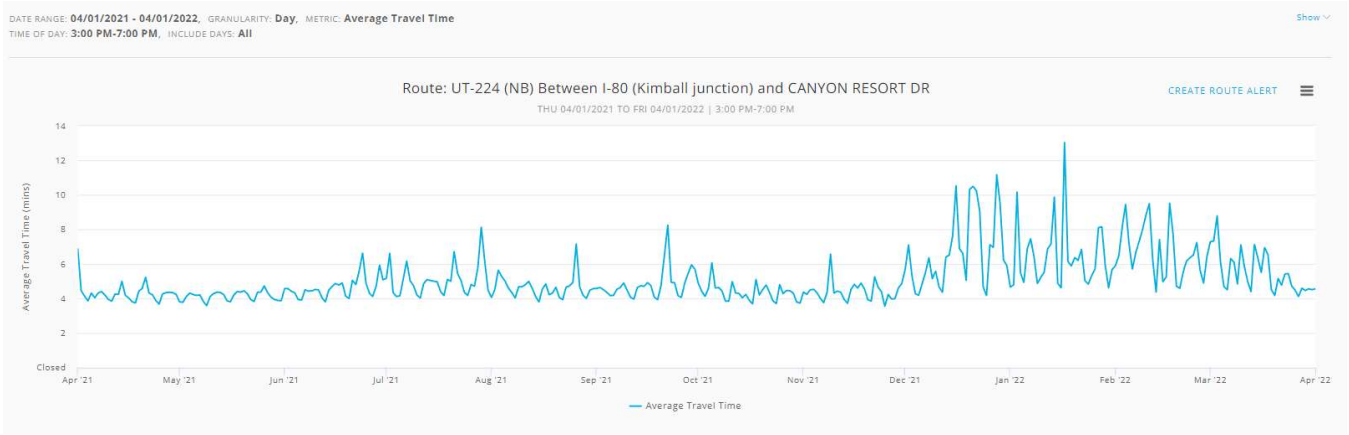



Figure A-9: Northbound AM (3:00-7:00 PM) Average Travel Times April 1, 2021 to April 1, 2022

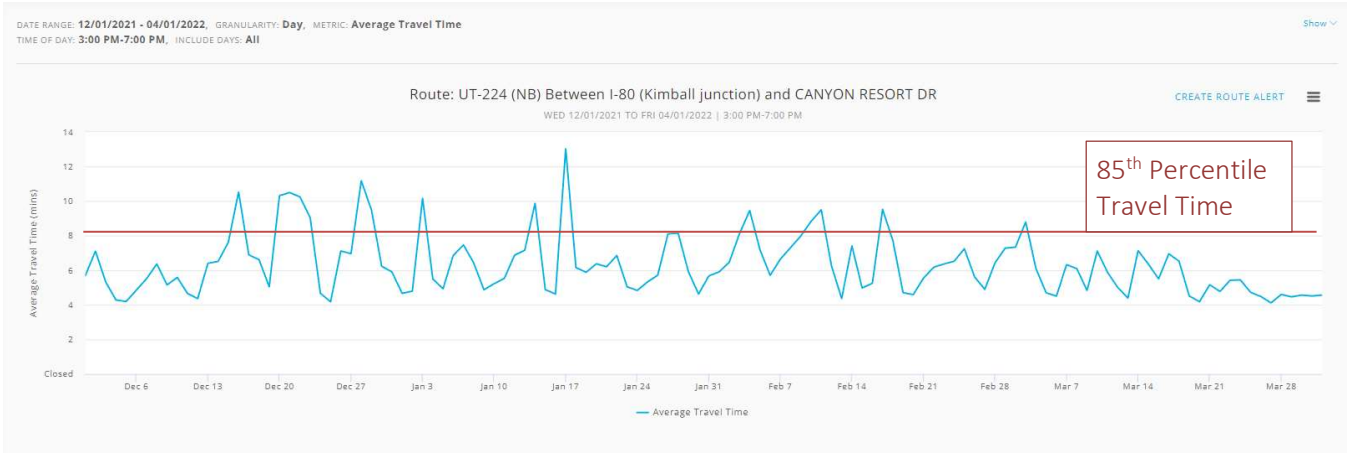



Figure A-10: Northbound AM (3:00-7:00 PM) Average Travel Times Dec 1, 2021 to April 1, 2022

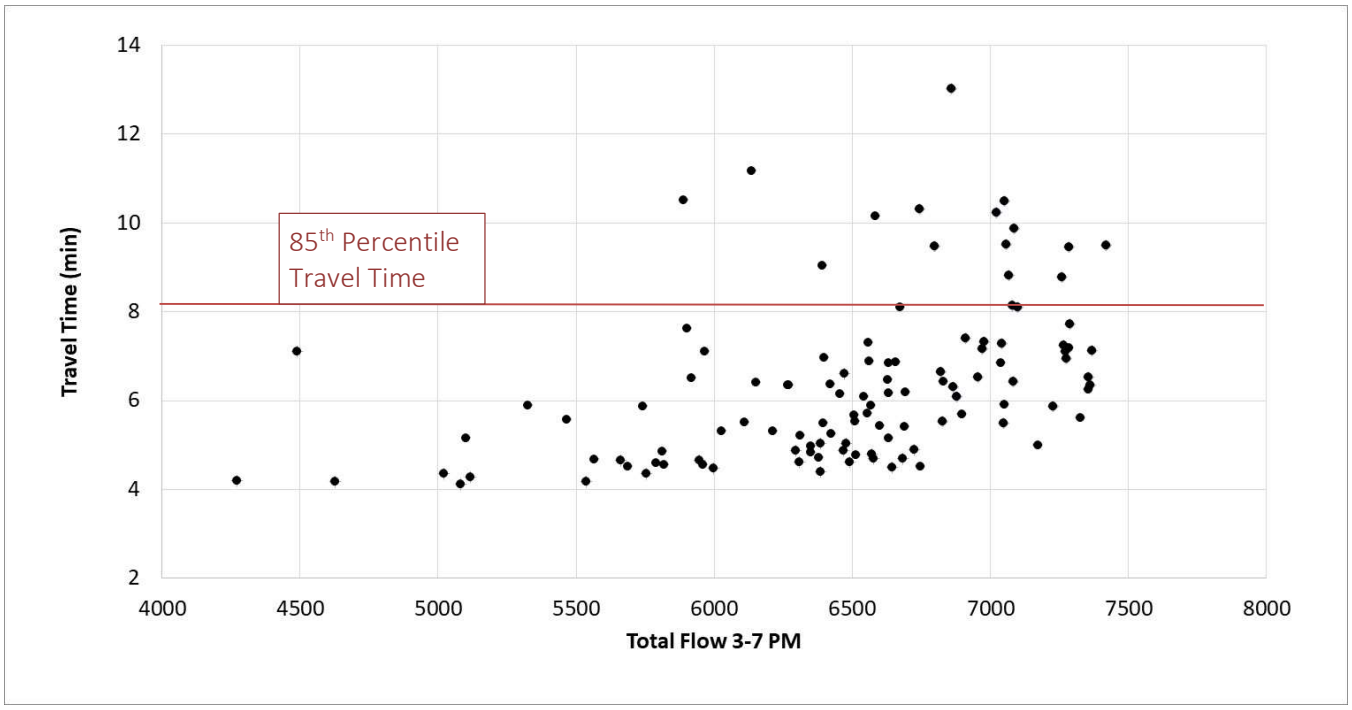



Figure A-11: Northbound AM (3:00-7:00 PM) Average Travel Time Versus Total Flow Dec 1, 2021 to April 1, 2022

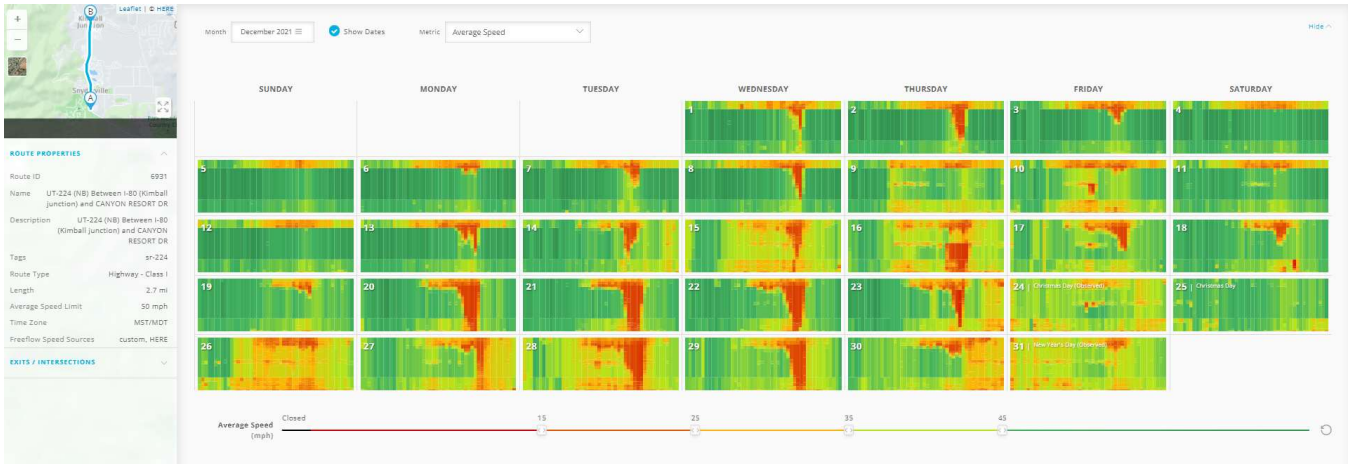



Figure A-12: Northbound Daily Speed Contours December 2021


Figure A-13: Northbound Daily Speed Contours January 2022

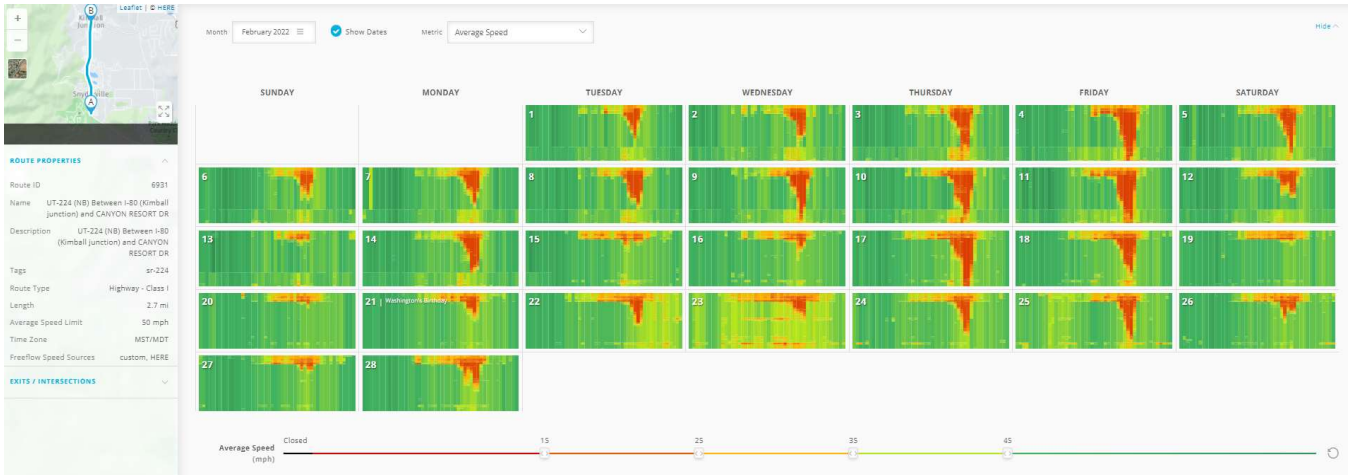



Figure A-14: Northbound Daily Speed Contours February 2022

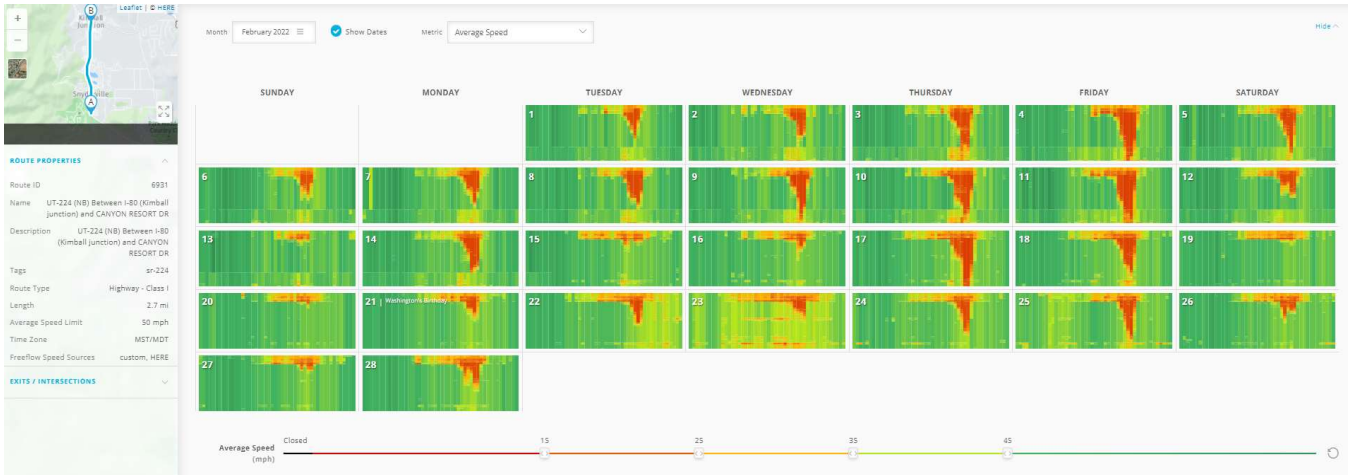



Figure A-15: Northbound Daily Speed Contours March 2022