FEHR PEERS

MEMORANDUM

Date: November 2021

To: H. W. Lochner
Salt Lake City Transportation Division

From: Fehr & Peers

Subject: 900 South Reconstruction Project: Traffic Assessment

UT20-2230

Introduction

The purpose of this memorandum is to document the traffic analysis conducted as part of the 900 South Reconstruction project in Salt Lake City, Utah. The project encompasses streetscape, roadway, and subsurface utility improvements along the 900 South corridor. An important component of the 900 South Reconstruction project is the construction of the 9 Line Trail, which will provide a pleasant, safe experience for people walking and bicycling along the corridor. This memorandum documents the Existing (2020) and the Opening Year Build (2023) conditions, analyzing the weekday PM peak hour (capturing commuter peak traffic) and the Saturday mid-day peak hour (capturing retail-oriented traffic).

Executive Summary

Fehr & Peers performed a traffic analysis for the proposed reconstruction of the 900 South corridor from 900 West to 1000 East, evaluating 24 study intersections, 13 of which are signalized. Traffic volumes were collected during the COVID-19 pandemic, when traffic around the state was observed to be lower than usual. Fehr & Peers performed a comprehensive evaluation to compare the August 2020 ("Existing") traffic counts to available historical data, indicating a need to adjust the weekday PM peak hour traffic counts; 2020 counts were multiplied by factors in the range of 1.16-1.37 to account for pandemic-related anomalies across the study area. The comparison revealed that the

COVID conditions had minimal effect on traffic conditions on 900 South for the Saturday mid-day peak hour, and no adjustments were made to the Saturday traffic counts.

In the Existing (2020) conditions, all study intersections operated at an acceptable Level of Service (LOS)in both weekday PM and Saturday mid-day peak hours.

Fehr & Peers also evaluated the Opening Year Build (2023) conditions to assess the impact of the proposed reconstruction and redesign to traffic operations on the corridor once construction is completed. Fehr & Peers estimated growth in traffic volumes for 2023 using linear annual growth rates based on the Wasatch Front Regional Council (WFRC) travel demand model.

As stated in the *Introduction*, one of the main purposes of the proposed reconstruction is to enhance and extend the 9-Line Trail and provide a pleasant, safe experience for people walking and bicycling along the corridor. Doing so, in some cases along the corridor, leads to reduced vehicle capacity. Understanding this, Fehr & Peers conducted a sensitivity analysis of the proposed reconstruction in the WFRC travel demand model. With a travel lane reduction along 900 South (4 or 5 lanes, to 3), the model projected shift of traffic to other routes and showed traffic volumes lower than existing conditions. Through discussions with Salt Lake City, however, Fehr & Peers proceeded with modeling the "worst-case scenario", a very conservative approach that assumed all projected development would be occupied by 2023 and that all projected traffic volumes would stay on 900 South, even with reduced vehicular capacity.

In Opening Year Build (2023) conditions, the analysis indicated that reduced capacity along 900 South causes eastbound and westbound congestion originating at the West Temple / 900 South intersection in the weekday PM peak hour. The eastbound congestion is expected to cause vehicular queues originating at West Temple that occasionally extend past 300 West, causing delays and added travel times in the Central 9th area (between 300 West and West Temple). As the queue is expected to extend past 200 West, where the TRAX line crosses 900 South, Fehr & Peers recommends additional signage and roadway striping to keep the intersection clear. The westbound congestion is expected to cause vehicular queues originating from West Temple that occasionally extend past State Street, causing delays and added travel times between West Temple and 400 East.

It should be noted that the delays and added travel times are likely overstated because they do not account for a change in driver behavior, as drivers traveling on 900 South with no destination along the corridor will potentially choose a different parallel route to travel to avoid congestion caused

by proposed reconstruction, because the reconstruction project will enhance the vehicular capacity at 800 South & West Temple, and because future trips in more mixed-use areas tend to be less automobile-focused. The 900 South project is designed to forward the long-term vision the City and its citizens have chosen, which is a future of many transportation choices; the design and enhanced bus service will encourage more active transportation and transit use.

The reconstruction of 900 South shows minimal impacts to traffic operations in the Saturday mid-day peak hour because there is less traffic on the corridor than the commuter peak, which is the weekday PM peak hour.

Table 1: Level of Service Summary

Intersection			Existing 2020 Background	Opening Year 2023 Build
ID	Location	Period[1]	LOS / Delay (Sec/Veh)[2]	LOS / Delay (Sec/Veh)[2]
1	900 West / 900 South	PM	9 / A	16 / B
		Sat	7 / A	13 / B
2	800 West / 900 South	PM	9 / A	9 / A
		Sat	8 / A	8 / A
3	700 West / 900 South	PM	11 / B	12 / B
		Sat	8 / A	10 / B
4	600 West / 900 South	PM	9 / A	9 / A
		Sat	7 / A	8 / A
5	500 West / 900 South	PM	11 / B	12 / B
		Sat	10 / B	11 / B
6	400 West / 900 South	PM	10 / B	20 / C
		Sat	8 / A	8 / A
7	300 West / 900 South	PM	18 / B	37 / D
		Sat	14 / B	22 / C
8	Washington Street / 900 South	PM	20 / C	**51 / F**
		Sat	10 / B	12 / B
9	200 West / 900 South	PM	14 / B	34 / C
		Sat	9 / A	13 / B
10	Jefferson Street / 900 South	PM	10 / B	**> 100 / F**
		Sat	8 / A	18 / C
11	West Temple / 900 South	PM	38 / D	40 / D
		Sat	20 / C	23 / C

Intersection			Existing 2020 Background	Opening Year 2023 Build
ID	Location	Period[1]	LOS / Delay (Sec/Veh)[2]	LOS / Delay (Sec/Veh)[2]
12	Main Street / 900 South	PM	18 / B	19 / B
		Sat	20 / C	25 / C
13	State Street / 900 South	PM	23 / C	30 / C
		Sat	19 / B	19 / B
14	Edison Street / 900 South	PM	13 / B	**> 100 / F**
		Sat	12 / B	14 / B
15	200 East / 900 South	PM	17 / B	48 / D
		Sat	25 / C	22 / C
16	300 East / 900 South	PM	9 / A	51 / D
		Sat	9 / A	12 / B
17	400 East / 900 South	PM	15 / B	53 / D
		Sat	10 / B	13 / B
18	500 East / 900 South	PM	11 / B	34 / C
		Sat	13 / B	15 / B
19	600 East / 900 South	PM	16 / B	45 / D
		Sat	25 / C	22 / C
20	700 East / 900 South	PM	22 / C	27 / C
		Sat	14 / B	18 / B
21	800 East / 900 South	PM	15 / C	16 / C
		Sat	9 / A	11 / B
22	Windsor Street / 900 South	PM	14 / B	10 / B
		Sat	11 / B	10 / B
23	900 East / 900 South	PM	21 / C	22 / C
		Sat	15 / B	15 / B
24	Lincoln street / 900 South	PM	14 / B	15 / B
		Sat	12 / B	12 / B

Notes
1. PM = Weekday PM Peak Hour, Sat = Saturday Mid-Day Peak Hour
2. Intersection average LOS and delay for signalized intersections, worst movement LOS and delay for unsignalized intersections.

Source: Fehr & Peers.

Background

The 900 South Reconstruction Project

The 900 South Reconstruction project encompasses streetscape, roadway, and subsurface utility improvements along the 900 South corridor from 900 West to 1100 East in Salt Lake City. An important component of the 900 South Reconstruction project is the construction of the 9 Line Trail, which will provide a pleasant, safe experience for people walking and bicycling along the corridor.

Study Intersections

This study analyzes the effects on traffic operations of the proposed reconstruction of 900 South. Impacts are specifically addressed at the following study intersections, noting their existing intersection controls:

1. 900 West / 900 South – Signalized
2. 800 West / 900 South – Side-street Stop
3. 700 West / 900 South – Side-street Stop
4. 600 West / 900 South – Side-street Stop
5. 500 West / 900 South – Side-street Stop
6. 400 West / 900 South – Side-street Stop
7. 300 West / 900 South – Signalized
8. Washington Street / 900 South – Side-street Stop
9. 200 West / 900 South – Signalized (with TRAX, north-south)
10. Jefferson Street / 900 South – Side-street Stop
11. West Temple / 900 South – Signalized (UDOT)
12. Main Street / 900 South – Signalized
13. State Street / 900 South – Signalized (UDOT)
14. Edison Street / 900 South – Side-street Stop
15. 200 East / 900 South – Signalized
16. 300 East / 900 South – Signalized
17. 400 East / 900 South – Signalized
18. 500 East / 900 South – Signalized
19. 600 East / 900 South – Signalized (with Toucan)

20. 700 East / 900 South – Signalized (UDOT)
21. 800 East / 900 South – Side-street Stop
22. Windsor Street / 900 South – Side-street Stop
23. 900 East / 900 South – Signalized
24. Lincoln Street / 900 South – Side-street Stop

The study intersections are shown in **Figure 1**.

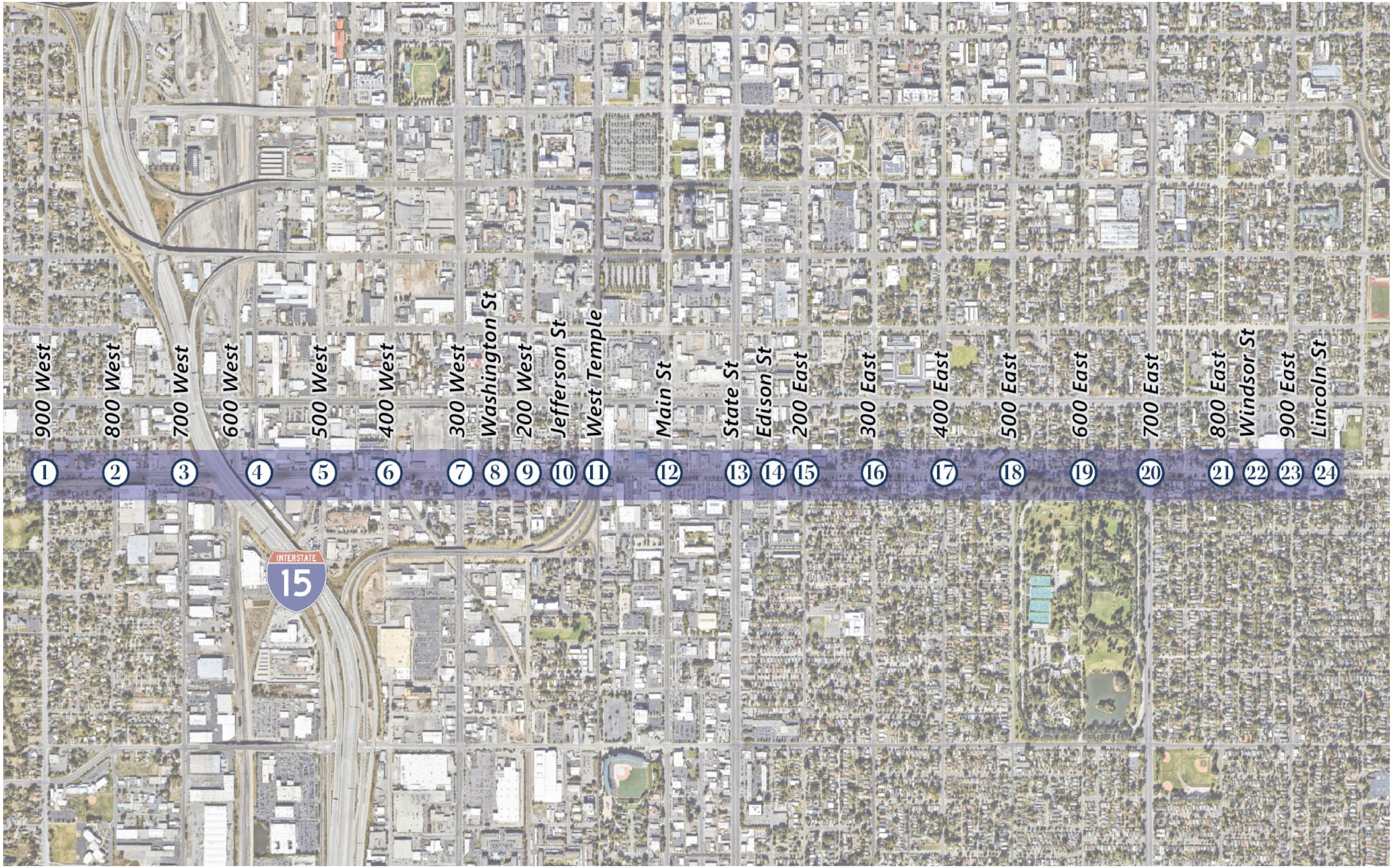


Figure 1

Project Location

Analysis Methodology

Level of Service (LOS) is a term that describes the operating performance of an intersection or roadway. LOS is measured quantitatively and reported on a scale from A to F, with A representing the best performance and F the worst. **Table 2** provides a brief description of each LOS letter designation and an accompanying average delay per vehicle for both signalized and unsignalized intersections. The Highway Capacity Manual 6th Edition (HCM 2016) methodology was used in this study to remain consistent with "state of the practice" professional standards. This methodology has different quantitative evaluations for signalized and unsignalized intersections. For signalized intersections, the LOS is provided for the overall intersection (weighted average of all approach delays). For this study, the traffic simulation software VISSIM was used to be able to simulate traffic conditions with multimodal aspects such as pedestrians, bicycles, and train crossings.

Table 2: Level of Service Descriptions

LOS	Description	Signalized Intersections	Unsignalized Intersections
		Avg. Delay (sec/veh)[1]	Avg. Delay (sec/veh)[2]
A	*Free Flow / Insignificant Delay* Extremely favorable progression. Individual users are virtually unaffected by others in the traffic stream.	< 10.0	< 10.0
B	*Stable Operations / Minimum Delays* Good progression. The presence of other users in the traffic stream becomes noticeable.	> 10.0 to 20.0	> 10.0 to 15.0
C	*Stable Operations / Acceptable Delays* Fair progression. The operation of individual users is affected by interactions with others in the traffic stream	> 20.0 to 35.0	> 15.0 to 25.0
D	*Approaching Unstable Flows / Tolerable Delays* Marginal progression. Operating conditions are noticeably more constrained.	> 35.0 to 55.0	> 25.0 to 35.0
E	*Unstable Operations / Significant Delays Can Occur* Poor progression. Operating conditions are at or near capacity.	> 55.0 to 80.0	> 35.0 to 50.0
F	*Forced, Unpredictable Flows / Excessive Delays* Unacceptable progression with forced or breakdown of operating conditions.	> 80.0	> 50.0

1. Overall intersection LOS and average delay (seconds/vehicle) for all approaches.
2. Worst movement LOS and delay (seconds/vehicle) only.

Source: Fehr & Peers descriptions, based on *Highway Capacity Manual, 6th Edition*.

Existing 2020 Background Conditions

The existing 2020 background conditions analysis examines the study intersections and roadway during the peak travel periods under existing traffic and geometric conditions. Through this analysis, existing traffic operational deficiencies were identified to serve as a basis for the reconstruction build conditions.

Roadway System

The primary roadways included in the analysis for this study are described below.

- **900 South** has a posted speed limit of 30 mph and is classified as a major collector in the study area. The cross section varies along the corridor in the study area as follows:
    - West of 900 West: one unstriped travel lane in each direction.
    - 900 West – 200 West: one travel lane in each direction and a two-way left-turn lane (TWLTL) and striped, dual-buffered bike lanes. The TWLTL is temporarily suspended where the roadway narrows at the railroad crossing between 700 West and 600 West.
    - 200 West – 200 East: two travel lanes in each direction and a TWLTL.
    - 200 East – 500 East: two travel lanes in each direction.
    - 500 East – 700 East: two travel lanes in each direction and a TWLTL.
    - 700 East – Windsor Street: one travel lane in each direction and a TWLTL and striped bike lanes.
    - Windsor Street – Lincoln Street: one travel lane in each direction and landscaped medians.
    - East of Lincoln Street: one travel lane in each direction and a TWLTL, with the 9-Line Trail above the curb on the south side of the street.
- **900 West** has a posted speed limit of 35 mph and is classified as a major collector in the study area. 900 West has one travel lane in each direction and a TWLTL and striped bike lanes.
- **800 West** has a posted speed limit of 25 mph and is classified as a local road in the study area. 800 West has one travel lane in each direction with a wide landscaped median separating the travel lanes north of 900 South.

- **700 West** has a posted speed limit of 25 mph and is classified as a local road in the study area. 700 West has one travel lane in each direction, without a striped centerline north of 900 South
- **600 West** has a posted speed limit of 25 mph and is classified as a local road in the study area. 600 West has one travel lane in each direction.
- **500 West** has a posted speed limit of 25 mph and is classified as a local road in the study area. 500 West has one travel lane in each direction without striped centerlines.
- **400 West** has a posted speed limit of 25 mph and is classified as a local road in the study area. 400 West has one travel lane in each direction without striped centerlines.
- **300 West** has a posted speed limit of 35 mph and is classified as a minor arterial in the study area. 300 West has two travel lanes in each direction and a TWLTL south of 900 South. North of 900 South, 300 West has three travel lanes in each direction.
- **Washington Street** has a posted speed limit of 25 mph and is classified as a local road in the study area. Washington Street has one travel lane in each direction without striped centerlines.
- **200 West** has a posted speed limit of 25 mph and is classified as a local road in the study area. 200 West has one travel lane in each direction and the Utah Transit Authority (UTA) TRAX line running in the median. 200 West also has striped bike lanes north of 900 South.
- **Jefferson Street** has a posted speed limit of 25 mph and is classified as a local road in the study area. Jefferson Street has one travel lane in each direction without striped centerlines.
- **West Temple** has a posted speed limit of 30 mph north of 900 South, 25 mph south of 900 South, and 40 mph on the I-15 freeway on-ramp south of 900 South. West Temple is classified as a minor arterial north of 900 South and a major collector/Interstate south of 900 South. West Temple has three travel lanes in each direction north of 900 South. South of 900 South, there is one northbound lane and two southbound lanes connecting to West Temple, while there are two off-ramp lanes and three on-ramp lanes coming from/going to I-15. West Temple north of 900 South (and the freeway ramps to the south) are a UDOT facility (SR 270 to the north).
- **Main Street** has a posted speed limit of 30 mph north of 900 South and 35 mph south of 900 South, and is classified as a major collector in the study area. Main Street has two travel lanes in each direction and striped bike lanes.
- **State Street** has a posted speed limit of 30 mph north of 900 South and 35 mph south of 900 South, and is classified as a principal arterial in the study area. State Street has three travel lanes in each direction and is a UDOT facility (US 89).

- **Edison Street** has a posted speed limit of 25 mph and is classified as a local road in the study area. Edison Street has one southbound lane north of 900 South (one-way), and one travel lane in each direction south of 900 South without a striped centerline.
- **200 East** has a posted speed limit of 30 mph and is classified as a local road in the study area. 200 East has two travel lanes in each direction and a TWLTL north of 900 South, and one travel lane in each direction south of 900 South.
- **300 East** has a posted speed limit of 30 mph north of 900 South and 25 mph south of 900 South, and is classified as a major collector in the study area. 300 East has one travel lane in each direction and a TWLTL and striped bikes lanes north of 900 South. South of 900 South, 300 East has one travel lane in each direction.
- **400 East** has a posted speed limit of 30 mph and is classified as a local road in the study area. 400 East has two travel lanes in each direction and a TWLTL north of 900 South. South of 900 South, 400 East has one travel lane in each direction and a southbound-only striped bike lane. 400 East has no striped centerline south of 900 South.
- **500 East** has a posted speed limit of 30 mph and is classified as a major collector in the study area. 500 East has two travel lanes in each direction north of 900 South. South of 900 South, 500 East has one travel lane in each direction and striped bike lanes.
- **600 East** has a posted speed limit of 20 mph and is classified as a local road in the study area. 600 East has one travel lane in each direction with a wide landscaped median separating the travel lanes north of 900 South, where cars are required to turn right (southbound to westbound) at 900 South. Vehicles leaving the park must turn right (eastbound) at 900 South. 600 East is classified as a neighborhood byway, emphasizing walking and bicycling over through traffic.
- **700 East** has a posted speed limit of 40 mph and is classified as a principal arterial in the study area. 700 East has three travel lanes in each direction and is a UDOT facility (SR 71).
- **800 East** has a posted speed limit of 25 mph and is classified as a local road in the study area. 800 East has one travel lane in each direction with a wide landscaped median separating the travel lanes north of 900 South. 800 East has no striped centerline south of 900 South.
- **Windsor Street** has a posted speed limit of 25 mph and is classified as a local road in the study area. Windsor Street has one travel lane in each direction without a striped centerline.
- **900 East** has a posted speed limit of 30 mph and is classified as a major collector in the study area. 900 East has one travel lane in each direction and a TWLTL north of 900 South. South of 900 South, 900 East has one travel lane in each direction.

- **Lincoln Street** has a posted speed limit of 25 mph and is classified as a local road in the study area. Lincoln Street has one travel lane in each direction without striped centerlines.

Traffic Volumes

Fehr & Peers collected traffic counts at the study intersections to establish existing conditions for the study area. Traffic counts for the weekday PM peak period were recorded from 4:00 PM to 6:00 PM on Tuesday, August 11, 2020, and traffic counts for the Saturday mid-day peak period were recorded from 12:00 PM to 2:00 PM on Saturday, August 8, 2020. Previous weekday PM peak hour traffic counts collected at the following intersections for the 900 South Ramps Feasibility Study (2018-2019) were also used for this study:

- 300 West / 900 South – collected on Wednesday, May 9, 2018
- 200 West / 900 South – collected on Wednesday, May 9, 2018
- West Temple / 900 South – collected on Wednesday, May 9, 2018

This traffic analysis's counts were collected in August 2020 during the COVID-19 pandemic, in which traffic in Utah was observed to be lower than usual. To account for atypical traffic volumes and to avoid potentially optimistic traffic operations analysis results, Fehr & Peers performed a comprehensive evaluation to compare the August 2020 traffic counts to available historical data. The following data sources were evaluated for comparison:

- Historical intersection turning movements collected by Fehr & Peers for the Life on State project (in 2017) and the 900 South Ramps Feasibility Study (in 2018)
- Roadway counts collected by Salt Lake City from various years
- The Utah Department of Transportation (UDOT) Automated Traffic Signal Performance Metrics (ATSPM) approach volume data and turning movement counts (turning movement counts were only available at the 700 East / 900 South intersection)

The traffic counts were compared against various locations along the 900 South corridor and evaluated in five different segments. Within each segment, a weighted average of the observed volume differences was calculated, providing an adjustment factor to be applied to each segment. Within each segment, the adjustment factor was applied to all turning movement counts to replicate "pre-COVID" traffic conditions for this study. The traffic counts collected previously at 300 West, 200 West, and West Temple in 2018 were considered to be pre-COVID conditions, and were not adjusted. Volume comparisons for the Weekday PM peak hour and the Saturday mid-day peak hour are shown in **Table 3**.

As shown in **Table 3**, the traffic counts for the Saturday mid-day peak hour showed minimal difference from historical data. This suggests that the COVID conditions had minimal impact to traffic conditions on 900 South. Therefore, no adjustment was applied to the Saturday mid-day peak hour traffic counts; 2020 counts were multiplied by factors in the range of 1.16-1.37 to account for pandemic-related anomalies across the study area.

Table 3: Volume Adjustments for the Weekday PM Peak Hour and Saturday Mid-day Peak Hour

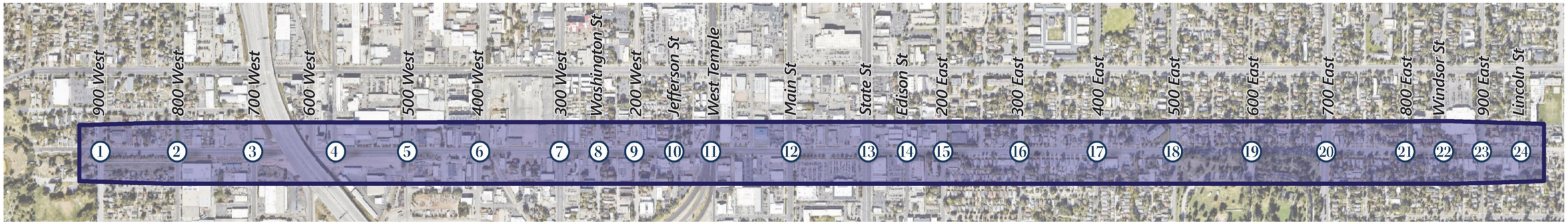
Segment	Location (Data Source)	Weekday PM			Saturday Mid-day		
		% Difference	Weighted Average	Adjustment Factor	% Difference	Weighted Average	Adjustment Factor
West of 300 W	900 S (between 700 W and 600 W) – SLC Counts	-18%	-18%	1.23	-7%	-7%	1.08
Central 9th	900 S / West Temple – ATSPM[1]	-29%	-21%	1.26	-14%	-2%	1.02
	900 S (between West Temple and Main St) – FP Counts	-27%			-		
	900 S (between West Temple and Main St) – SLC Counts	-1%			14%		
West Temple – 400 E	Main Street (between 800 S and 900 S) – FP Counts	-32%	-27%	1.37	-	-3%	1.04
	State Street (between 800 S and 900 S) – FP Counts	-29%			-		
	200 E (between 800 S and 900 S) – FP Counts	-53%			-		
	200 E (between 800 S and 900 S) – SLC Counts	-41%			-3%		
400 E – 800 E	900 S (between 400 E and 500 E) – SLC Counts	-26%	-20%	1.25	5%	5%	0.96
	900 S (between 500 E and 600 E) – SLC Counts	-18%			0%		
	900 S / 700 E – ATSPM[1]	-22%			11%		
	800 S / 700 E – ATSPM[1]	-17%			-1%		
East of 800 E	900 S (between 800 E and Windsor St) – SLC Counts	-14%	-14%	1.16	30%	30%	0.77

Notes:
1. ATSPM data collected was collected and compared between August 2019 and August 2020.

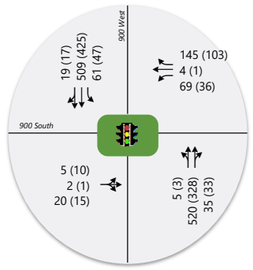
Source: Fehr & Peers, based on data from Salt Lake City and UDOT ATSPM.

The existing adjusted weekday PM peak hour volumes and the Saturday mid-day peak hour volumes are shown in **Figure 2**.

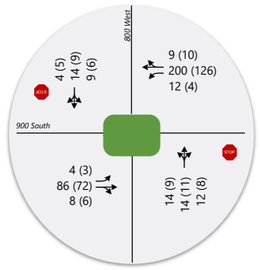
Also because of COVID conditions, travel time measurements were not taken on the 900 South corridor. Instead, probe data from iPeMS provided by UDOT were extracted to estimate typical weekday PM peak hour and Saturday mid-day peak hour travel times along 900 South. This was then used to compare modeled travel times to calibrate and validate the VISSIM model.



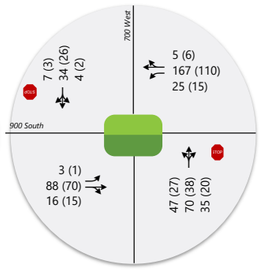
1. 900 West/900 S



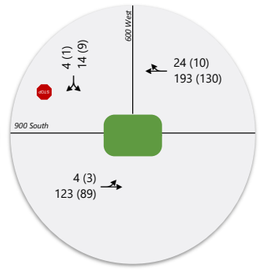
2. 800 West/900 S



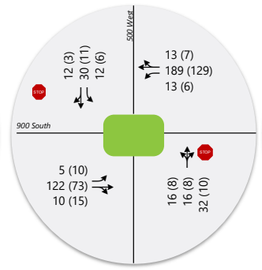
3. 700 West/900 S



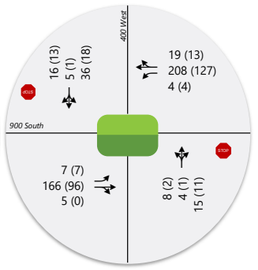
4. 600 West/900 S



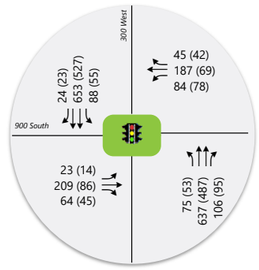
5. 500 West/900 S



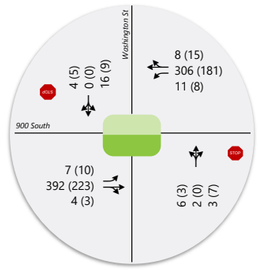
6. 400 West/900 S



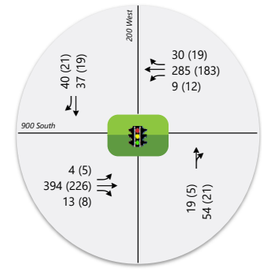
7. 300 West/900 S



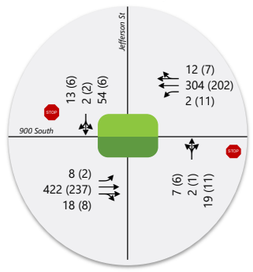
8. Washington St/900 S



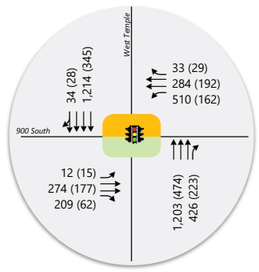
9. 200 West/900 S



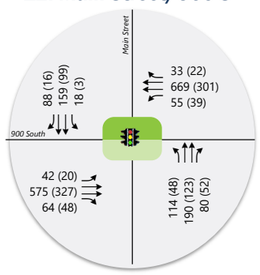
10. Jefferson St/900 S



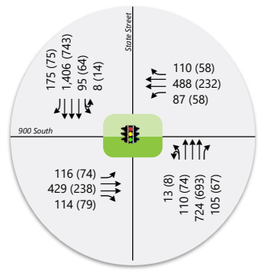
11. West Temple/900 S



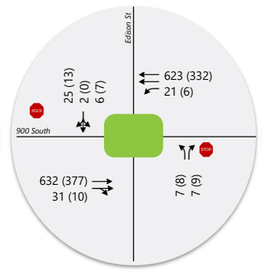
12. Main Street/900 S



13. State Street/900 S



14. Edison St/900 S



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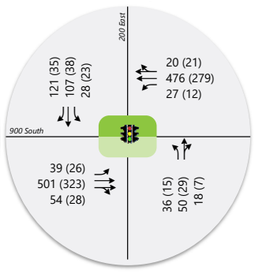

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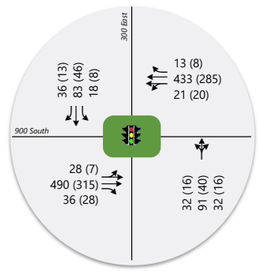

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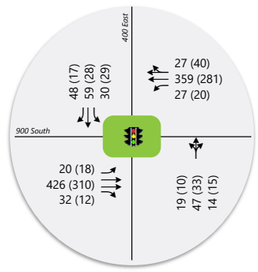

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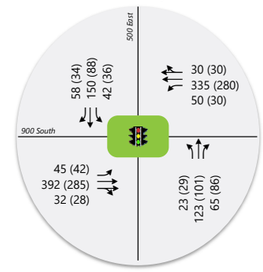

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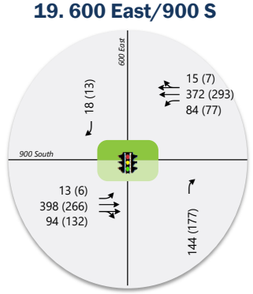

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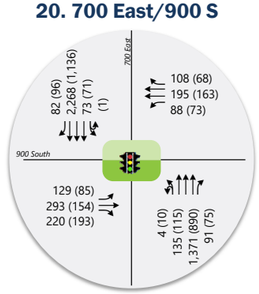

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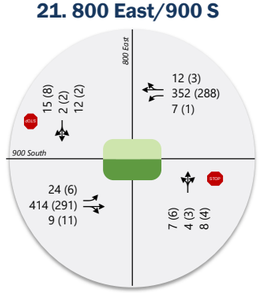
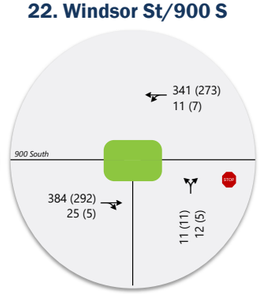


22. Windsor St/900 S



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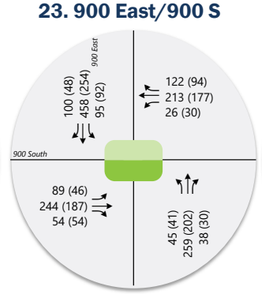
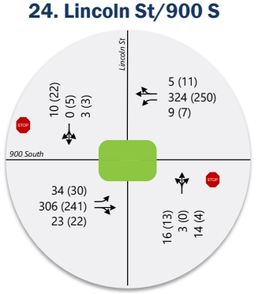


24. Lincoln St/900 S



LEGEND

- *Stop Sign*
- *Signalized*
- *Lane Configuration* — PM (Sat) / PM (Sat) / PM (Sat) — *Peak Hour Traffic Volume per lane*
- *Intersection Level of Service (LOS):* PM / SAT — A B C D E F

Figure 2

Existing Conditions

Analysis Results

Using VISSIM mircosimulation software, the HCM 6 delay thresholds described in the *Analysis Methodology* section of this memorandum, the existing 2020 background weekday PM peak hour and Saturday mid-day peak hour LOS were computed for each study intersection. The results of this analysis are reported in **Table 4** and **Figure 2** (see Appendix for the detailed LOS report).

Table 4: Existing 2020 Background Conditions Weekday PM and Saturday Mid-day Peak Hour Level of Service

Intersection				Worst Movement[1]			Overall Intersection[2]	
ID	Location	Period	Control	Movement[3]	Delay Sec/Veh	LOS	Avg. Delay Sec/Veh	LOS
1	900 West / 900 South	PM	Signal	-	-	-	9	A
		Sat		-	-	-	7	A
2	800 West / 900 South	PM	NB/SB Stop	NB Thru	9	A	-	-
		Sat		SB Thru	8	A	-	-
3	700 West / 900 South	PM	NB/SB Stop	NB Left	11	B	-	-
		Sat		NB Thru	8	A	-	-
4	600 West / 900 South	PM	SB Stop	SB Left	9	A	-	-
		Sat		SB Left	7	A	-	-
5	500 West / 900 South	PM	NB/SB Stop	SB Thru	11	B	-	-
		Sat		SB Thru	10	B	-	-
6	400 West / 900 South	PM	NB/SB Stop	SB Left	10	B	-	-
		Sat		SB Left	8	A	-	-
7	300 West / 900 South	PM	Signal	-	-	-	18	B
		Sat		-	-	-	14	B
8	Washington Street / 900 South	PM	NB/SB Stop	NB Left	20	C	-	-
		Sat		NB Right	10	B	-	-
9	200 West / 900 South	PM	Signal	-	-	-	14	B
		Sat		-	-	-	9	A
10	Jefferson Street / 900 South	PM	NB/SB Stop	NB Right	10	B	-	-
		Sat		NB Right	8	A	-	-
11	West Temple / 900 South	PM	Signal	-	-	-	38	D
		Sat		-	-	-	20	C
12	Main Street / 900 South	PM	Signal	-	-	-	18	B
		Sat		-	-	-	20	C

Intersection				Worst Movement[1]			Overall Intersection[2]	
ID	Location	Period	Control	Movement[3]	Delay Sec/Veh	LOS	Avg. Delay Sec/Veh	LOS
13	State Street / 900 South	PM	Signal	-	-	-	23	C
		Sat		-	-	-	19	B
14	Edison Street / 900 South	PM	NB/SB Stop	SB Left	13	B	-	-
		Sat		SB Left	12	B	-	-
15	200 East / 900 South	PM	Signal	-	-	-	17	B
		Sat		-	-	-	25	C
16	300 East / 900 South	PM	Signal	-	-	-	9	A
		Sat		-	-	-	9	A
17	400 East / 900 South	PM	Signal	-	-	-	15	B
		Sat		-	-	-	10	B
18	500 East / 900 South	PM	Signal	-	-	-	11	B
		Sat		-	-	-	13	B
19	600 East / 900 South	PM	Signal	-	-	-	16	B
		Sat		-	-	-	25	C
20	700 East / 900 South	PM	Signal	-	-	-	22	C
		Sat		-	-	-	14	B
21	800 East / 900 South	PM	NB/SB Stop	NB Right	15	C	-	-
		Sat		SB Right	9	A	-	-
22	Windsor Street / 900 South	PM	NB Stop	NB Left	14	B	-	-
		Sat		NB Left	11	B	-	-
23	900 East / 900 South	PM	Signal	-	-	-	21	C
		Sat		-	-	-	15	B
24	Lincoln street / 900 South	PM	NB/SB Stop	SB Right	14	B	-	-
		Sat		NB Left	12	B	-	-

Notes:
1. This represents the worst movement LOS and delay (seconds/vehicle) and is only reported for unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds/vehicle) and is only reported for signalized intersections.
3. NB=Northbound, SB=Southbound, EB=Eastbound, WB=Westbound

Source: Fehr & Peers.

As shown in **Table 4**, all study intersections operate at acceptable LOS (LOS D or better) for both weekday PM and Saturday mid-day peak hours. However, the following locations with traffic deficiencies should be noted:

- 300 West / 900 South
    - In both weekday PM and Saturday mid-day peak hours, the westbound left movement operates at LOS E. The average maximum queue however is not expected to exceed the available storage.
    - In the reconstruction design, the vehicular capacity on 900 South will not be reduced at this intersection.
- West Temple / 900 South
    - The high volumes coming from the I-15 off-ramp causes delays in the northbound approach, and the northbound through movement operates at LOS E in the weekday PM peak hour. Also, the westbound left turn movement experiences moderate delay with average maximum queues expected to exceed the available storage. In the design, the capacity of the westbound left turn movement at 800 South is proposed to be increased, encouraging more vehicles to access the I-15 on-ramp via 800 South.
    - In the reconstruction design, the vehicular capacity on 900 South will be reduced from 5 lanes to 3 lanes at this intersection.
- State Street / 900 South
    - The eastbound and westbound left turn movements experience high delays and operate at LOS E in the weekday PM peak hour. The eastbound left turn movement also operates at LOS E in the Saturday mid-day peak hour. These left turn movements are currently running permissive with no protected signal phase. The eastbound left turn movement experiences average maximum queues that exceed the available storage in the weekday PM peak hour.
    - In the reconstruction design, the vehicular capacity on 900 South will be reduced from 5 lanes to 3 lanes at this intersection.
- 700 East / 900 South
    - The westbound left turn movement experiences high delays and operates at LOS F in the weekday PM peak hour. The average maximum queues however are not expected to exceed the available storage.
    - In the reconstruction design, the vehicular capacity on 900 South will be reduced from 5 lanes to 3 lanes west of this intersection
- 900 East / 900 South

- The delays and LOS are not an issue at this intersection for both weekday PM and Saturday mid-day peak hours. However, the eastbound left turn movement experiences average maximum queues that exceed the short available storage.
- In the reconstruction design, the vehicular capacity on 900 South will not be reduced at this intersection.

The City acknowledges these increases in projected delay, and signal timing adjustments will be made to improve traffic operations. However, the ultimate goal of the project is a complete street, and model results are a conservative reflection of expected traffic on the corridor.

To calibrate the existing VISSIM model, travel time measurements were compared to observed travel times. As mentioned previously, travel time measurements were not collected in the field due to COVID conditions. Instead, modeled travel time measurements were compared against travel time measurements collected from the iPeMS data. The travel time measurements were compared in five segments along the 900 South corridor. The existing 2020 background travel time measurements for the weekday PM peak hour and Saturday mid-day peak hour are shown in **Table 5** and **Table 6**, respectively. As shown in **Table 5** and **Table 6**, the average travel times from the VISSIM model fall within the observed range of travel times in most segments.

Table 5: Existing 2020 Background Conditions Weekday PM Travel Times

Location	Eastbound				Westbound			
	Observed[1]			Modeled	Observed[1]			Modeled
	Avg	Min	Max	Avg	Avg	Min	Max	Avg
900 West – 300 West	02:38	02:01	03:59	01:47	02:38	02:07	03:37	02:40
300 West – West Temple	01:33	01:09	02:09	01:31	01:27	01:02	01:52	01:12
West Temple – 400 East	02:45	02:05	03:26	03:07	03:04	02:15	04:11	03:02
400 East – 900 East	02:44	02:08	03:26	02:52	02:56	02:17	03:35	03:02
900 East – 1000 East	00:32	00:26	00:40	00:55	00:32	00:24	00:46	00:24

Notes:
1. Weekday PM peak hour travel times were collected from iPeMS for 2019 (pre-COVID).
Source: Fehr & Peers.

Table 6: Existing 2020 Background Conditions Saturday Mid-day Travel Times

Location	Eastbound				Westbound			
	Observed[1]			Modeled	Observed[1]			Modeled
	Avg	Min	Max	Avg	Avg	Min	Max	Avg
900 West – 300 West	02:50	02:15	03:39	01:48	02:32	02:03	03:32	02:49
300 West – West Temple	01:31	01:13	01:43	01:26	01:23	00:57	01:45	01:29
West Temple – 400 East	02:33	02:08	03:01	04:09	02:56	02:21	03:27	03:13
400 East – 900 East	02:31	02:00	03:14	03:20	02:42	02:08	03:11	02:55
900 East – 1000 East	00:30	00:25	00:41	00:49	00:29	00:26	00:44	00:22

Notes:
1. Saturday mid-day peak hour travel times were collected from iPeMS for 2019 (pre-COVID).
Source: Fehr & Peers.

Opening Year 2023 Build Conditions

The Opening Year Build (2023) conditions analysis examines the study intersections and roadway during the weekday PM and Saturday mid-day peak hours under projected opening year traffic and the proposed roadway configuration.

Reconstruction Geometry and Signal Operations

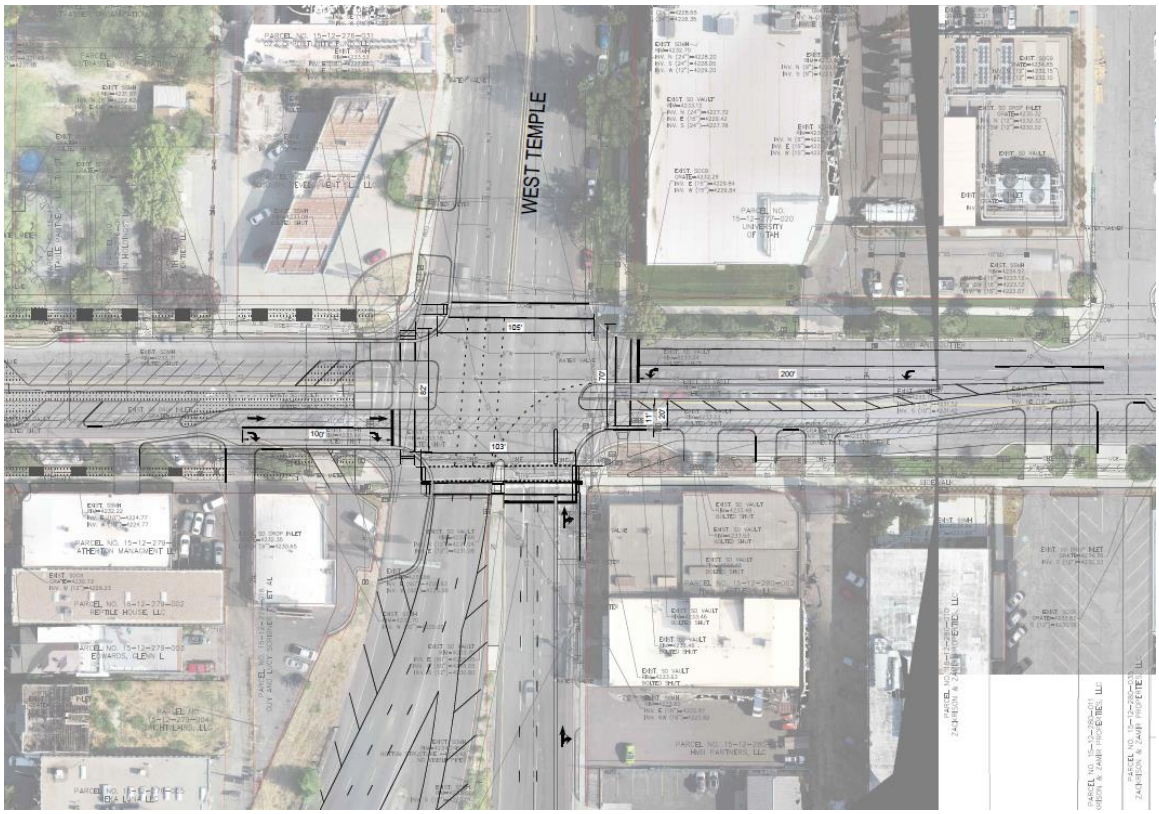
Traffic analysis was based on the proposed (as of December 2020) corridor configuration. The proposed reconstruction includes an enhanced extension of the 9-Line Trail throughout the study area on the south side of the 900 South corridor. Major changes to roadway lane configurations are also proposed at the following segments on 900 South:

- **Central 9th (between 300 West and West Temple)** – 900 South will be reduced to one travel lane in each direction and angled parking in the median. Left turn storage lanes will be preserved at 300 West, 200 West, and West Temple, but not at Washington Street and Jefferson Street.
- **Between West Temple and 700 East** – 900 South will be reduced to a three-lane cross section with one travel lane in each direction and a TWLTL.

Major changes are also proposed at the West Temple / 900 South intersection. This intersection currently functions as a ramp terminal where the I-15 ramps connect, and experiences high traffic volumes. This intersection presents a safety concern for the proposed trail crossing. The following intersection configuration changes were agreed upon through coordination with UDOT, and were included in the VISSIM model for this study (also shown in figure below):

- Traffic approaching the intersection on the I-15 off-ramp will not be able to turn right onto eastbound 900 South. Vehicles approaching on the local system's West Temple can still make a northbound right. Vehicles from the off-ramp will be routed to continue northbound to 800 South. This outer lane (on the local system's West Temple) was separated from the I-15 off-ramp with a median, and converted to a shared through-right lane for northbound West Temple.
- The I-15 off-ramp was expanded to three lanes up to where the hook off-ramp to southbound West Temple splits off.
- The eastbound left turn was restricted and eliminated to provide more space for an extended eastbound right turn lane and Central Ninth streetscape enhancements.

- The southbound approach was reduced to three lanes to simplify the lane striping configuration, reduce lane changes and merges, and enhance lane utilization. The three lanes all connect to the I-15 on-ramp, with an optional inner diverge lane connecting to southbound Jefferson Street (currently two lanes connect to Jefferson Street, which was reduced to one lane).
- Northbound West Temple north of 900 South was expanded to four lanes to provide a receiving lane for northbound West Temple.



Following discussions with UDOT and Salt Lake City, the proposed signal changes below are included in the model for this study at various intersections along the corridor:

- Protected left turn phases were provided for the eastbound and westbound left turns at both 300 West and 200 West intersections. The wide median in the Central 9th area with angled parking causes sight distance issues for vehicles turning left on 900 South. The protected left turn phases help improve safety by reducing conflict points with the opposing through traffic.

- A Leading Pedestrian Interval (LPI) phase was implemented for the trail crossings at UDOT corridors (West Temple, State Street, and 700 East). The eastbound right will receive a blank out sign restricting turns for about four seconds to allow people walking and bicycling to enter the crossing and be visible to the vehicle drivers.
- At West Temple, a variable protected left turn phase is proposed for the westbound left. When the button is pushed for either the crosswalk or the trail crossing, the westbound left will be restricted to a protected only left turn phase. At other instances where there are no trail users crossing West Temple, the westbound left will be permissive, allowing vehicles to turn while the opposing eastbound through movement has a green. This was proposed for added safety of the people in the crosswalk and the trail crossing. For modeling purposes, the westbound left turn was modeled as a protected phase.
- At State Street and 700 East, a LPI phase is also proposed for the westbound left, utilizing a Flashing Yellow Arrow (FYA) signal head. The LPI will prohibit vehicles making a westbound left to turn until pedestrians and bicyclists are visible in the trail crossing. A 15-second LPI is recommended as a start, with the ability to monitor and modify as needed based on field observations.

Traffic Volumes

Fehr & Peers estimated 2023 traffic volumes using linear annual growth rates based on the Wasatch Front Regional Council (WFRC) travel demand model. Additionally, the Salt Lake City Redevelopment Agency (SLCRDA) and the Salt Lake City Planning Division provided feedback on planned developments for the years leading up to and including 2023 to account for local traffic generated by new development. Fehr & Peers compared these planned developments with the projected growth in the WFRC travel demand model. This process revealed that the model accurately reflected the planned future growth for the corridor area, specifically the study corridor west of West Temple which should experience the greatest growth of any portion of the study corridor. The following annual growth rates extracted from the model were used for estimating 2023 traffic volumes for this analysis for 900 South (**Table 7**) and for the analysis roadways that intersect with 900 South (**Table 8**).

Table 7: Growth Rates for 900 South

From	To	Growth Rate
West of 700 West	West Temple	1.4%
West Temple	Richards Street	2.2%
Richards Street	Main Street	2.1%
Main Street	State Street	5.5%
State Street	300 East	0.1%
300 East	500 East	1.6%
500 East	700 East	0.2%
700 East	900 East	0.1%
900 East	East of Lincoln Street	0.3%

Source: Fehr & Peers.

Table 8: Growth Rates for Cross-Streets

Roadway	Growth Rates	
	North of 900 South	South of 900 South
900 West	3.6%	4.4%
700 West	2.2%	2.1%
300 West	1.9%	1.7%
West Temple	3.1%	3.1%
Main Street	-0.8%	4.0%
State Street	2.3%	1.1%
300 East	0.1%	0.5%
500 East	1.7%	1.9%
700 East	0.7%	-0.4%
900 East	1.1%	0.3%

Source: Fehr & Peers.

The WFRC travel demand model covers the entire Wasatch Front Region and thus does not model smaller roadways to ensure quality control. To estimate future growth on these smaller roadways, Fehr & Peers used nearby streets to estimate growth rates that would be applicable to that specific

roadway location. Calculated growth rates for study roadways not included in the WFRC model are shown in **Table 9**.

Table 9: Growth Rates for Cross-Streets Which Are Not in the Model

Roadway	Growth Rates		Growth Rate Calculation Method
	North of 900 South	South of 900 South	
800 West	2.9%	3.3%	Average of 900 West and 700 West
600 West	7.5%	1.9%	North: Average of 700 West and 400 West South: Average of 700 West and 300 West
500 West	7.5%	1.9%	North: Average of 700 West and 400 West South: Average of 700 West and 300 West
400 West	12.9%	1.9%	North: included in the model – no calculation needed South: Average of 700 West and 300 West
Washington Street	2.5%	2.4%	Average of 300 West and West Temple
200 West	2.5%	2.4%	Average of 300 West and West Temple
Jefferson Street	2.5%	2.4%	Average of 300 West and West Temple
Edison Street	1.2%	0.8%	Average of State Street & 300 East
200 East	1.2%	0.8%	Average of State Street & 300 East
400 East	0.9%	1.2%	Average of 300 East and 500 East
600 East	1.2%	0.8%	Average of 500 East and 700 East
800 East	0.9%	0.9%	Average of 700 East and 900 East
Windsor Street	0.9%	0.9%	Average of 700 East and 900 East
Lincoln Street	1.1%	0.3%	Same growth rates as 900 East

Source: Fehr & Peers.

Fehr & Peers also conducted a sensitivity analysis of the proposed reconstruction of the study corridor in the WFRC travel demand model. With the travel lane reduction along 900 South, particularly near West Temple/I-15 On-Ramp, the model projected shift of traffic to other routes and showed traffic volumes lower than existing conditions. Through discussions with Salt Lake City, however, Fehr & Peers proceeded with modeling the "worst-case scenario", a very conservative approach that assumed all projected development would be occupied by 2023 and that all

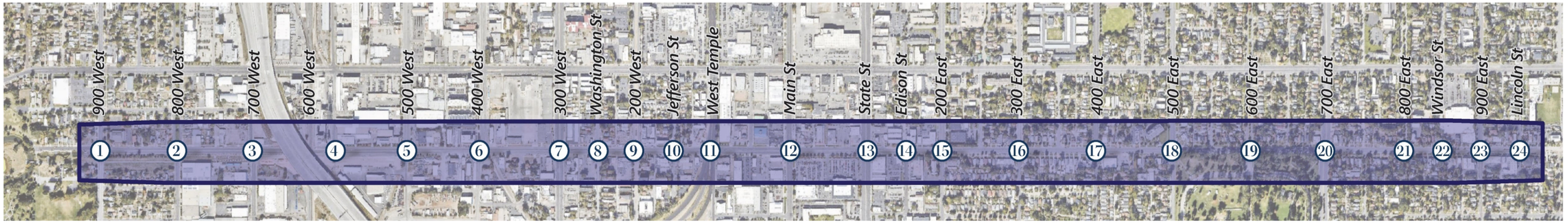
projected traffic volumes would stay on 900 South, even with reduced vehicular capacity. These "worst-case-scenario" growth rates are reflected in **Table 7**, **Table 8**, and **Table 9** above.

Samples of the number of people walking and bicycling along other trails were provided by Salt Lake City to estimate the number of expected users of the 9-Line Trail. Samples for the following trails were provided:

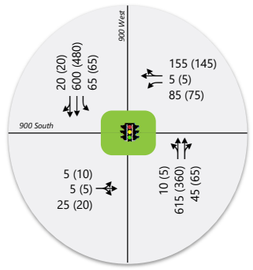
- S-line Trail near 700 East – 70-90 bidirectional users per peak hour
- 9-Line Trail near around 1200 West – 30-50 bidirectional users per peak hour
- 9-Line/Sunnyside Trail near around 1700 East – 20-25 bidirectional users per peak hour

Based on the samples as described above, 60 bidirectional users (30 pedestrians and 30 bicyclists) were assumed to use the newly improved 9-Line Trail in the study area, and were included in the VISSIM model.

Opening year 2023 weekday PM peak hour and Saturday mid-day peak hour volumes are shown in **Figure 3**.



1. 900 West/900 S



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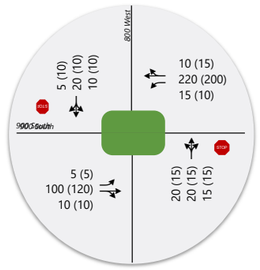
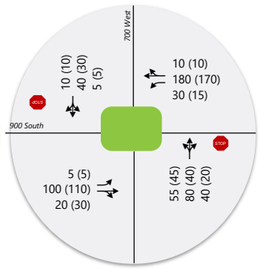
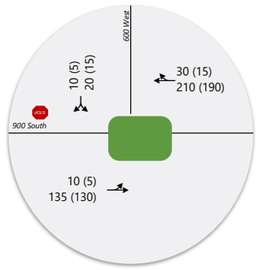


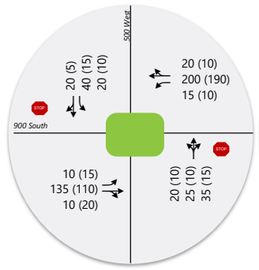
3. 700 West/900 S



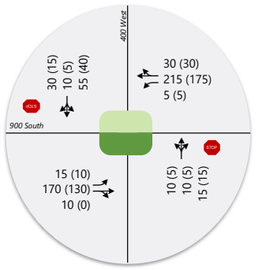
4. 600 West/900 S



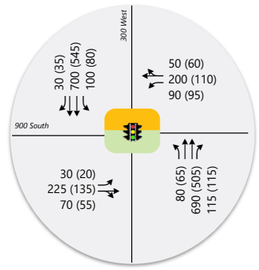
5. 500 West/900 S



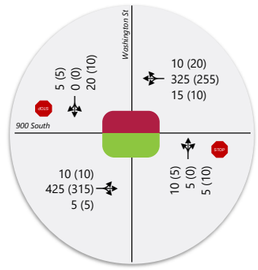
6. 400 West/900 S



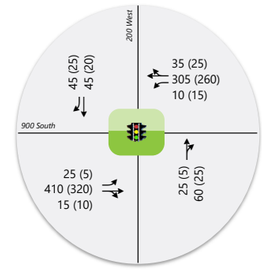
7. 300 West/900 S



8. Washington St/900 S



9. 200 West/900 S



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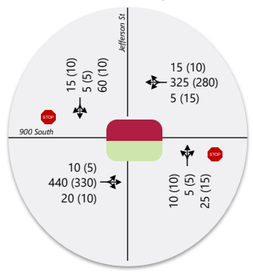
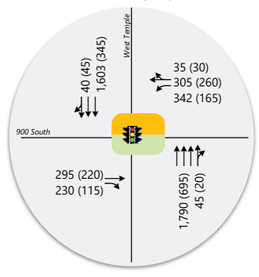


11. West Temple/900 S



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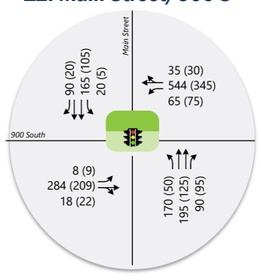

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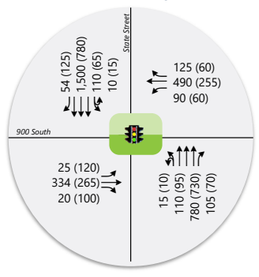
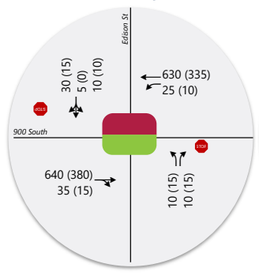


14. Edison St/900 S



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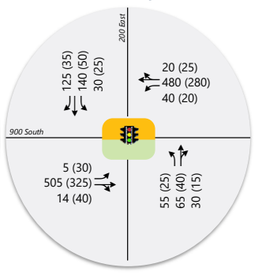

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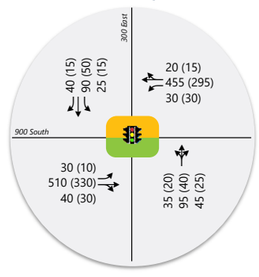

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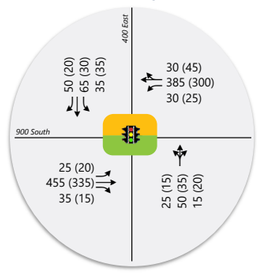

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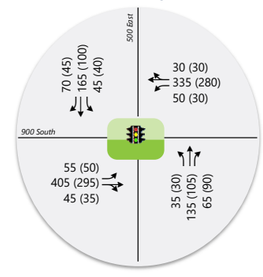

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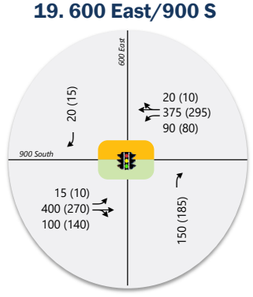

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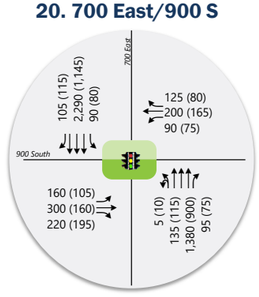
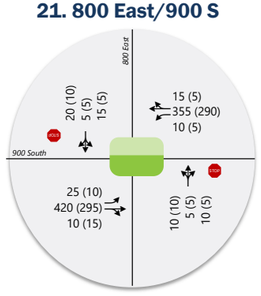
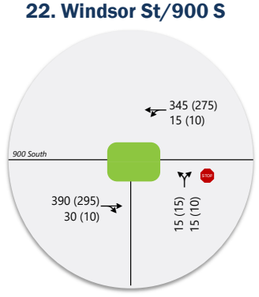


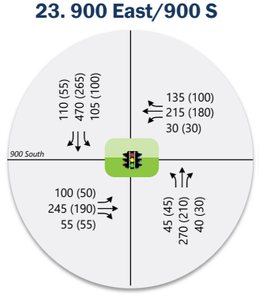
21. 800 East/900 S



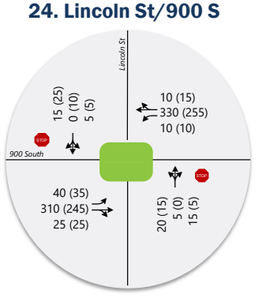
22. Windsor St/900 S



23. 900 East/900 S



24. Lincoln St/900 S



LEGEND

- Stop Sign
- Signalized
- Lane Configuration (PM (Sat) / PM (Sat) / PM (Sat)) — Peak Hour Traffic Volume per lane
- Intersection Level of Service (LOS): PM / SAT — A B C D E F

Figure 3

Opening Year 2023 Build

Analysis Results

Using VISSIM software the HCM 6 delay thresholds provided in the Analysis Methodology section, the opening year 2023 build weekday PM peak hour and Saturday mid-day peak hour LOS were computed for each study intersection. The results of this analysis are reported in **Table 10** and **Figure 3** (see Appendix for the detailed LOS report).

Table 10: Opening Year 2023 Build Conditions Weekday PM and Saturday Mid-day Peak Hour Level of Service

Intersection				Worst Movement[1]			Overall Intersection[2]	
ID	Location	Period	Control	Movement[3]	Delay Sec/Veh	LOS	Avg. Delay Sec/Veh	LOS
1	900 West / 900 South	PM	Signal	-	-	-	16	B
		Sat		-	-	-	13	B
2	800 West / 900 South	PM	NB/SB Stop	NB Thru	9	A	-	-
		Sat		NB Thru	8	A	-	-
3	700 West / 900 South	PM	NB/SB Stop	NB Thru	12	B	-	-
		Sat		NB Thru	10	B	-	-
4	600 West / 900 South	PM	SB Stop	SB Left	9	A	-	-
		Sat		SB Left	8	A	-	-
5	500 West / 900 South	PM	NB/SB Stop	NB Thru	12	B	-	-
		Sat		NB Thru	11	B	-	-
6	400 West / 900 South	PM	NB/SB Stop	SB Left	20	C	-	-
		Sat		SB Left	8	A	-	-
7	300 West / 900 South	PM	Signal	-	-	-	37	D
		Sat		-	-	-	22	C
8	Washington Street / 900 South	PM	NB/SB Stop	SB Left	**51**	**F**	-	-
		Sat		NB Left	12	B	-	-
9	200 West / 900 South	PM	Signal	-	-	-	34	C
		Sat		-	-	-	13	B
10	Jefferson Street / 900 South	PM	NB/SB Stop	SB Left	**> 100**	**F**	-	-
		Sat		NB Left	18	C	-	-
11	West Temple / 900 South	PM	Signal	-	-	-	40	D
		Sat		-	-	-	23	C
12	Main Street / 900 South	PM	Signal	-	-	-	19	B
		Sat		-	-	-	25	C

Intersection				Worst Movement[1]			Overall Intersection[2]	
ID	Location	Period	Control	Movement[3]	Delay Sec/Veh	LOS	Avg. Delay Sec/Veh	LOS
13	State Street / 900 South	PM	Signal	-	-	-	30	C
		Sat		-	-	-	19	B
14	Edison Street / 900 South	PM	NB/SB Stop	SB Right	**> 100**	**F**	-	-
		Sat		SB Left	14	B	-	-
15	200 East / 900 South	PM	Signal	-	-	-	48	D
		Sat		-	-	-	22	C
16	300 East / 900 South	PM	Signal	-	-	-	51	D
		Sat		-	-	-	12	B
17	400 East / 900 South	PM	Signal	-	-	-	53	D
		Sat		-	-	-	13	B
18	500 East / 900 South	PM	Signal	-	-	-	34	C
		Sat		-	-	-	15	B
19	600 East / 900 South	PM	Signal	-	-	-	45	D
		Sat		-	-	-	22	C
20	700 East / 900 South	PM	Signal	-	-	-	27	C
		Sat		-	-	-	18	B
21	800 East / 900 South	PM	NB/SB Stop	SB Left	16	C	-	-
		Sat		SB Left	11	B	-	-
22	Windsor Street / 900 South	PM	NB Stop	NB Right	10	B	-	-
		Sat		NB Right	10	B	-	-
23	900 East / 900 South	PM	Signal	-	-	-	22	C
		Sat		-	-	-	15	B
24	Lincoln street / 900 South	PM	NB/SB Stop	NB Left	15	B	-	-
		Sat		NB Left	12	B	-	-

1. This represents the worst movement LOS and delay (seconds/vehicle) and is only reported for unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds/vehicle) and is only reported for signalized intersections.
3. NB=Northbound, SB=Southbound, EB=Eastbound, WB=Westbound

Source: Fehr & Peers.

As shown in **Table 10**, all study intersections operate at acceptable LOS (LOS D or better) for both weekday PM and Saturday mid-day peak hours, with the exception of the following locations:

- Washington Street / 900 South – LOS F in the PM peak hour

- In the PM peak hour, the reduced capacity on 900 South and the high volumes at the I-15 ramps on West Temple cause the West Temple / 900 South intersection to become a bottleneck for eastbound and westbound traffic. The eastbound queues from West Temple extend throughout the Central 9th area, causing added delays for vehicles trying to make a southbound left turn onto 900 South at Washington Street. As a side-street stop-controlled intersection, it is not uncommon for drivers exiting the side street to wait for substantial periods for a gap in traffic; no reasonable improvements at this intersection prevent this condition.

- Jefferson Street / 900 South – LOS F in the PM peak hour
  - Similar to the delays at Washington Street, the congestion in the Central 9th area caused by the bottleneck at the West Temple / 900 South intersection causes added delays for vehicles trying to make a southbound left turn onto 900 South at Jefferson Street. As a side-street stop-controlled intersection, it is not uncommon for drivers exiting the side street to wait for substantial periods for a gap in traffic; no reasonable improvements at this intersection prevent this condition.
- Edison Street / 900 South – LOS F in the PM peak hour
  - Similar to the delays at Washington Street and Jefferson Street, the bottleneck at the West Temple / 900 South intersection also causes westbound congestion and queues that occasionally extend past Main Street, State Street, and Edison Street, adding delays for vehicles trying to make a northbound left onto 900 South at Edison Street. As a side-street stop-controlled intersection, it is not uncommon for drivers exiting the side street to wait for substantial periods for a gap in traffic; no reasonable improvements at this intersection prevent this condition.

Although the remaining study intersections operate at acceptable LOS, the following locations with deficiencies in traffic operations. It should be noted that, in this application, deficiencies are defined as intersections with LOS of D or worse, and do not account for multimodal improvements:

- 300 West / 900 South
  - The congestion throughout the Central 9th area caused by the bottleneck at the West Temple / 900 South intersection and additionally by angled parking maneuvers and slow speeds cause eastbound queues that occasionally extend past 300 West, causing delays for the eastbound movements and the southbound left turns onto 900 South. The overall intersection however operates at LOS D.

- 200 West / 900 South
    - Similar to 300 West, the eastbound queues occasionally extend past 200 West, causing eastbound delays. Because of the TRAX crossing at this intersection, Fehr & Peers recommends signage/roadway striping to keep the intersection clear.
- West Temple / 900 South
    - Because of reduced capacity on 900 South and the high volumes, this intersection becomes a bottleneck, causing eastbound and westbound delays on 900 South. The eastbound approach experiences high delays, as well as the westbound left turn movement. However, the westbound left turn delays are likely overstated, as it was modeled as a protected only left turn phase. This delay will likely be reduced as the left turn phase becomes variable to allow permissive turns when there are not trail users. The model reports the average maximum queue for the westbound left turn movement as 470 feet in the PM peak hour, which suggests that the queues may extend past Richards Street.
- State Street / 900 South
    - Westbound congestion on 900 South caused by the bottleneck at the West Temple / 900 South intersection causes queues that occasionally extend past State Street, causing high delays on the westbound approach. The model reports the average maximum queue for the westbound left turn movement as 172 feet in the PM peak hour.
- 200 East to 500 East
    - The reduced capacity on 900 South causes delays for the westbound traffic between 200 East and 500 East. However, there are no significant queueing issues (queues exceeding the available storage) for the left turns on 900 South in this stretch.
- 600 East / 900 South
    - All movements operate at acceptable LOS at this intersection. The model reports the average maximum queue for the westbound left turn movement as around 200 feet in the PM peak hour. It is recommended that the TWLTL be utilized to provide a storage length to accommodate for the queues of vehicles entering Liberty Park.
- 700 East / 900 South
    - The northbound left turn, eastbound left turn, and westbound left turn movements experience high delays at this intersection in the PM peak hour. However, the overall intersection operates at LOS C. High eastbound volumes at this intersection

also cause queues to occasionally extend past the 600 East intersection. The model reports the average maximum queue for the eastbound left turn movement as 273 feet, and the eastbound right turn movement as 527 feet.

- 900 East / 900 South
    - The delays and LOS are not an issue at this intersection for both weekday PM and Saturday mid-day peak hours. However, the eastbound left turn movement experiences average maximum queues that exceed the short available storage.

Travel time estimates were collected from the VISSIM model for the opening year build conditions during the weekday PM peak hour and Saturday mid-day peak hour. The opening year build conditions travel times were compared to the existing travel times to evaluate the impact of the reconstruction to corridor travel times on 900 South. The travel time comparisons for the weekday PM peak hour and the Saturday mid-day peak hour are shown in **Table 11** and **Table 12**, respectively.

Table 11: Weekday PM Travel Time Comparison

Location	Eastbound			Westbound		
	Existing	Opening Year Design	% Increase	Existing	Opening Year Design	% Increase
900 West – 300 West	01:47	02:19	30%	02:40	02:47	5%
300 West – West Temple	01:31	04:31	**199%**	01:12	02:04	72%
West Temple – 400 East	03:07	04:00	29%	03:02	10:10	**236%**
400 East – 900 East	02:52	04:16	49%	03:02	06:21	**109%**
900 East – 1000 East	00:55	00:55	-1%	00:24	00:24	-1%

Source: Fehr & Peers.

Table 12: Saturday Mid-day Travel Time Comparison

Location	Eastbound			Westbound		
	Existing	Opening Year Design	% Increase	Existing	Opening Year Design	% Increase
900 West – 300 West	01:48	01:47	0%	02:49	02:35	-8%
300 West – West Temple	01:26	02:03	43%	01:29	01:50	24%
West Temple – 400 East	04:09	03:48	-8%	03:13	03:26	7%
400 East – 900 East	03:20	03:09	-5%	02:55	02:58	2%
900 East – 1000 East	00:49	00:47	-5%	00:22	00:22	-1%

Source: Fehr & Peers.

As shown in **Table 11**, the most significant impact on the 900 South corridor in the PM peak hour can be seen in the eastbound travel in the Central Ninth area (between 300 West and West Temple) and in the westbound travel between West Temple and 400 East and between 400 East and 900 East. The eastbound travel in the Central 9th area is expected to increase by about three minutes within the short segment of about two blocks. The westbound travel time is expected to increase by more than seven minutes between West Temple and 400 East, and by more than three minutes between 400 East and 900 East. The 900 South project is designed to forward the long-term vision the City and its citizens have chosen, which is a future of many transportation choices. he local community council has been involved in the design of this project and supports the final design. The design and enhanced bus service will encourage more active transportation and transit use.

The other segments in the weekday PM peak hour and all segments in the Saturday mid-day show minimal impacts to travel times from the proposed reconstruction.

Conclusions and Recommendations

The model projects that, in Opening Year Build Conditions (2023), the reduced capacity causes eastbound and westbound congestion originating at the West Temple / 900 South intersection in the weekday PM peak hour. The eastbound congestion is expected to cause vehicular queues originating from West Temple that occasionally extend past 300 West, causing delays and added travel times in the Central 9th area (between 300 West and West Temple). Because the queue is expected to extend past 200 West, where the TRAX line crosses 900 South, Fehr & Peers recommends enhanced signage and roadway striping to keep the intersection clear. The westbound congestion is expected to cause vehicular queues originating from West Temple that occasionally extend past State Street, causing delays and increased travel times between West Temple and 400 East.

It should be noted that the delays and increased travel times are likely overstated, as vehicles traveling on 900 South with no destination along the corridor will likely choose a different parallel route to travel, as the capacity on 900 South is reduced. Multi-modal use of the corridor is also expected with the reduce in capacity.

The reconstruction of 900 South shows minimal impacts to traffic operations in the Saturday mid-day peak hour because there is less traffic on the corridor. In locations where the vehicular capacity is reduced, the design does strive to preserve turn lanes at most locations to minimize delays and

impacts to traffic flow. Traffic signal operations are also implemented, especially at the UDOT roadway intersections, to minimize traffic impacts and enhance trail crossing safety.