

Memorandum

Date: January 10, 2022
To: Brian Abbanat, City of Davis
From: Adrian Engel, PE, & Kyle Baumgartner, Fehr & Peers
Subject: **West Fourteenth Street & Oak Avenue Demonstration Project**

RS19-3838

Introduction

The purpose of this memorandum is to document the differences observed between the existing conditions along West Fourteenth Street between Oak Avenue and B Street and the conditions during the demonstration project that took place between November 7th – 13th, 2021. The memorandum also provides considerations for their Fourteenth Street/Villanova Drive Improvements project based on the observations and lessons learned from the demonstration project.

Existing Conditions

Existing conditions along West Fourteenth Street between Oak Avenue and B Street consist of a single travel lane, bike lane, and on-street parking in each direction (eastbound/westbound) separated by a two-way left turn lane.

There is an existing all-way stop controlled intersection on the west end of the corridor at Oak Avenue with the following approach movements:

- Northbound Left/Through/Right Turn Lane
- Northbound Bike Lane
- Eastbound Left Turn Pocket
- Eastbound Through/Right Turn Lane
- Eastbound Bike Lane
- Southbound Left/Through/Right Turn Lane
- Southbound Bike Lane



- Westbound Left Turn Pocket
- Westbound Through/Right Turn Lane
- Westbound Bike Lane
- Crosswalks are provided on all approaches

There is an existing all-way stop controlled intersection on the east end of the corridor at B Street with the following approach movements:

- Northbound Left/Right Turn Lane
- Northbound Bike Lane
- Eastbound Through/Right Turn Lane
- Eastbound Bike Lane
- Westbound Through/Left Turn Lane
- Westbound Bike Lane
- Crosswalks are provided on all approaches

There is an existing mid-block crosswalk crossing West Fourteenth Street located between Beech Lane and Eureka Avenue.

Traffic Volumes

Intersection turning movement counts were collected at the West Fourteenth Street/Oak Avenue and West Fourteenth Street/B Street intersections from Monday June 3rd through Friday June 7th of 2019. The average weekday counts (Tuesday – Thursday) are summarized for the AM and PM peak hours in **Tables 1 & 2**.

Table 1: Existing Conditions Volumes W 14th St & Oak Ave

Start Time	Oak Ave Southbound			W 14 th St Westbound			Oak Ave Northbound			W 14 th St Eastbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
7:45 AM	115	80	36	32	75	96	10	78	38	51	156	15
3:00 PM	103	73	27	20	114	131	18	76	9	21	101	15

Source: Fehr & Peers 2019.



Table 2: Existing Conditions Volumes W 14th St & B Street

Start Time	B St Southbound			W 14 th St Westbound			B St Northbound			W 14 th St Eastbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
7:45 AM	-	-	-	63	261	-	169	-	34	-	160	82
3:15 PM	-	-	-	48	195	-	122	-	57	-	194	89

Source: Fehr & Peers 2019.

Average daily traffic (ADT) volumes and 85th percentile speed data were collected along West Fourteenth Street between Beech Lane and B Street from Monday June 3rd through Friday June 7th of 2019. The average weekday ADT volumes & 85th percentile speed data (Tuesday – Thursday) are summarized in **Table 3**.

Table 3: Existing Conditions ADT Volumes & 85th Percentile Speed W 14th St

7-9 AM Volumes	12-2 PM Volumes	4-6 PM Volumes	Off Peak Volumes	ADT Volumes	85 th % Speed
673	700	856	2918	5147	33 MPH

Source: Fehr & Peers 2019.

Observations

Fehr & Peers performed traffic observations in 2019 prior to the demonstration project, and again in 2021 after the demonstration project had been removed to help set a baseline for the observations taken during the demonstration project.

Queueing:

The primary queue observed was on the eastbound approach to the West Fourteenth Street and Oak Avenue Intersection. Prior to and after the demonstration project the queue was observed to extend from the intersection to about 100' to the west of Reed Drive. Smaller eastbound queues were noted at the entrance to the high school parking lot.

Behavioral Observations:

Multiple lanes of traffic eastbound/westbound on West Fourteenth Street entering the all-way stop controlled intersection at Oak Avenue made it confusing for vehicles, bicycles, and pedestrians to determine who had the right of way, resulting in operational inefficiencies and increasing conflicts for bicyclists and pedestrians.



Demonstration Project Conditions

The demonstration project conditions along West Fourteenth Street between Oak Avenue and B Street were modified to consist of a single travel lane, bike lane, and on-street parking in the eastbound direction separated by a two-way left turn lane. The westbound bike lane/on-street parking was modified to include a separated two-way cycle track. **Figure 1** illustrates the demonstration project limits, and **Figure 2** illustrates the implemented two-way cycle track.

The existing all-way stop controlled intersection on the west end of the corridor at Oak Avenue was modified to provide a protected intersection with the following approach movements:

- Northbound Left/Through/Right Turn Lane
- Northbound Bike Lane
- *Eastbound Left Turn Pocket Was Removed*
- Eastbound Left/Through/Right Turn Lane
- Eastbound Bike Lane
- Southbound Left/Through/Right Turn Lane
- Southbound Bike Lane
- *Westbound Left Turn Pocket Was Removed*
- Westbound Left/Through/Right Turn Lane
- Westbound/Eastbound Two-Way Cycle Track
- Crosswalks and Bike Crossings provided on all approaches

Figures 3 illustrates the protected intersection as it was implemented during the demonstration project, and **Figure 4** compares the demonstration project to the concept proposed with the initial traffic control plan.

The existing all-way stop controlled intersection was modified to maintain the existing lane configurations and provide entrance to and exit from the two-way cycle track on the north side of West Fourteenth Street.

The existing mid-block crosswalk crossing West Fourteenth Street located between Beech Lane and Eureka Avenue remained with the demonstration project.



Figure 1: West Fourteenth Street Demonstration Project





Figure 2: Two-Way Cycle Track





Traffic Volumes

The existing condition counts taken in 2019 were taken before the COVID-19 pandemic. Travel patterns have changed significantly as the stay-at-home orders have changed schooling and work schedules.

Intersection turning movement counts were collected at the West Fourteenth Street/Oak Avenue and West Fourteenth Street/B Street intersections during the demonstration project on Wednesday, November 10, 2021. The counts are summarized for the AM and PM peak hours in **Tables 4 & 5**.

Table 4: Demonstration Project Volumes W 14th St & Oak Ave

Start Time	Oak Ave Southbound			W 14 th St Westbound			Oak Ave Northbound			W 14 th St Eastbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
8:15 AM	96	57	31	28	165	101	8	90	35	74	164	12
2:30 PM	96	58	21	23	137	127	20	52	21	20	134	10

Source: Fehr & Peers 2021.

Table 5: Demonstration Project Volumes W 14th St & B Street

Start Time	B St Southbound			W 14 th St Westbound			B St Northbound			W 14 th St Eastbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
8:15 AM	-	-	-	60	195	-	142	-	31	-	104	108
2:30 PM	-	-	-	39	148	-	115	-	65	-	170	149

Source: Fehr & Peers 2021.

Average daily traffic (ADT) volumes and 85th percentile speed data were collected along West Fourteenth Street between Eureka Avenue and B Street during the demonstration project on Wednesday, November 10, 2021. The ADT volumes & 85th percentile speed data are summarized in **Table 6**.

There was an overall decrease in the daily traffic and PM peak hour traffic on Fourteenth Street during the demonstration project. However, the morning peak hour did see an overall increase of arrivals and a shifting of the peak hour to later in the morning. Differences between the existing conditions volumes taken in 2019 and the demonstration project volumes from 2021 are partially



attributed due to the changes in the bell schedule at Davis Senior High School, aligning the start and end times of the high school to the adjacent schools, construction on Covell Blvd, and COVID related policy changes.

Table 6: Demonstration Project ADT Volumes & 85th Percentile Speed W 14th St

7-9 AM Volumes	12-2 PM Volumes	4-6 PM Volumes	Off Peak Volumes	ADT Volumes	85 th % Speed
715	671	679	2416	4481	33 MPH

Source: Fehr & Peers 2021.

Observations

Fehr & Peers performed traffic observations during the demonstration project throughout the week to compare the observations to the existing conditions.

Queueing Observations:

The primary queue observed during the demonstration project was also the eastbound approach to the West Fourteenth Street and Oak Avenue Intersection. During the morning arrival time for the schools the queue was observed to extend from the intersection to just before Anderson Road. Similar to the existing condition, eastbound queues of four to six cars were noted at the entrance to the high school parking lot.

Vehicle Operations Observations during the demonstration project:

- Vehicles seemed to have a clearer indication of right-of-way, yielding appropriately for opposing vehicle, bicycle, and pedestrian movements with the elimination of the left turn pockets
- Larger vehicles making a westbound right turn would occasionally clip the raised channelizers
- In one instance, a bus making a westbound left turn encroached into the northbound lane and required the northbound vehicle to back-up further behind the limit line
- Two vehicles were observed traveling in the two-way cycle track, perceiving it as single wide lane on the first day of the demonstration (this behavior was not observed after the center stripe was installed clearly delineating the two-way cycle track)
- Vehicles observed picking up and dropping off passengers in the westbound travel lane along West Fourteenth Street
- Vehicles turning into driveways across the buffered two-way cycle track would occasionally clip the raised channelizers
- Eastbound vehicles on West Fourteenth Street pulling into the student parking lot in the AM peak hour would consistently queue roughly 200 feet, utilizing the two-way left turn lane as a left turn pocket



- The westbound queue on West Fourteenth Street at Oak Avenue during the PM peak hour would consistently queue back to the student parking lot exit, restricting sight distance for vehicles making a left turn out of the student parking lot
- Low hanging foliage from the trees on the northeast corner of the student parking lot exit were restricting sight distance for vehicles exiting the driveway (this was improved after the first day of the demonstration project after the trees were trimmed)

Bicycle Operations Observations:

- Bicyclists at the West Fourteenth Street/Oak Avenue protected intersection occasionally stop at existing crosswalk instead of stopping closer to the proposed bike lane stop bar
- Bicyclists at the West Fourteenth Street/Oak Avenue protected intersection occasionally continue straight through the intersection, weaving through the channelizers used to replicate the 'raised corner islands', instead of following the proposed path of travel
- Bicyclists at the West Fourteenth Street/Oak Avenue protected intersection occasionally leave the bike lanes and take the vehicle travel lanes to make left turns
- Eastbound bicyclists at the West Fourteenth Street/Oak Avenue protected intersection occasionally use the curb ramp on the northeast corner of the intersection and ride along the sidewalk to access the bike parking area to the east
- Eastbound bicyclists observed crossing West Fourteenth Street mid-block between Oak Avenue and Beech Lane to access the bike parking area
- Bicyclists observed leaving the bike parking area near the student parking lot, crossing West Fourteenth Street mid-block just west of the student parking lot exit before heading east on West Fourteenth Street
- A holistic view of area bikeway connections should be considered when for determining the overall extent of the cycle track as part of an all-ages and abilities network including the Eureka Avenue neighborhood bikeway, the shared use path on the west side of F Street that connects to Davis Community Park and the Covell Boulevard pedestrian overcrossing, and the future Anderson Drive separated and buffered bike lanes.

Pedestrian Operations Observations:

- Pedestrians at the West Fourteenth Street/Oak Avenue protected intersection occasionally used the green taped bicycle lane when crossing the intersection
- Pedestrians at the West Fourteenth Street/Oak Avenue protected intersection would occasionally wait at the curb ramp on the sidewalk instead of waiting near the proposed pedestrian loading area within the street protected by channelizers
- Pedestrians during the PM peak hour exiting near the student parking lot would cross West Fourteenth Street mid-block to get to parked cars, and cars waiting for pick-up in the on-street parking provided on the south side of the street



Bus Operations Observations:

- Northbound buses traveling along Oak Avenue would stop in street just south of West Fourteenth Street to load/unload passengers, blocking the minimal northbound queue
- Westbound buses traveling along West Fourteenth Street would angle into the bike lane just west of Oak Avenue to load/unload passengers, blocking both the westbound vehicle lane and the westbound bike lane
 - In one instance, a platoon of westbound bicycles approaching the bus stop had to maneuver around the bus into the vehicle travel lane as the bus was unloading passengers
- The relocated bus stops to the far side of the intersections away from the school increased the number of pedestrians within the protected intersection compared to the existing bus stop location along the school frontage.