Fehr & Peers

Technical Memorandum

Date: January 22, 2026

To: Pamela Dalcin-Walling, PE, QSD/P, Dokken Engineering

From: John Gard, and Mari Ramones, Fehr & Peers

Subject: Project Alternatives Analysis and Recommendations for the Gateway Activation Project in Citrus Heights, CA

Purpose

This technical memorandum recaps the project kickoff, initial community outreach, and intersection alternatives analysis for the Gateway Activation Project (GAP) in Citrus Heights, CA. The City of Citrus Heights staff identified project build alternatives to be evaluated for the primary study intersections at Old Auburn Road/Argo Drive, Old Auburn Road/Wachtel Way, and Old Auburn Road/Oakwood Hills Circle East.

Background

The Citrus Heights Gateway Activation Project (GAP) proposes to extend multi-modal connections along Old Auburn Road from the eastern border of the City of Citrus Heights for about 0.55 miles west. The proposed improvements will connect with existing and planned bicycle and pedestrian improvements to the west and east.

The objectives of the GAP project are to:

- Extend multimodal facilities on Old Auburn Road from the City's eastern boundary to the existing Class I trail to the west (Robert Creek Court)
- Extend multimodal facilities on Wachtel Way south to the Arcade-Cripple Creek Trail
- Upgrade intersections at Old Auburn Road/Wachtel Way and Old Auburn Road/Oakwood Hills Circle East
- Improve pedestrian safety and crossings at multiple points within the study corridor

An existing conditions analysis was conducted in early 2025 to document key characteristics such as existing roadway, bicycle and pedestrian networks, vehicle queuing, vehicle speeds, cut-through travel, and safety. The Existing Conditions Analysis Memorandum can be found in **Appendix A.**

Following the existing conditions analysis, the project team conducted a preliminary analysis of intersection alternatives for the following three study intersections:

1. Old Auburn Road/Argo Drive

2. Old Auburn Road/Wachtel Way
3. Old Auburn Road/Oakwood Hills Circle East

Alternatives at Old Auburn Road/Argo Drive were evaluated based on improving pedestrian safety and creating a crossing to connect the existing Class I trail to the west and the proposed trail to the east. Secondary considerations included traffic control devices that could reduce corridor speeds.

Several intersection controls were evaluated for the Old Auburn Road/Wachtel Way and Old Auburn Road/Oakwood Hills Circle East intersection. After a preliminary alternatives analysis, the project team narrowed down the alternatives to present at a community meeting. The alternatives that were chosen for a more focused analysis are discussed below.

Community Outreach

The project team hosted a kickoff community meeting on April 29, 2025 to introduce the project and gather community input on preliminary design concepts. The meeting began with the project team presenting the project overview and objectives. During the presentation, the team introduced the following geometric options for community input:

1. Two options for a pedestrian crossing at Argo Drive: a Pedestrian Hybrid Beacon (PHB) and a roundabout alternative.
2. Two options for the Old Auburn Road/Wachtel Way intersection: Traffic Signal and Roundabout.
3. Two options for the Old Auburn Road/Oakwood Hills Circle East intersection: Maintain existing All-Way Stop-Control (AWSC) and Roundabout.

The project team presented the safety and operational benefits and drawbacks of each alternative along with various other engineering design aspects.

Community members expressed interest in both the pedestrian hybrid beacon and roundabout options for Argo Drive. For the intersection improvements at Wachtel Way, community members preferred the roundabout alternative over the signal alternative. However, several attendees expressed concerns about the roundabout and the ability for residents to use it safely. At Oakwood Hills Circle East, residents preferred the roundabout to the existing condition of All-Way Stop-Control.

For a detailed description of the community workshop and project alternative exhibits, see the project website at https://www.citrusheights.net/1343/Gateway-Activation-Project-GAP.

Argo Drive Pedestrian Crossing

Fehr & Peers evaluated the appropriate type of traffic control and pedestrian crossing at the Old Auburn Road/Argo Drive intersection. Fehr & Peers documented existing conditions and evaluated potential improvements.

Existing Conditions

The Old Auburn Road/Argo Drive intersection is controlled by stop signs on the two side-street approaches. In this area, Old Auburn Road features one travel lane in each direction separated by a two-way left-turn lane (TWLTL). There are also wide Class II (on-street) bike lanes present in each direction (may have accommodated on-street parking at one time). Just west of the intersection, Old Auburn Road is 71 feet wide, measured from face of curb.

No crosswalks are located at the intersection and the posted speed limit on this section of Old Auburn Road is 40 miles per hour. The nearest crosswalk to this intersection across Old Auburn Road is at Wachtel Way, 900 feet to the east. There are not continuous sidewalks along Old Auburn Road between Argo Drive and Wachtel Way, which requires pedestrians to walk in the shoulder or bike lane. The next closest crossing is 2,300 feet to the west at Wintergreen Drive.

Figure 1 shows the existing AM and PM peak hour traffic volumes at the study intersection based on counts collected on Wednesday, October 30, 2024.

Image 1 is a photo taken in March 2025 of a group of pedestrians beginning to cross Old Auburn Road at Argo Drive. Halfway across, they began jogging/running across the road as vehicles were approaching.

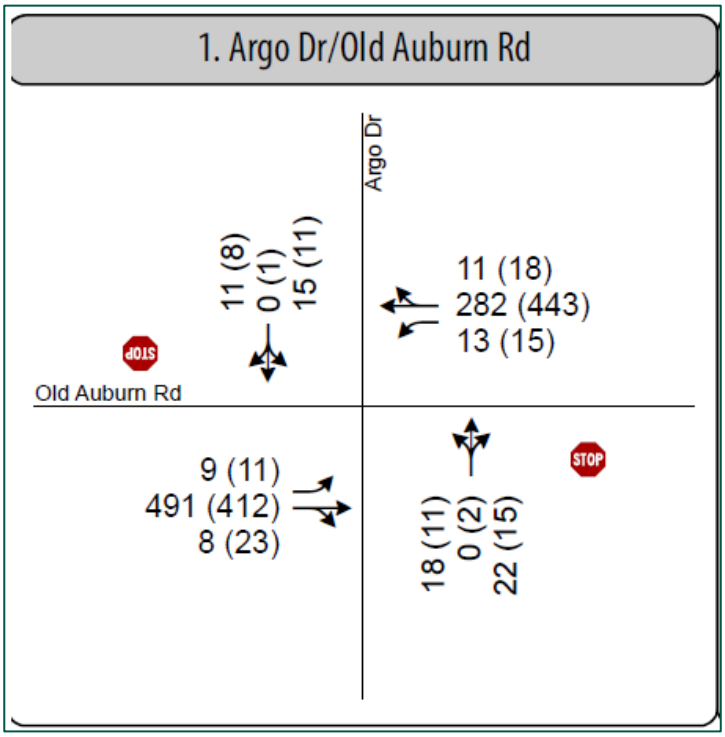


Figure 1: Existing AM (PM) peak hour traffic volumes.



Image 1: View of pedestrians crossing Old Auburn Road at Argo Drive

Warrants Analysis

The *California Manual of Uniform Traffic Control Devices* (Caltrans, 2014) contains several different types of warrants or installation guidelines applicable to the study intersection. They include:

- Traffic Signal Warrants
- Pedestrian Hybrid Beacon Guidelines for Installation

Traffic Signal Warrant Analysis

There are nine (9) traffic signal warrants as shown in **Image 2**. Of these nine, warrants 1, 2, 3, 4, and 7 would be applicable to the study intersection. Warrant 5 is not applicable because the intersection is not an established school crossing. Warrants 6, 8, and 9 are also not applicable for various reasons.

02 **The investigation of the need for a traffic control signal shall include an analysis of factors related to the existing operation and safety at the study location and the potential to improve these conditions, and the applicable factors contained in the following traffic signal warrants:**

Warrant 1, Eight-Hour Vehicular Volume
Warrant 2, Four-Hour Vehicular Volume
Warrant 3, Peak Hour
Warrant 4, Pedestrian Volume
Warrant 5, School Crossing
Warrant 6, Coordinated Signal System
Warrant 7, Crash Experience
Warrant 8, Roadway Network
Warrant 9, Intersection Near a Grade Crossing

Image 2: List of all signal warrants contained in CA MUTCD.

The following conclusions were reached regarding whether the study intersection satisfies any of the applicable CA MUTCD signal warrants:

- **None of the traffic volume-based signal warrants would be satisfied.** This is because the largest hourly side-street traffic volume is 40 vehicles, half of the minimum required for the 4-hour warrant and only 40% of the required volume for the peak hour warrant.
- **The pedestrian volume warrant would not be met.** During the October 2024 counts, only a single pedestrian crossed Old Auburn Road during the five-hour count window.
- **The crash experience warrant would not be met.** Between 2018 and 2023, two reported crashes occurred at the study intersection. This warrant requires five collisions in a 12-month period of a type susceptible to correction by a traffic signal.

Pedestrian Hybrid Beacon Warrant Analysis

Page 973 of the *CA MUTCD* states the following with regard to when pedestrian hybrid beacons (PHBs) should be installed:

> *For a major street where the posted or statutory speed limit or the 85th-percentile speed exceeds 35 mph, the need for a pedestrian hybrid beacon should be considered if the engineering study finds that the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding total of all pedestrians crossing the major street for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4F-2 for the length of the crosswalk.*

Image 3 shows Figure 4F-2 from the CA MUTCD and indicates that a minimum of 20 pedestrian crossings per hour are suggested by this guideline. **Image 4** shows the pedestrian signal heads visible to motorists at PHBs.

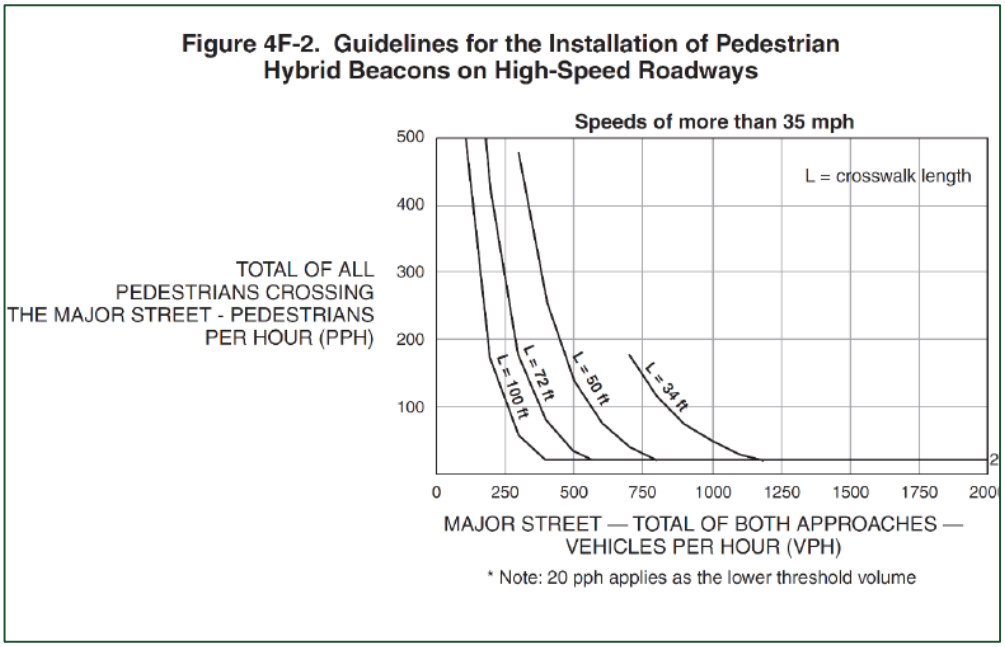


Image 3: Guidelines for installing pedestrian hybrid beacons

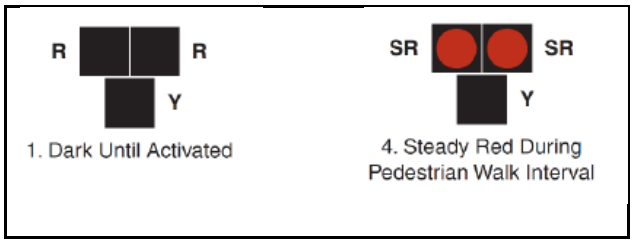


Image 4: pedestrian hybrid beacons signal heads

In summary, the Old Auburn Road/Argo Drive intersection does not currently have a sufficient level of pedestrian crossings to meet the guideline for PHB installation. While such an installation may attract more pedestrians, it is unknown whether at least 20 per hour will occur.

Although the suggested guidelines are not met for pedestrian volumes, the CA MUTCD allows for the installation of a PHB based on an analysis and engineering judgment.

Conclusions

From the aforementioned analyses, it was determined that neither a traffic signal nor a PHB are appropriate solutions for the Old Auburn Road/Argo Drive intersection. However, it is worth noting that the majority of the language related to the signal warrant analysis in the *CA MUTCD* is regulatory and uses wording like "shall". In contrast, language associated with the PHB is primarily optional, guidance, or support, suggesting there may be some flexibility in application and deference given to the lead agency.

Page 973 of the *CA MUTCD* states the following: "A conventional traffic control signal operation with a standard signal face displaying green, yellow and red (steady and/or flashing red) indications, at a mid-block crosswalk is an alternative to the pedestrian hybrid beacon." This type of installation (i.e. a pedestrian signal) is in place in multiple locations in Citrus Heights, such as nearby Woodside Middle School and various locations along Auburn Boulevard and Greenback Lane.

In lieu of the signal alternatives mentioned above, a roundabout was considered.

Image 5 shows Exhibit 8.8 of *NCHRP 1043: Guide for Roundabouts* (2023). This exhibit shows a range of appropriate intersection traffic control treatments across a wide range of traffic volumes. The red 'X" on this image shows the volume at the Old Auburn Road/Argo Drive intersection. The volume is at the cusp of where side-street stop-control or a single-lane roundabout is advised.

A single-lane roundabout would offer several benefits to travelers on the Old Auburn Road corridor including:

1. **Reduced travel speeds**. Motorists would be required to slow down well below the 40 mph posted speed limit in order to navigate the roundabout.
2. **Improved Pedestrian Crossing**: The currently uncontrolled 70-foot wide crossing of Old Auburn Road at Argo Drive would be converted into a much shorter crossing distance (and across one lane at a time with a refuge island in between).
3. **Acceptable traffic operations**: The roundabout would operate with only modest delays and queues.
4. **Improved Corridor Safety**: Roundabouts are known to have lower collision rates than signals or stop signs under most conditions. They are especially effective in reducing fatal or severe injury collisions.

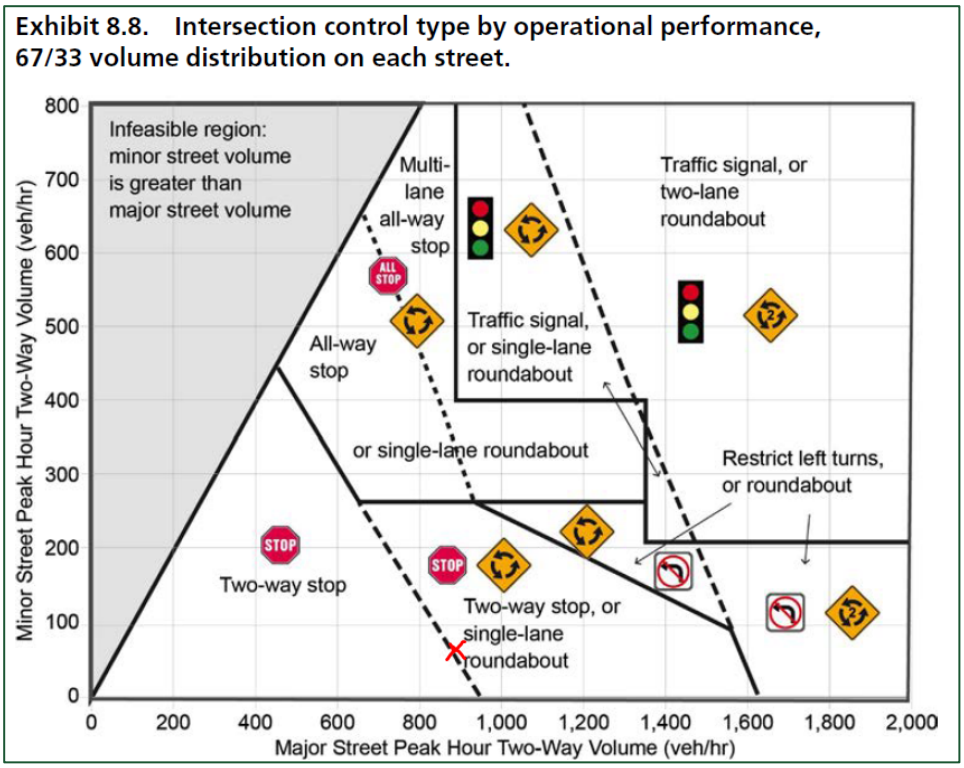


Image 5: Exhibit 8.8 of NCHRP 1043: Guide for Roundabouts (2023)

Alternatives Analysis

The project team considered a range of traffic control alternatives for the remaining two study intersections, Old Auburn Road/Wachtel Way and Old Auburn Road/Oakwood Hills Circle East. These two intersections were analyzed as a pair due to their proximity to each other and the upstream/downstream effects that each control type has on the other intersection. The following alternatives were developed for subsequent analysis:

- Alternative 1 – Consists of a roundabout at the Old Auburn Road/Wachtel Way intersection and maintaining the existing AWSC at the Old Auburn Road/Oakwood Hills Circle East intersection.
  A roundabout was considered due to its ability to reduce vehicle travel speeds and conflict points, and to improve multi-modal crossing conditions at the intersection. **Image 6** shows the configuration at the study intersections under this alternative.
- Alternative 2 – Consists of roundabouts at both study intersections. **Image 7** shows this configuration at the study intersections under this alternative.

- Alternative 3 – Consists of installing a traffic signal at the Old Auburn Road/Wachtel Way intersection with east-west split phasing (i.e., no westbound left-turn lane) and the Old Auburn Road/Oakwood Hills Circle East intersection remain as AWSC. **Image 8** shows the configuration at the study intersections under this alternative.

(Please see "Warrant Analysis at the Old Auburn Road/Oakwood Hills Circle East–Linda Creek Ct Intersection" for a discussion regarding why a traffic signal was not considered at the Old Auburn Road/Oakwood Hills Circle East intersection under any of these alternatives.)



Image 6: Proposed intersection configurations for Alternative 1.

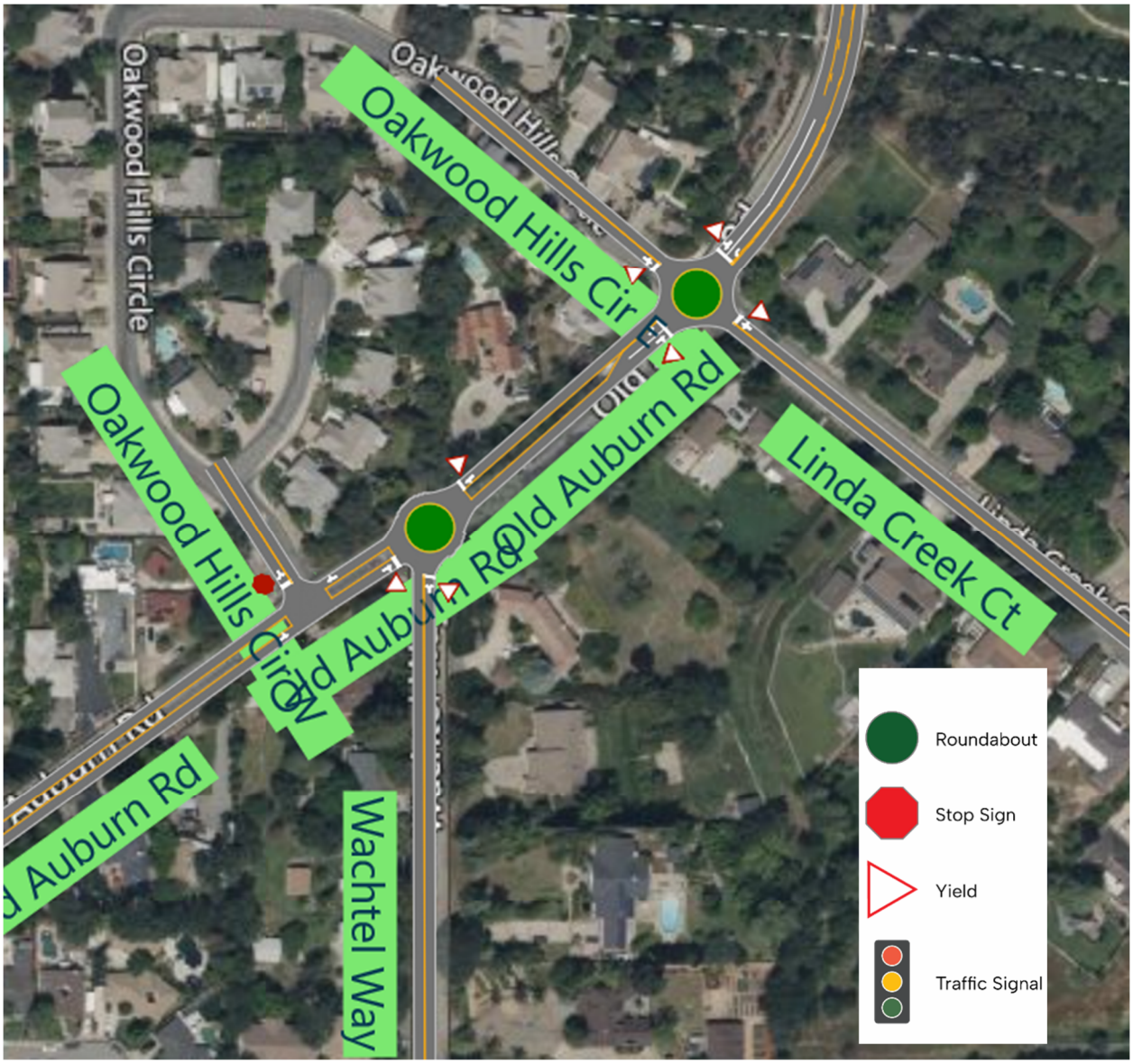


Image 7: Proposed intersection configurations for Alternative 2.

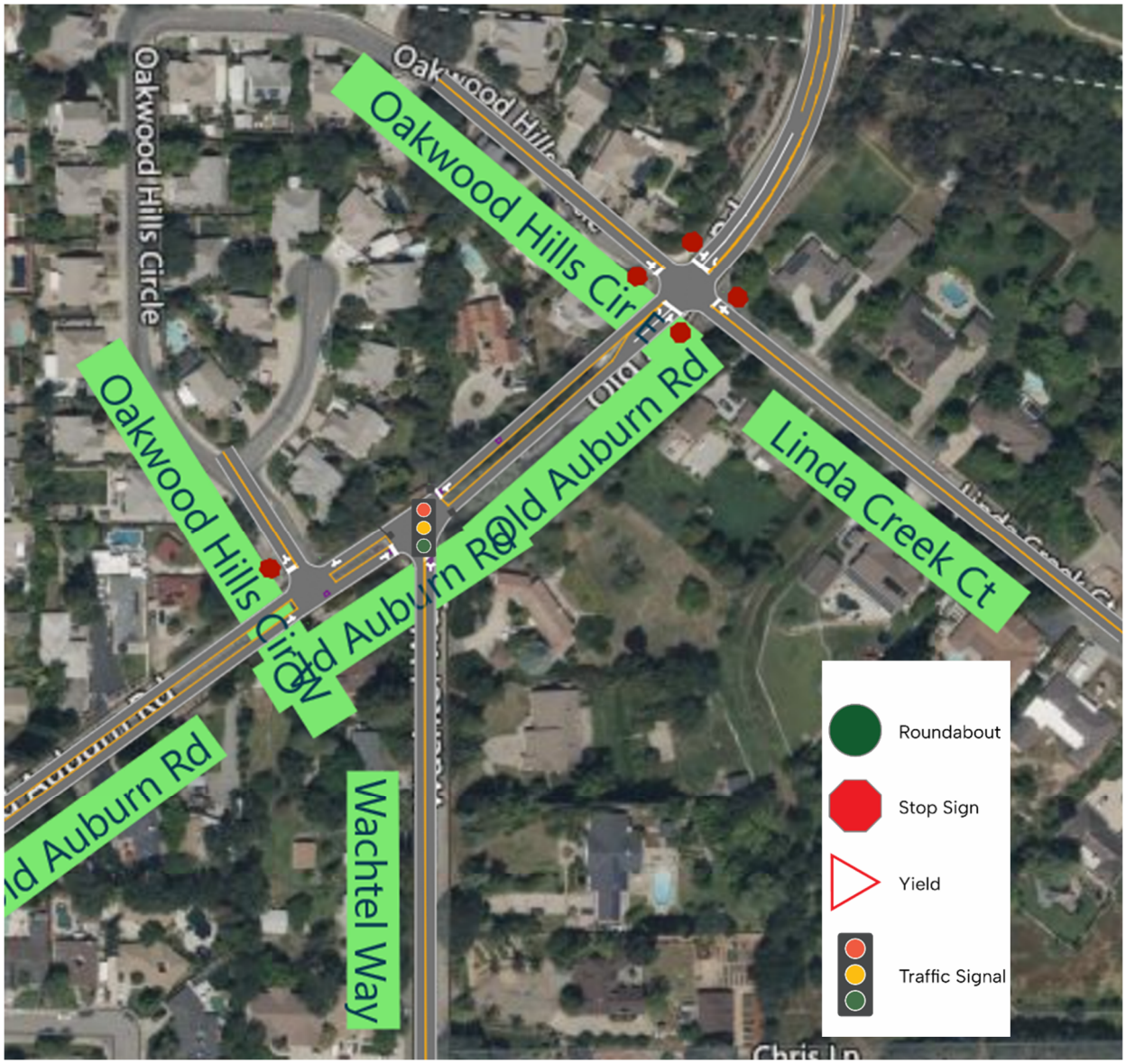


Image 8: Proposed intersection configurations for Alternative 3.

To confirm that a roundabout would be a viable solution for this segment of Old Auburn Road, the project team research locations in the Northern California area with comparable single lane roundabouts. The City of Chico installed a single lane roundabout at the Manzanita Avenue/Vallombrosa Avenue intersection over 10 years ago. This roundabout has comparable ADT volumes of 11,142 vehicles on Manzanita Avenue, similar to Old Auburn Road west of Wachtel Way. Conversations with the City of Chico staff revealed that one collision has been reported at this roundabout in last 7 years. Comparable single-lane roundabouts also exist on Elk Grove Boulevard between Waterman Road and Bradshaw Road in the City of Elk Grove. The existing ADT on Elk Grove Boulevard at this location is about 13,200 vehicles.

Warrant Analysis at the Old Auburn Road/ Oakwood Hills Circle East-Linda Creek Ct Intersection

A traffic signal was evaluated as a potential alternative at the Old Auburn Road/Oakwood Hills Circle East-Linda Creek Ct intersection. Similar to the warrant analysis presented previously at the Old Auburn Road/Argo Drive intersection, warrants 1, 2, 3, 4, and 7 would be applicable to this study intersection.

Based on the results of the warrant analysis, it was determined that the Old Auburn Road/Oakwood Hills Cir E-Linda Creek Ct intersection does not satisfy any of the applicable CA MUTCD signal warrants for the following reasons:

- **None of the traffic volume-based signal warrants would be satisfied.** The largest hourly side-street traffic volume is 5 vehicles, which does not meet the lowest threshold volume for a minor-street approach with one lane.
- **The pedestrian volume warrant would not be met.** During the October 2024 counts, only seven pedestrians crossed Old Auburn Road during the five-hour count window.
- **The crash experience warrant would not be met.** Between 2018 and 2023, one reported crash occurred at the study intersection.

Additionally, installing a traffic signal at this intersection would lead to higher vehicle speeds through the corridor. This could potentially increase the frequency of collisions and street noise on Old Auburn Road. With a traffic signal in place, the eastbound and westbound through movements on Old Auburn Road would receive a green signal indication the vast majority of the day (due to lack of side street traffic). Motorists on Old Auburn Road may become accustomed to the signal being green and consequently drive less cautiously when approaching it. In summary, the installation of a traffic signal is not warranted based on traffic volume and collision history and would be detrimental to overall safety in the corridor.

Intersection Operations

Traffic operations for each alternative were analyzed using delay and Level of Service (LOS) as primary measures of intersection performance. Automobile LOS is a qualitative description of traffic flow from the perspective of motorists. The *Highway Capacity Manual (HCM) 7th Edition* (Transportation Research Board, 2022) defines six levels of service from LOS A representing the least congested traffic conditions to LOS F representing the most congested traffic conditions. These grades represent the perspective of drivers and are an indication of the comfort and convenience associated with driving, as well as speed, travel time, traffic interruptions, and freedom to maneuver.

LOS at signalized and all-way stop-controlled intersections and roundabouts is based on the weighted average control delay measured in seconds per vehicle for all motorists traveling through the intersection. For side-street stop-controlled intersections, this study reports the average control delay for the lane group or movement with the greatest delay, and for the intersection as a whole.

The corridor was analyzed using Synchro's SimTraffic micro-simulation module to apply the methodologies. SimTraffic considers interactions between closely spaced adjacent intersections, turn

lane spillbacks, and upstream/downstream bottlenecks. In this study, given the above guidance, SimTraffic was used to analyze all study intersections.

Table 1 compares the LOS and delay results for the three build alternatives versus existing conditions. Note that the City's General Plan specifies that "the city shall strive to achieve LOS E or better conditions during peak hours". Key findings from this table are:

- The Old Auburn Road/Wachtel Way intersection would continue to operate unacceptably during the AM peak hour under Alternative 1. This occurs because the heavy eastbound travel demand approaching the Old Auburn Road/Oakwood Hills Circle East all-way stop would regularly spill back into the roundabout, locking it up.
- Alternative 2 would provide LOS A or B operations at each intersection during the AM and PM peak hours.
- Alternative 3 would also provide acceptable operations, though delays would be much greater than under Alternative 2.

Table 1. Peak Hour Level of Service – Alternatives Analysis

Alternative	Traffic Control at Wachtel Way	Peak Hour	LOS/Delay (s)	Traffic Control at Oakwood Hills Circle East	LOS/Delay (s)
Existing Conditions	AWSC	AM	**F / 56**	AWSC	E / 38
		PM	B / 14		**F / 75**
1	RAB	AM	**F / 115**	AWSC	D / 33
		PM	B / 12		C / 20
2	RAB	AM	B / 13	RAB	A / 9
		PM	B / 10		A / 8
3	Signal	AM	D / 50	AWSC	C / 20
		PM	D / 52		E / 45

Notes: AWSC = All-Way Stop-Controlled
Bolded numbers indicate deficient operations per City of Citrus Heights General Plan Policy 29.2.
Source: Fehr & Peers, 2025.

Vehicle Queuing Results

Table 2 shows the maximum queue lengths based on SimTraffic results for critical movements at the study intersections. Key findings from this table are summarized below:

1) Alternative 1
   a) Eastbound Old Auburn Road east of Wachtel Way: This alternative would deliver large platoons of traffic departing Wachtel Way. Those vehicles would incur the all-way stop at Oakwood Hills Circle East, which results in vehicle queues spilling back into the Wachtel Way roundabout. This, in turn, causes a lengthy eastbound queue to develop approaching the roundabout.
   b) Westbound Old Auburn Road: This alternative reduces the maximum queue in the westbound direction during the PM peak hour from 1,150 feet (existing) to 400 feet. This occurs because vehicles traveling westbound only have to stop at Old Auburn Road/Oakwood Hills Circle East and are able to travel freely through the roundabout.
   c) Northbound Wachtel Way: Motorists on this approach during the AM peak hour would have a difficult time finding gaps in traffic within the roundabout due to the heavy eastbound travel demand and the queue spill back mentioned above.
2) Alternative 2
   a) Eastbound Old Auburn Road: This alternative reduces the maximum queue in the eastbound direction during the AM peak hour from 850 feet (existing) to 275 feet. This reduction in queuing is due to the constant flow of traffic through the double roundabouts and minimal stopping of vehicles.
   b) Westbound Old Auburn Road: This alternative reduces the maximum queue in the westbound direction during the PM peak hour from 1,150 feet (existing) to 150 feet.
   c) Northbound Wachtel Way: When compared to Alternative 1, motorists on this approach would have a much easier time entering the roundabout, thereby resulting in less delays and shorter queues.
3) Alternative 3
   a) Eastbound Old Auburn Road west of Wachtel Way: When compared to existing conditions, this alternative results in a maximum queue that is slightly less during the AM peak hour, but twice as long during the PM peak hour. This change stems from altered corridor traffic flow characteristics due to the all-way stop at Wachtel Way being replaced by a signal.
   b) Westbound Old Auburn Road: This alternative reduces the maximum queue in the westbound direction during the PM peak hour from 1,150 feet (existing) to 825 feet. Under this alternative, westbound traffic would continue to spill back from Wachtel Way into the Oakwood Hills Circle East intersection. This change stems from altered corridor traffic flow characteristics due to the all-way stop at Wachtel Way being replaced by a signal.

Travel Times and Speeds

Corridor travel times and average travel speeds were compared against existing conditions for each alternative. Existing corridor travel times in the peak direction of travel (i.e., eastbound in the AM peak hour and westbound in the PM peak hour) are shown in **Image 9**. As shown, average travel speeds are in the 11-12 miles per hour (mph) range, which is well below the posted speed limit of 35 mph.

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Table 2. Maximum Vehicle Queues

Intersection	Movement	Available Storage (ft)[2]	Maximum Queue (ft)[1]											
			Existing Conditions			Alternative 1			Alternative 2			Alternative 3		
			Control	AM Peak Hour	PM Peak Hour	Control	AM Peak Hour	PM Peak Hour	Control	AM Peak Hour	PM Peak Hour	Control	AM Peak Hour	PM Peak Hour
Old Auburn Road/Wachtel Way	EBT	90	AWSC	**850**	**300**	RAB	**1,125**	**225**	RAB	**275**	**225**	Signal	**775**	**650**
	WB L/T	350		175	**375**		75	175		75	225		**350**	**375**
	NBL	600		275	275		**850**	125		200	125		325	250
	NBR[3]	100		125	100									
Old Auburn Road/Oakwood Hills Circle E/Linda Creek Ct	EBT	350	AWSC	150	125	AWSC	**400**	175	RAB	200	75	AWSC	300	175
	WBT	1,370		125	1,150		200	400		75	150		150	825

Notes:
[1] Results based on SimTraffic. Maximum queue lengths are rounded to nearest 25 feet. All queues are expressed on a "per lane" basis or approach as noted. Includes vehicles that may queue in the taper length of a turn pocket.
[2] Available storage lengths based on review of aerial imagery. Distance is either length of turn lane or distance to nearest upstream intersection.
[3] Existing lane configuration is a shared northbound LT/RT lane. For purposes of the simulation, a small right turn pocket was added to better model vehicle queuing conditions. With signal, this becomes a shared left/right lane.
Bolded text represents a queue that extends into or beyond the nearest upstream intersection.



Image 9: Existing corridor travel times in peak travel direction.

Table 3 compares the travel times and speeds for the proposed alternatives. As shown, Alternative 2 results in the lowest corridor travel time of about 1.5 minutes, or about half of the time it takes to travel under existing conditions. With Alternative 2, there is an increase of 6 mph in the AM peak Hour and 12 mph in the PM peak hour.

Table 3. Corridor Travel Times and Average Speed Comparisons

Scenario	AM Peak Hour	PM Peak Hour
	Eastbound (From Wintergreen Drive to Linda Creek Ct)	Westbound (from South Cirby Way to Argo Drive)
Existing Conditions	185 seconds / 11 mph	184.8 seconds / 12 mph
Alternative 1 (Roundabout/AWSC)	100.4 seconds / 19 mph	89.8 seconds / 23.5 mph
Alternative 2 (Roundabout/Roundabout)	87.3 seconds / 17 mph	82.4 seconds / 24 mph
Alternative 3 (Signal/AWSC)	141.6 seconds / 16 mph	164.9 seconds / 17 mph

Conclusions

Alternative 2 emerged as the preferred alternative when considering traffic operations and safety considerations. The superior benefits of this alternative versus the others is documented below:

- Corridor Travel Delays: Alternative 2 would result in an overall average delay during AM and PM peak hours of 10 seconds per vehicle at the Old Auburn Road/Wachtel Way and Oakwood Hills Circle East intersections. In contrast, Alternatives 1 and 3 would result in overall average delays of about 45 seconds, due to the AWSC at Oakwood Hills Circle East remaining in place under each alternative.
- Corridor Vehicle Queuing: Alternative 2 would have the least amount of vehicle queuing approaching and between the two intersections among the three alternatives studied.
- Corridor Travel Times: Alternatives 1 and 2 would have comparable travel times along Old Auburn Road. However, this metric is a bit misleading because Alternative 1 creates challenges for motorists on northbound Wachtel Way to enter the roundabout, whereas Alternative 2 does not. Thus, Alternative 2 has the least amount of overall travel time on both corridors.
- Safety: Improved safety (over existing conditions and the other alternatives) is one of the primary reasons why the roundabout combination in Alternative 2 is favored. Roundabouts reduce crash severity by eliminating right-angle conflicts, which are the crash type most responsible for fatalities at signalized intersections. Roundabouts are one of FHWA's proven safety countermeasures because they can promote lower speeds, calm traffic, and lead to improved operational performance. Furthermore, the signal at Old Auburn Road/Wachtel Way in Alternative 3 presented safety concerns related to the skewed intersection configuration. It was anticipated that the northbound Wachtel Way to westbound Old Auburn Road left turn movement would present challenges similar to what the City has experienced at the Old Auburn Road/Fair Oaks Boulevard intersection.

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Appendix A: Existing Conditions Analysis

FEHR PEERS

Memorandum

Date: January 22, 2025

To: Pamela Dalcin-Walling, PE, QSD/P, Dokken Engineering

From: John Gard, PE, and Mari Ramones, Fehr & Peers

Subject: Existing Conditions Analysis for the Citrus Heights Gateway Activation Project

SA24-0281

Introduction

Project Background

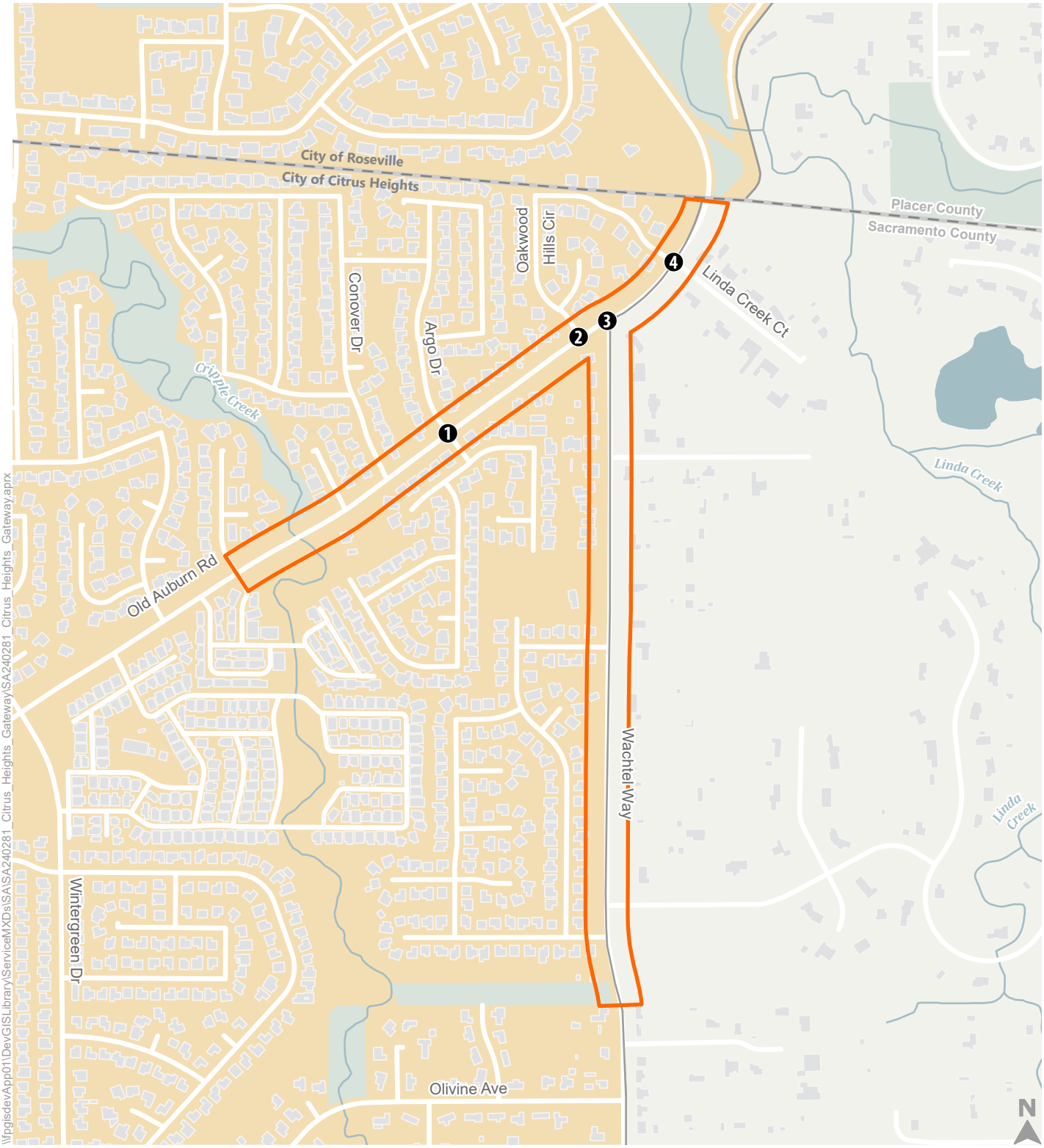
This project will transform Old Auburn Road between the Roseville/Citrus Heights border and Orielle Creek Road (0.55 miles to the west) into a Complete Streets corridor. It would extend multi-modal connections through the corridor to connect with existing and planned improvements to the west and east, addressing documented safety issues. Additionally, the project would make improvements to 0.6 miles of Wachtel Way south of Old Auburn Road for similar purposes and benefits.

Study Area and Time Periods

Figure 1 shows the study area including the four study intersections. Morning (7:00 to 9:00 a.m.) and evening (3:00 to 6:00 p.m.) peak period traffic counts were collected at the following four intersections on Wednesday, October 30, 2024.

1. Old Auburn Road/Argo Drive
2. Old Auburn Road/Oakwood Hills Circle W
3. Old Auburn Road/Wachtel Way
4. Old Auburn Road/Oakwood Hills Circle E/Linda Creek Ct

Schools were in session, weather conditions were sunny, and typical traffic conditions were observed at the time of the counts. **Appendix A** provides the traffic count data sheets.



1 Study Intersection
Study Corridor
City Limits
County Limits
Parks and Open Space

Figure 1

Study Area

Existing Conditions

Existing Roadway Network

The following are descriptions of the primary roadways in the vicinity of the project:

- **Old Auburn Road** is a two-lane east/west major collector, as shown in the City of Citrus Heights General Plan Circulation Map. The two lanes are divided by a Two-Way-Left-Turn-Lane (TWLTL) west of Argo Drive and divided by a striped centerline east of Argo Drive. Old Auburn Road serves a variety of residential and commercial land uses. Within the project vicinity, it has a westbound posted speed limit of 35 miles per hour (mph) east of Wachtel Way, and 40 mph west of Wachtel Way. Eastbound, the posted speed limit is 40 mph throughout the study corridor.
- **Wachtel Way** is a two-lane north/south major collector as per the City of Citrus Heights General Plan Circulation Map. It extends from Old Auburn Road to Oak Avenue, where it becomes Kenneth Avenue. Wachtel Way has a posted speed limit of 35 mph.

Based on a traffic survey collected in September 2021, the existing 85th percentile speed along the section of Old Auburn Road 1200' west of Wachtel Way was 45 mph in the eastbound direction, and 46 mph in the westbound direction. The posted speed liming along this section of the corridor is 40 mph. A speed survey collected in March 2017 determined that the existing 85th percentile speed along Wachtel Way north of Chris Lane was 40 mph in the northbound and southbound directions. The posted speed limit along this section of the corridor is 35 mph.

Existing Bicycle and Pedestrian Network

Figure 2 shows existing bicycle facilities in the study area. As shown, there are Class II Bike Lanes in the study area. Class II Bike Lanes are established along streets to provide a restricted right-of-way designated for the use of bicycles with a striped lane, pavement markings, and signage. Some bike lanes may have striped buffers to add additional space between cyclists and cars, increasing separation from motor vehicles for added bicyclist comfort. Vehicle/pedestrian crossflow may occur at driveways and also where right-turn lanes are developed approaching intersections. Within the study area, Class II bike lanes exist on both sides of Old Auburn Road from Wintergreen Drive to Linda Creek Court. Class II bike lanes with a buffer exist on both sides of Wachtel Way to Pitalo Way, and on the east side of Wachtel Way south of Pitato Way.

Within the study area, sidewalks are present but discontinuous on Old Auburn Road. **Figure 3** shows existing pedestrian facilities in the study area. Continuous sidewalks are present on the north side of Old Auburn Road from Robert Creek Court to about 400 feet east of Argo Drive. This segment of sidewalk connects to the existing shared-use bike/pedestrian trail located west of

Robert Creek Court. Though other sidewalk segments exist along Old Auburn Road and Wachtel Way, they are discontinuous. See Figure 3 for mapped sidewalks along the corridor. There is a marked crosswalk on the west leg of the Old Auburn Road/Wachtel Way intersection which connects only to the Class II buffered bike lane on Wachtel Way, and not to any sidewalks.

During the AM and PM peak hours, pedestrian and bicycle activity was modest at all intersections (i.e. 8 or less pedestrian crossings per hour and 8 or less bicyclists per hour). Field observations revealed some pedestrians walking or running on either side of Old Auburn Road to turn onto Wachtel Way. Some of these movements were likely associated with the connection to the Arcade-Cripple Creek Trail on Wachtel Way.

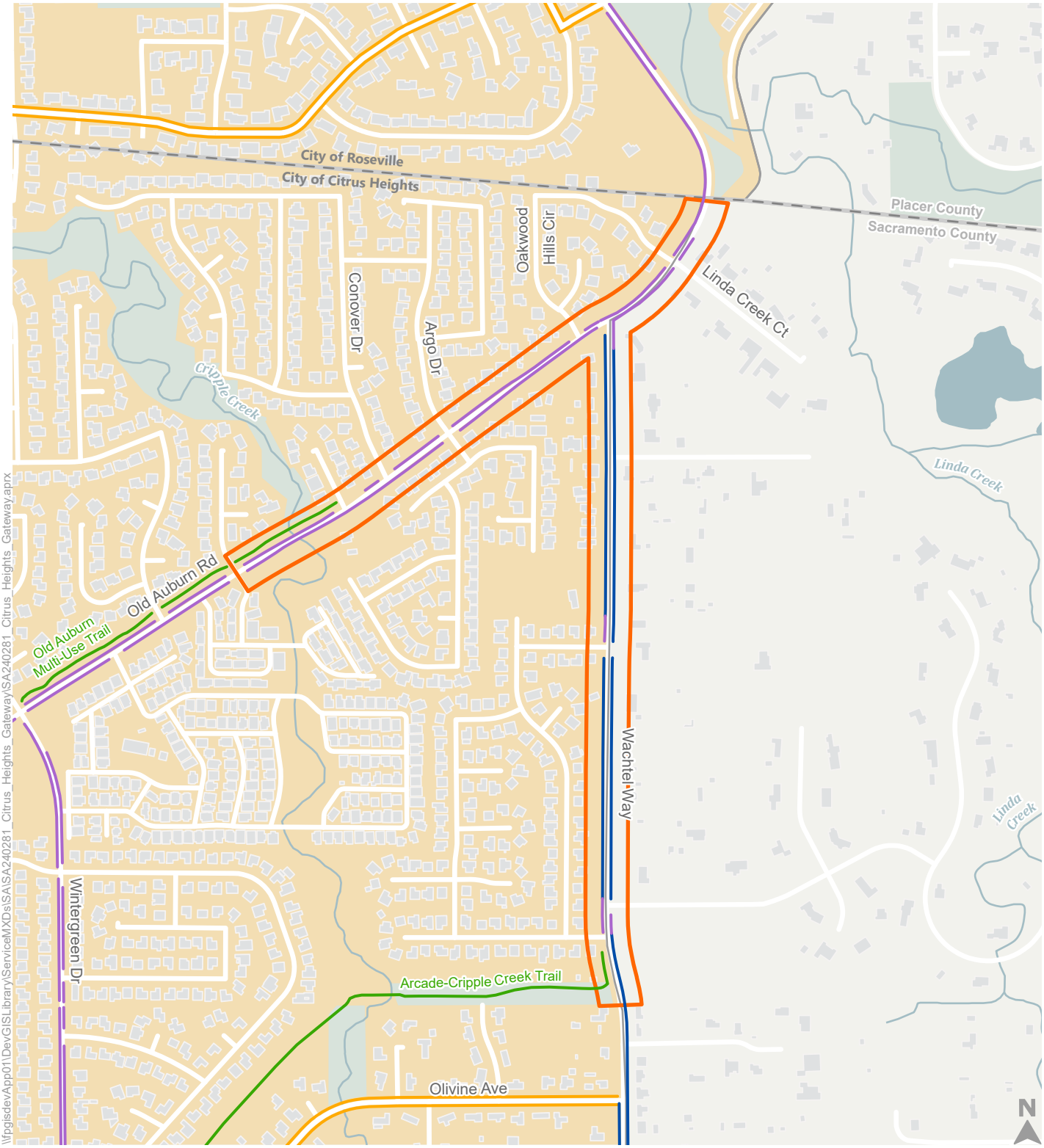


Figure 2

Existing Bicycle Facilities

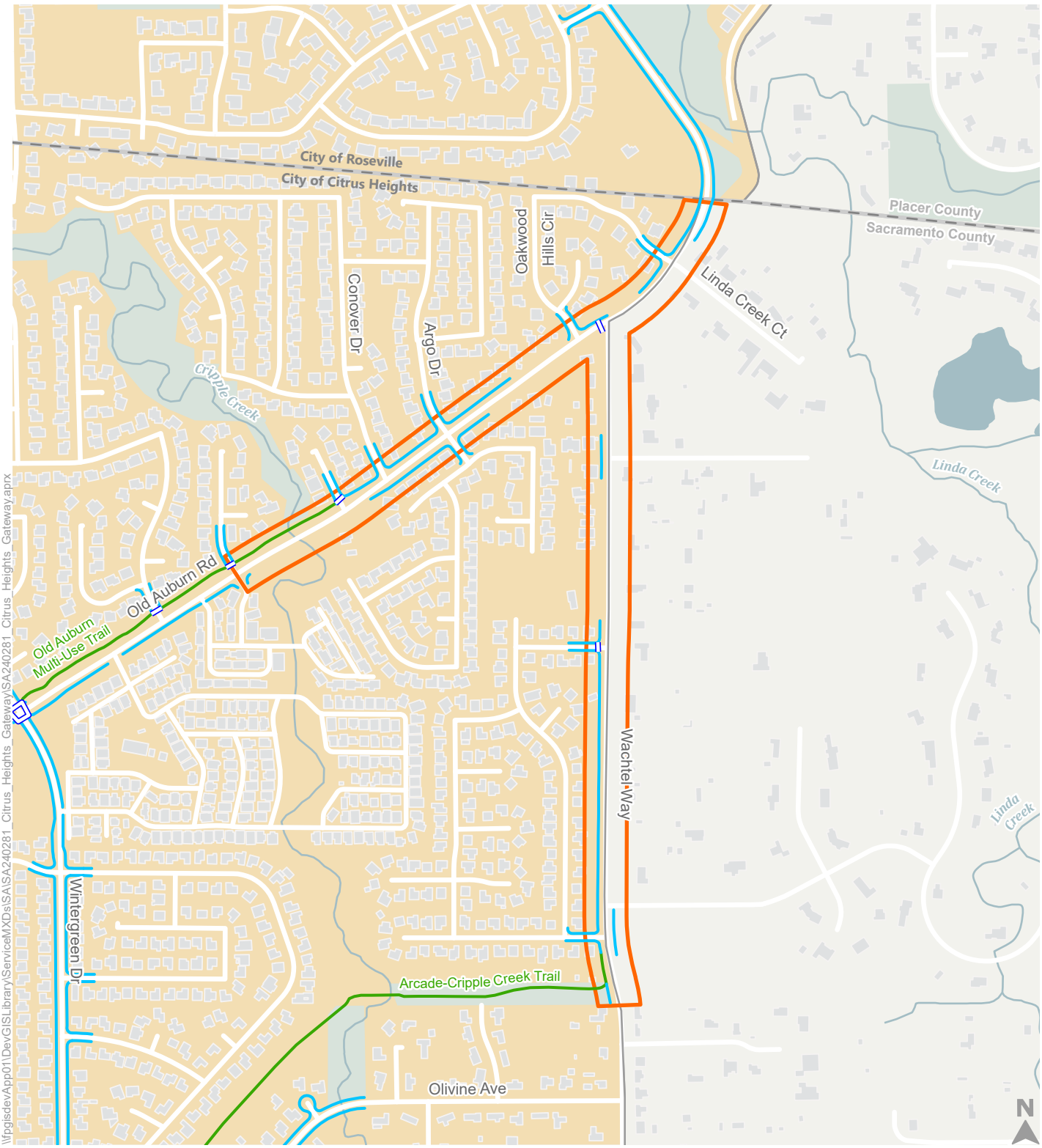


Figure 3

Existing Pedestrian Facilities

Existing Transit Facilities and Services

While there are no transit facilities and services directly serving the study area, Roseville Transit and Sacramento Regional Transit (SacRT) operate a few fixed-route bus lines near the study area.

Roseville Transit operates Routes C and F with a stop on S Cirby Way past Rimna Way, approximately 0.56 miles from the Old Auburn Road/Oakwood Hills Circle E/Linda Creek Ct intersection. Both routes have two-hour headways Monday-Friday, departing as early as 6:20 a.m. until 6:43 p.m.

SacRT operates Line 21 with the closest stop to the study area at the Old Auburn Road/Sunrise Boulevard intersection, which is about 1.53 miles away from the Old Auburn Road/Argo Drive intersection. This route operates with 30-minute headways on Monday-Friday, and hour-long headways on the weekend.

Additionally, SacRT operates a program called SacRT Flex, which is a limited-service neighborhood shuttle for a limited group of qualified riders, including seniors (age 62+), low-income individuals, and persons with disabilities. The program serves 9 zones in the Sacramento area, including within the study area up to the City of Citrus Heights boundary. The program operates Monday through Friday between 7 a.m. to 7 p.m., excluding holidays.

Traffic Data Collection

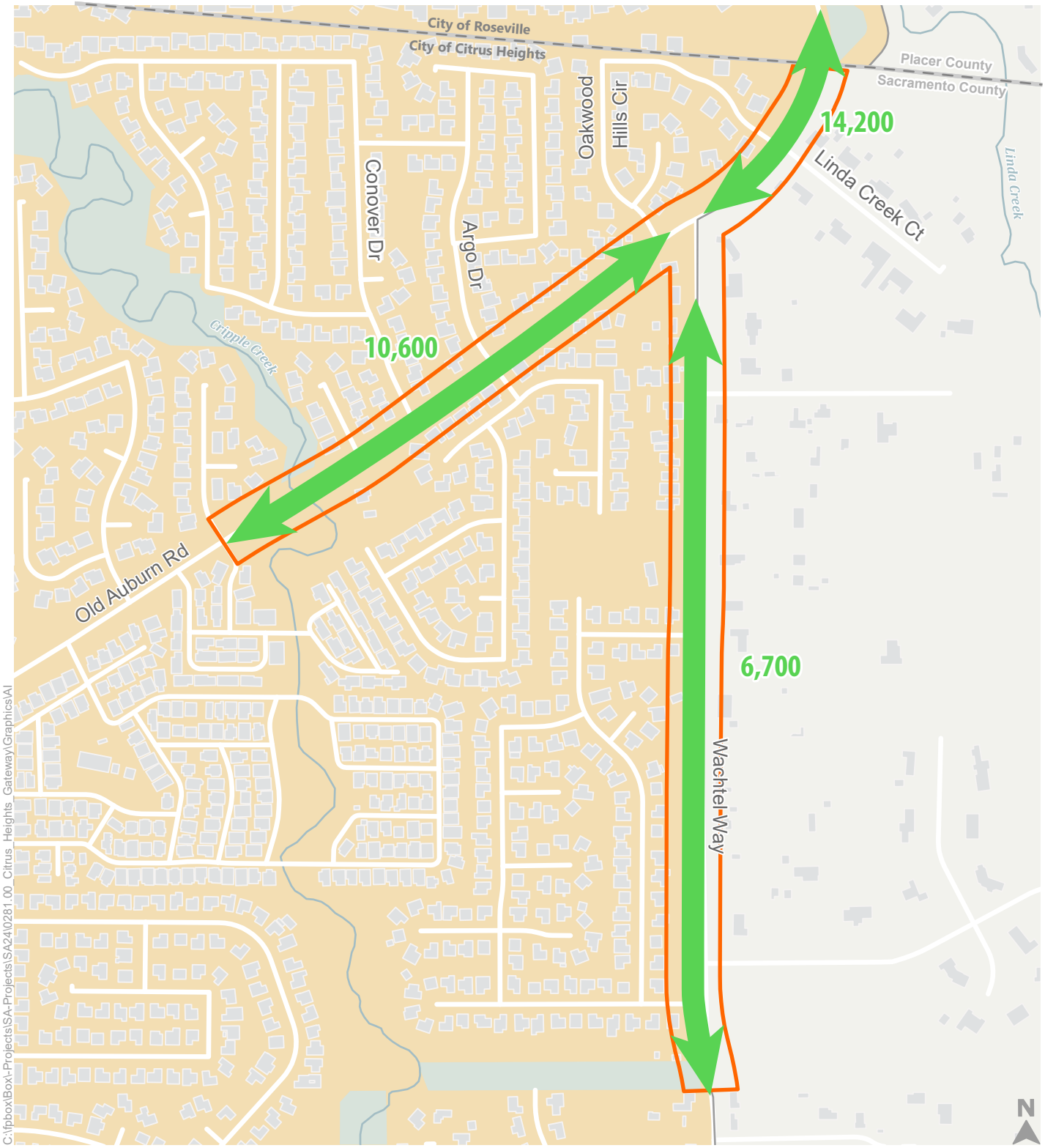
All counts at the four study intersections included vehicle turning movements, heavy vehicles, bicyclists, and pedestrians. Two-day roadway segment traffic counts, including vehicle classification, were collected at the following two segments in the study area on Tuesday, October 29, 2024, and Wednesday, October 30, 2024:

1. Old Auburn Road west of Wachtel Way
2. Wachtel Way south of Old Auburn Road

Table 1 displays the AM peak hour, PM peak hour, and daily volumes for each segment**. Figure 4** shows the average daily traffic at the study area segments. The AM peak hour occurred from 7:30 to 8:30 a.m., and the PM peak hour occurred from 4 to 5 p.m. The peak direction was vehicles traveling eastbound and westbound on Old Auburn Road. Key findings from this figure and table are:

1. The Wednesday count was about 2 to 3% busier than the Tuesday count.
2. Through a process of factoring up existing AM and PM peak hour segment volumes (to daily), the estimated ADT is 14,200 vehicles on Old Auburn Road east of Wachtel Way. As the volume on Old Auburn Road drops precipitously west of Wachtel Way, this indicates that a considerable number of vehicles at the City of Citrus Heights/Roseville border

originate or are destined to/from the south on Wachtel Way (toward unincorporated Sacramento County).



Study Corridor

City Limits

County Limits

Parks and Open Space

X,XXX

Average AM/PM Daily Traffic Volume

Notes: Volumes represent two-way traffic totals and are rounded to the nearest 100. Counts were conducted on Tuesday October 29, 2024 and Wednesday, October 30, 2024.

Volumes on Old Auburn Rd at City of RS/CH Limit is estimated using a k-factor of daily to AM and PM peak period counts from the two counted locations.

Figure 4

Average Daily Traffic Volumes (ADT) - Existing Conditions

Table 1: Roadway Segment Traffic Volumes – Existing Conditions

Roadway Segment	Day 1 / Day 2		
	AM Peak Hour	PM Peak Hour	Daily
Old Auburn Road west of Wachtel Way	941 / 838	890 / 914	10,451 / 10,733
Wachtel Way south of Old Auburn Road	565 / 565	593 / 617	6,666 / 6,795

Notes: All roadway segment traffic volumes summarized are two-way total volumes.
Traffic counts were performed on Tuesday, October 29, 2024, and Wednesday, October 30, 2024.
Source: Fehr & Peers, 2025.

Intersection Operations

This study analyzes traffic operations using delay and LOS as primary measures of intersection performance. Automobile LOS is a qualitative description of traffic flow from the perspective of motorists. The *Highway Capacity Manual (HCM) 7th Edition* (Transportation Research Board, 2022) defines six levels of service from LOS A representing the least congested traffic conditions to LOS F representing the most congested traffic conditions. These grades represent the perspective of drivers and are an indication of the comfort and convenience associated with driving, as well as speed, travel time, traffic interruptions, and freedom to maneuver.

Intersection LOS at signalized and all-way stop controlled intersections and roundabouts is based on the weighted average control delay measured in seconds per vehicle for all motorists traveling through the intersection. For side-street stop-controlled intersections, this study reports the average control delay for the lane group or movement with the greatest delay, and for the intersection as a whole.

Table 2 presents the control delay range for each LOS for signalized and unsignalized intersections. As shown, the delay ranges for signalized intersections are different from unsignalized intersections. The *HCM* anticipates that motorists expect signalized intersections to carry higher traffic volumes that result in greater delay than at an unsignalized intersection and roundabout. Unsignalized intersections are associated with more uncertainty as delays are less predictable, which can reduce users' delay tolerance.

Table 2: Level of Service Definitions – Intersections

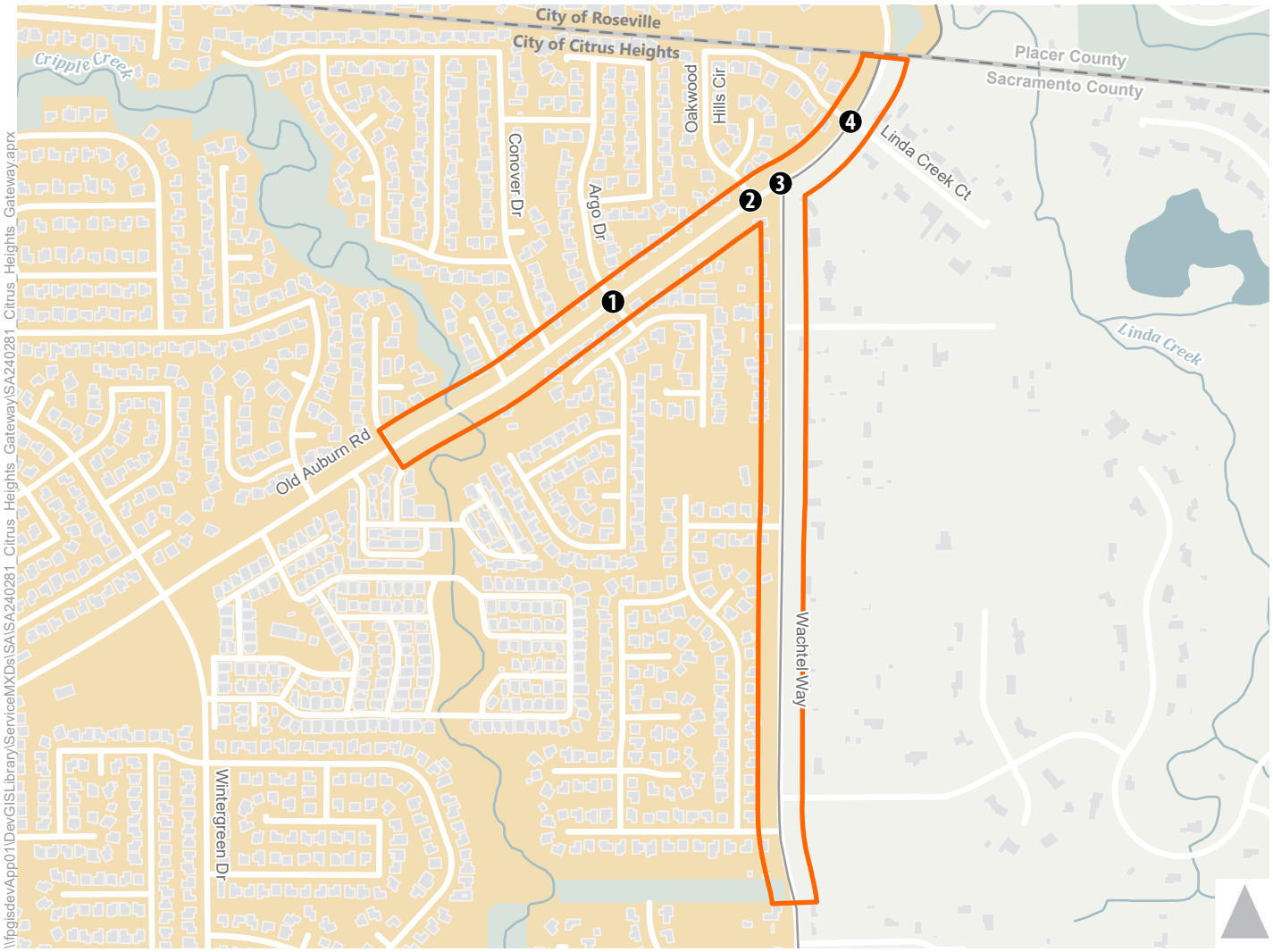
Level of Service	Average Control Delay[1]	
	Signalized Intersections	Unsignalized Intersections and Roundabouts
A	≤ 10	≤ 10
B	>10 to 20	>10 to 15
C	>20 to 35	>15 to 25
D	>35 to 55	>25 to 35
E	>55 to 80	>35 to 50
F	>80	>50

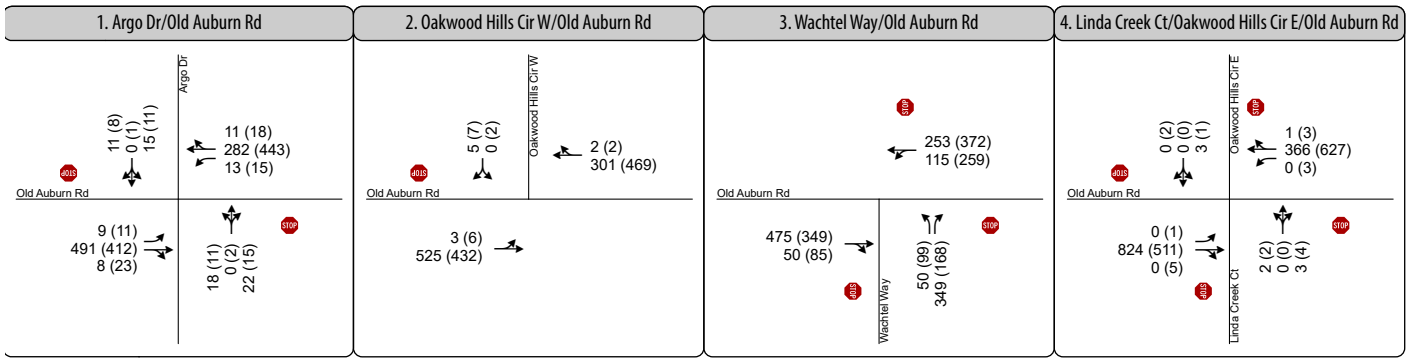
Notes:
1. Average control delay presented in seconds per vehicle. Delay values are rounded to the nearest second and evaluated for LOS based on the above thresholds (i.e., 10 seconds per vehicle = LOS A)
Source: *Highway Capacity Manual 7th Edition*, Transportation Research Board, 2022.

Study intersections are analyzed using Synchro's SimTraffic micro-simulation module to apply the methodologies presented in the *HCM*. Synchro considers traffic volumes, lane configurations, signal timings, and other parameters. SimTraffic additionally considers interactions between adjacent intersections, turn lane spillbacks, coordinated signal timing, and upstream/downstream bottlenecks. SimTraffic is preferable to use when operating conditions are near capacity, turn lane storage exceedance is common, and/or intersections are spaced closely together. In this study, given the above guidance, SimTraffic was used to analyze all study intersections (where vehicle queuing is of particular concern). The Sidra software program is used to analyze roundabouts, if proposed as part of a project alternative.

The system peak hours of the study intersections on Old Auburn Road occurred from 7:30 to 8:30 a.m. and 4 to 5 p.m. Trucks, as defined by the Highway Capacity Manual and its existing national truck classifications, represented about 1% of traffic on Old Auburn Road during the morning and evening peak hours. **Figure 5** presents the existing weekday a.m. and p.m. peak hour traffic volume, lane configurations, and traffic control devices at the study intersections. On the busiest section (Old Auburn Road east of Wachtel Way), nearly 70% of AM peak hour traffic is headed eastbound (into Roseville) while 55% of PM peak hour traffic is headed westbound.

Table 3 displays peak hour intersection operations under existing conditions. See **Appendix B** for technical calculations.





- Study Intersection
- Study Corridor
- City Limits
- County Limits
- Parks and Open Space
- Turn Lane
- AM (PM) Peak Hour Traffic Volume
- Traffic Signal
- Stop Sign

Figure 5

Peak Hour Traffic Volumes and Lane Configurations - Existing Conditions

Table 3: Peak Hour Level of Service – Existing Conditions

	Intersection	Control	Delay/LOS (Worst Movement)[1]	
			AM Peak Hour	PM Peak Hour
1.	Old Auburn Road/Argo Drive	SSSC	4 (24 SBT) / A (C)	3 (11 NBT) / A (B)
2.	Old Auburn Road/Oakwood Hills Circle W	SSSC	**54 (83 EBT) / F (F)**	5 (46 (SBL) / A (E)
3.	Old Auburn Road/Wachtel Way	AWSC	**56 / F**	38 / E
4.	Old Auburn Road/Oakwood Hills Circle E/Linda Creek Ct	AWSC	14 / B	**75 / F**

Notes: SSSC = Side-Street Stop Controlled. AWSC = All-Way Stop-Controlled
[1] For side-street stop controlled and uncontrolled intersections, level of service and delay for the worst movement are reported with the movement listed in parentheses. Delay is reported in seconds per vehicle.
Bolded numbers indicate deficient operations per City of Citrus Heights General Plan policy.
Source: Fehr & Peers, 2025.

Per the City of Citrus Heights General Plan Policy 29.2, the City will strive to achieve LOS E or better conditions for City roadways and intersections during peak hours. As shown, the study intersections do not operate acceptably during the AM and PM peak hours. It should be noted that this policy provides an exception to the LOS E standard for certain roadways (and intersections along them) including Old Auburn Road from Sylvan Road to Fair Oaks Boulevard. Since the study area does not extend that far westerly, an LOS E standard applies for all study facilities. Key findings from Table 3 are as follows:

AM Peak Hour:

1. The all-way stop Old Auburn Road/Wachtel Way intersection operates at LOS F. The eastbound queue spills back through intersection #2 (Oakwood Hills Circle W) causing it to also operate at LOS F.

PM Peak Hour:

1. The all-way stop Old Auburn Road/Wachtel Way intersection operates at LOS E. The westbound queue spills back through the all-way intersection #4 (Oakwood Hills Circle E/Linda Creek Ct) causing it to operate at LOS F.[1]

[1] LOS F operations during the PM peak hour at intersection 4 are not due to the volume of major street versus side street traffic. Rather, it is due to westbound queues spill back from the stop sign at Wachtel Way into this intersection. In reality, capacity constraints at the Old Auburn Road/Wachtel Way intersection are the reason why intersection #4 operates unacceptably.

Vehicle Queuing

Table 4 identifies the maximum queue lengths based on SimTraffic results for critical movements at the study intersections. SimTraffic reported queues were compared to observed queues on the day of the counts to ensure the simulation model is accurately representing existing conditions. Refer to Appendix B for technical calculations.

Table 4: Maximum Vehicle Queues – Existing Conditions

Intersection		Control	Movement	Available Storage (ft)[2]	Maximum Queue (ft)[1]	
					AM Peak Hour	PM Peak Hour
1.	Old Auburn Road/Argo Drive	SSSC	EBL	300	50	50
			EBT	300	75	-
2.	Old Auburn Road/Oakwood Hills Circle W	SSSC	EB L/T	700	700	200
			WBT	100	**125**	25
			SB Shared	115	50	50
3.	Old Auburn Road/Wachtel Way	AWSC	EBT	90	**850**	300
			WB L/T	350	175	**375**
			NBL	600	275	275
			NBR[3]	100	125	100
4.	Old Auburn Road/Oakwood Hills Circle E/Linda Creek Ct	AWSC	EBT	350	150	125
			WBT	1,370	125	1,150[4]

Notes:
[1] Results based on SimTraffic. Maximum queue lengths are rounded to nearest 25 feet. All queues are expressed on a "per lane" basis or approach as noted. Includes vehicles that may queue in the taper length of a turn pocket.
[2] Available storage lengths based on review of aerial imagery. Distance is either length of turn lane or distance to nearest upstream intersection.
[3] Existing lane configuration is a shared northbound LT/RT lane. For purposes of the simulation, a small right turn pocket was added to better model vehicle queuing conditions.
[4] Analysis is based on 1.0 PHF (per City TIS guidelines), which by definition reports LOS/queuing for an hourly condition and can miss any spikes in travel demand within the peak hour that often cause the worst-case queue.
Bolded text represents a queue that extends past the nearest upstream intersection.

During the field visit, westbound queues on Old Auburn Road during the PM peak hour occasionally extended past Lund Drive (see **Image 1**).



Image 1: View of queued vehicles on westbound Old Auburn Road spilling back from Oakwood Hills Circle E to Lund Drive and beyond (PM peak hour).

Image 2 is a screenshot from the SimTraffic simulation showing the WB queue during the PM peak hour, extending back past the Lund Drive intersection.

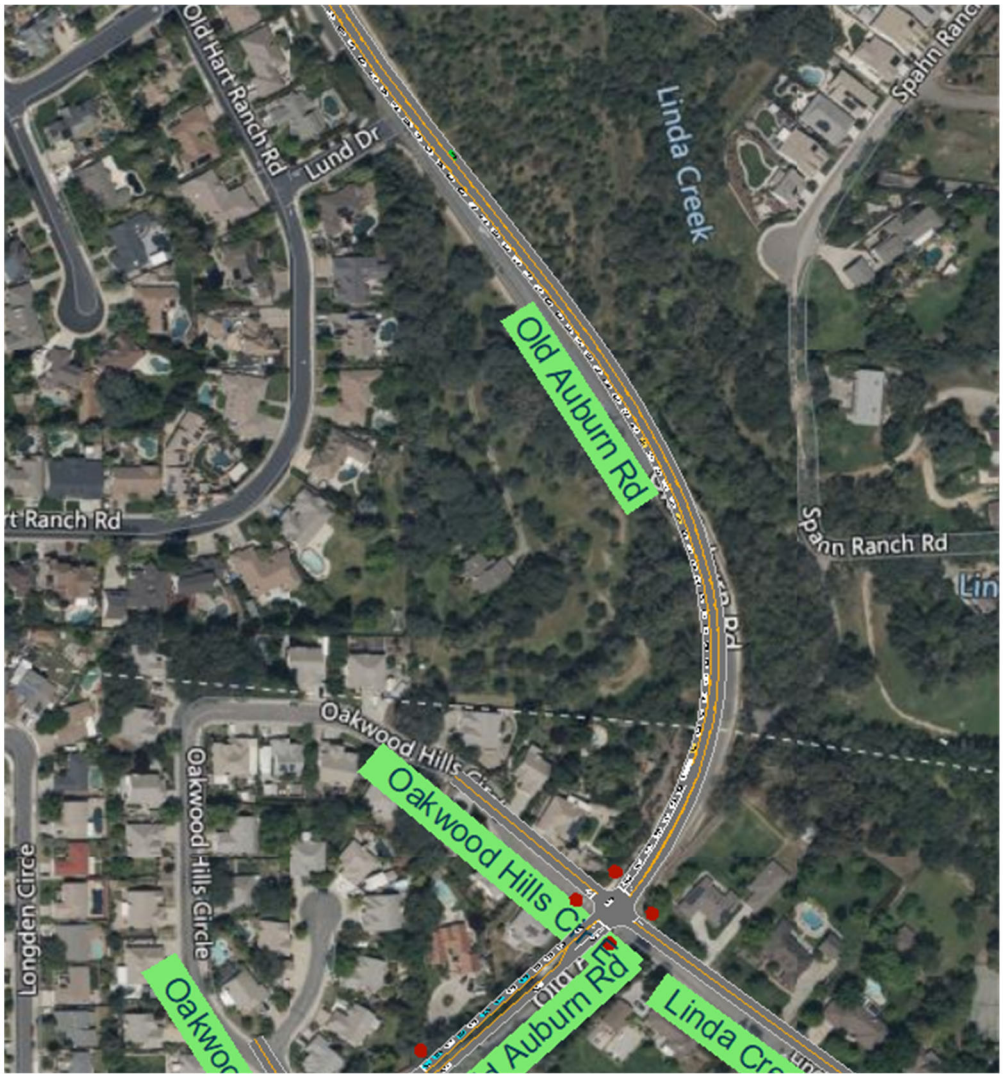


Image 2: SimTraffic screenshot of queued vehicles on westbound Old Auburn Road approaching Oakwood Hills Circle E (PM peak hour)

As displayed in Table 4, queuing is minimal on the side street approaches at the study intersections. During the AM peak hour, the eastbound approach sees significant queuing at intersections 2 and 3. The eastbound queue extends back from the Old Auburn Road/Wachtel Way intersection to past the Old Auburn Road/Argo Drive intersection, as shown in **Image 3** below.



Image 3: View of queued vehicles on eastbound Old Auburn Road approaching Wachtel Way (AM peak hour).

During the PM peak hour, queuing was observed for the westbound approach at the Old Auburn Road/Oakwood Hills Circle E/Linda Creek Court, and Old Auburn Road/Wachtel Way intersections. During the field observations, it was noted that the westbound queue sometimes extended from the Old Auburn Road/Oakwood Hills Circle E/Linda Creek Court intersection back to the Old Auburn Road/Cirby Way intersection, a distance of about 1,600 feet. **Image 4** below shows westbound queuing during the PM peak hour along Old Auburn Road, east of Oakwood Hills Circle E/Linda Creek Court.



Image 4: View of queued vehicles on westbound Old Auburn Road approaching Oakwood Hills Circle E (PM peak hour).

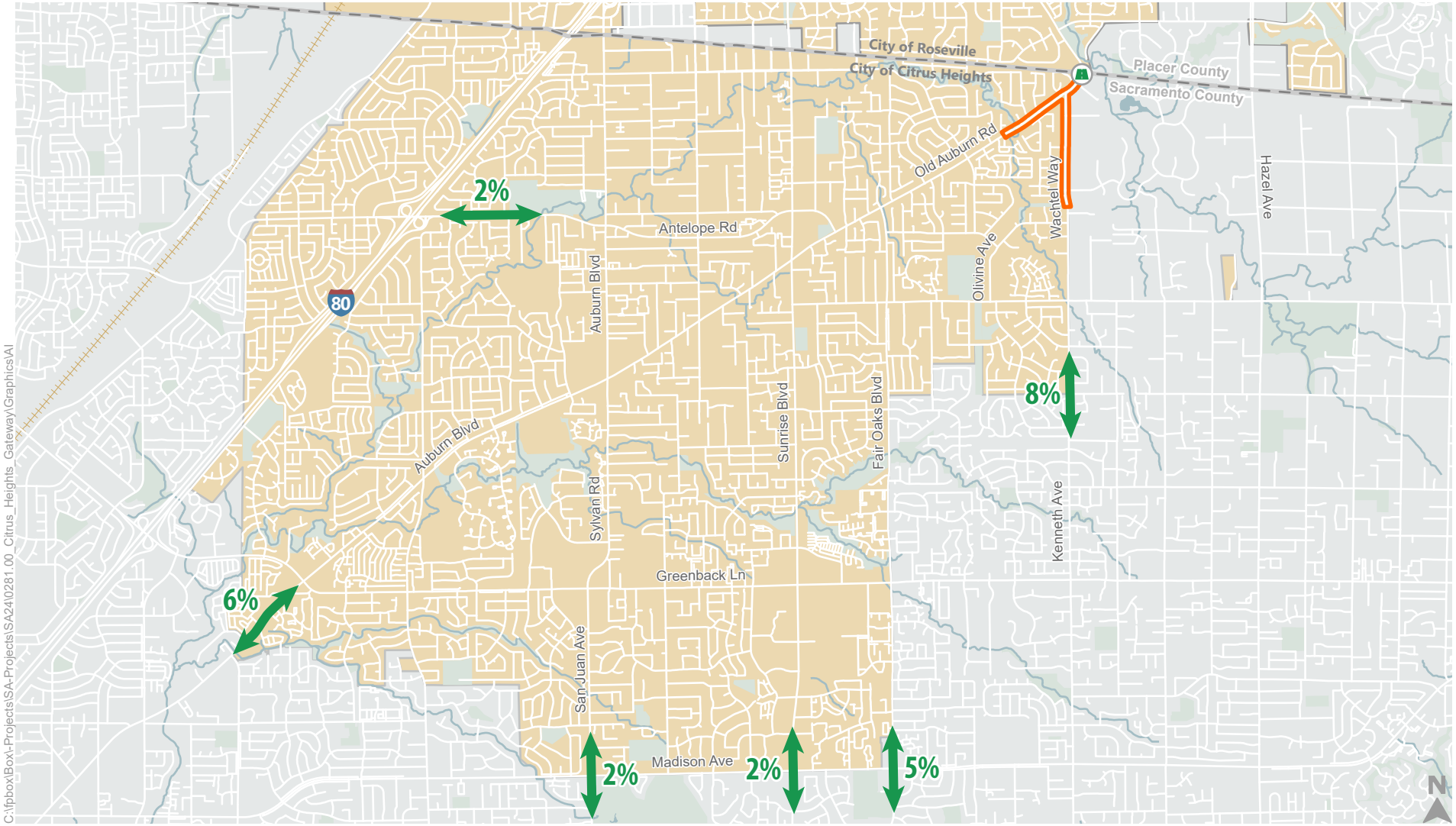
Cut-Through Travel on Old Auburn Road

This section discusses the degree to which Old Auburn Road is being used as a cut-through route. In this context, 'cut-through' is defined as a vehicle at the Citrus Heights/Roseville border that does not have a trip origin or destination in Citrus Heights. To conduct this analysis, 'big data' was acquired from StreetLight Data.[2]

[2] Transportation Data Solutions | StreetLight Data

StreetLight Data combines connected vehicle data with machine learning algorithms to understand travel patterns across the country. Trips are created from the location records by starting a trip once a device is traveling at a reasonable speed, snapping records to road network data to create the trip route. A trip end is identified once the device remains stationary within 100 meters for over 5 minutes. Data is validated using permanent traffic counters and embedded sensors, and normalized with multiple data sources, including parcel data, digital road network data, and census information to calculate vehicle volume estimates.

Figure 6 shows the percentage of vehicles that are traveling on Old Auburn Road at Citrus Heights/Roseville border that also travel through the Citrus Heights' southerly and westerly gateway streets into and out of Citrus Heights. As shown, about 25% of trips at the Citrus Heights/Roseville border do not stop in Citrus Heights. Preferred external gateways are: Wachtel Way (8%), Auburn Boulevard south of Greenback Lane (6%) and Sunrise Boulevard south of Madison Avenue (5%).



Study Corridor
County Limits
City Limits
Parks and Open Space

Origin-Destination Segment
X% Origin-Destination Percentage

Note: Values represent approximate percentage of trips using Old Auburn Road as a cut through route, regardless if during AM peak hour, PM peak hour, or daily conditions.

Figure 6

Origin-Destination Analysis on Old Auburn Road

Safety Analysis

Fehr & Peers evaluated the reported collision history within the study area based on the City of Citrus Heights Police Department records. Collisions reported between January 1, 2018, and December 31, 2023, were used for this analysis. Provisional data for 2024 collisions was available but was not included in the analysis. Collisions during this 6-year period were pulled from individual police records.

Collision History

Between 2018 and 2023, there were 16 reported collisions along the study corridor, including 10 collisions involving injuries. One collision involved a bicyclist (resulting in a minor injury). There were no collisions involving pedestrians, and no fatal collisions along the study area.

Table 5 displays the ranked (from most to least common) collision type within the study area. As displayed, rear end collisions are the most common collision type, followed by broadside collisions and hit object collisions. Police record descriptions identify the potential cause for the rear-end collisions was due to drivers traveling at high speeds and not recognizing the stop-and-go traffic at the intersection. The majority of broadside collisions occurred at the Old Auburn Road/Wachtel Way intersection, due to vehicles entering the intersection and failing to yield to the driver already in the intersection. Two of the three hit object collisions were due to driving under the influence (DUI). In all hit object collisions, the driver was traveling at unsafe speeds and collided with power or lighting equipment on the side of the road. It should be noted that these collisions occurred on Old Auburn Road east of Argo Drive heading eastbound. The eastbound direction of this segment features a narrowed bike lane, an open drainage channel, and multiple nearby overhead poles.

Table 5: Type of Collision – January 1, 2018 to December 31, 2023.

Category	Total Collisions	%
Rear end	5	31%
Broadside	5	31%
Hit Object	3	20%
Head-On	1	6%
Sideswipe	1	6%
Overturned	1	6%

Source: City of Citrus Heights Police Department records.

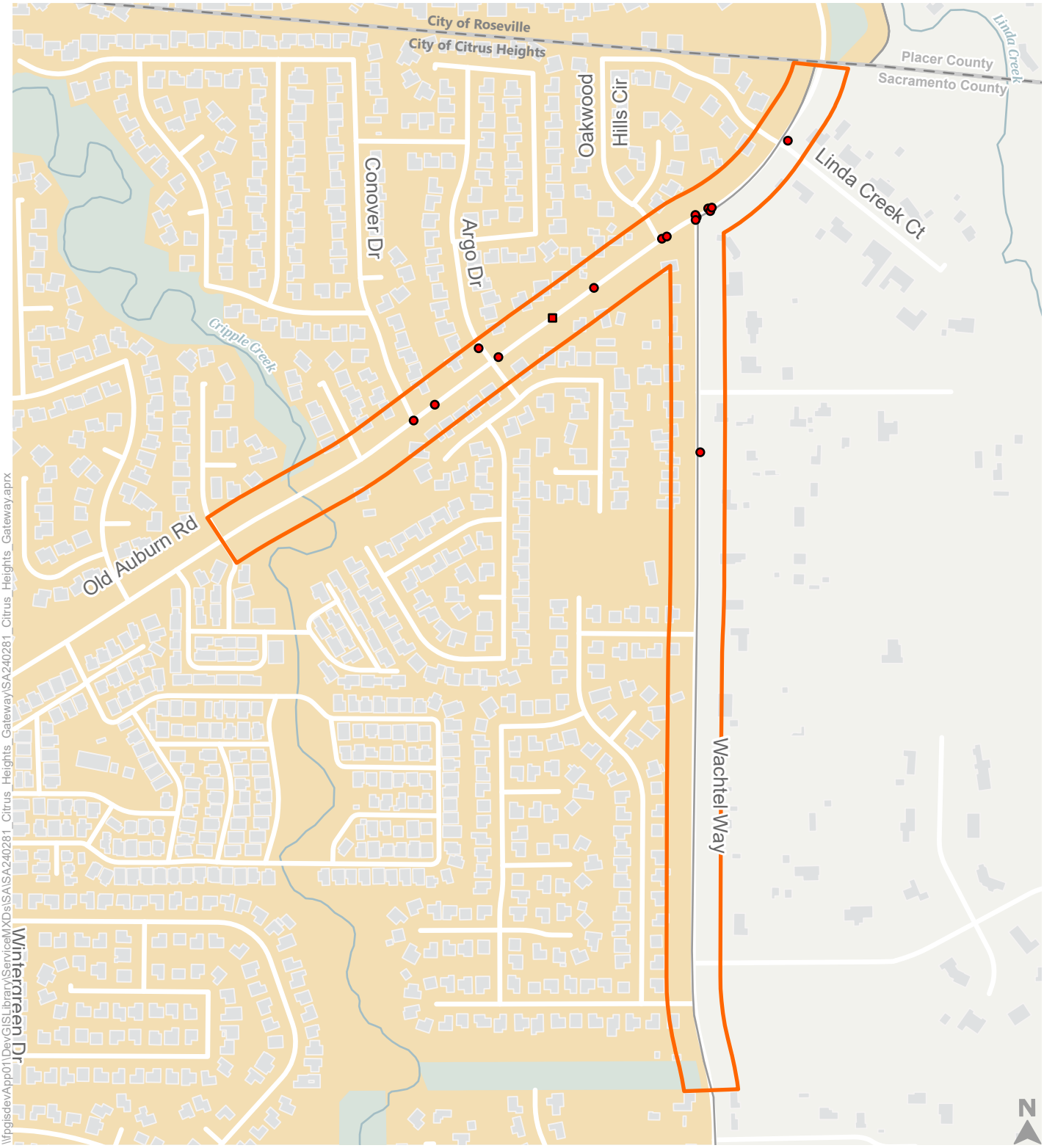
Figure 7 displays the location of all reported collisions on the corridor during the collision analysis period. As displayed, hot spots are located at the Old Auburn Road/Wachtel Way intersection. Half of the 16 total reported collisions occurred at or near this intersection. Of these eight intersection collisions, four were broadside and four were read ends. There were seven collisions along Old Auburn Road. Of those seven collisions, four of those were located at intersections, and four were mid-block. There was one collision on Wachtel Way (located just north of Pitalo Way).

Half of all reported collisions occurred between 2:00 PM and 5:30 PM. This 3.5-hour period of the day sees about 30% of all daily traffic in the study area. Thus, the percentage of all collisions is disproportionately high during this period relative to the amount of daily traffic during this period. This time period experiences considerable congestion and stop-and-go traffic. Reports indicate that rear end collisions occurred because the driver was traveling at high speeds and failed to stop for the stopped vehicle in front, resulting in a rear end.

Of the 16 reported collisions along the study corridor, 31%, or 5 collisions, involved driving under the influence of alcohol or drugs (DUI). These collisions occurred at nighttime and at areas along the corridor with streetlights. This is a high percentage considering that Citywide, 9% of all collisions were due to DUI per the City's Local Road Safety Plan (2021).

Table 6 lists the primary collision factor for all reported collisions in the study area during the analysis period. As shown, DUI and unsafe speed collisions were the most common. Unsafe speed collisions mainly resulted in rear ends. Automobile right of way collisions primarily resulted in

broadside collisions, and improper turning collisions resulted in sideswipe and broadside collisions.



Study Corridor
City Limits
County Limits
Parks and Open Space

Vehicle Collision
Bicycle Involved Collision

Collision data pulled from City of Citrus Heights Police Department records for the six-year period between 2018-2023.

Figure 7

Collisions 2018-2023

Table 6: Primary Collision Factor – January 1, 2018 to December 31, 2023.

Primary Collision Factor (PCF)	Total Collisions	%
Driving Under Influence (DUI)	5	31%
Unsafe Speed	5	31%
Automobile Right of Way	4	25%
Improper Turning	2	13%

Source: City of Citrus Heights Police Department records.

Table 7 shows the lighting conditions for all the reported collisions. As shown, half of the 16 total collisions occurred during daylight, 38% occurred in the dark with streetlights, and the rest occurred in the dark or at dusk. This shows that most collisions in the study area are not caused by a lack of lighting, but because of a lack of clear recovery zone and driver awareness.

Table 7: Lighting Conditions – January 1, 2018 to December 31, 2023.

Lighting	Total Collisions	%
Daylight	8	50%
Dark – Streetlights	6	38%
Dark – No Streetlights	1	6%
Dusk/Dawn	1	6%

Source: City of Citrus Heights Police Department records.

The City of Citrus Heights Local Roadway Safety Plan (LRSP) (2021) identifies two recommendations related to bike and pedestrian safety in the study area. Within the LRSP is an excerpt from the *Safe Routes to School Master Plan Report*, Citrus Heights (2014), from which there are two recommendations related to bike facilities in the study area. The first one is to install 5' or 6' Class II bike lanes or a Class I bike path on Old Auburn Road to improve bike access to the Woodside K-8 school. A westbound Class I bike path exists on Old Auburn Road from Robert

Creek Court to Garry Oak Drive. An extension of the bike path east to the City of Citrus Heights / City of Roseville border would improve connectivity for residents in the study area. The second recommendation is to improve bicyclist crossings of Old Auburn Road at key cross streets such as Wintergreen Drive, Fair Oaks Boulevard, and Wachtel Way. The recommendation lists potential improvements at the intersections like colored pavement, wayfinding and signage, and pavement markings to improve bike access to Woodside K-8 and bike/pedestrian safety at controlled intersections.