

FINAL TECHNICAL MEMORANDUM

Date: July 21, 2022
To: Jack Varozza, City of Roseville
From: John Gard & Sonia Anthoine, Fehr & Peers
Subject: ***Evaluation of Access and On-Site Circulation for Grocery Outlet Retail Center***

RS22-4178

This memorandum presents the analysis and conclusions of our access and on-site circulation study for the proposed Grocery Outlet Retail Center to be located south of Pleasant Grove Boulevard and east of Fiddymment Road in Roseville, CA. This memorandum supersedes our draft study dated May 16, 2022. According to the project site plan analyzed in May 2022, the proposed project would consist of the following land uses: ¹

- Grocery Outlet grocery store – 16,000 square feet
- Fast-food restaurant with drive-through window – 3,200 square feet
- General commercial – 4,600 square feet

The analysis focuses on weekday PM peak hour conditions, which represents the peak 60-minute period of traffic between 4 and 6 PM. Normally, this is the busiest hour of travel on City roadways.

Project Site Plan

The project location is shown on **Figure 1** and the project site plan (*Grocery Outlet, Morton & Pitalo, June 2022*) is shown on **Figure 2**. Access to the project site would be provided via two existing driveways on Pleasant Grove Boulevard and one existing driveway on Fiddymment Road. The following turning movements are permitted at each driveway (see Figure 2 for driveway numbering and locations):

- Driveway 1 on Fiddymment Road: Right In/Right Out
- Driveway 2 on Pleasant Grove Boulevard: Right In/Right Out
- Driveway 3 on Pleasant Grove Boulevard: Full Access

Note that there are reciprocal access agreements in place on the subject property, allowing travel between the adjacent CVS drug store directly to the west and the Camino Real Way residential project directly to the east.

¹ Note that the latest site plan (*Grocery Outlet, Morton & Pitalo, June 2022*) shows a 2,600 square-foot fast-food restaurant. It also notes that this restaurant is not part of the Design Review permit. Thus, a supplemental analysis of its layout and circulation will be required once an application for that pad is submitted.

Existing Conditions

Traffic counts were collected at Driveways 1 and 2 on a weekday in April 2022. Traffic counts were collected at Driveway 3 on a weekday in February 2022. Weather was dry and no unusual traffic conditions were observed during the counts.

Figure 3 shows the existing peak hour traffic volumes, lane configurations, and traffic controls at these driveways. As shown, all three driveways are controlled by stop signs for exiting traffic. At Driveway 3, a north leg also exists, which provides access to the Pleasant Grove Community Church. This north leg will also provide access to the future West Roseville Marketplace, which would occupy the northeast quadrant of the Fiddymment Road/Pleasant Grove Boulevard intersection.

The weekday PM peak hour traffic volumes collected in 2022 were compared against volumes collected in February 2020 (i.e., prior to the COVID-19 pandemic). It was found that the new counts were greater than the 2020 counts despite the ongoing effects of COVID-19 on travel behavior. The increase in traffic is attributable to substantial growth in residences on the west side of the City of Roseville.

As part of the weekday PM peak hour traffic counts, maximum vehicle queues were observed for critical movements in the study area. Maximum observed queues and available storage for these movements are shown in **Table 1**. The following key findings are derived from this table:

- *Outbound traffic at Driveway 1 on Fiddymment Road currently exceeds the 50 feet of available throat depth. This could be attributable to motorists waiting to merge across three lanes of traffic on Fiddymment Road to perform a left or u-turn at Pleasant Grove Boulevard.*
- *Available turn lane storage at Driveways 2 and 3 on Pleasant Grove Boulevard is adequate to accommodate weekday PM peak hour traffic.²*

Project Travel Characteristics

Trip Generation

Project trip generation estimates were calculated using trip rates from the *Trip Generation Manual, 11th Edition* (Institute of Transportation Engineers, 2021). **Table 2** presents the project's trip generation for weekday PM peak hour conditions. The grocery store and fast-food restaurants were assumed to be standard/typical users and not ultra-popular brands such as In-N-Out Burger, Chick-fil-A, or Trader Joe's. The findings of this study would not be applicable should specialized users such as these occupy the site.

² On Sunday mornings, Pleasant Grove Community Church operates in-person Sunday services. After services conclude at about 11 AM, congestion and queuing occur at Driveway 3 for about 15 minutes.

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TABLE 1: MAXIMUM VEHICLE QUEUES IN STUDY AREA – EXISTING CONDITIONS				
Intersection/ Driveway	Movement	Available Storage ¹	Weekday PM Peak Hour ²	
			Traffic Volume	Maximum Vehicle Queue ³
Pleasant Grove Blvd/Fiddymment Road	Northbound Left-Turn	250 feet per lane	600	Exceeds available storage ⁴
	Westbound Left-Turn	250 feet per lane	459	Exceeds available storage ⁴
Driveway 1 on Fiddymment Road	Westbound Right-Turn	50 feet	76	125 feet
Driveway 2 on Pleasant Grove Blvd	Northbound Right-Turn	50 feet	34	50 feet
Driveway 3 on Pleasant Grove Blvd	Eastbound Left/U-Turn	150 feet	Left: 3 U-Turn: 15	50 feet
	Westbound Left/U-Turn	200 feet	Left: 35 U-Turn: 7	100 feet
	Northbound Left/Through /Right-Turn	60 feet	Left: 10 Through: 0 Right: 13	50 feet
Notes: ¹ Based on review of aerial imagery. ² Based on traffic counts collected on a weekday in February and April 2022. ³ 25 feet assumed per queued vehicle unless noted otherwise. ⁴ It was not possible to determine maximum number of queued left-turning vehicles due to queued traffic in adjacent through lane (i.e., unclear whether stopped vehicle was a left or through movement). Bolded text indicates that maximum queue exceeds available storage. Source: Fehr & Peers, 2022.				

Table 2 shows expected pass-by traffic to each use. A pass-by trip is made by a motorist who enters the site to shop or receive services while en-route to a different primary destination. These trips are already present on the adjacent street, though they do add trips to the project driveways. It is important that traffic assignments separately consider new and pass-by trips because they have different origins/destinations and travel patterns.

After accounting for internal and pass-by trips, the project would generate approximately 160 new trips during the weekday PM peak hour.

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Land Use	ITE Land Use Code	Quantity	Trip Rates ¹			Vehicle Trips		
			In	Out	Total	In	Out	Total
Grocery Store	944	16 KSF	4.4	4.5	8.9	71	72	143
Fast-Food Restaurant with Drive through Window	934	3.2 KSF	17.2	15.9	33.1	55	51	106
General Retail	822	4.6 KSF	3.3	3.3	6.6	15	15	30
Gross Trips						141	138	279
Internal Trips ²						-7	-7	-14
Pass-By Trips ³						-52	-52	-104
New Vehicle Trips						82	79	161
<p>Notes:</p> <p>¹ Trip rates from the <i>Trip Generation Manual, 11th Edition</i> (Institute of Transportation Engineers, 2021).</p> <p>² Estimated 5% of project trips expected to be internal.</p> <p>³ The following pass-by percentages were applied based on data in the <i>Trip Generation Manual, 11th Edition</i> (Institute of Transportation Engineers, 2021):</p> <ul style="list-style-type: none"> - Grocery Store: 24% - Fast-Down Restaurant with Drive through Window: 55% - General Retail: 40% <p>KSF = thousand square feet. Source: Fehr & Peers, 2022.</p>								

Trip Distribution/Assignment

The distribution of project trips is expected to be proportional to the distribution of residences near the project site. West Roseville (i.e., west of Fiddymment Road) has a general lack of restaurants and grocery stores, though a retail center (anchored by a Raley's) is currently being constructed at the Blue Oaks Boulevard/Fiddymment Road intersection. The closest established retail centers are along Woodcreek Oaks Boulevard at Blue Oaks Boulevard and Pleasant Grove Boulevard. Thus, the proposed retail uses would be the closest site to a large number of new residences situated west of Fiddymment Road.

To further inform the expected trip distribution, the project was added to the City's base year (2020) travel demand model and a select zone traffic assignment was performed.

Table 3 displays the project's estimated trip distribution under near-term conditions³. These percentages consider the above trip distribution aspects.

³ Near-term is used in this context because the trip distribution would likely change under a cumulative condition given the amount of planned retail in the adjacent Sierra Vista Specific Plan to the west.

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Trip Distribution	Percentage
Fiddymment Road north of Pleasant Grove Boulevard	20%
Fiddymment Road south of Pleasant Grove Boulevard	30%
Pleasant Grove Boulevard west of Fiddymment Road	25%
Pleasant Grove Boulevard east of Project Site	25%
Total	100%

Source: Fehr & Peers, 2022.

New trips were assigned to project driveways based on the trip distribution percentages in Table 4 and permitted driveway movements. Pass-by trip assignments considered the relative volume of traffic on each public street, and ease of performing pass-by movements. It should be noted that u-turns are permitted on the northbound approach to the Pleasant Grove Boulevard/Fiddymment Road intersection.

Figure 4 displays the weekday PM peak hour traffic volumes at the project driveways under existing plus project conditions. The project would change driveway volumes as follows during the weekday PM peak hour:

- Traffic exiting Driveway 1 would increase from 76 to 104 vehicles during the PM peak hour, a 37% increase.
- Traffic volumes entering and exiting Driveway 2 would nearly double from 40 to 76 vehicles.
- Traffic in the Driveway 3 westbound left/u-turn lane would nearly double from 42 to 81 vehicles.
- Traffic in the Driveway 3 eastbound Pleasant Grove Boulevard left/u-turn lane would increase from 18 to 39 vehicles, with the vast majority (92%) being u-turns.
- Traffic exiting Driveway 3 would increase from 23 to 91 vehicles, with 60% of those trips being left turns.

Traffic Operations at Driveway 3/Pleasant Grove Blvd. Driveway

The Pleasant Grove Boulevard/Driveway 3 intersection was analyzed using a SimTraffic micro-simulation model, which employs procedures from the *Highway Capacity Manual, 6th Edition* (Transportation Research Board, 2016). SimTraffic is a more appropriate analysis method than a deterministic model (such as Synchro) because it considers the effects of platooned arrivals and provides more accurate estimates of vehicle queuing.

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In addition to including the subject intersection, the SimTraffic model also includes the signalized Pleasant Grove Boulevard/Fiddymment Road and Pleasant Grove Boulevard/Sun City Lane intersections, which are situated 650 feet to the west and 3,000 feet to the east, respectively, from the subject intersection⁴. These two intersections create gaps in traffic due to their signal operations, but also result in large platoons of vehicles during which time it can be difficult to turn out of the project driveway. Per City standards, a peak hour factor of 1.0 was utilized to analyze weekday PM peak hour conditions.

Table 4 shows traffic operations results at the Pleasant Grove Boulevard/Driveway 3 intersection under existing and existing plus project conditions (see **Appendix A** for technical calculations). This table indicates that motorists exiting Driveway 3 currently experience an average wait time of 31 seconds to turn onto Pleasant Grove Boulevard. Under existing plus project conditions, that delay would increase to 167 seconds per vehicle, which corresponds to LOS F conditions. This increased delay is caused by more traffic exiting the driveway, as well as more turning traffic on Pleasant Grove Boulevard, which has right-of-way priority at the intersection.

During the weekday PM peak hour, the project would add 14 vehicles to the northbound left-turn movement and 19 vehicles to the westbound left-turn movement at the Pleasant Grove Boulevard/Fiddymment Road intersection. This would cause further queue spillbacks out of each pair of dual left-turn lanes. However, traffic levels are anticipated to be reduced for those movements in the near future as additional roadway capacity within the Sierra Vista Specific Plan is constructed.

⁴ Measured from the centerline of each intersection.

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**TABLE 4:
WEEKDAY PM PEAK HOUR MAXIMUM VEHICLE QUEUES IN STUDY AREA – EXISTING PLUS PROJECT
CONDITIONS**

Intersection/ Driveway	Movement	Available Storage ¹	Existing ²		Existing Plus Project	
			Traffic Volume	Maximum Vehicle Queue ³	Traffic Volume	Maximum Vehicle Queue ⁴
Pleasant Grove Blvd/Fiddymment Road	Northbound Left-Turn	250 feet per lane	600	Exceeds available storage ⁵	614	Exceeds available storage ⁵
	Westbound Left-Turn	250 feet per lane	459	Exceeds available storage ⁵	478	Exceeds available storage ⁵
Driveway 1 on Fiddymment Road	Westbound Right-Turn	50 feet	76	125 feet	104	150 feet
Driveway 2 on Pleasant Grove Blvd	Northbound Right-Turn	50 feet	34	50 feet	69	75 feet
Driveway 3 on Pleasant Grove Blvd	Eastbound Left/U-Turn	150 feet	Left: 3 U-Turn: 15	50 feet	Left: 3 U-Turn: 36	75 feet
	Westbound Left/U-Turn	200 feet	Left: 36 U-Turn: 6	100 feet	Left: 75 U-Turn: 6	150 feet
	Northbound Left/Through/ Right-Turn	60 feet	Left: 10 Through: 0 Right: 13	50 feet	Left: 54 Through: 0 Right: 37	275 feet

Notes:

¹ Based on review of aerial imagery.

² Based on traffic counts collected on a weekday in February and April 2022.

³ 25 feet assumed per queued vehicle.

⁴ Calculated as project-related increase in maximum queue from SimTraffic added to existing observed maximum queue.

⁵ It was not possible to determine maximum number of queued left-turning vehicles due to queued traffic in adjacent through lane (i.e., unclear whether stopped vehicle was a left or through movement).

Bolded text indicate maximum queue exceeds available storage.

Source: Fehr & Peers, 2022.

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Based on this analysis, the following is recommended:

- Outbound movements at Driveway 3 should be restricted to right-turns by constructing a gullwing in the driveway median.

This recommendation would also prohibit left/through movements from the opposing driveway. **Figure 5** shows the existing plus project PM peak hour volumes with this modification in place. The above recommendation would shift 54 left-turns exiting Driveway 3 to either use Driveway 1 or Driveway 2.

Conditions were reanalyzed using SimTraffic with this modification in place. The northbound approach was found to improve conditions to LOS A with an average delay of 10 seconds per vehicle. Refer to **Table 5** for queuing results (see **Appendix B** for technical calculations). Table 5 indicates that the recommended modification at Driveway 3 would result in incrementally greater maximum queues at Driveways 1 and 2. Measures for addressing excess queuing at these driveways are presented in the next section.

TABLE 5: WEEKDAY PM PEAK HOUR MAXIMUM VEHICLE QUEUES IN STUDY AREA – EXISTING PLUS PROJECT CONDITIONS WITH DRIVEWAY 3 MODIFICATION								
Driveway	Movement	Available Storage ¹	Existing ²		Existing Plus Project		Existing Plus Project with Modifications ³	
			Traffic Volume	Max Queue ⁴	Traffic Volume	Max Queue ⁴	Traffic Volume	Max Queue ⁴
Driveway 1	Westbound Right-Turn	50 feet	76	125 feet	104	150 feet	122	200 feet
Driveway 2	Northbound Right-Turn	50 feet	34	50 feet	69	75 feet	105	100 feet
Driveway 3	Eastbound Left/U-Turn	150 feet	Left: 3 U-Turn: 15	50 feet	Left: 3 U-Turn: 36	75 feet	Left: 3 U-Turn: 72	100 feet
	Northbound ³	60 feet	Left: 10 Right: 13	50 feet	Left: 54 Right: 37	275 feet	Right: 37	65 feet

Notes:

¹ Based on review of aerial imagery.

² Based on traffic counts collected on a weekday in February and April 2022.

³ Modifications would install a gullwing in Pleasant Grove Boulevard median at Driveway 3, restricting side-street movements to right-turns only (while maintaining major street left-turn ingress).

⁴ 25 feet assumed per queued vehicle (unless otherwise noted).

Bolded text indicate maximum queue exceeds available storage.

Source: Fehr & Peers, 2022.

Additional analysis and/or discussions are needed regarding the long-term feasibility of maintaining the eastbound left/u-turn lane at Driveway 3. This is being driven by the projected increase in traffic on westbound Pleasant Grove Boulevard and expected worsening of operations at the Fiddymment Road/Pleasant Grove Boulevard intersection. According to the most recent 2035 forecasts and operations analysis from the *Transportation Impact Study for the City of Roseville Housing Element Update* (Fehr & Peers, May 2021), this intersection is expected to operate at LOS F during the weekday AM peak hour and LOS E during the weekday PM peak hour. The westbound approach is expected to experience a 78% increase in PM peak hour traffic between now and 2035. This could potentially cause westbound traffic to spill back beyond Driveway 3, making eastbound left-turns difficult to perform.

Review of Project Access and On-Site Circulation

Since all three project driveways already exist and are currently in use, our review of project access primarily relates to whether the addition of project trips would require alterations to the driveway designs. This section also includes a detailed review of internal circulation. Refer to **Figure 6** for recommendations.

1. Need for Deceleration Lanes at Project Driveways

The following standard contained in the *City of Roseville Design and Construction Standards* (2021) are applicable to the review of project driveways.

- *Right-turn deceleration lanes shall be provided at driveways when:*
 - *the driveway is located on an arterial,*
 - *the right-turn ingress volume is expected to exceed 50 vehicles per hour,*
 - *there is ample room to fit a deceleration lane, and*
 - *the travel speed of the roadway equals or exceeds 45 mph.*

A right-turn curb flare shall be provided when these conditions are met but the right-turn volume is between 10 and 50 vehicles per hour. There may be cases where some of the criteria are met, but City staff may still require a deceleration lane in the interest of safety.

Evaluation: Driveway 1 currently serves 40 inbound right-turns during the PM peak hour. Neither a deceleration lane or taper is present at this driveway. Streetlights, power poles, and utility vaults are situated immediately to the south of this driveway. Driveway 2 currently serves 40 inbound right-turns during the PM peak hour and has a 200-foot right-turn deceleration lane that also serves as a bus stop/turnout. Driveway 3 currently serves 5 inbound right-turns during the PM peak hour and has a 150-foot right-turn deceleration taper.

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Conclusion #1: *No changes in deceleration lanes/tapers are recommended at any of the project driveways.*

Technical Support:

- A deceleration taper would have already been constructed at Driveway 1 for the CVS Pharmacy if it had been deemed feasible.
- A right-turn deceleration lane is already present at Driveway 2.
- With the addition of project trips, the right-turn deceleration taper (versus a full deceleration lane) is sufficient at Driveway 3.

2. Maximum queue lengths for outbound movements at driveways

Table 5 indicated the maximum expected outbound vehicle queues at Driveways 1 and 2 would exceed the available storage under existing plus project conditions. The maximum throat depth at Driveway 3 would be within 5 feet of what is provided. Hence, no changes in design at that driveway are recommended. The following is recommended at Driveways 1 and 2:

Recommendation #1: *The Grocery Outlet Retail Center project applicant shall take the following steps:*

1. *Retain a professional transportation consultant to monitor queuing at Driveway 1 after the proposed project is constructed.*⁵
2. *If outbound vehicle queues cause inbound traffic to spill onto Fiddymont Road, then feasible physical improvements (such as those shown on Figure 6) should be implemented.*⁶

To address vehicular queuing at Driveway 2, the project site plan was recently modified to close the drive aisle opening to the Grocery Outlet parking lot that was proposed to be situated directly opposite the CVS drive aisle. This will improve the queuing condition for outbound traffic, by reducing the number of turning movements. The following is recommended:

Recommendation #2: *As part of the same monitoring effort for Driveway 1, vehicle queuing at Driveway 2 should also be monitored. If outbound queued traffic causes inbound traffic to back onto Pleasant Grove Boulevard, then the driveway should be modified either by posting a sign on the eastbound CVS drive aisle approach stating "Do Not Block Intersection" or by adding "Do Not Block Intersection" pavement markings.*

⁵ Monitoring would consist of measuring inbound and outbound traffic levels and queuing on three weekdays from 4 to 6 PM.

⁶ Feasible improvements may include (but are not limited to) minor driveway widening on the south side just east of Fiddymont Road to enable construction of a short inbound left-turn pocket into the CVS Pharmacy drive aisles, or construction of a raised median along the driveway throat. Note that the project applicant also owns the adjacent property to the west, thus making these improvements feasible from a property ownership perspective.

3. Driveway 3 Improvements along Pleasant Grove Boulevard

Table 5 indicates that a maximum queue of 100 feet (4 vehicles) is expected under existing plus project conditions in the eastbound left/u-turn lane with Driveway 3 assuming a gullwing is constructed. This left-turn lane would also be used by the West Roseville Marketplace project. According to the final access study for that project (*Final Technical Memorandum for Evaluation of Access and Circulation for West Roseville Marketplace*, Fehr & Peers, April 2022), that project would increase the maximum queue in the turn lane by 3 vehicles. Thus, with both projects constructed, the maximum queue would be 175 feet (7 vehicles), which exceeds the available storage of 150 feet. The following is recommended:

Recommendation #3: *The Grocery Outlet Retail Center project applicant shall coordinate with the West Roseville Marketplace applicant to identify proportionate funding and responsibility of construction of the following improvement:*

- *Lengthen the eastbound left-turn lane at Driveway 3 from 150 feet to at least 175 feet.*

Lengthening the turn lane to 175 feet could be accomplished by reducing the transition taper (to the westbound dual left-turn lane approaching Fiddymment Road) from 120 to 95 feet. Coordination with City of Roseville staff is recommended to discuss additional lengthening beyond 175 feet (given that it would require reducing the amount of storage for the westbound left-turn lane from Pleasant Grove Boulevard onto Fiddymment Road).

The *Final Technical Memorandum for Evaluation of Access and Circulation for West Roseville Marketplace* (2022) recommended a continuous acceleration/deceleration lane be added at its project driveways along Pleasant Grove Boulevard. This necessitates relocation of curb, gutter, and sidewalk. As part of those improvements, it would be desirable if the westbound Pleasant Grove Boulevard travel lanes could be relocated 1 to 2 feet to the north of their current location. This would enable the median to be slightly wider, which is desirable in order to provide "a positive offset"⁷ for the face-to-face left-turns at Driveway 3. A 3-foot raised median island is already present adjacent to the eastbound left-turn lane to further enable this construction.

⁷ This refers to the placement of left-turn pockets such that simultaneously present motorists in each turn pocket would be able to see around each other and observe oncoming traffic. See Appendix B for illustration of this concept.

4. Review of Internal Circulation

The project site plan shows a fast-food restaurant with a drive-through lane situated in the northeast corner of the project site. A meeting was held between the project applicant, engineer, and architect, Fehr & Peers, and City of Roseville staff in June 2022 to discuss concerns regarding the fast-food restaurant's drive-through lane and vehicle queues expected at Driveway 3. That meeting led to a modification in the fast-food restaurant layout (as shown in Figure 2), which provides several meaningful improvements over the prior site plan including:

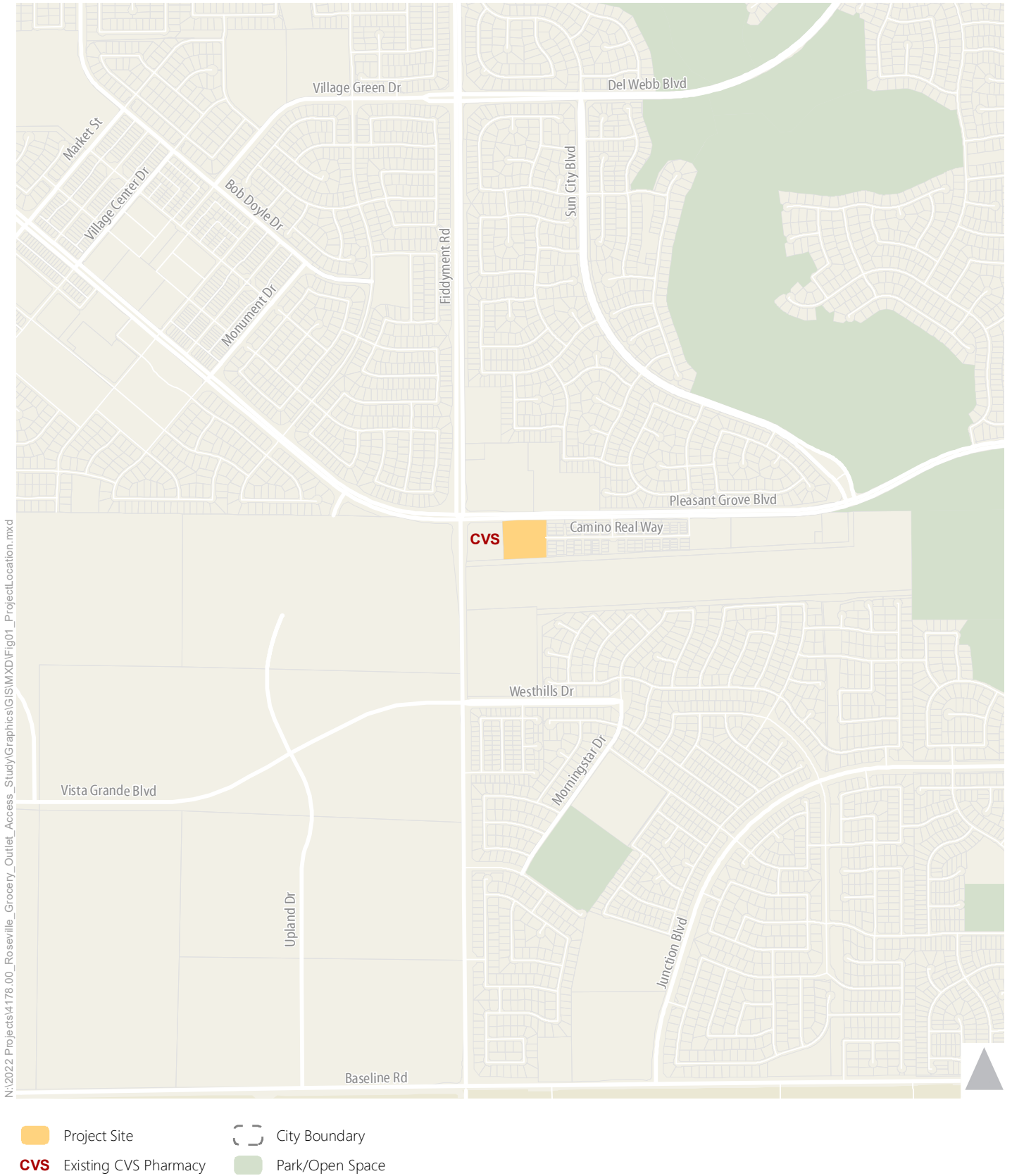
1. The length of the drive-through lane has been significantly extended to reduce the likelihood of vehicles spilling out of it, which could block other traffic in the center.
2. The new layout has reduced the width of the drive aisle south of the restaurant (connecting to Camino Real Way) from an excessively wide 55 feet to a typical 24 feet.
3. The main internal intersection southwest of the restaurant has been reduced in size and is now a more traditional squared-up design.
4. Although the drive-through lane exit remains in its original location (about 50 feet south of Pleasant Grove Boulevard), the site plan now shows a raised median at Driveway 3, which would force motorists exiting the drive-through lane to turn right (onto Pleasant Grove Boulevard). The raised median will help with the flow of traffic exiting the drive-through lane (as vehicles would not be able to perform the more time-consuming left-turn to remain within the center).

The site plan has also been modified to include additional on-site sidewalks and crosswalks per the prior study recommendations.

Since the design review permit does not include the fast-food restaurant, this study does not include any specific recommendations regarding its design shown on the site plan. The raised median shown in the site plan at Driveway 3 would not be necessary to accommodate traffic associated with buildout of the remainder of the retail center. The need for that median should be evaluated in conjunction with the review of the proposed use for that parcel.

We also recommend the project's architect or engineer evaluate the turning requirements of delivery trucks that would serve Grocery Outlet.

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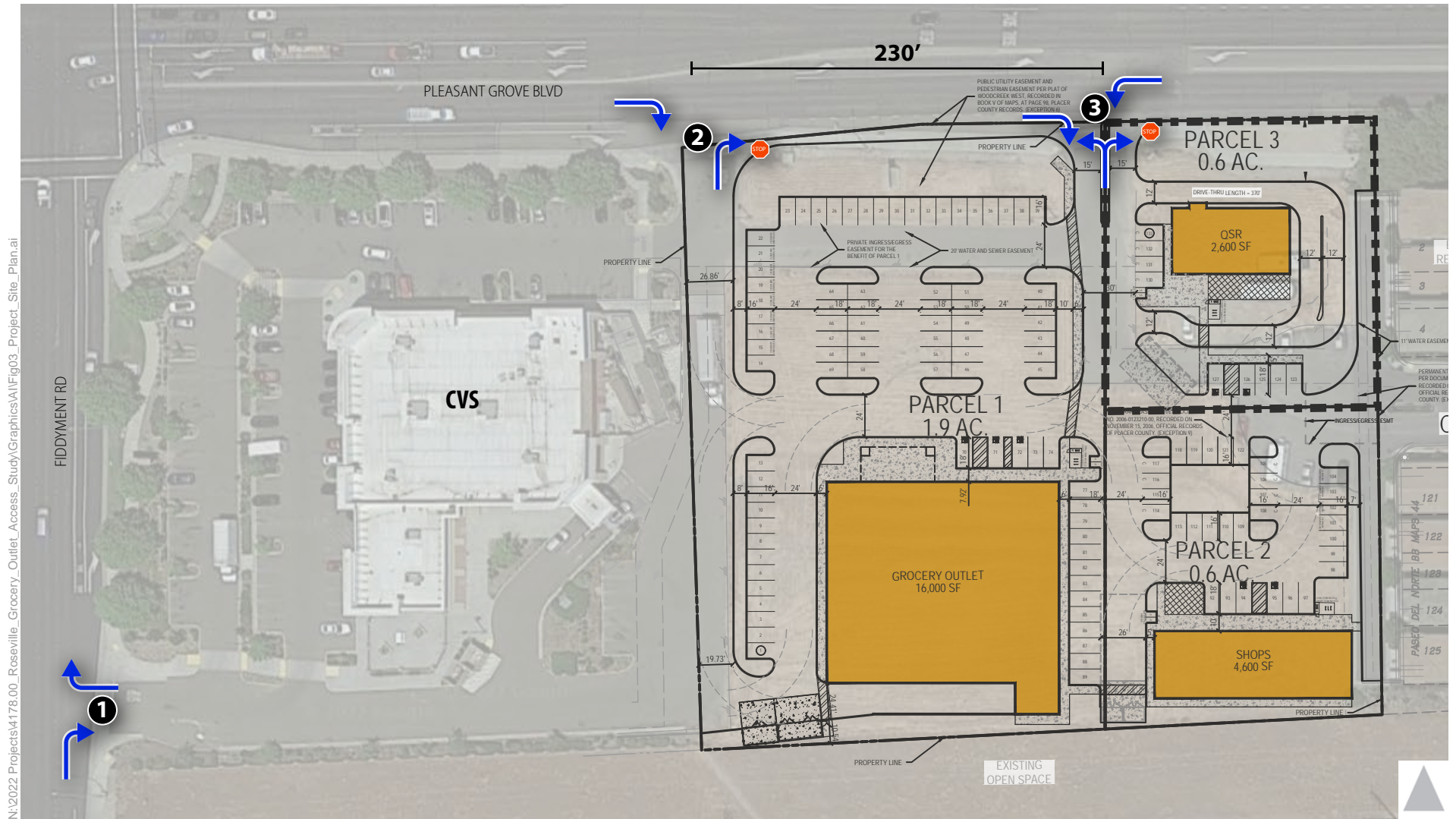


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Figure 1
Project Location

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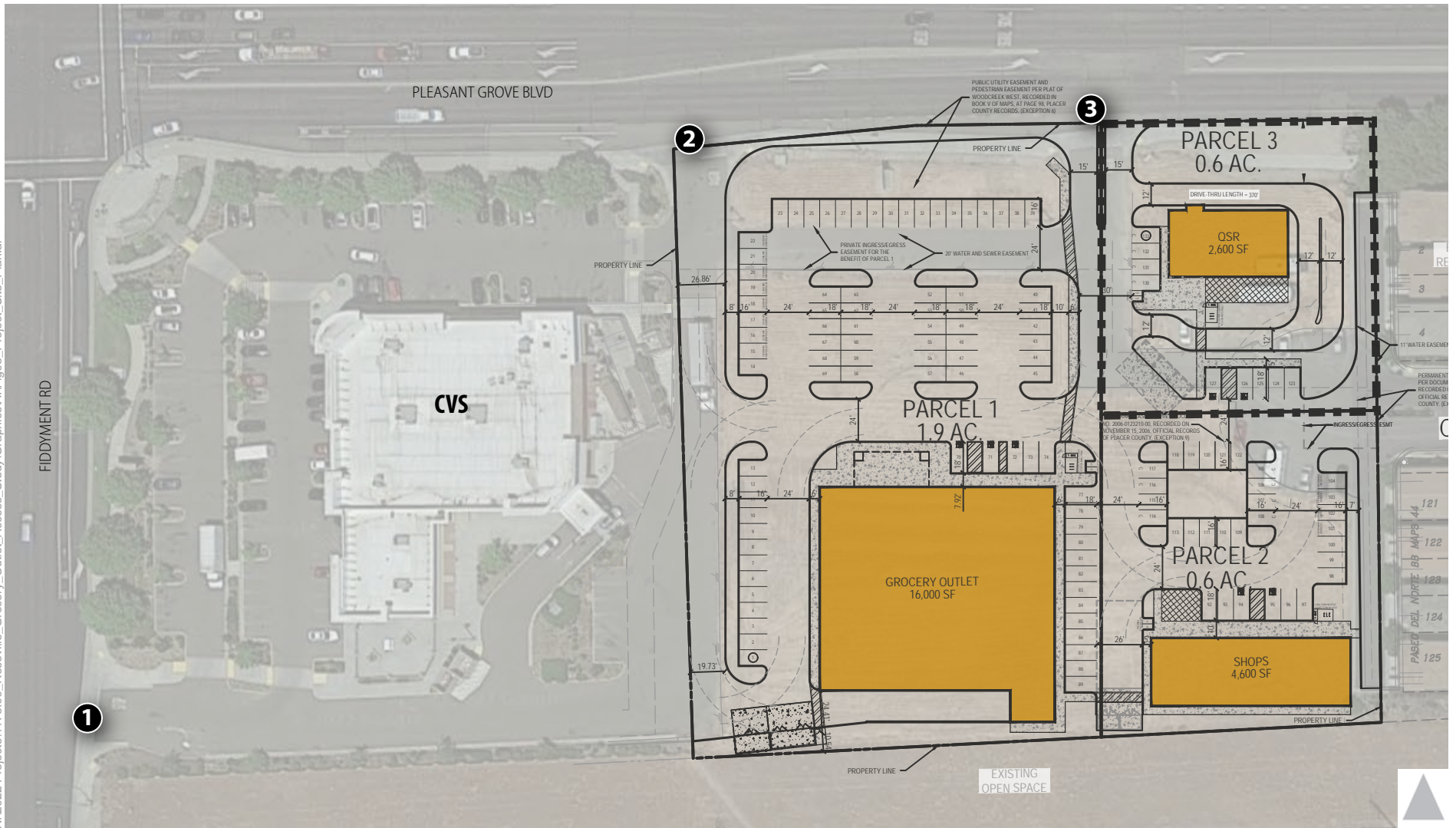
- # Study Intersection
- ↘ Permitted Turning Movement



Figure 2
Project Site Plan

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1. Dwy 1/Fiddymnt Rd	2. Dwy 2/Pleasant Grove Blvd	3. Dwy 3/Pleasant Grove Blvd

Study Intersection

↔ Vehicle Turning Movement

xx PM Peak Hour Volume

● Stop Sign

Note: Volumes at Driveway 3 represent conditions assuming the currently permitted full-access on the southbound approach (versus the recent prohibition of southbound left-turns via sign posted by a private party).

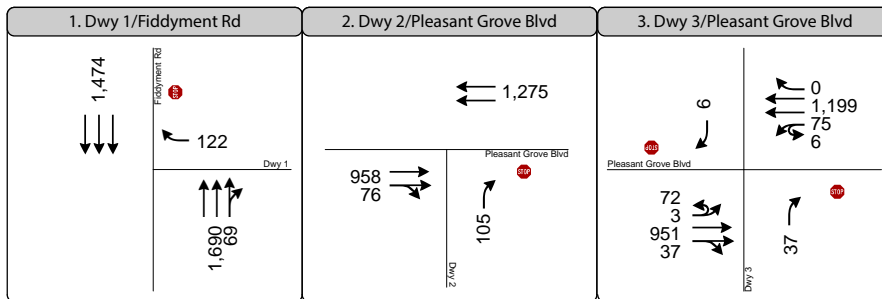
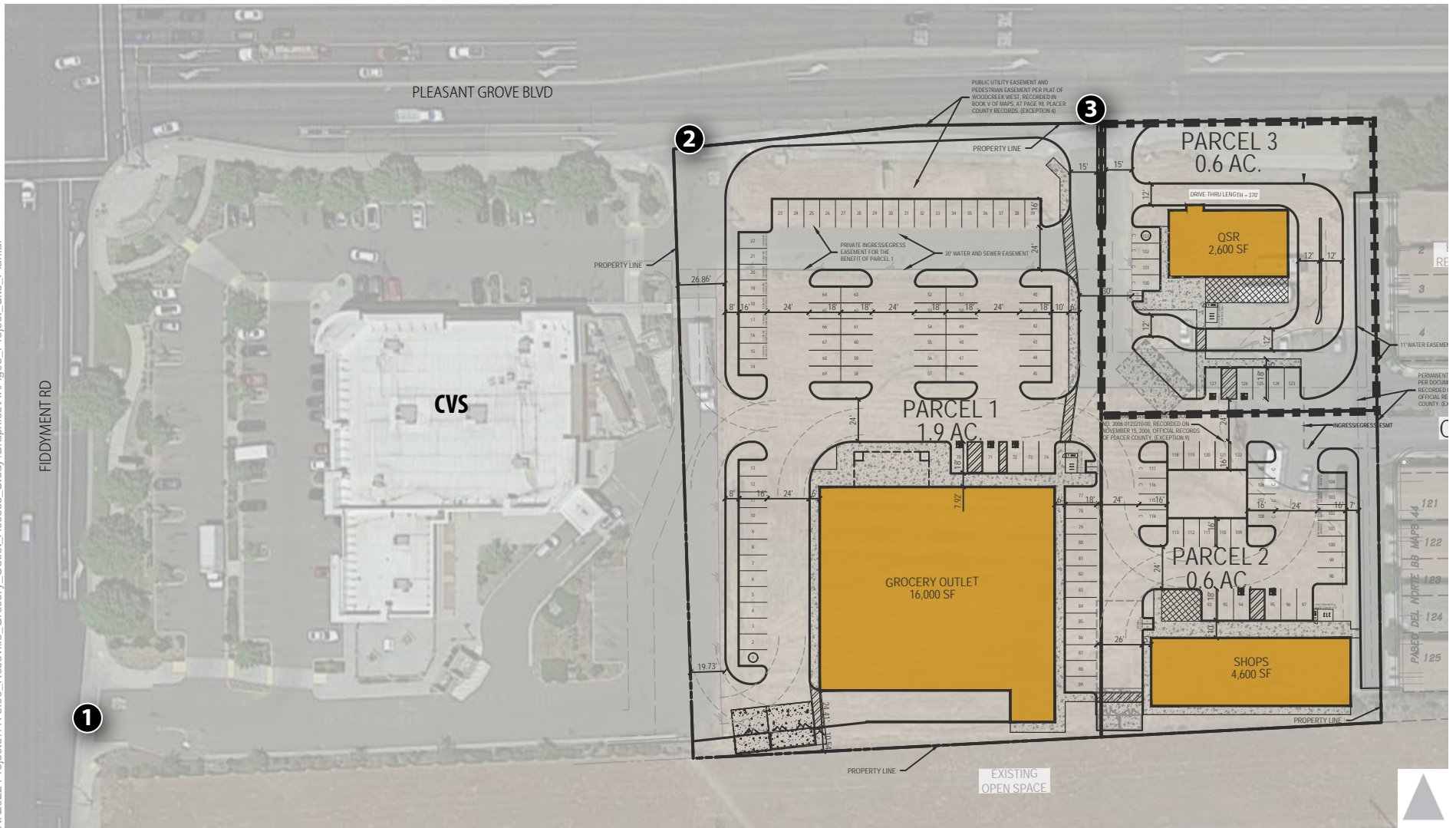
Figure 3

PM Peak Hour Traffic Volumes and Lane Configurations - Existing Conditions



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Study Intersection

↶ Vehicle Turning Movement

xx PM Peak Hour Volume

● Stop Sign

Figure 5

PM Peak Hour Traffic Volumes and Lane Configurations - Existing Plus Project with Access Modifications Conditions



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Appendix A – Existing and Existing Plus Project Technical Calculations

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SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Roseville Grocery Outlet Center
Existing
PM Peak Hour

Intersection 1 **Fiddymnt Rd/Project Driveway 1** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn						
	Through	1,694	1,691	99.8%	2.5	0.9	A
	Right Turn	40	41	103.0%	1.4	0.7	A
	Subtotal	1,734	1,733	99.9%	2.5	0.9	A
SB	Left Turn						
	Through	1,454	1,426	98.1%	1.5	0.1	A
	Right Turn						
	Subtotal	1,454	1,426	98.1%	1.5	0.1	A
EB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
WB	Left Turn						
	Through						
	Right Turn	76	76	99.9%	23.1	15.1	C
	Subtotal	76	76	99.9%	23.1	15.1	C
Total		3,264	3,235	99.1%	2.6	0.8	A

Intersection 2 **Project Driveway 2/Pleasant Grove Blvd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn						
	Through						
	Right Turn	34	34	101.2%	6.8	2.6	A
	Subtotal	34	34	101.2%	6.8	2.6	A
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	941	931	98.9%	3.1	0.4	A
	Right Turn	40	39	98.5%	2.0	0.6	A
	Subtotal	981	970	98.9%	3.1	0.4	A
WB	Left Turn						
	Through	1,246	1,226	98.4%	1.7	0.3	A
	Right Turn						
	Subtotal	1,246	1,226	98.4%	1.7	0.3	A
Total		2,261	2,231	98.7%	2.4	0.2	A

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SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Roseville Grocery Outlet Center
Existing
PM Peak Hour

Intersection 3 **Project Driveway 3/Pleasant Grove Blvd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	10	10	101.0%	48.3	36.6	E
	Through						
	Right Turn	13	14	110.8%	17.0	16.4	C
	Subtotal	23	25	106.5%	30.9	25.5	D
SB	Left Turn	2	1	70.0%	9.5	22.2	A
	Through						
	Right Turn	4	4	90.0%	4.1	5.7	A
	Subtotal	6	5	83.3%	10.0	12.8	A
EB	Left Turn	18	19	106.1%	7.6	4.4	A
	Through	952	941	98.8%	1.4	0.1	A
	Right Turn	5	5	96.0%	1.8	1.5	A
	Subtotal	975	965	98.9%	1.5	0.1	A
WB	Left Turn	42	40	96.2%	15.6	4.4	C
	Through	1,217	1,195	98.2%	3.3	0.3	A
	Right Turn						
	Subtotal	1,259	1,235	98.1%	3.7	0.3	A
Total		2,263	2,229	98.5%	3.2	0.6	A

Intersection 4 **Fiddymt Rd/Pleasant Grove Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	600	598	99.7%	60.4	8.9	E
	Through	748	756	101.0%	30.5	2.0	C
	Right Turn	422	414	98.2%	14.6	1.5	B
	Subtotal	1,770	1,768	99.9%	36.8	3.0	D
SB	Left Turn	142	142	100.1%	56.8	6.2	E
	Through	674	669	99.2%	41.7	3.2	D
	Right Turn	70	66	94.7%	14.2	3.8	B
	Subtotal	886	877	99.0%	42.0	2.3	D
EB	Left Turn	64	60	94.4%	58.5	9.5	E
	Through	417	414	99.3%	50.7	5.1	D
	Right Turn	321	319	99.2%	15.6	2.7	B
	Subtotal	802	793	98.9%	37.0	3.6	D
WB	Left Turn	459	437	95.3%	54.9	4.4	D
	Through	646	639	99.0%	40.8	3.1	D
	Right Turn	141	146	103.8%	8.6	1.0	A
	Subtotal	1,246	1,223	98.1%	42.3	2.8	D
Total		4,704	4,661	99.1%	39.3	1.8	D

Queuing and Blocking Report

Intersection: 1: Fiddymnt Rd & Project Drwy 1

Movement	WB	NB	NB	NB	NB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	133	122	222	164	34
Average Queue (ft)	43	33	25	10	1
95th Queue (ft)	94	109	145	84	16
Link Distance (ft)	295		1308	1308	1308
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		5			
Storage Blk Time (%)		6	0		
Queuing Penalty (veh)		20	0		

Intersection: 2: Project Drwy 2 & Pleasant Grove Blvd

Movement	EB	EB	WB	WB	WB	NB
Directions Served	T	TR	T	T	T	R
Maximum Queue (ft)	4	8	56	80	64	60
Average Queue (ft)	0	0	3	4	3	24
95th Queue (ft)	4	5	23	37	34	54
Link Distance (ft)	287	287		190	190	279
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			5			
Storage Blk Time (%)			0	0		
Queuing Penalty (veh)			2	1		

Intersection: 3: Project Drwy 3 & Pleasant Grove Blvd

Movement	EB	EB	EB	WB	NB	SB	SB
Directions Served	UL	T	TR	UL	LTR	L	R
Maximum Queue (ft)	41	3	7	59	74	19	24
Average Queue (ft)	11	0	0	20	23	1	3
95th Queue (ft)	33	3	3	47	60	11	15
Link Distance (ft)		190	190		553		1028
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	150			200		150	
Storage Blk Time (%)							
Queuing Penalty (veh)							

CC Attachment 8

Queuing and Blocking Report

Roseville Grocery Outlet Center

Existing Conditions

Intersection: 4: Fiddymt Rd & Pleasant Grove Blvd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	UL	L	T	T	R	L	L
Maximum Queue (ft)	56	112	284	259	198	278	287	292	295	80	284	306
Average Queue (ft)	9	47	178	140	87	169	183	182	199	30	234	252
95th Queue (ft)	36	94	254	232	153	248	261	268	286	61	311	331
Link Distance (ft)			1049	1049			287	287	287	287	284	284
Upstream Blk Time (%)						0	0	0	1		1	7
Queuing Penalty (veh)						0	1	1	3		3	20
Storage Bay Dist (ft)	245	245			245	255						
Storage Blk Time (%)			1	0	0	0	1					
Queuing Penalty (veh)			1	0	0	1	3					

Intersection: 4: Fiddymt Rd & Pleasant Grove Blvd

Movement	NB	NB	NB	NB	SB	SB	SB	SB	SB	SB
Directions Served	T	T	T	R	UL	L	T	T	T	R
Maximum Queue (ft)	259	280	240	271	128	136	232	235	217	86
Average Queue (ft)	162	172	127	123	60	68	148	153	136	28
95th Queue (ft)	237	248	225	224	113	119	212	218	205	65
Link Distance (ft)	284	284	284	284			497	497	497	
Upstream Blk Time (%)	0	0	0	0						
Queuing Penalty (veh)	0	0	0	1						
Storage Bay Dist (ft)					230	230				230
Storage Blk Time (%)							0		0	
Queuing Penalty (veh)							0		0	

Intersection: 10: Bend

Movement	NB	NB
Directions Served	T	T
Maximum Queue (ft)	92	265
Average Queue (ft)	3	15
95th Queue (ft)	67	157
Link Distance (ft)	497	497
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 58

CC Attachment 8

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Roseville Grocery Outlet
Existing Plus Project
PM Peak Hour

Intersection 1 **Fiddymnt Rd/Project Driveway 1** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn						
	Through	1,690	1,688	99.9%	3.5	1.9	A
	Right Turn	69	74	106.7%	1.9	1.1	A
	Subtotal	1,759	1,762	100.2%	3.4	1.8	A
SB	Left Turn						
	Through	1,474	1,463	99.3%	1.5	0.1	A
	Right Turn						
	Subtotal	1,474	1,463	99.3%	1.5	0.1	A
EB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
WB	Left Turn						
	Through						
	Right Turn	104	108	103.8%	28.6	18.8	D
	Subtotal	104	108	103.8%	28.6	18.8	D
Total		3,337	3,333	99.9%	3.4	1.6	A

Intersection 2 **Project Driveway 2/Pleasant Grove Blvd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn						
	Through						
	Right Turn	69	72	103.8%	6.4	1.5	A
	Subtotal	69	72	103.8%	6.4	1.5	A
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	958	956	99.8%	3.6	0.3	A
	Right Turn	76	80	105.3%	2.0	0.4	A
	Subtotal	1,034	1,036	100.2%	3.4	0.3	A
WB	Left Turn						
	Through	1,293	1,286	99.5%	2.0	0.3	A
	Right Turn						
	Subtotal	1,293	1,286	99.5%	2.0	0.3	A
Total		2,396	2,394	99.9%	2.8	0.2	A

CC Attachment 8

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Roseville Grocery Outlet
Existing Plus Project
PM Peak Hour

Intersection 3 **Project Driveway 3/Pleasant Grove Blvd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	54	55	101.1%	166.6	82.3	F
	Through						
	Right Turn	37	33	89.7%	166.9	86.0	F
	Subtotal	91	88	96.5%	166.7	81.9	F
SB	Left Turn	2	1	65.0%	22.1	37.6	C
	Through						
	Right Turn	4	5	115.0%	4.2	5.3	A
	Subtotal	6	6	98.3%	18.9	24.8	C
EB	Left Turn	39	39	100.3%	8.8	2.6	A
	Through	951	952	100.1%	1.6	0.1	A
	Right Turn	37	39	104.9%	2.6	0.3	A
	Subtotal	1,027	1,030	100.3%	1.8	0.1	A
WB	Left Turn	81	80	98.6%	16.1	4.9	C
	Through	1,199	1,193	99.5%	3.5	0.5	A
	Right Turn						
	Subtotal	1,280	1,273	99.4%	4.2	0.7	A
Total		2,404	2,397	99.7%	9.7	3.4	A

Intersection 4 **Fiddymnt Rd/Pleasant Grove Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	614	602	98.0%	66.0	10.7	E
	Through	753	766	101.7%	33.7	5.7	C
	Right Turn	427	426	99.7%	17.3	5.1	B
	Subtotal	1,794	1,793	100.0%	40.8	6.4	D
SB	Left Turn	164	162	98.8%	59.9	7.6	E
	Through	669	674	100.8%	40.2	3.6	D
	Right Turn	70	67	95.3%	14.0	5.2	B
	Subtotal	903	903	100.0%	41.7	3.0	D
EB	Left Turn	64	65	101.3%	69.8	10.9	E
	Through	443	447	101.0%	54.4	6.5	D
	Right Turn	316	305	96.6%	15.3	4.7	B
	Subtotal	823	817	99.3%	41.2	4.6	D
WB	Left Turn	478	475	99.4%	59.0	3.7	E
	Through	663	656	98.9%	43.7	3.2	D
	Right Turn	152	155	101.6%	8.8	1.0	A
	Subtotal	1,293	1,285	99.4%	44.8	2.7	D
Total		4,813	4,799	99.7%	42.1	2.7	D

CC Attachment 8

Queuing and Blocking Report

Roseville Grocery Outlet Center

Existing Plus Project Conditions

Intersection: 1: Fiddymnt Rd & Project Drwy 1

Movement	WB	NB	NB	NB	NB	NB
Directions Served	R	T	T	T	T	TR
Maximum Queue (ft)	164	37	124	318	270	73
Average Queue (ft)	64	2	48	54	23	2
95th Queue (ft)	142	17	137	231	146	28
Link Distance (ft)	295			1308	1308	1308
Upstream Blk Time (%)	1					
Queuing Penalty (veh)	0					
Storage Bay Dist (ft)		5	5			
Storage Blk Time (%)			10	0		
Queuing Penalty (veh)			33	0		

Intersection: 2: Project Drwy 2 & Pleasant Grove Blvd

Movement	EB	EB	WB	WB	WB	NB
Directions Served	T	TR	T	T	T	R
Maximum Queue (ft)	25	11	56	96	104	83
Average Queue (ft)	1	0	4	4	4	37
95th Queue (ft)	15	6	26	35	38	65
Link Distance (ft)	287	287		190	190	279
Upstream Blk Time (%)				0	0	
Queuing Penalty (veh)				0	0	
Storage Bay Dist (ft)			5			
Storage Blk Time (%)			0	0		
Queuing Penalty (veh)			2	1		

Intersection: 3: Project Drwy 3 & Pleasant Grove Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	SB	SB
Directions Served	UL	T	TR	UL	T	T	LTR	L	R
Maximum Queue (ft)	61	6	6	95	5	11	304	24	24
Average Queue (ft)	21	0	0	32	0	1	145	2	4
95th Queue (ft)	49	4	4	70	5	7	293	12	18
Link Distance (ft)		190	190		3022	3022	553		1028
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	150			200				150	
Storage Blk Time (%)									
Queuing Penalty (veh)									

CC Attachment 8

Queuing and Blocking Report

Roseville Grocery Outlet Center

Existing Plus Project Conditions

Intersection: 4: Fiddymt Rd & Pleasant Grove Blvd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	UL	L	T	T	R	UL	L
Maximum Queue (ft)	62	134	300	270	220	281	292	302	295	74	289	307
Average Queue (ft)	11	48	196	165	84	185	200	194	207	30	241	262
95th Queue (ft)	37	101	279	245	160	264	277	284	291	58	320	339
Link Distance (ft)			1049	1049			287	287	287	287	284	284
Upstream Blk Time (%)						0	1	1	1		2	11
Queuing Penalty (veh)						0	2	3	4		7	34
Storage Bay Dist (ft)	245	245			245	255						
Storage Blk Time (%)			3	1	0	1	2					
Queuing Penalty (veh)			2	3	0	2	5					

Intersection: 4: Fiddymt Rd & Pleasant Grove Blvd

Movement	NB	NB	NB	NB	SB	SB	SB	SB	SB	SB
Directions Served	T	T	T	R	UL	L	T	T	T	R
Maximum Queue (ft)	271	282	251	283	138	145	238	250	238	82
Average Queue (ft)	168	177	133	134	68	81	154	156	141	26
95th Queue (ft)	245	257	234	238	123	133	219	221	211	60
Link Distance (ft)	284	284	284	284			497	497	497	
Upstream Blk Time (%)	0	0	0	0						
Queuing Penalty (veh)	0	1	0	1						
Storage Bay Dist (ft)					230	230				230
Storage Blk Time (%)							0		0	
Queuing Penalty (veh)							1		0	

Intersection: 10: Bend

Movement	NB	NB
Directions Served	T	T
Maximum Queue (ft)	239	300
Average Queue (ft)	9	13
95th Queue (ft)	111	143
Link Distance (ft)	497	497
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 100

CC Attachment 8

Appendix B – Existing Plus Project with Modifications Technical Calculations

CC Attachment 8

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Roseville Grocery Outlet
Existing Plus Project with Mitigation
PM Peak Hour

Intersection 1 **Fiddymt Rd/Project Driveway 1** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn						
	Through	1,690	1,687	99.8%	5.4	4.5	A
	Right Turn	69	63	91.6%	1.8	0.5	A
	Subtotal	1,759	1,750	99.5%	5.2	4.4	A
SB	Left Turn						
	Through	1,474	1,470	99.7%	1.5	0.1	A
	Right Turn						
	Subtotal	1,474	1,470	99.7%	1.5	0.1	A
EB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
WB	Left Turn						
	Through						
	Right Turn	122	115	94.1%	60.4	59.0	F
	Subtotal	122	115	94.1%	60.4	59.0	F
Total		3,355	3,335	99.4%	5.2	3.5	A

Intersection 2 **Project Driveway 2/Pleasant Grove Blvd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn						
	Through						
	Right Turn	105	105	100.4%	6.7	1.7	A
	Subtotal	105	105	100.4%	6.7	1.7	A
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	958	954	99.6%	3.3	0.3	A
	Right Turn	76	73	96.4%	1.9	0.7	A
	Subtotal	1,034	1,027	99.4%	3.2	0.3	A
WB	Left Turn						
	Through	1,275	1,260	98.8%	2.1	0.5	A
	Right Turn						
	Subtotal	1,275	1,260	98.8%	2.1	0.5	A
Total		2,414	2,393	99.1%	2.8	0.3	A

CC Attachment 8

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Roseville Grocery Outlet
Existing Plus Project with Mitigation
PM Peak Hour

Intersection 3 **Project Driveway 3/Pleasant Grove Blvd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn						
	Through						
	Right Turn	37	37	98.9%	9.7	2.1	A
	Subtotal	37	37	98.9%	9.7	2.1	A
SB	Left Turn	2	2	100.0%	15.2	21.1	C
	Through						
	Right Turn	4	4	107.5%	18.3	33.3	C
	Subtotal	6	6	105.0%	28.3	33.6	D
EB	Left Turn	75	74	98.3%	13.0	6.7	B
	Through	951	948	99.6%	1.5	0.0	A
	Right Turn	37	38	103.8%	2.5	0.3	A
	Subtotal	1,063	1,060	99.7%	2.3	0.6	A
WB	Left Turn	81	78	96.2%	15.9	3.0	C
	Through	1,199	1,183	98.7%	3.7	0.5	A
	Right Turn						
	Subtotal	1,280	1,261	98.5%	4.5	0.5	A
Total		2,386	2,364	99.1%	3.7	0.6	A

Intersection 4 **Fiddymnt Rd/Pleasant Grove Blvd** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	628	622	99.0%	67.9	16.7	E
	Through	757	750	99.0%	35.2	4.8	D
	Right Turn	427	429	100.5%	20.1	7.4	C
	Subtotal	1,812	1,800	99.4%	42.9	9.3	D
SB	Left Turn	164	160	97.3%	61.8	7.6	E
	Through	669	670	100.2%	40.4	4.2	D
	Right Turn	70	68	97.6%	16.2	5.0	B
	Subtotal	903	898	99.5%	42.4	3.8	D
EB	Left Turn	64	63	98.6%	60.6	15.3	E
	Through	443	437	98.7%	52.7	5.0	D
	Right Turn	316	316	99.9%	14.8	3.8	B
	Subtotal	823	816	99.2%	38.5	4.0	D
WB	Left Turn	471	470	99.8%	55.4	5.4	E
	Through	656	646	98.4%	43.3	3.7	D
	Right Turn	148	144	97.5%	8.8	1.0	A
	Subtotal	1,275	1,260	98.8%	44.0	3.5	D
Total		4,813	4,775	99.2%	42.4	4.6	D

Intersection: 1: Fiddymnt Rd & Project Drwy 1

Movement	WB	NB	NB	NB	NB	SB
Directions Served	R	T	T	T	TR	T
Maximum Queue (ft)	217	124	415	307	42	5
Average Queue (ft)	83	57	81	47	2	0
95th Queue (ft)	206	148	321	235	23	5
Link Distance (ft)	519		1309	1309	1309	283
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		5				
Storage Blk Time (%)		13	0			
Queuing Penalty (veh)		45	0			

Intersection: 2: Project Drwy 2 & Pleasant Grove Blvd

Movement	EB	WB	WB	WB	NB
Directions Served	TR	T	T	T	R
Maximum Queue (ft)	17	50	91	77	95
Average Queue (ft)	1	4	5	6	45
95th Queue (ft)	10	27	39	41	79
Link Distance (ft)	287		190	190	279
Upstream Blk Time (%)			0		
Queuing Penalty (veh)			0		
Storage Bay Dist (ft)		5			
Storage Blk Time (%)		1	0		
Queuing Penalty (veh)		2	1		

Intersection: 3: Project Drwy 3 & Pleasant Grove Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	SB	SB
Directions Served	UL	T	TR	UL	T	T	TR	L	R
Maximum Queue (ft)	90	25	12	84	5	9	65	24	29
Average Queue (ft)	34	1	1	31	0	0	27	2	3
95th Queue (ft)	70	17	7	63	5	7	58	13	17
Link Distance (ft)		190	190		3022	3022	553		1028
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	150			200				150	
Storage Blk Time (%)		0							
Queuing Penalty (veh)		0							

CC Attachment 8

Queuing and Blocking Report

Roseville Marketplace
Existing Plus Project with Mitigation Conditions

Intersection: 4: Fiddymnt Rd & Pleasant Grove Blvd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	UL	L	T	T	R	UL	L
Maximum Queue (ft)	51	122	289	253	193	277	296	289	303	70	289	306
Average Queue (ft)	10	49	190	154	85	180	197	194	208	29	247	267
95th Queue (ft)	36	99	266	239	156	262	277	283	299	56	315	336
Link Distance (ft)			1049	1049			287	287	287	287	283	283
Upstream Blk Time (%)						0	1	1	2		2	14
Queuing Penalty (veh)						0	2	2	6		7	43
Storage Bay Dist (ft)	245	245			245	255						
Storage Blk Time (%)			2	0	0	1	2					
Queuing Penalty (veh)			1	1	0	2	5					

Intersection: 4: Fiddymnt Rd & Pleasant Grove Blvd

Movement	NB	NB	NB	NB	SB	SB	SB	SB	SB	SB
Directions Served	T	T	T	R	UL	L	T	T	T	R
Maximum Queue (ft)	267	275	225	278	140	154	237	241	235	96
Average Queue (ft)	160	173	130	134	68	80	153	157	140	28
95th Queue (ft)	237	248	226	238	121	138	222	221	214	68
Link Distance (ft)	283	283	283	283			497	497	497	
Upstream Blk Time (%)	0	0		0						
Queuing Penalty (veh)	0	0		1						
Storage Bay Dist (ft)					230	230				230
Storage Blk Time (%)							1		0	
Queuing Penalty (veh)							1		0	

Intersection: 10: Bend

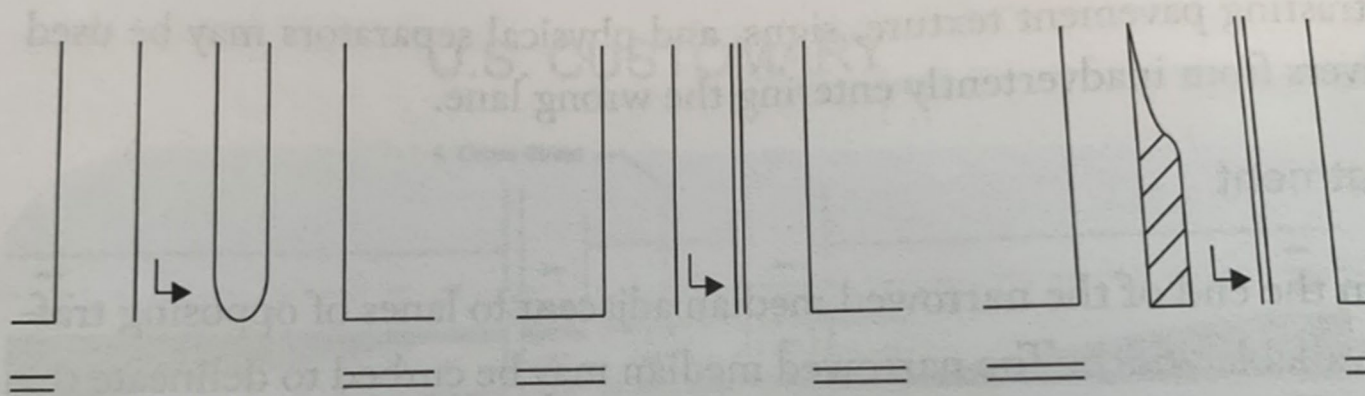
Movement	NB	NB
Directions Served	T	T
Maximum Queue (ft)	204	340
Average Queue (ft)	10	21
95th Queue (ft)	124	189
Link Distance (ft)	497	497
Upstream Blk Time (%)	0	0
Queuing Penalty (veh)	0	0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 120

9-114

A Policy on Geometric Design of Highways and Streets



Negative Offset
(a)

No Offset
(b)

Positive Offset
(c)