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Traffic Study

TRAFFIC IMPACT REPORT

ETUDE WINERY EXPANSION

July 15, 2016

Prepared for: ETUDE WINERY

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I. INTRODUCTION

This traffic report has been prepared at the request of the Napa County Public Works and Planning, Building & Environmental Sciences departments as authorized by Etude Winery. It has determined if traffic from the proposed winery expansion will result in any significant impacts to the local circulation system and the need for any mitigation measures. **Figure 1** shows the winery location along Cuttings Wharf Road about a mile south of SR 12-121.

II. SCOPE OF SERVICES

The scope of service for this traffic study was approved by the Napa County Public Works Department. Evaluation was conducted for harvest Friday and Saturday PM peak traffic conditions. Existing (2015), year 2020 and year 2030 (Cumulative – General Plan Buildout) horizons were evaluated both with and without project traffic. Operating conditions along SR 12-121 and Cuttings Wharf Road as well as at the SR 12-121 intersection with Cuttings Wharf Road were evaluated for all analysis scenarios based upon significance criteria contained in the General Plan and/or utilized in all recent County traffic studies. In addition, the project driveway intersection with Cuttings Wharf Road was evaluated for sight line adequacy. Significant impacts, if any, were identified and measures listed, if needed, to mitigate all impacts to a less than significant level.

III. SUMMARY OF FINDINGS

A. “WITHOUT PROJECT” OPERATING CONDITIONS

1. EXISTING VOLUMES – HARVEST 2015

Analysis peak traffic hours were based upon the highest volumes surveyed at the SR 12-121/Cutting Wharf Road intersection found during counts for this study. Based upon seasonal adjustments of February 2016 traffic counts, two-way harvest 2015 volumes along SR 12-121 just east of Cuttings Wharf Road would be slightly higher during the Friday PM peak hour compared to the Saturday PM peak hour (about 1,745 Friday PM peak hour vehicles versus about 1,685 Saturday PM peak hour vehicles), while volumes along Cuttings Wharf Road at the project entrance would be similar during both peak hours (200 vehicles during the Friday PM peak hour versus about 195 vehicles during the Saturday PM peak hour). The driveway serving the project site would be expected to have about 20-25 two-way vehicles during both the harvest Friday and Saturday PM peak hours with maximum visitor traffic levels.

2. YEAR 2015 HARVEST – CIRCULATION SYSTEM UNACCEPTABLE LEVEL OF SERVICE OPERATION

INTERSECTIONS

- **SR 12-121/ Cuttings Wharf Road**
 - Friday & Saturday PM peak traffic hours

ROADWAY SEGMENTS

- **SR 12-121**
 - Friday PM Peak Hour – Both directions east and west of / Cuttings Wharf Road
 - Saturday PM Peak Hour – Both directions east and west of / Cuttings Wharf Road

3. YEAR 2020 HARVEST – CIRCULATION SYSTEM UNACCEPTABLE LEVEL OF SERVICE OPERATION

INTERSECTIONS

- **SR 12-121/ Cuttings Wharf Road**
 - Friday & Saturday PM peak traffic hours

ROADWAY SEGMENTS

- **SR 12-121**
 - Friday PM Peak Hour – Both directions east and west of / Cuttings Wharf Road
 - Saturday PM Peak Hour – Both directions east and west of / Cuttings Wharf Road

• 4. YEAR 2030 HARVEST – CIRCULATION SYSTEM UNACCEPTABLE LEVEL OF SERVICE OPERATION

INTERSECTIONS

- **SR 12-121/Cuttings Wharf Road**
 - Friday & Saturday PM peak traffic hours

ROADWAY SEGMENTS

- **SR 12-121**
 - Friday PM Peak Hour – Both directions east and west of / Cuttings Wharf Road
 - Saturday PM Peak Hour – Both directions east and west of / Cuttings Wharf Road

B. PROJECT IMPACTS

1. PROJECT TRIP GENERATION

The proposed project will result in the following trip generation during harvest Friday and Saturday PM peak traffic hours.

PROJECT TRIP GENERATION

HARVEST

| FRIDAY PM PEAK HOUR* (3:00-4:00) | | SATURDAY PM PEAK HOUR* (3:30-4:30) | |
|-------------------------------------|-------------------|---------------------------------------|-------------------|
| INBOUND TRIPS | OUTBOUND TRIPS | INBOUND TRIPS | OUTBOUND TRIPS |
| 9 | 9 | 9 | 9 |

* Peak traffic hours at SR/12-121/Cuttings Wharf Road.

Trips during the Friday and Saturday PM peak hours would be visitors by appointment.

2. YEAR 2015 EXISTING + PROJECT OFF-SITE CIRCULATION IMPACTS - HARVEST

The proposed project would not result in any significant off-site level of service impacts to either SR 12-121 or Cuttings Wharf Road or to the SR 12-121/Cuttings Wharf Road intersection. The project would not degrade operation from acceptable to unacceptable at any analyzed location, increase peak hour volumes by 1 percent or greater along any roadway segment already experiencing unacceptable “Without Project” operation, or by 10 percent or greater of the Cuttings Wharf Road stop sign controlled approach volume to SR 12-121, which would be operating with unacceptable delay. *Less than Significant.*

3. YEAR 2020 EXISTING + PROJECT OFF-SITE CIRCULATION IMPACTS - HARVEST

The proposed project would not result in any significant off-site level of service impacts to either SR 12-121 or Cuttings Wharf Road or to the SR 12-121/Cuttings Wharf Road intersection. The project would not degrade operation from acceptable to unacceptable at any analyzed location, increase peak hour volumes by 1 percent or greater along any roadway segment already experiencing unacceptable “Without Project” operation, or by 10 percent or greater of the Cuttings Wharf Road stop sign controlled approach volume to SR 12-121, which would be operating with unacceptable delay. *Less than Significant.*

4. YEAR 2030 EXISTING + PROJECT OFF-SITE CIRCULATION IMPACTS - HARVEST

The proposed project would not result in any significant off-site level of service impacts to either SR 12-121 or Cuttings Wharf Road or to the SR 12-121/Cuttings Wharf Road intersection. The project would not degrade operation from acceptable to unacceptable at any analyzed location, increase peak hour volumes by 1 percent or greater along any

roadway segment already experiencing unacceptable “Without Project” operation, or by 10 percent or greater of the Cuttings Wharf Road stop sign controlled approach volume to SR 12-121, which would be operating with unacceptable delay. *Less than Significant.*

5. LEFT TURN LANE ON CUTTINGS WHARF ROAD AT THE PROJECT ENTRANCE

A left turn lane will be provided on the southbound Cuttings Wharf Road approach to the Etude Winery driveway as part of the project. *Less than Significant.*

6. SIGHT LINES AT PROJECT DRIVEWAY

The project driveway connects to Cuttings Wharf Road about 200 feet north of the South Road intersection. There will be acceptable sight lines at the project driveway connection to Cuttings Wharf Road with the left turn lane roadway widening and select tree removal along the project’s Cuttings Wharf Road frontage near the driveway. *Less than Significant.*

7. MARKETING EVENTS

The four proposed new marketing events each year would not add any significant traffic to the local circulation system during peak weekday or weekend traffic hours. *Less than Significant.*

8. TRAFFIC MITIGATIONS

No traffic-related mitigations are required.

C. CONCLUSIONS & RECOMMENDATIONS

The project will result in no significant off-site circulation system operational impacts to either SR 12-121 or Cuttings Wharf Road or to the SR 12-121/Cuttings Wharf Road intersection. In addition, a left turn lane will be provided on the southbound Cuttings Wharf Road approach to the project driveway. There will be acceptable sight lines at the project driveway connection to Cuttings Wharf Road with the left turn lane roadway widening and select tree removal along the project’s Cuttings Wharf Road frontage near the driveway. No traffic mitigations will be required.

IV. PROJECT LOCATION & DESCRIPTION

The Etude Winery is located on the east side of Cuttings Wharf Road with a driveway located about a mile south of the SR 12-121/Cuttings Wharf Road intersection (see **Figure 2**). The current driveway connection will be maintained.

The proposed Etude Winery expansion will contain the following components.

- Increase production from 150,000 up to 300,000 gallons/year.
- Add 2 new full-time and 4 new part-time production employees.
- Add 1 additional week of bottling on-site.
- 100% of new grapes required will be grown off site. New grapes will be transported to the site in about 5 trucks/day over 40 days.
- 150 new tours and tasting visitors per day maximum (by appointment only) – 7 days per week from 10:00 AM to 4:30 PM.
- New marketing events – 4 per year, maximum 40 visitors per event. Any day of the week starting at 5:00 PM or later.
- A left turn lane will be provided on the Cuttings Wharf Road southbound approach to the winery driveway, constructed to County standards. Select tree removal will also take place along the project's Cuttings Wharf Road frontage just north and south of the driveway in order to provide acceptable sight lines for turn movements to/from the winery.

V. CIRCULATION SYSTEM EVALUATION PROCEDURES

A. ANALYSIS LOCATIONS

At County direction, the following locations have been evaluated.

1. **SR 12-121/Cuttings Wharf Road intersection (the Cuttings Wharf Road northbound approach is stop sign controlled).**
2. **Cuttings Wharf Road/Etude Winery Driveway intersection.**
3. **SR 12-121 two-lane highway segments just east and west of Cuttings Wharf Road and Cuttings Wharf Road between SR 12-121 and the Etude Winery driveway.**

The intersection along SR 12-121 requested for analysis is shown in **Figure 2** along with a schematic presentation of its approach lanes and control.

B. ROADWAY DESCRIPTION

SR 12-121 provides subregional access to Cuttings Wharf Road. It is a two-lane highway with a 55 mile per hour posted speed limit near the project site. It extends from the Sonoma/Napa county line easterly to State Route 29. SR 12-121 has two well-paved travel lanes and wide paved shoulders. A left turn deceleration lane is provided on the westbound approach to Cuttings Wharf Road while a right turn deceleration lane is provided on the eastbound approach. An eastbound acceleration lane is also provided for right turns from Cuttings Wharf Road.

Cuttings Wharf Road is a two-lane collector roadway extending in a general southerly direction from its intersection with SR 12-121. It ends about 3 miles south of SR 12-121 at the Napa River. There is no posted speed limit between the project driveway and SR 12-121, although observed speeds ranged from 40 to 55 miles per hour. Cuttings Wharf Road is stop sign controlled on its single lane approach to SR 12-121.

C. VOLUMES

1. ANALYSIS SEASONS AND DAYS OF THE WEEK

At County request project traffic impacts have been evaluated during harvest conditions. Based upon more than four years of historical information from Caltrans PeMS (Performance Measurement System) count surveys along SR 29 in the Napa Valley, September has the highest daily volumes of the year (during harvest).

In regards to the peak traffic days of the week, the recently released Napa County Travel Behavioral Study¹ shows that the highest weekday volumes in Napa Valley occur on a Friday, with the highest weekend volumes occurring on a Saturday. In addition, historical count data from the City of Napa show that Friday has the highest volumes of any weekday, while Caltrans historical counts for SR 29 between St. Helena and Napa also show that weekday AM and PM peak hour volumes are higher on a Friday than on either a Wednesday or Thursday. Therefore, Friday and Saturday peak traffic conditions were evaluated at all analysis locations in this study.

2. COUNT RESULTS

Friday 3:00 to 6:00 PM and Saturday noon to 6:00 PM turn movement counts were conducted by Crane Transportation Group (CTG) in mid February 2016 at the SR 12-121 intersection with Cuttings Wharf Road as well as at the Cuttings Wharf Road intersection with the Etude Winery driveway. The peak traffic hours were 3:00-4:00 on Friday and 3:30-4:30 on Saturday. Resultant February 2016 peak hour counts are presented in **Appendix Figure 1**.

¹ Fehr & Peers, December 8, 2014.

3. SEASONAL ADJUSTMENTS

February 2016 peak hour traffic counts were seasonally adjusted to reflect 2015 September harvest conditions. Historical traffic count data from Caltrans PeMS system as well as past studies were used to determine that September weekday volumes are about 13 percent higher than February weekday volumes, while September weekend volumes are about 18 percent higher than February weekend volumes.

Resultant 2015 harvest Friday and Saturday PM peak hour volumes are presented in **Figure 3**.

D. INTERSECTION LEVEL OF SERVICE

1. ANALYSIS METHODOLOGY

Transportation engineers and planners commonly use a grading system called level of service (LOS) to measure and describe the operational status of the local roadway network. LOS is a description of the quality of a roadway facility's operation, ranging from LOS A (indicating free-flow traffic conditions with little or no delay) to LOS F (representing oversaturated conditions where traffic flows exceed design capacity, resulting in long queues and delays). Intersections, rather than roadway segments between intersections, are almost always the capacity controlling locations for any circulation system.

Unsignalized Intersections. For unsignalized (all-way stop-controlled and side-street stop-controlled) intersections, the 2010 *Highway Capacity Manual* (Transportation Research Board, National Research Council) methodology for unsignalized intersections was utilized. For side-street stop-controlled intersections, operations are defined by the level of service and average control delay per vehicle (measured in seconds), with delay reported for the stop sign controlled approaches or turn movements, although overall delay is also typically reported for intersections along major highways. For all-way stop-controlled intersections, operations are defined by the average control delay for the entire intersection (measured in seconds per vehicle). The delay at an unsignalized intersection incorporates delay associated with deceleration, acceleration, stopping, and moving up in the queue. **Table 1** summarizes the relationship between delay and LOS for unsignalized intersections.

2. MINIMUM ACCEPTABLE OPERATION

Napa County has no published minimum level of service standards for unsignalized public road or private driveway intersections. The County General Plan (Policy CIR-16) states that the County shall seek to maintain an arterial Level of Service D or better on all County roadways except where maintaining this desired level of service would require installation of more travel lanes than shown on the Circulation Map. For this study, LOS D has been used for unsignalized intersections as the poorest acceptable operation for the entire intersection, with LOS E as the poorest acceptable operation for a side street stop sign controlled intersection approach. The reason for use of LOS E as the criteria for individual movements and LOS D as the criteria for the overall intersection is that the poorest operation at an unsignalized intersection is typically a

specific stop sign controlled movement, unless side street volumes are high, in which case both the overall intersection and stop sign controlled movement are LOS F. Stop sign controlled intersections along Silverado Trail with low volumes of side street traffic tend to have poor stop sign controlled levels of service, but good to acceptable overall operation. As side street volumes increase, overall intersection operation also tends to degrade, but will usually remain one or more levels of service better than the stop sign controlled movement. When overall operation also degrades to LOS E or F operation, it is an indication of large volumes on the stop sign controlled approach, and the potential need for intersection signalization. The combined use of both criteria allows the County to identify those stop sign controlled intersections that have unacceptable delay for side street traffic as well as a sufficient amount of side street traffic that may meet signal warrant criteria levels.

E. ROADWAY SEGMENT LEVEL OF SERVICE

1. ANALYSIS METHODOLOGY

Roadway segment operation for SR 12-121 and Cuttings Wharf Road has been evaluated based upon criteria developed for Napa County roadways as part of the County General Plan Update in 2007: Napa County General Plan Update EIR – Technical Memorandum for Traffic and Circulation Supporting the Findings and Recommendations by Dowling Associates, February 2007. Table 5 in this report, “Peak Hour Roadway Capacities,” shows the following directional capacity limit-level of service relationships for a two-lane rural highway, such as Silverado Trail, and a two-lane rural collector, such as Cuttings Wharf Road.

ROADWAY SEGMENT CAPACITIES

| | | LOS A | LOS B | LOS C | LOS D | LOS E |
|--|--------------------------------|--------------|--------------|--------------|--------------|--------------|
| 2-Lane Rural Highway – SR 12-121 | Maximum Peak Direction Volumes | 100 | 330 | 620 | 870 | 1200 |
| | Volume/Capacity Ratio | (.08) | (.28) | (.52) | (.73) | (1.00) |
| 2-Lane Collector – Cuttings Wharf Road | Maximum Peak Direction Volumes | 73 | 97 | 480 | 760 | 810 |
| | Volume/Capacity Ratio | (.09) | (.12) | (.59) | (.94) | (1.00) |

2. MINIMUM ACCEPTABLE OPERATION

Level of service D (LOS D) is the poorest acceptable roadway segment operation in Napa County.

F. PLANNED IMPROVEMENTS

There are no planned and funded circulation system capacity improvements at any location evaluated in this study.²

VI. FUTURE HORIZON TRAFFIC VOLUME PROJECTIONS (WITHOUT PROJECT)

Traffic analysis has been conducted for existing, year 2020 and year 2030 horizons at County request. The 2030 horizon reflects the County General Plan Buildout year, while 2020 reflects a near term horizon year after the proposed winery expansion should be at full production. Traffic modeling for the General Plan shows about a 10 percent growth in two-way weekday PM peak hour traffic along SR 12-121 in the project area between 2015 and 2030, with about a 17 percent growth along Cuttings Wharf Road. Projecting straight line traffic growth for analysis purposes, this translates into about a 3.3 percent growth in two-way PM peak hour traffic along SR 12-121 and about a 6 percent growth along Cuttings Wharf Road from 2015 to 2020.

Traffic modeling projections were not available for Saturday PM peak hour conditions along any analysis roadway. Therefore, volumes on both roadways were uniformly increased by the PM percentages detailed above for weekday PM peak hour conditions.

Resultant year 2020 harvest “Without Project” Friday and Saturday PM peak hour volumes are presented in **Figure 4**, while year 2030 harvest “Without Project” PM Friday and Saturday peak hour volumes are presented in **Figure 5**.

² Mr. Rick Marshall, P.E., Napa County Public Works Department, November 2015.

VII. OFF-SITE CIRCULATION SYSTEM OPERATION – WITHOUT PROJECT

1. EXISTING OPERATING CONDITIONS (WITHOUT PROJECT)

A. HARVEST

1. INTERSECTION LEVEL OF SERVICE (SR 12-121/Cuttings Wharf Road) – Table 2

a) Friday PM Peak Hour

Acceptable overall operation: LOS A

Unacceptable Cuttings Wharf Road stop sign controlled operation: LOS F

b) Saturday PM Peak Hour

Acceptable overall operation: LOS A

Unacceptable Cuttings Wharf Road stop sign controlled operation: LOS F

2. ROADWAY SEGMENT LEVEL OF SERVICE (SR 12-121 & Cuttings Wharf Road) – Table 3

a) Friday PM Peak Hour

SR 12-121: Unacceptable operation in both directions east and west of Cuttings Wharf Road: LOS F eastbound and LOS E westbound (west of Cuttings Wharf Road) and LOS F eastbound and westbound (east of Cuttings Wharf Road).

Cuttings Wharf Road: Acceptable operation in both directions: LOS C northbound and southbound.

b) Saturday PM Peak Hour

SR 12-121: Unacceptable operation in both directions east and west of Cuttings Wharf Road: LOS F eastbound and westbound.

Cuttings Wharf Road: Acceptable operation in both directions: LOS C northbound and southbound.

2. YEAR 2020 OPERATING CONDITIONS (WITHOUT PROJECT)

A. HARVEST

1. INTERSECTION LEVEL OF SERVICE (SR 12-121/Cuttings Wharf Road) – Table 4

a) Friday PM Peak Hour

Acceptable overall operation: LOS B

Unacceptable Cuttings Wharf Road stop sign controlled operation: LOS F

b) Saturday PM Peak Hour

Acceptable overall operation: LOS A

Unacceptable Cuttings Wharf Road stop sign controlled operation: LOS F

2. ROADWAY SEGMENT LEVEL OF SERVICE (SR 12-121/Cuttings Wharf Road) – Table 5

a) Friday PM Peak Hour

SR 12-121: Unacceptable operation in both directions east and west of Cuttings Wharf Road: LOS F eastbound and LOS E westbound (west of Cuttings Wharf Road) and LOS F eastbound and westbound (east of Cuttings Wharf Road).

Cuttings Wharf Road: Acceptable operation in both directions: LOS C northbound and southbound.

b) Saturday PM Peak Hour

SR 12-121: Unacceptable operation in both directions east and west of Cuttings Wharf Road: LOS F eastbound and westbound.

Cuttings Wharf Road: Acceptable operation in both directions: LOS C northbound and southbound.

3. YEAR 2030 OPERATING CONDITIONS (WITHOUT PROJECT)

A. HARVEST

1. INTERSECTION LEVEL OF SERVICE (SR 12-121/Cuttings Wharf Road) – Table 6

a) Friday PM Peak Hour

Acceptable overall operation: LOS C

Unacceptable Cuttings Wharf Road stop sign controlled operation: LOS F

b) Saturday PM Peak Hour

Acceptable overall operation: LOS A

Unacceptable Cuttings Wharf Road stop sign controlled operation: LOS F

2. ROADWAY SEGMENT LEVEL OF SERVICE (SR 12-121/Cuttings Wharf Road) – Table 7

a) Friday PM Peak Hour

SR 12-121: Unacceptable operation in both directions east and west of Cuttings Wharf Road: LOS F eastbound and westbound.

Cuttings Wharf Road: Acceptable operation in both directions: LOS C northbound and southbound.

b) Saturday PM Peak Hour

SR 12-121: Unacceptable operation in both directions east and west of Cuttings Wharf Road: LOS F eastbound and westbound.

Cuttings Wharf Road: Acceptable operation in both directions: LOS C northbound and southbound.

VIII. PROJECT IMPACT EVALUATION SIGNIFICANCE CRITERIA

A. SIGNIFICANCE CRITERIA

The following criteria have recently been developed for traffic impact analysis in Napa County.

I. EXISTING + PROJECT CONDITIONS

A. ARTERIAL SEGMENTS

A project would cause a significant impact requiring mitigation if:

1. An arterial segment operates at LOS A, B, C or D during the selected peak hours without project trips, and deteriorates to LOS E or F with the addition of project trips, or
2. An arterial segment operates at LOS E or F during the selected peak hours without project trips, and the addition of project trips increases the total segment volume by one percent or more.

For the second criteria, the following equation should be used if the arterial operates at LOS E or F without the project:

$$\text{Project Contribution \%} = \text{Project Trips} \div \text{Existing Volumes}$$

B. SIGNALIZED INTERSECTIONS

A project would cause a significant impact requiring mitigation if:

1. A signalized intersection operates at LOS A, B, C or D during the selected peak hours without project trips, and deteriorates to LOS E or F with the addition of project trips, or
2. A signalized intersection operates at LOS E or F during the selected peak hours without project trips, and the addition of project trips increases the total entering volume by one percent or more.

For the second criteria, the following equation should be used if the signalized intersection operates at LOS E or F without the project:

$$\text{Project Contribution \%} = \text{Project Trips} \div \text{Existing Volumes}$$

Maintaining LOS D or better at all signalized intersections would sometimes require expanding the physical footprint of an intersection. In some locations around the County, expanding physical transportation infrastructure could be in direct conflict with the

County's goals of preserving the area's rural character, improving safety, and sustaining the agricultural industry, making these potential improvements infeasible. The County's Circulation Element lists intersections that are slated for improvement or expansion in unincorporated Napa County.³

Transportation studies should individually consider the feasibility of potential mitigation measures with respect to right-of-way acquisition, regardless of the intersection's place in the Circulation Element's identified improvement lists, and present potential alternative mitigation measures that do not require right-of-way acquisition. County staff would then review that information and make the decision about the feasibility of the identified potential mitigations.

For intersections that cannot be improved without substantial additional right-of-way according to both the Circulation Element and the individual transportation impact study, and where other mitigations such as updating signal timing, signal phasing and operations, and/or signing and striping improvements do not improve the LOS, LOS E or F will be considered acceptable and the one percent threshold would not apply. Analysis of signalized intersection LOS should still be presented for informational purposes, and there should still be an evaluation of effects on safety and local access, per Policy CIR-18.

C. UNSIGNALIZED INTERSECTIONS (ALL WAY STOP AND SIDE STREET STOP SIGN CONTROLLED)

LOS for all way stop controlled intersections is defined as an average of the delay at all approaches. LOS for side street stop controlled intersections is defined by the delay and LOS for the worst case approach. The recommended interpretation of Policy CIR-16 regarding unsignalized intersection significance criteria is as follows:

1. An unsignalized intersection operates at LOS A, B, C or D during the selected peak hours without project trips, the LOS deteriorates to LOS E or F with the addition of project traffic, and the peak hour traffic signal warrant criteria should also be evaluated and presented for informational purposes, or
2. An unsignalized intersection operates at LOS E or F during the selected peak hours without project trips and the project contributes one percent or more of the total entering traffic for all way stop controlled intersections, or 10 percent or more of the traffic on a side street approach for side street stop controlled intersections; the peak hour traffic signal warrant criteria should also be evaluated and presented for informational purposes.

All Way Stop Controlled Intersections

³ According to the Circulation Element dated June 8, 2008, the following intersections can be altered or expanded as a mitigation measure: SR-12/Airport Boulevard/SR-29, SR-221/SR-12/Highway 29, and several intersections along SR-29 and SR-128 north of Napa. The significance criteria shown above should apply to facilities where appropriate based upon the most recent Circulation Element chapter of the General Plan.

For the second criteria at an all way stop controlled intersection, the following equation should be used if the all way stop controlled intersection operates at LOS E or F without the project.

$$\text{Project Contribution \%} = \text{Project Trips} \div \text{Existing Volumes}$$

Side Street Stop Controlled Intersections

For the second criteria at a side street stop controlled intersection, the following equation should be used if the side street stop controlled intersection operates at LOS E or F without the project.

$$\text{Project Contribution \%} = \text{Project Trips} \div \text{Existing Volumes}$$

Both of those volumes are for the stop controlled approaches only. Each stop controlled approach that operates at LOS E or F should be analyzed individually.

D. OTHER CRITERIA

- If projected daily volumes on the project driveway in combination with volumes on the roadway providing access to the project driveway meet County warrant criteria for provision of a left turn lane on the approach to the project entrance.
- If sight lines at project access driveways do not meet Caltrans stopping sight distance criteria based upon prevailing vehicle speeds.

II. CUMULATIVE CONDITIONS

A. ARTERIAL SEGMENTS, SIGNALIZED INTERSECTIONS AND UNSIGNALIZED INTERSECTIONS

A project would cause a significant cumulative impact requiring mitigation if:

1. The overall amount of expected traffic growth causes conditions to deteriorate such that any of the significance criteria described above for existing conditions are met, and
2. The project's contribution to a significant cumulative impact would be equal to or greater than five percent of the growth in traffic from existing conditions.

A project's contribution to a cumulative condition would be calculated as the project's percentage contribution to the total growth in traffic from existing conditions.

$$\text{Project Contribution \%} = \text{Project Trips} \div (\text{Cumulative Volumes} - \text{Existing Volumes})$$

IX. PROJECT TRIP GENERATION & DISTRIBUTION

A. TRIP GENERATION

Friday AM and PM peak hour and Saturday afternoon peak hour harvest trip generation projections were developed with the assistance of the project applicant for all components of the proposed Etude Winery expansion (see worksheets in the **Appendix**). Results are presented on an hourly basis in **Tables 8** and **9** for harvest Friday and Saturday PM peak hour conditions, respectively. A summary of peak hour trips associated with the winery is then presented in **Table 10**. During the harvest Friday PM peak traffic hour there would be a projected 9 new inbound and 9 new outbound vehicles. During the harvest Saturday PM peak traffic hour, there would also be a projected 9 new inbound and 9 new outbound vehicles. All traffic during these peak hours would be associated with visitation by appointment only assuming the maximum 150 new visitors per day (resulting in 54 to 58 new vehicles accessing the Winery between 10:00 AM and 4:30 PM for tours and tasting). The five expected new grape deliveries per day for 40 days during harvest would be scheduled any time between 7:00 AM and 2:00 PM and would not impact PM peak traffic flows on the local roadway system.

B. TRIP DISTRIBUTION

Project traffic was distributed to SR 12-121 in a pattern reflective of existing vehicle distribution patterns. This indicates virtually all project traffic would travel between the Winery entrance and the state highway and then to/from the east on SR 12-121.

The harvest Friday and Saturday project traffic increments expected on Cuttings Wharf Road and SR 12-121 during times of ambient PM peak traffic flows through the SR 12-121/Cuttings Wharf Road intersection are presented in **Figure 6**. Resultant Friday and Saturday “With Project” PM peak hour volumes for harvest 2015, 2020 and 2030 conditions are presented in **Figure 7, 8** and **9**, respectively.

C. PLANNED ROADWAY IMPROVEMENTS

There are no capacity increasing roadway improvements planned by the County on the local roadway network serving the project site.⁴

⁴ Rick Marshall, Napa County Public Works Department, November 2015.

X. PROJECT IMPACTS

A. EXISTING WITH PROJECT CONDITIONS

1. HARVEST

a) Summary

Project traffic would not result in any significant level of service impacts at the SR 12-121/Cuttings Wharf Road intersection or any significant level of service impacts along any analyzed SR 12-121 or Cuttings Wharf Road roadway segments during any Friday or Saturday PM peak traffic hour. *Less than Significant.*

b) Intersection Level of Service (SR 12-121/Cuttings Wharf Road) – Table 2

Friday and Saturday PM peak hour operation would remain unacceptable at the SR 12-121/Cuttings Wharf Road intersection. However, project traffic would only be 5.2 percent of the traffic on the Cuttings Wharf Road stop sign controlled approach to SR 29 during the Friday PM peak hour, and 6.0 percent during the Saturday PM peak hour, which would be less than the minimum 10 percent traffic added significance criteria limit. *Less than Significant.*

c) Roadway Segments (SR 12-121 & Cuttings Wharf Road) – Table 3

During both the Friday and Saturday PM peak hours when “Without Project” operation along SR 12-121 would be an unacceptable LOS E or F in both directions, project traffic would only increase segment volumes by .09 to .15 percent to the west of Cuttings Wharf Road, and by 0.46 to 0.56 percent to the east of Cuttings Wharf Road, which would combine to be less than the minimum 1 percent traffic added significance criteria limit for two-way flow on an arterial roadway segment. *Less than Significant.*

B. YEAR 2020 WITH PROJECT CONDITIONS

1. HARVEST

a) Summary

Project traffic would not result in any significant level of service impacts at the SR 12-121/Cuttings Wharf Road intersection or any significant level of service impacts along any analyzed SR 12-121 or Cuttings Wharf Road roadway segments during any Friday or Saturday PM peak traffic hour. *Less than Significant.*

**b) Intersection Level of Service (SR 12-121/Cuttings Wharf Road)
– Table 4**

Friday and Saturday PM peak hour operation would remain unacceptable at the SR 12-121/Cuttings Wharf Road intersection. However, project traffic would only be 5.1 percent of the traffic on the Cuttings Wharf Road stop sign controlled approach to SR 29 during the Friday PM peak hour, and 5.7 percent during the Saturday PM peak hour, which would be less than the minimum 10 percent traffic added significance criteria limit. *Less than Significant.*

**c) Roadway Segments (SR 12-121 & Cuttings Wharf Road) –
Table 5**

During both the Friday and Saturday PM peak hours when “Without Project” operation along SR 12-121 would be an unacceptable LOS E or F in both directions, project traffic would only increase segment volumes by .09 to .15 percent to the west of Cuttings Wharf Road, and by .44 to .54 percent to the east of Cuttings Wharf Road, which would combine to be less than the minimum 1 percent traffic added significance criteria limit for two-way flow on an arterial roadway segment. *Less than Significant.*

C. YEAR 2030 WITH PROJECT CONDITIONS

1. HARVEST

a) Summary

Project traffic would not result in any significant level of service impacts at the SR 12-121/Cuttings Wharf Road intersection or any significant level of service impacts along any analyzed SR 12-121 or Cuttings Wharf Road roadway segments during any Friday or Saturday PM peak traffic hour. *Less than Significant.*

**b) Intersection Level of Service (SR 12-121/Cuttings Wharf Road)
– Table 6**

Friday and Saturday PM peak hour operation would remain unacceptable at the SR 12-121/Cuttings Wharf Road intersection. However, project traffic would only be 4.7 percent of the traffic on the Cuttings Wharf Road stop sign controlled approach to SR 29 during the Friday PM peak hour, and by 5.1 percent during the Saturday PM peak hour, which would be less than the minimum 10 percent traffic added significance criteria limit. *Less than Significant.*

**c) Roadway Segments (SR 12-121 & Cuttings Wharf Road) –
Table 7**

During both the Friday and Saturday PM peak hours when “Without Project” operation along SR 12-121 would be an unacceptable LOS E or F in both directions, project traffic would only increase segment volumes by .08 to .14 percent to the west of Cuttings Wharf Road, and by .44 to .53 percent to the east of Cuttings Wharf Road, which would combine to be less than the

minimum 1 percent traffic added significance criteria limit for two-way flow on an arterial roadway segment. *Less than Significant.*

XI. LEFT TURN LANE AT PROJECT ENTRANCE

The project will be providing a left turn lane on the southbound Cuttings Wharf Road approach to the Winery driveway. Please see **Appendix Figures A-2, A-3 and A-4** for design drawings. The design will be to County criteria. *Less than Significant.*

XII. SIGHT LINE ADEQUACY AT PROJECT DRIVEWAY

Project Driveway Connection to Cuttings Wharf Road

Cuttings Wharf Road is level and straight at the project entrance. It has no posted speed limit between SR 12-121 and the Etude Winery driveway. Observed speeds on Cuttings Wharf Road at the project entrance ranged from 40 to occasionally more than 55 miles per hour (mph).

Sight lines for drivers turning from the project driveway to see Cuttings Wharf Road traffic are about 700 feet to the north and about 250 feet to the south. Sight lines are limited to the south by the trunks of large eucalyptus trees growing along the winery frontage just south of the winery driveway. Corner sight line criteria at a private driveway connection to a public road are based upon minimum stopping sight distance. Shown below are Caltrans minimum stopping sight distance criteria from the Highway Design Manual.⁵

| SPEED (MPH) | MINIMUM STOPPING SIGHT DISTANCE |
|--------------------|--|
| 50 | 430 |
| 55 | 500 |
| 60 | 580 |

Based upon available sight lines and observed vehicle speeds along Cuttings Wharf Road at the project entrance, existing sight lines to the south are currently not acceptable at the Winery driveway intersection. However, acceptable sight lines of at least 500 feet to the north and south along Cuttings Wharf Road at the project driveway connection will be provided as part of the widening project to construct a left turn lane on the southbound Cuttings Wharf Road approach to the project driveway. Select tree removal along the project's Cuttings Wharf Road frontage just north and south of the driveway will also be required in order to provide the acceptable sight lines. Planned sight lines are presented in **Appendix Figures A-2, A-3 and A-4**. *Less than Significant.*

⁵ Caltrans *Highway Design Manual*, 2014.

XIII. MARKETING EVENTS

Table 11 presents details of the number of guests, employees and hired event staffing that would likely be present for the project's four newly proposed marketing events.

Each new marketing event would be held with up to 40 guests (resulting in about 15 to 16 vehicle trips to/from the winery). Hired event staffing for each of these events would result in an additional 5 vehicles accessing the winery. All events could occur on any day of the week and would start after 5:00 PM.

There will be no regular visitation allowed during any marketing events. *Less than Significant.*

XIV. MITIGATION MEASURES

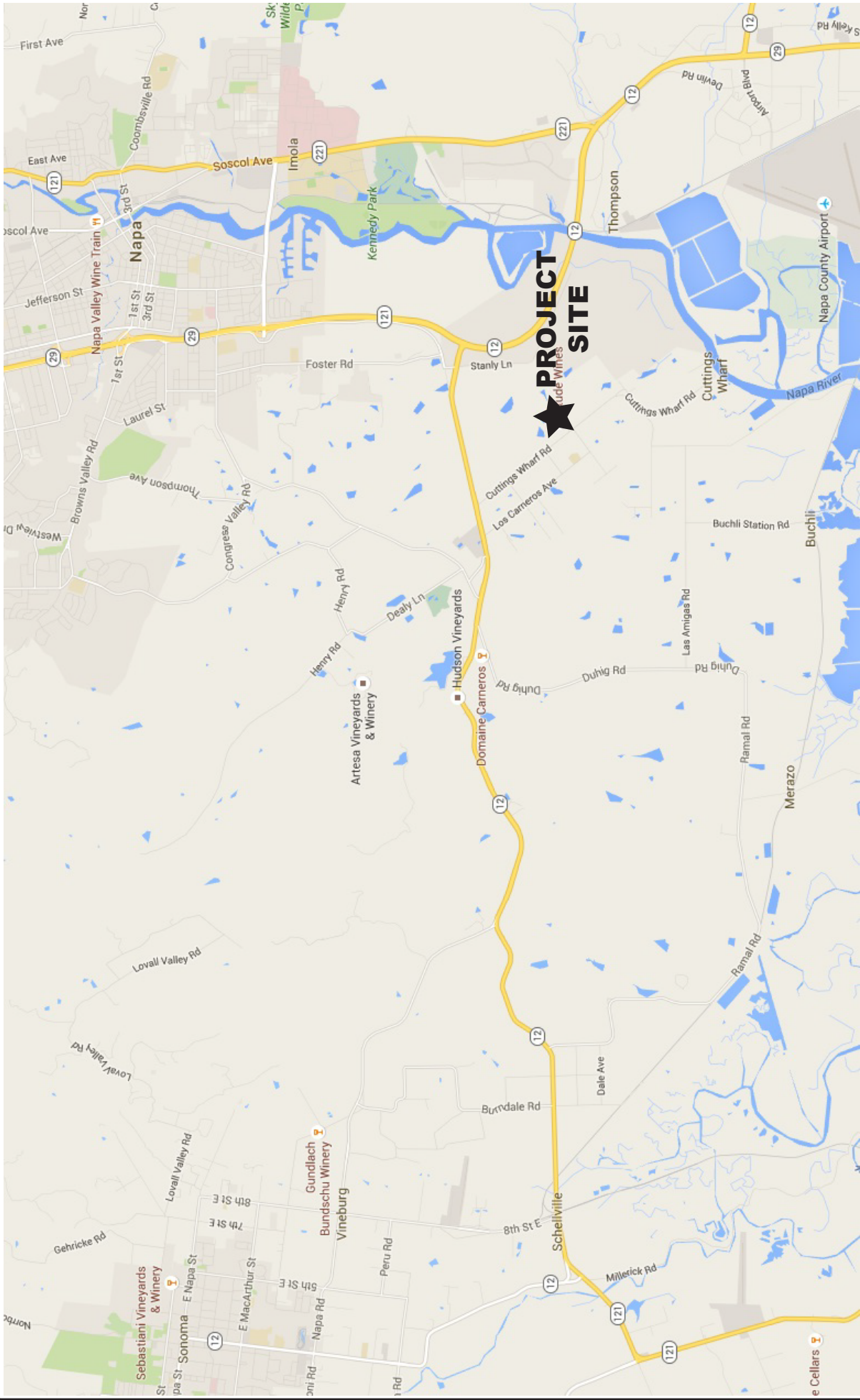
No traffic-related mitigations are required.

XV. CONCLUSIONS & RECOMMENDATIONS

The project will result in no significant off-site circulation system operational impacts to either SR 12-121 or Cuttings Wharf Road or to the SR 12-121/Cuttings Wharf Road intersection. In addition, a left turn lane will be provided on the southbound Cuttings Wharf Road approach to the project driveway. There will be acceptable sight lines at the project driveway connection to Cuttings Wharf Road with left turn lane roadway widening and select tree removal along the project's Cuttings Wharf Road frontage near the driveway. No traffic mitigations will be required.

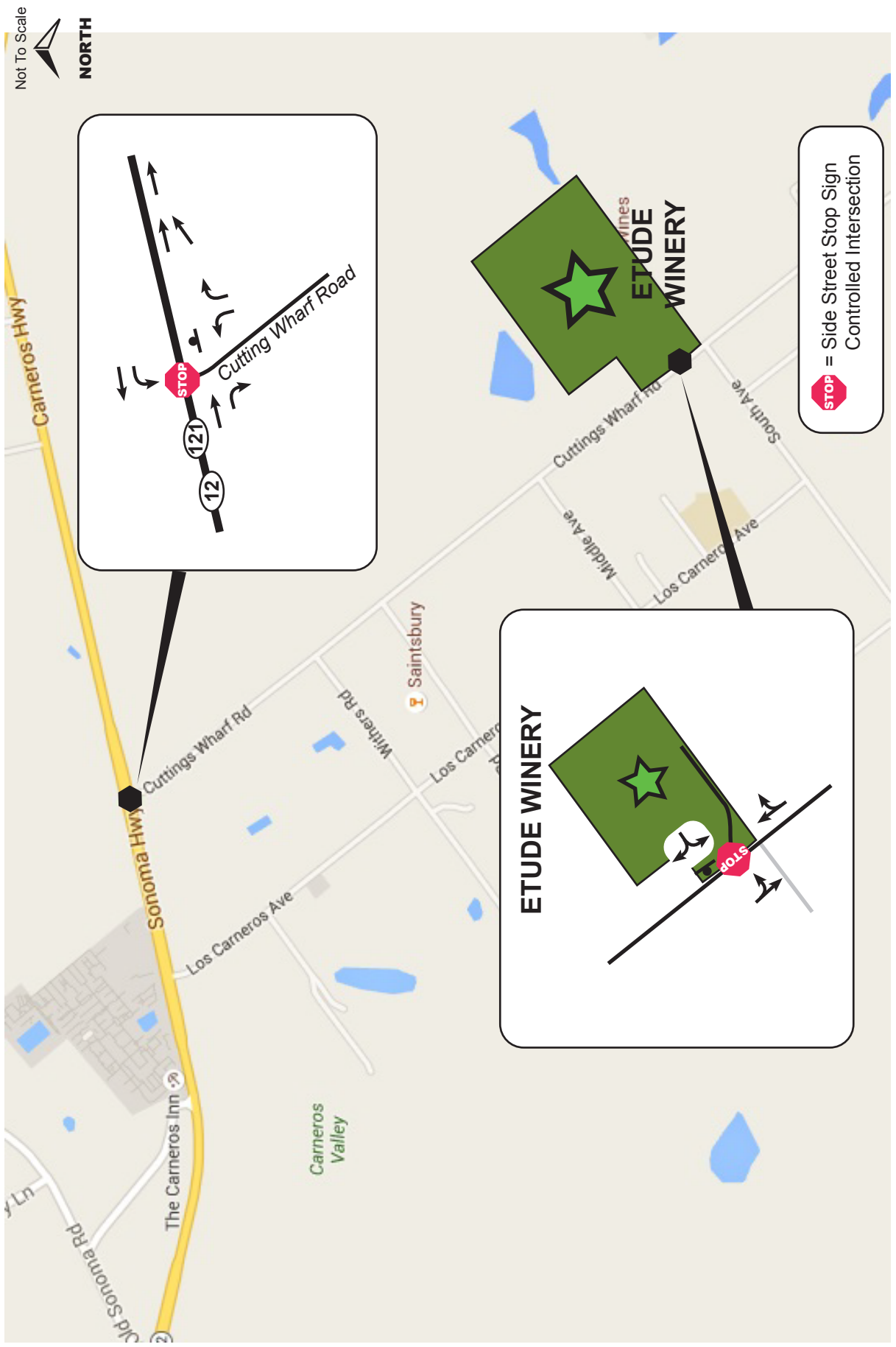
This Report is intended for presentation and use in its entirety, together with all of its supporting exhibits, schedules, and appendices. Crane Transportation Group will have no liability for any use of the Report other than in its entirety, such as providing an excerpt to a third party or quoting a portion of the Report. If you provide a portion of the Report to a third party, you agree to hold CTG harmless against any liability to such third parties based upon their use of or reliance upon a less than complete version of the Report.

Figures



Map data ©2015 Google

Figure 1
Area Map



Etude Winery Major Modification Traffic Study

Map data ©2015 Google

Figure 2
Local Map with
Lane Geometrics and Intersection Control

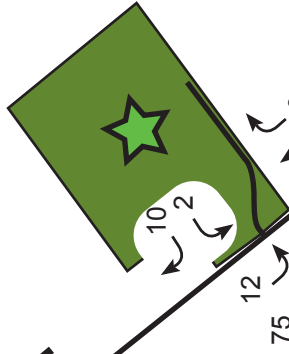
Not To Scale



NORTH

Saturday PM Peak Hour (3:30-4:30)

ETUDE WINERY



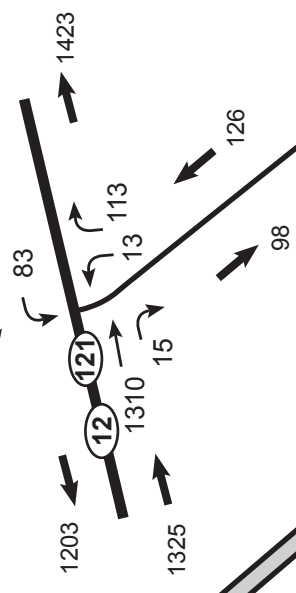
Cuttings Wharf Road

120

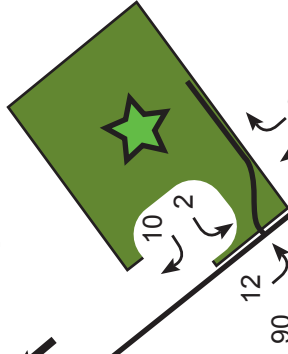
87

110

77



ETUDE WINERY



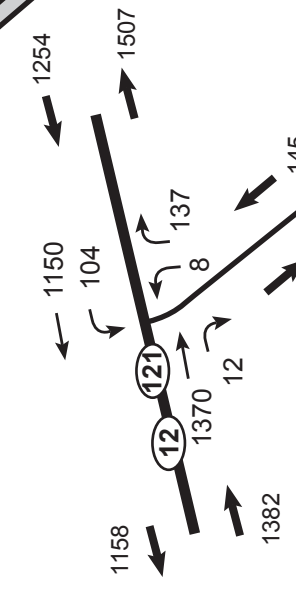
Cuttings Wharf Road

115

102

105

92



xx - Harvest Estimate

Friday PM Peak Hour (3:00-4:00)

Etude Winery Major Modification Traffic Study

Figure 3

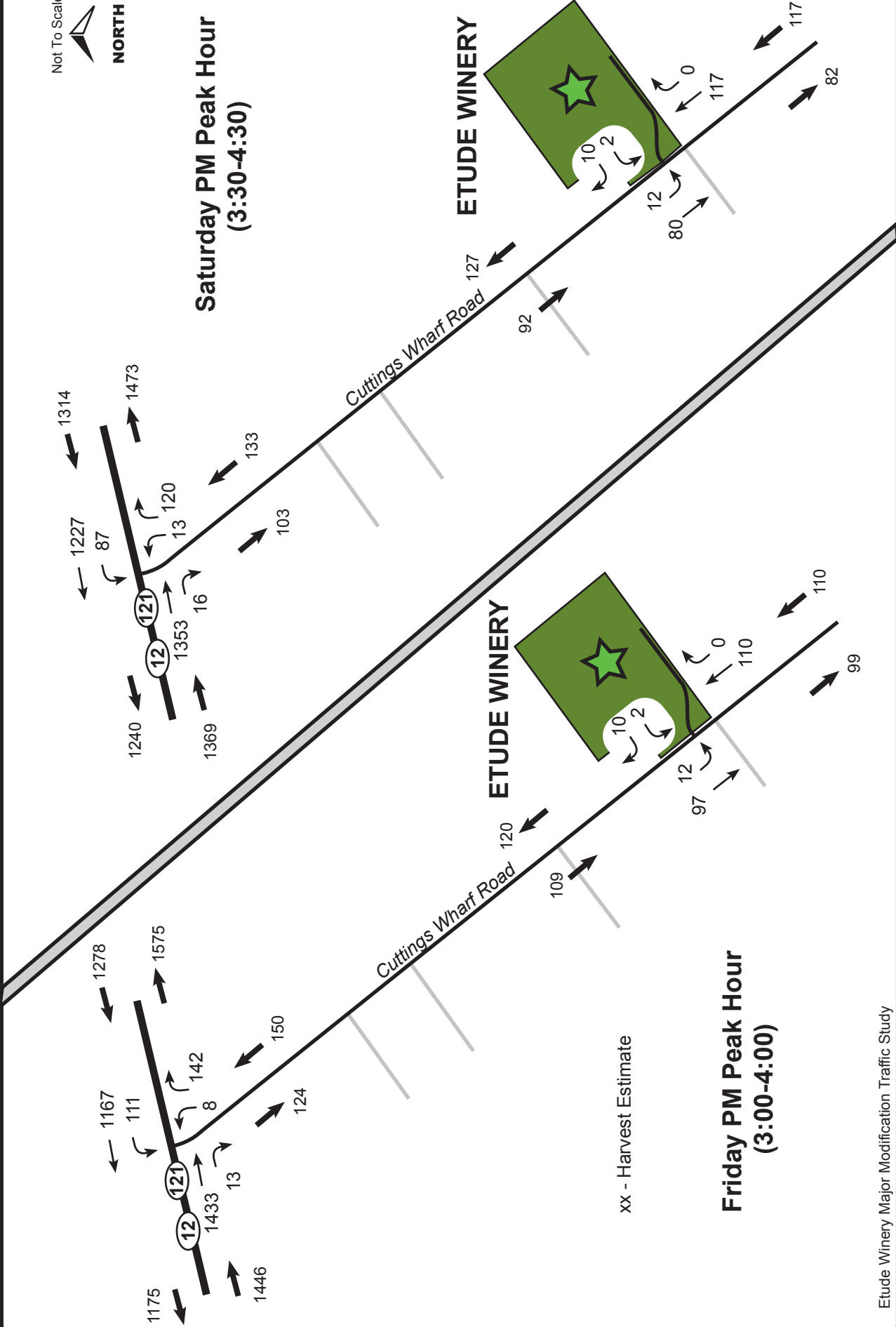
**Existing (2015) Harvest Friday
and Saturday PM Peak Hour Traffic Volumes
without Project**

Not To Scale



Saturday PM Peak Hour (3:30-4:30)

ETUDE WINERY



Friday PM Peak Hour (3:00-4:00)

ETUDE WINERY

Etude Winery Major Modification Traffic Study

Figure 4

Year 2020 Harvest Friday
and Saturday PM Peak Hour Traffic Volumes
without Project

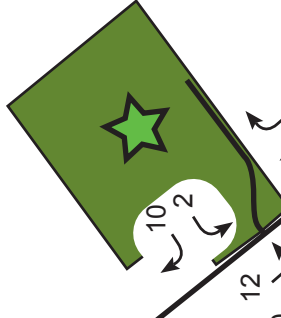
Not To Scale



NORTH

Saturday PM Peak Hour (3:30-4:30)

ETUDE WINERY



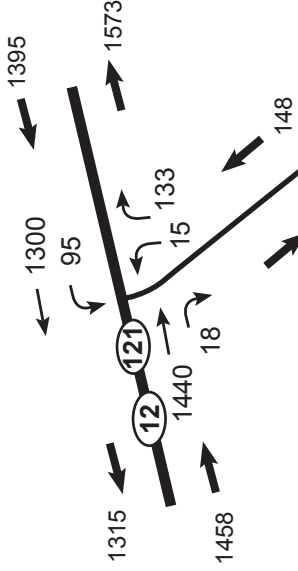
Cuttings Wharf Road

140

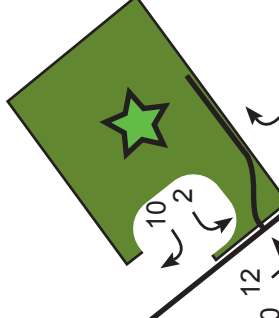
102

130

92



ETUDE WINERY



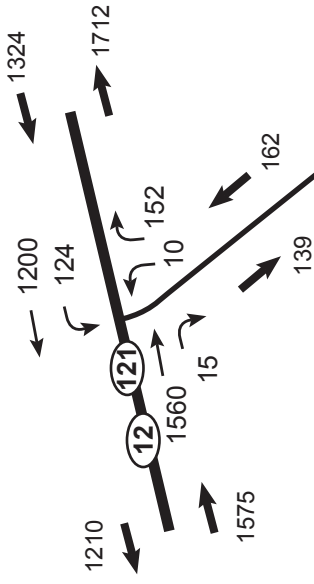
Cuttings Wharf Road

130

122

120

112



xx - Harvest Estimate

Friday PM Peak Hour (3:00-4:00)

Etude Winery Major Modification Traffic Study

Figure 5

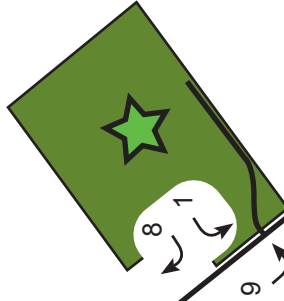
**Year 2030 Harvest Friday
and Saturday PM Peak Hour Traffic Volumes
without Project**

Not To Scale

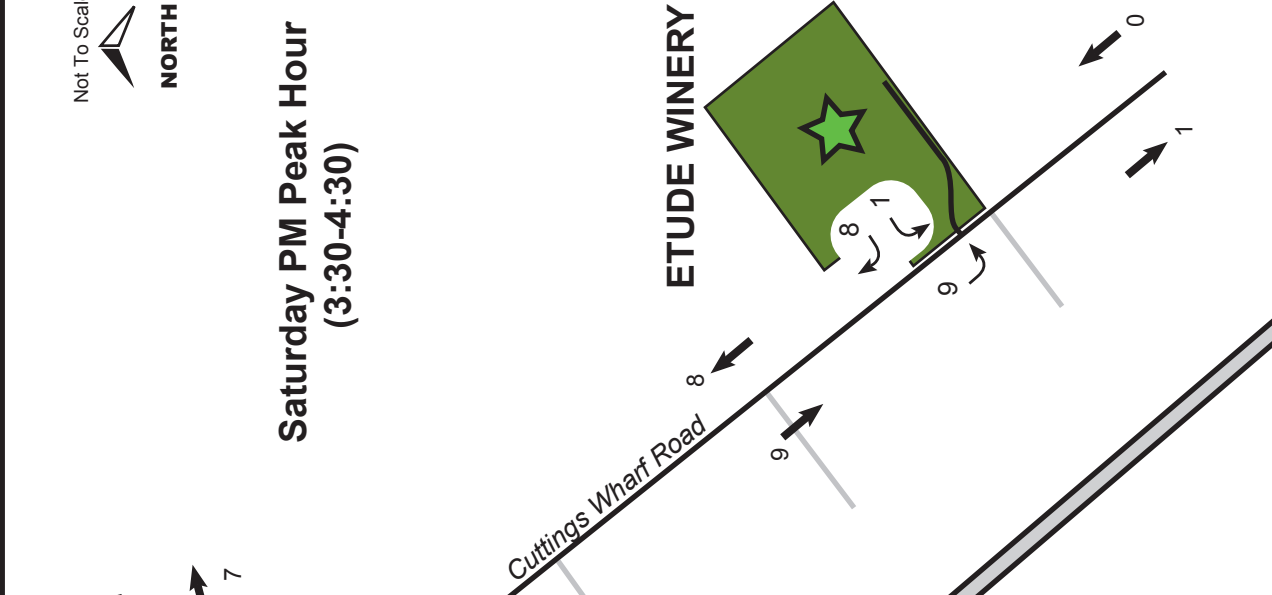


Saturday PM Peak Hour (3:30-4:30)

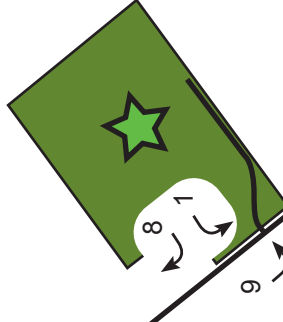
ETUDE WINERY



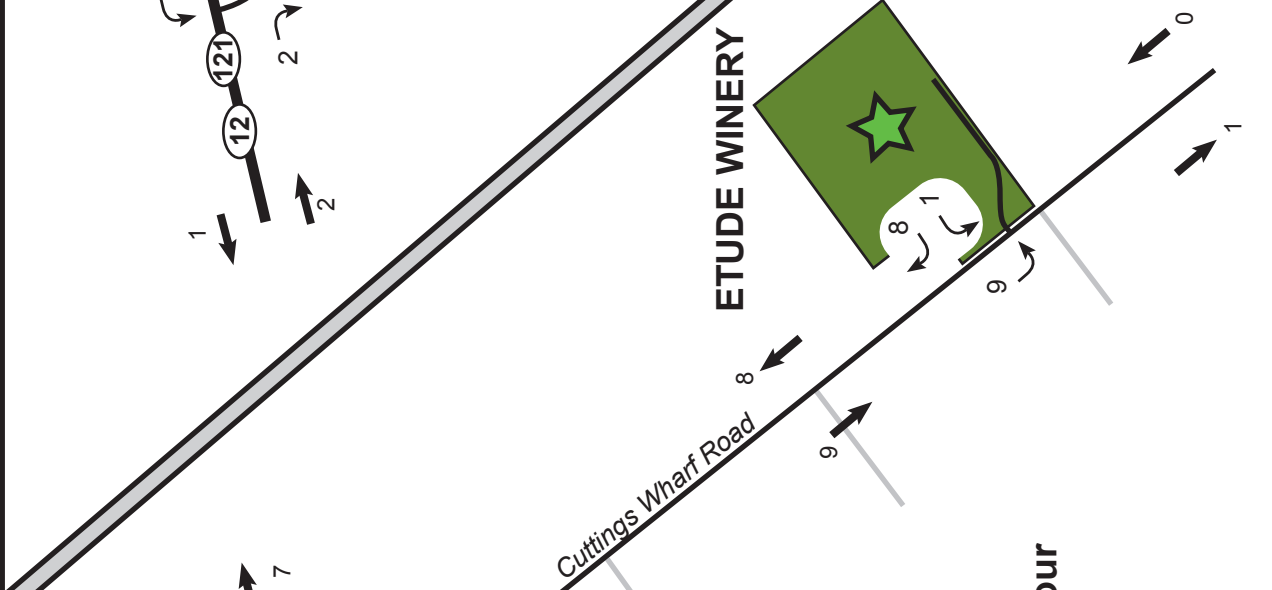
Cuttings Wharf Road



ETUDE WINERY



Cuttings Wharf Road



Friday PM Peak Hour (3:00-4:00)

Etude Winery Major Modification Traffic Study

Figure 6

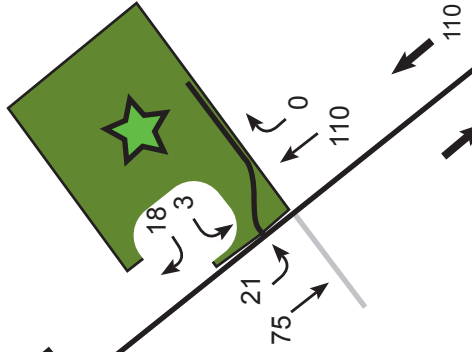
Existing (2015), 2020 and 2030
Harvest Friday and Saturday PM Peak Hour
Project Increment Volumes

Not To Scale

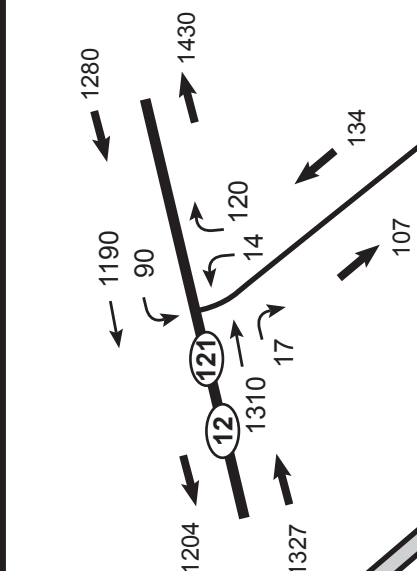


Saturday PM Peak Hour (3:30-4:30)

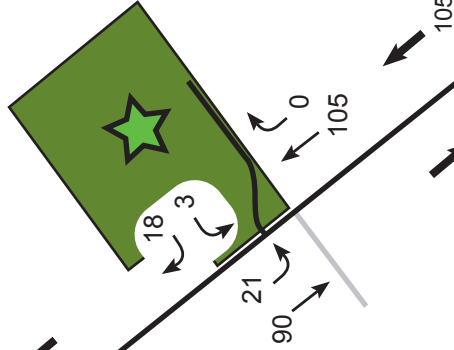
ETUDE WINERY



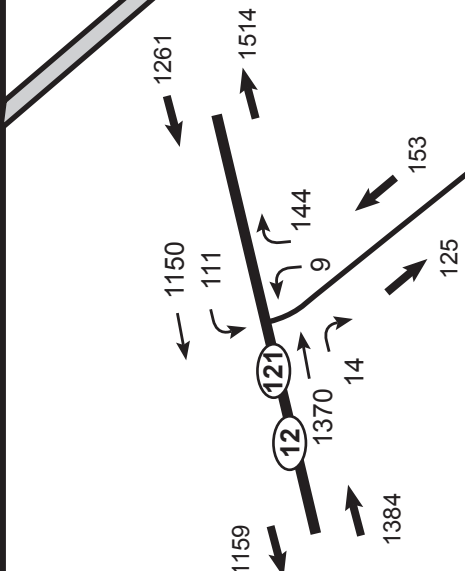
Cuttings Wharf Road



ETUDE WINERY



Cuttings Wharf Road



xx - Harvest Estimate

Friday PM Peak Hour (3:00-4:00)

Etude Winery Major Modification Traffic Study

Figure 7

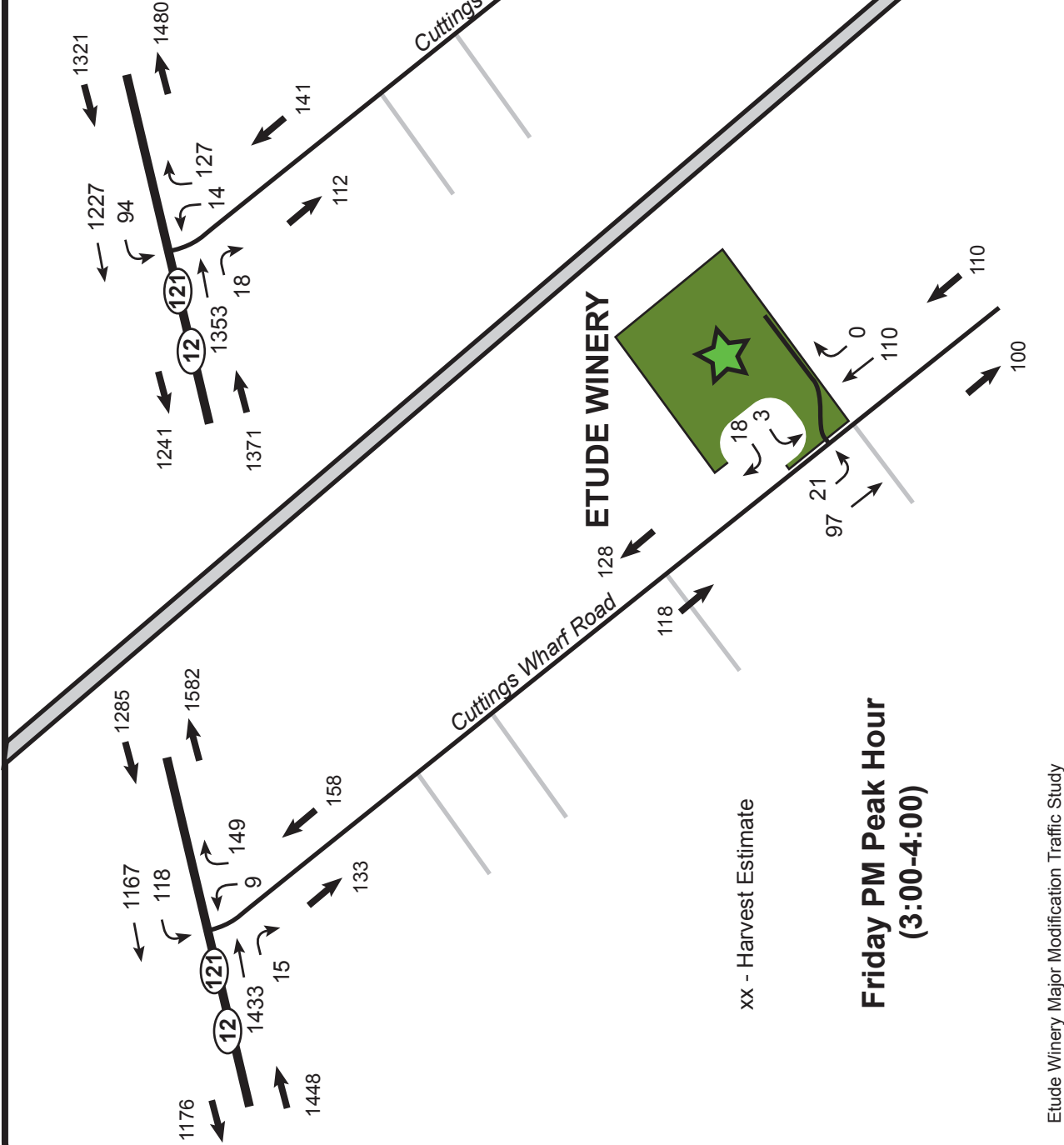
Existing (2015) Harvest Friday
and Saturday PM Peak Hour Traffic Volumes
with Project

Not To Scale



Saturday PM Peak Hour (3:30-4:30)

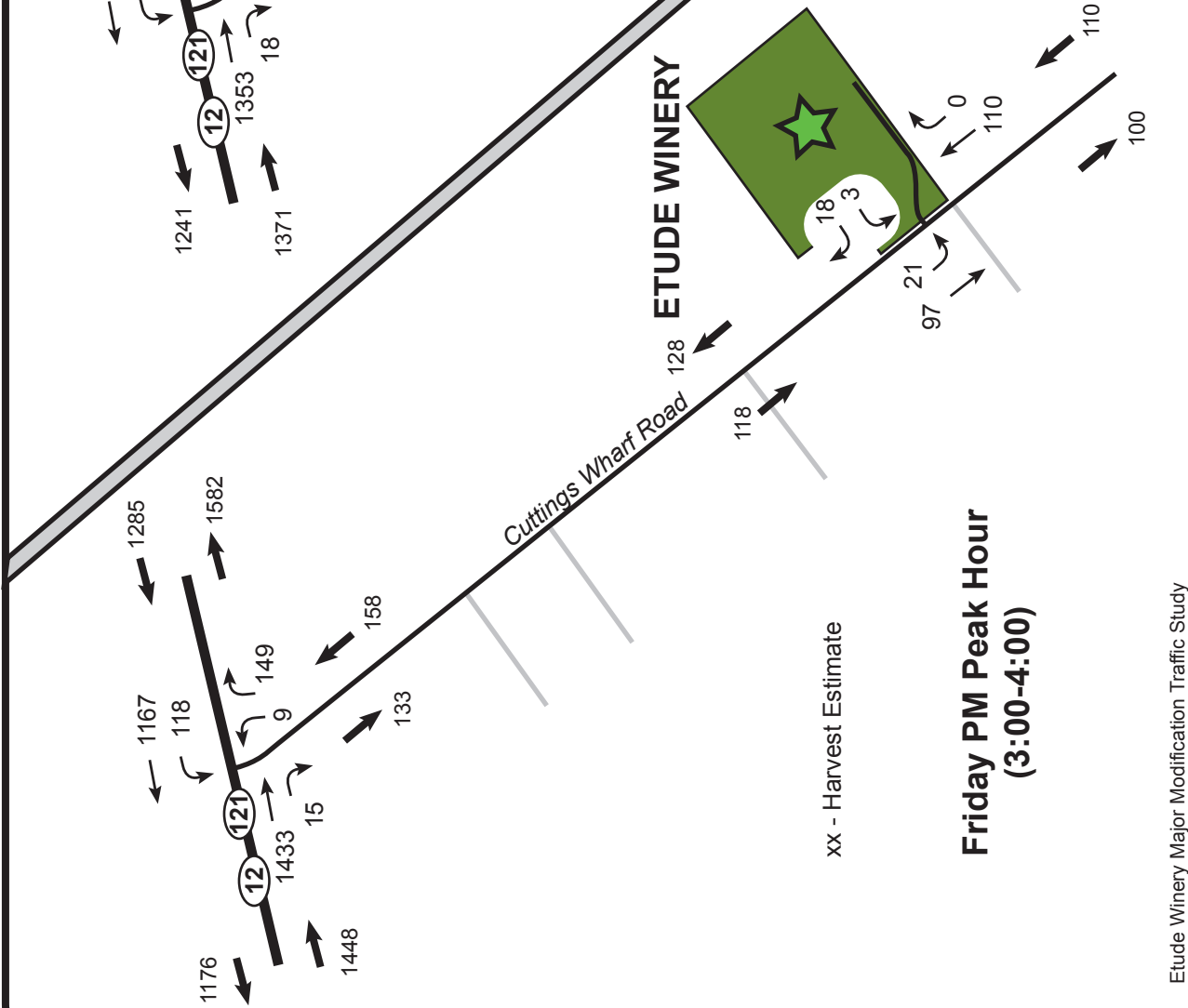
ETUDE WINERY



Friday PM Peak Hour (3:00-4:00)

ETUDE WINERY

xx - Harvest Estimate



Etude Winery Major Modification Traffic Study

Figure 8

Year 2020 Harvest Friday
and Saturday PM Peak Hour Traffic Volumes
with Project

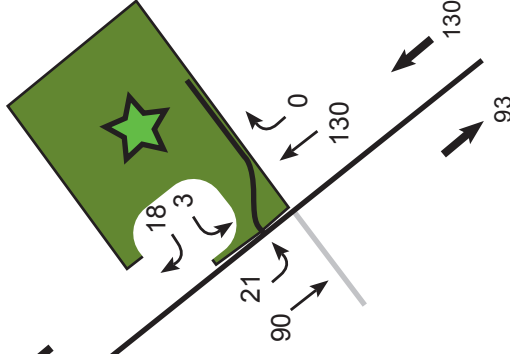
Not To Scale



NORTH

Saturday PM Peak Hour (3:30-4:30)

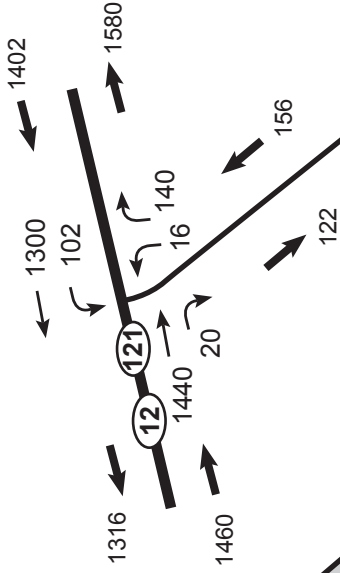
ETUDE WINERY



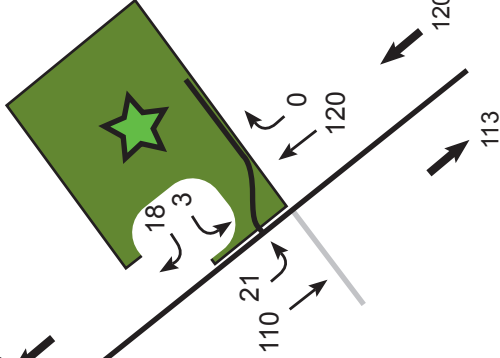
Cuttings Wharf Road

148

111



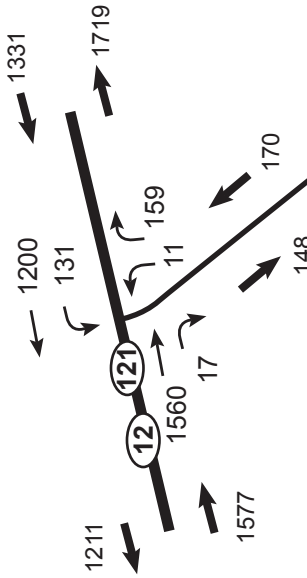
ETUDE WINERY



Cuttings Wharf Road

138

131



xx - Harvest Estimate

Friday PM Peak Hour (3:00-4:00)

Etude Winery Major Modification Traffic Study

Figure 9

**Year 2030 Harvest Friday
and Saturday PM Peak Hour Traffic Volumes
with Project**

Tables

Table 1

UNSIGNALIZED INTERSECTION LOS CRITERIA

| Level of Service | Description | Average Control Delay (Seconds Per Vehicle) |
|-------------------------|---|--|
| A | Little or no delays | ≤ 10.0 |
| B | Short traffic delays | 10.0 to 15.0 |
| C | Average traffic delays | 15.0 to 25.0 |
| D | Long traffic delays | 25.0 to 35.0 |
| E | Very long traffic delays | 35.0 to 50.0 |
| F | Extreme traffic delays with intersection capacity exceeded (for an all-way stop), or with approach/turn movement capacity exceeded (for a side street stop controlled intersection) | > 50.0 |

Source: 2010 Highway Capacity Manual (Transportation Research Board).

Table 2

INTERSECTION LEVEL OF SERVICE

EXISTING – 2015

HARVEST

| LOCATION | FRIDAY PM PEAK HOUR | | SATURDAY PM PEAK HOUR | |
|---|--|------------------------------|--------------------------|------------------------------|
| | W/O PROJECT | WITH PROJECT | W/O PROJECT | WITH PROJECT |
| SR 12-121/Cuttings Wharf Rd. (Unsignalized – Cuttings Wharf Rd. stop sign controlled) | F-146.4 ⁽¹⁾ [A-8.2] ⁽²⁾ | F-162.7 [A-9.5] <.61%> | F-96.0 [A-4.9] | F-102.7 [A-5.5] <.62%> |

(1) Unsignalized level of service – control delay in seconds: Cuttings Wharf Road stop sign controlled approach.

(2) [Overall intersection level of service – average delay in seconds.]

<xx> – Percent project traffic added to intersection. Less than a 1% increase is not considered a significant impact.

Theoretical control delay results above 120 seconds with LOS F operation are presented for “with” versus “without” project comparison purposes only. Doubtful if some drivers would wait this long to make a left turn.

Year 2010 Highway Capacity Manual (HCM) Analysis Methodology for unsignalized intersections

Source: Crane Transportation Group

Table 3

ROADWAY SEGMENT LEVEL OF SERVICE

EXISTING – 2015

HARVEST

| LOCATION | DIRECTION | DIRECTIONAL CAPACITY (VEH/HR) | FRIDAY PM PEAK HOUR | | | | SATURDAY PM PEAK HOUR | | | |
|---------------------------------------|-----------|-------------------------------|---------------------|--------------------|--------------|----------------------------|-----------------------|-----|--------------|-------------|
| | | | W/O PROJECT | | WITH PROJECT | | W/O PROJECT | | WITH PROJECT | |
| | | | VOL ⁽¹⁾ | LOS ⁽²⁾ | VOL | LOS | VO L | LOS | VOL | LOS |
| SR 12-121 West of Cuttings Wharf Rd. | EB | 1200 | 1382 | F | 1384 | F [.14%] ⁽³⁾ | 1325 | F | 1327 | F [.15%] |
| | WB | 1200 | 1158 | B | 1159 | E [.09%] ⁽³⁾ | 1203 | F | 1204 | F [.08%] |
| SR 12-121 East of Cuttings Wharf Rd. | EB | 1200 | 1507 | F | 1514 | F [.46%] ⁽³⁾ | 1423 | F | 1430 | F [.49%] |
| | WB | 1200 | 1254 | F | 1261 | F [.56%] ⁽³⁾ | 1273 | F | 1280 | F [.55%] |
| Cuttings Wharf Rd. South of SR 12-121 | NB | 810 | 145 | C | 153 | C | 126 | C | 134 | C |
| | SB | 810 | 116 | C | 125 | C | 98 | C | 107 | C |

⁽¹⁾ Vol = volume

⁽²⁾ LOS = level of service.

⁽³⁾ [] = % project traffic added to road segment at locations with unacceptable “Without Project” operation. Less than a 1% increase is not considered a significant impact.

Analysis Methodology Source: Napa County General Plan Update EIR Technical Memorandum for Traffic and Circulation Supporting the Findings and recommendations, Dowling Associates, February 9, 2007.

Compiled by: Crane Transportation Group

Table 4

INTERSECTION LEVEL OF SERVICE

YEAR 2020

HARVEST

| LOCATION | FRIDAY PM PEAK HOUR | | SATURDAY PM PEAK HOUR | |
|---|---|-------------------------------|--------------------------|------------------------------|
| | W/O PROJECT | WITH PROJECT | W/O PROJECT | WITH PROJECT |
| SR 12-121/Cuttings Wharf Rd. (Unsignalized – Cuttings Wharf Rd. stop sign controlled) | F-181.5 ⁽¹⁾ [B-10.1] ⁽²⁾ | F-206.2 [B-11.9] <.59%> | F-113.3 [A-5.8] | F-127.8 [A-6.8] <.60%> |

(1) Unsignalized level of service – control delay in seconds: Cuttings Wharf Road stop sign controlled approach.

(2) [Overall intersection level of service – average delay in seconds.]

<xx> – Percent project traffic added to intersection. Less than a 1% increase is not considered a significant impact.

Theoretical control delay results above 120 seconds with LOS F operation are presented for “with” versus “without” project comparison purposes only. Doubtful if some drivers would wait this long to make a left turn.

Year 2010 Highway Capacity Manual (HCM) Analysis Methodology for unsignalized intersections

Source: Crane Transportation Group

Table 5
ROADWAY SEGMENT LEVEL OF SERVICE
YEAR 2020
HARVEST

| LOCATION | DIRECTION | DIRECTIONAL CAPACITY (VEH/HR) | FRIDAY PM PEAK HOUR | | | | SATURDAY PM PEAK HOUR | | | |
|---------------------------------------|-----------|-------------------------------|---------------------|--------------------|--------------|----------------------------|-----------------------|-----|--------------|-------------|
| | | | W/O PROJECT | | WITH PROJECT | | W/O PROJECT | | WITH PROJECT | |
| | | | VOL ⁽¹⁾ | LOS ⁽²⁾ | VOL | LOS | VO L | LOS | VOL | LOS |
| SR 12-121 West of Cuttings Wharf Rd. | EB | 1200 | 1446 | F | 1448 | F [.14%] ⁽³⁾ | 1369 | F | 1371 | F [.15%] |
| | WB | 1200 | 1175 | E | 1176 | E [.09%] ⁽³⁾ | 1240 | F | 1241 | F [.08%] |
| SR 12-121 East of Cuttings Wharf Rd. | EB | 1200 | 1575 | F | 1582 | F [.44%] ⁽³⁾ | 1473 | F | 1480 | F [.47%] |
| | WB | 1200 | 1278 | F | 1285 | F [.54%] ⁽³⁾ | 1314 | F | 1321 | F [.53%] |
| Cuttings Wharf Rd. South of SR 12-121 | NB | 810 | 150 | C | 158 | C | 133 | C | 141 | C |
| | SB | 810 | 124 | C | 133 | C | 103 | C | 112 | C |

⁽¹⁾ Vol = volume

⁽²⁾ LOS = level of service.

⁽³⁾ [] = % project traffic added to road segment at locations with unacceptable “Without Project” operation. Less than a 1% increase is not considered a significant impact.

Analysis Methodology Source: Napa County General Plan Update EIR Technical Memorandum for Traffic and Circulation Supporting the Findings and recommendations, Dowling Associates, February 9, 2007.

Compiled by: Crane Transportation Group

Table 6

INTERSECTION LEVEL OF SERVICE

YEAR 2030

HARVEST

| LOCATION | FRIDAY PM PEAK HOUR | | SATURDAY PM PEAK HOUR | |
|---|---|-------------------------------|--------------------------|-------------------------------|
| | W/O PROJECT | WITH PROJECT | W/O PROJECT | WITH PROJECT |
| SR 12-121/Cuttings Wharf Rd. (Unsignalized – Cuttings Wharf Rd. stop sign controlled) | F-320.0 ⁽¹⁾ [C-17.7] ⁽²⁾ | F-349.1 [C-20.1] <.55%> | F-188.8 [A-9.8] | F-204.5 [B-11.1] <.56%> |

(1) Unsignalized level of service – control delay in seconds: Cuttings Wharf Road stop sign controlled approach.

(2) [Overall intersection level of service – average delay in seconds.]

<xx> – Percent project traffic added to intersection. Less than a 1% increase is not considered a significant impact.

Theoretical control delay results above 120 seconds with LOS F operation are presented for “with” versus “without” project comparison purposes only. Doubtful if some drivers would wait this long to make a left turn.

Year 2010 Highway Capacity Manual (HCM) Analysis Methodology for unsignalized intersections

Source: Crane Transportation Group

Table 7

ROADWAY SEGMENT LEVEL OF SERVICE

YEAR 2030

HARVEST

| LOCATION | DIRECTION | DIRECTIONAL CAPACITY (VEH/HR) | FRIDAY PM PEAK HOUR | | | | SATURDAY PM PEAK HOUR | | | |
|---------------------------------------|-----------|-------------------------------|---------------------|--------------------|--------------|----------------------------|-----------------------|-----|--------------|-------------|
| | | | W/O PROJECT | | WITH PROJECT | | W/O PROJECT | | WITH PROJECT | |
| | | | VOL ⁽¹⁾ | LOS ⁽²⁾ | VOL | LOS | VO L | LOS | VOL | LOS |
| SR 12-121 West of Cuttings Wharf Rd. | EB | 1200 | 1575 | F | 1577 | F [.13%] ⁽³⁾ | 1458 | F | 1460 | F [.14%] |
| | WB | 1200 | 1210 | F | 1211 | F [.08%] ⁽³⁾ | 1315 | F | 1316 | F [.08%] |
| SR 12-121 East of Cuttings Wharf Rd. | EB | 1200 | 1712 | F | 1719 | F [.40%] ⁽³⁾ | 1573 | F | 1580 | F [.44%] |
| | WB | 1200 | 1324 | F | 1331 | F [.53%] ⁽³⁾ | 1395 | F | 1402 | F [.50%] |
| Cuttings Wharf Rd. South of SR 12-121 | NB | 810 | 162 | C | 170 | C | 148 | C | 156 | C |
| | SB | 810 | 139 | C | 148 | C | 113 | C | 122 | C |

⁽¹⁾ Vol = volume

⁽²⁾ LOS = level of service.

⁽³⁾ [] = % project traffic added to road segment at locations with unacceptable “Without Project” operation. Less than a 1% increase is not considered a significant impact.

Analysis Methodology Source: Napa County General Plan Update EIR Technical Memorandum for Traffic and Circulation Supporting the Findings and recommendations, Dowling Associates, February 9, 2007.

Compiled by: Crane Transportation Group

Table 8

**PROJECT TRIP GENERATION
ETUDE WINERY EXPANSION**

HARVEST

FRIDAY

| | TOTAL | HOURS | PM PEAK PERIOD | | | | | |
|--|-----------------------------|------------------|----------------|----------|----------|----------|----------|----------|
| | | | 3-4 PM* | | 4-5 PM | | 5-6 PM | |
| | | | IN | OUT | IN | OUT | IN | OUT |
| Production Employees – Full Time | 2 | 7:00 AM-7:00 PM | 0 | 0 | 0 | 0 | 0 | 0 |
| Production Employees – Part Time | 4 | 7:00 AM-7:00 PM | 0 | 0 | 0 | 0 | 0 | 0 |
| Grape Delivery Trucks | 5/day (40 days) | 7:00 AM-2:00 PM | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Trucks (Bottle Supply/Case Pickup) | 1-2/month | 7:00 AM-4:00 PM | 0 | 0 | 0 | 0 | 0 | 0 |
| Visitors by Appointment | 150 (58 veh) ⁽¹⁾ | 10:00 AM-4:30 PM | 0 | 9 | 9 | 0 | 9 | 0 |
| TOTAL | 0 | | 9 | 9 | 0 | 9 | 0 | 0 |

* PM peak traffic hour at SR 12-121/Cuttings Wharf Road intersection.

⁽¹⁾ 2.6 visitors/vehicle average on weekdays per County data.

Source: Etude Winery

Compiled by: Crane Transportation Group

Table 9

**PROJECT TRIP GENERATION
ETUDE WINERY EXPANSION**

HARVEST

SATURDAY

| | TOTAL | HOURS | TRIPS | | | | | | | | | |
|----------------------------------|-----------------------------|------------------|----------|----------|----------|----------|----------|----------|----------|----------|------------|----------|
| | | | 2-3 PM | | 3-4 PM | | 4-5 PM | | 5-6 PM | | 3:30-4:30* | |
| | | | IN | OUT | IN | OUT | IN | OUT | IN | OUT | IN | OUT |
| Production Employees – Full Time | 2 | 7:00 AM-7:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Production Employees – Part Time | 4 | 7:00 AM-7:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Grape Delivery Trucks | 5/day (40 days) | 7:00 AM-2:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Visitors by Appointment | 150 (54 veh) ⁽¹⁾ | 10:00 AM-4:30 PM | 9 | 9 | 9 | 9 | 0 | 9 | 0 | 0 | 9 | 9 |
| TOTAL | 0 | | 9 | 9 | 9 | 9 | 0 | 9 | 0 | 0 | 9 | 9 |

* PM peak traffic hour at SR 12-121/Cuttings Wharf Road intersection.

⁽¹⁾ 2.8 visitors/vehicle average on weekdays per County data.

Source: Etude Winery

Compiled by: Crane Transportation Group

Table 10

**PROJECT TRIP GENERATION SUMMARY
ETUDE WINERY EXPANSION**

HARVEST

| FRIDAY PM PEAK HOUR* (3:00-4:00) | | SATURDAY PM PEAK HOUR* (3:30-4:30) | |
|---|---------------------------|---|---------------------------|
| INBOUND TRIPS | OUTBOUND TRIPS | INBOUND TRIPS | OUTBOUND TRIPS |
| 9 | 9 | 9 | 9 |

* Peak hour at SR 12-121/Cuttings Wharf Road intersection.

Source: Etude Winery; compiled by Crane Transportation Group

Table 11

**ETUDE WINERY EXPANSION
NEW MARKETING EVENT TRAFFIC DETAILS**

| ACTIVITY | STAFF/GUEST CATEGORY | # OF PEOPLE | # OF VEHICLES | TIMES | REGULAR VISITATION ELIMINATED DURING MARKETING EVENT? |
|-------------------------------|-----------------------------|--------------------|----------------------|-------------------------|--|
| Marketing Event 4 per year | Guests | 40 | | Weekday 5:00-9:00 PM | Yes |
| | Extra Winery Staff | 1 | 1 | | |
| | Caterers | 2 | 2 | | |
| | Entertainers | 1 | 1 | | |
| | Delivery vehicles | 1 | 1 | | |

Source: Etude Winery applicant

Appendix

Appendix

ETUDE WINERY EXISTING PERMIT & EXPECTED PROJECT TRAFFIC ACTIVITY DETAILS

HARVEST

Gallons/Year Production Under Current Permit: 150,000
Proposed Project Increment of Increased Production: 150,000 gallons
Total Production With Project: 300,000 gallons

| PROPOSED PROJECT INCREMENT | |
|--|--|
| <p>A. Full-time admin employees # on Friday <u> 0 </u> # on Saturday <u> 0 </u> # on Sunday <u> 0 </u> Work hours: Weekday NA Saturday NA Sunday NA</p> | <p>D. Part-time production employees # on Friday <u> 4 </u> # on Saturday <u> 4 </u> # on Sunday <u> 0 </u> Work hours: Weekday 7:00 AM to 7:00 PM Saturday 7:00 AM to 7:00 PM Sunday NA</p> |
| <p>B. Full-time production employees # on Friday <u> 2 </u> # on Saturday <u> 2 </u> # on Sunday <u> 0 </u> Work hours: Weekday 7:00 AM to 7:00 PM Saturday 7:00 AM to 7:00 PM Sunday NA</p> | <p>E. Tours & tasting employees # on Friday <u> 0 </u> # on Saturday <u> 0 </u> # on Sunday <u> 0 </u> Work hours: Weekday NA Saturday NA Sunday NA</p> |
| <p>C. Part-time admin employees # on Friday <u> 0 </u> # on Saturday <u> 0 </u> # on Sunday <u> 0 </u> Work hours: Weekday NA Saturday NA Sunday NA</p> | <p>F. Other employees # on Friday <u> 0 </u> # on Saturday <u> 0 </u> # on Sunday <u> 0 </u> Work hours: Weekday NA Saturday NA Sunday NA</p> |

Appendix

**ETUDE WINERY
EXISTING PERMIT & EXPECTED PROJECT
TRAFFIC ACTIVITY DETAILS**

HARVEST

| PROPOSED PROJECT INCREMENT | |
|---|---------------------|
| G. Tours/tasting visitors by appointment | |
| # on Friday | <u>150</u> |
| # on Saturday | <u>150</u> |
| # on Sunday | <u>150</u> |
| Tasting hours: | |
| Weekday | 10:00 AM to 4:30 PM |
| Saturday | 10:00 AM to 4:30 PM |
| Sunday | 10:00 AM to 4:30 PM |
| H. Grape delivery trucks | |
| # on Friday | <u>5</u> |
| # on Saturday | <u>5</u> |
| # on Sunday | <u>0</u> |
| Delivery hours: | |
| Weekday | 7:00 AM to 2:00 PM |
| Saturday | 7:00 AM to 2:00 PM |
| Sunday | NA |
| # days of grape delivery: | <u>40</u> |

J. Grape Truck Source

| PROPOSED PROJECT INCREMENT | |
|--|-------------|
| Percent grapes grown on site: | <u>0</u> % |
| Grapes grown off site – access route to winery | |
| SR 12-121 from the west: | <u>80</u> % |
| SR 12-121 from the east: | <u>20</u> % |

K. Bottling

On-site bottling.

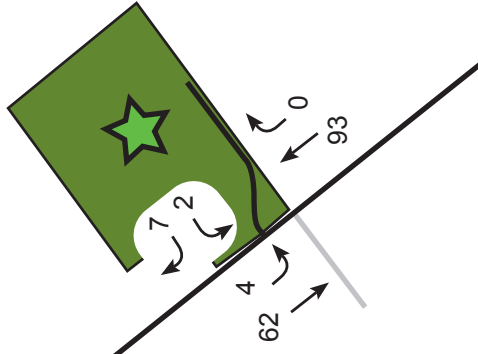
| PROPOSED PROJECT INCREMENT | |
|-----------------------------------|--|
| One additional week in December. | |

Not To Scale

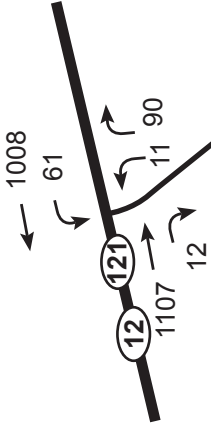


Saturday PM Peak Hour (3:30-4:30)

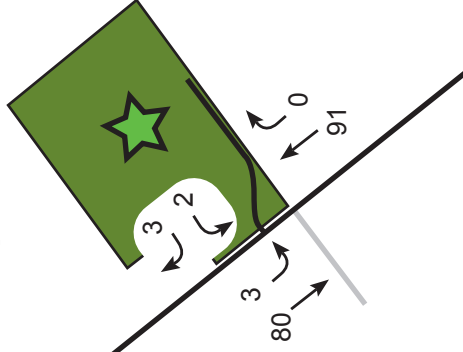
ETUDE WINERY



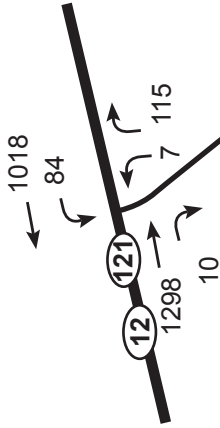
Cuttings Wharf Road



ETUDE WINERY



Cuttings Wharf Road



Friday PM Peak Hour (3:00-4:00)

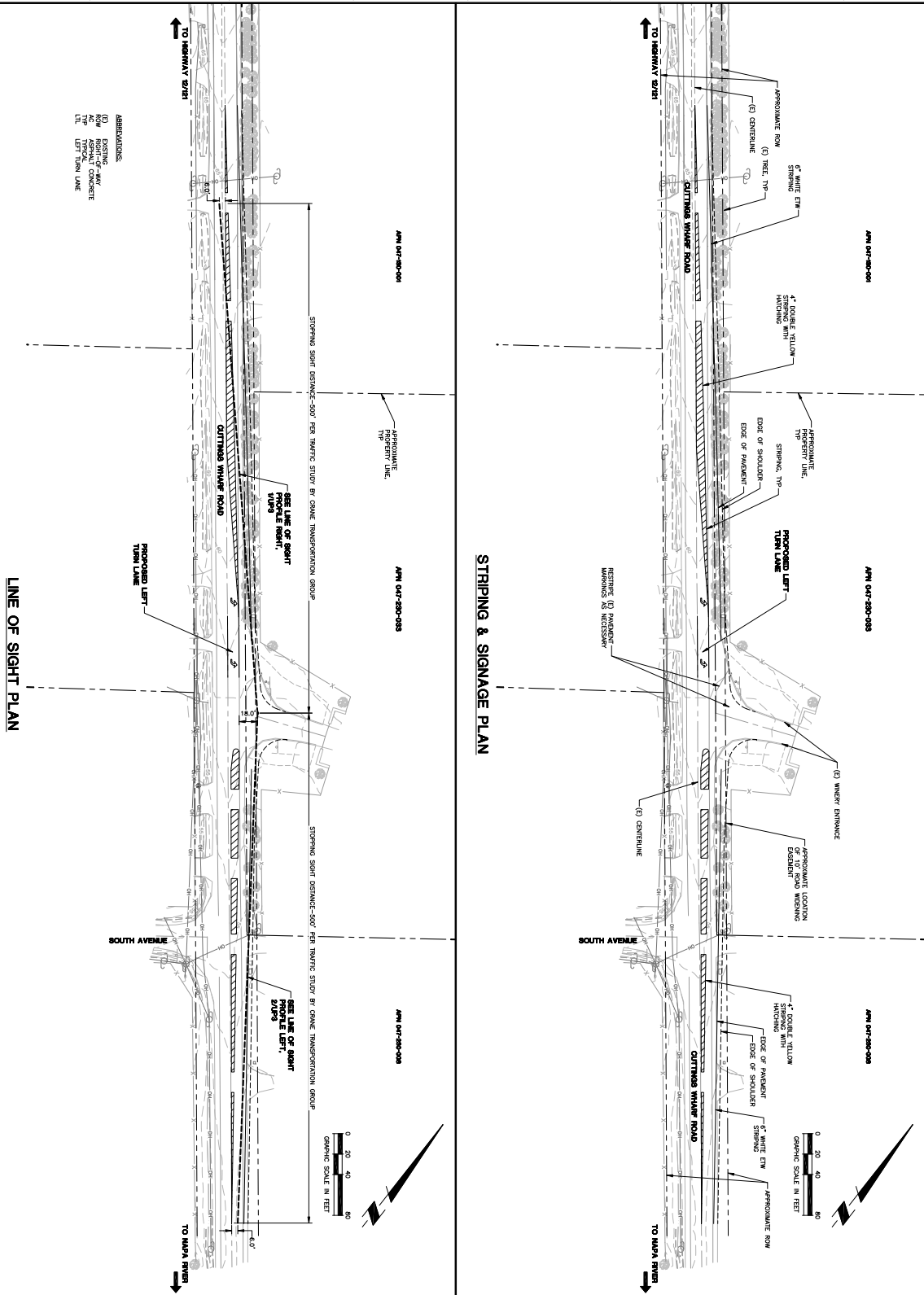
Etude Winery Major Modification Traffic Study

Figure A1

Existing (2016) February Weekday PM and Saturday PM Peak Hour Traffic Volumes

201701201542 ETUDE WINERY STRIPING & SIGNAGE PLAN (SUMMIT) 15142-039-1P1-01-2017

REVISION NO. 7/12/2016 2:57 PM



- ASSOCIATIONS:
- EQ. DISTING. - MAY
 - TR. - ASPHALT CONCRETE
 - TL. - LEFT TURN LANE

LINE OF SIGHT PLAN

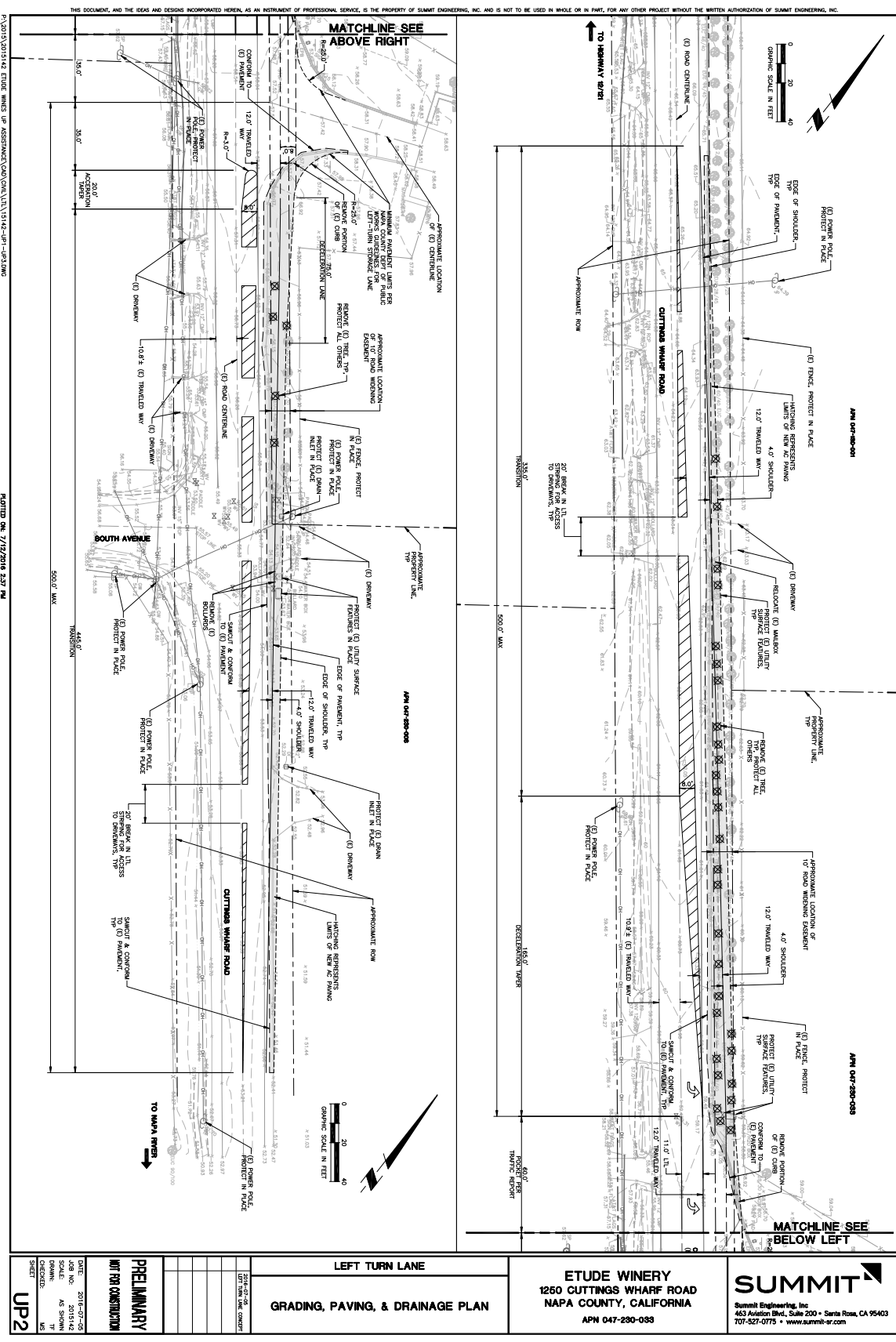
STRIPING & SIGNAGE PLAN

| | | | | |
|--|---|---|--|---|
| <p>DATE: 2016-07-05 JOB NO: 2015142 SCALE: AS SHOWN DRAWN BY: JES CHECKED BY: MS SHEET: UPI1</p> | <p>PRELIMINARY NOT FOR CONSTRUCTION</p> | <p>LEFT TURN LANE STRIPING & SIGNAGE PLAN/ LINE OF SIGHT PLAN</p> | <p>ETUDE WINERY 1250 CUTTINGS WHARF ROAD NAPA COUNTY, CALIFORNIA APN 047-280-039</p> | <p>SUMMIT Summit Engineering, Inc 463 Aviation Blvd, Suite 200 • Santa Rosa, CA 95403 707-527-0775 • www.summit-ar.com</p> |
| | <p>201701201542 ETUDE WINERY STRIPING & SIGNAGE PLAN (SUMMIT) 15142-039-1P1-01-2017</p> | | | |

Etude Winery Major Modification Traffic Study



Figure A2
**Striping & Signage Plan/
Line of Sight Plan**



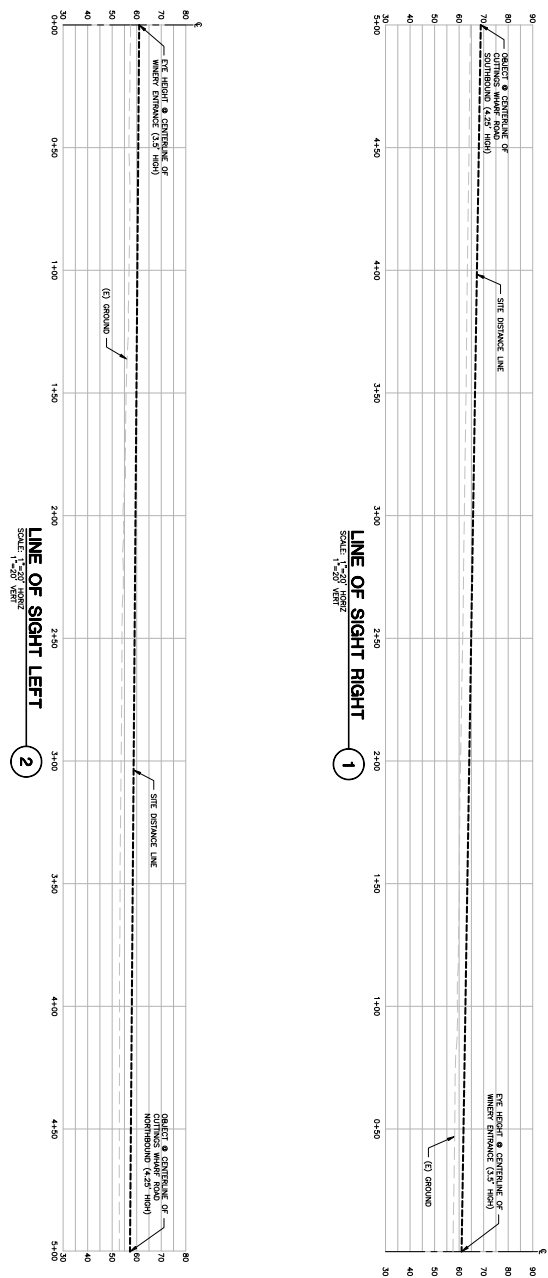
Etude Winery Major Modification Traffic Study

Figure A3
Grading, Paving, & Drainage Plan



P:\2015\2015142_ETUDE WINERY UP ASSESSMENT\CON\CON\A\1\15142-UP1-UP1.DWG

PLOTTED ON 7/19/2016 2:37 PM



| | | | | |
|--|-------------------------------------|--|--|--|
| DATE: 2016-07-08 SCALE: AS SHOWN DRAWN: JT CHECKED: MS SHEET: UP3 | PRELIMINARY NOT FOR CONSTRUCTION | LEFT TURN LANE LINE OF SIGHT PROFILES | ETUDE WINERY 1250 CUTTINGS WHARF ROAD NAPA COUNTY, CALIFORNIA APN 047-290-033 | Summit Engineering, Inc. 463 Aviation Blvd., Suite 200 • Santa Rosa, CA 95403 707-527-0775 • www.summit-ar.com |
| | | 2017-07-08 DATE: 2016-07-08 SCALE: AS SHOWN DRAWN: JT CHECKED: MS SHEET: UP3 | LEFT TURN LANE LINE OF SIGHT PROFILES | ETUDE WINERY 1250 CUTTINGS WHARF ROAD NAPA COUNTY, CALIFORNIA APN 047-290-033 |

Etude Winery Major Modification Traffic Study

Figure A4
Line of Sight Profiles



TECHNICAL APPENDIX

Capacity Worksheets

Intersection

Int Delay, s/veh 8.2

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|--------------------------|------|------|------|------|------|-------|
| Vol, veh/h | 1370 | 12 | 104 | 1150 | 8 | 137 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | Yield |
| Storage Length | - | 100 | 175 | - | 0 | 50 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 2 | 0 | 2 | 0 | 0 | 0 |
| Mvmt Flow | 1489 | 13 | 113 | 1250 | 9 | 149 |

| Major/Minor | Major1 | Major2 | Minor1 |
|----------------------|--------|--------|--------|
| Conflicting Flow All | 0 | 0 | 1489 |
| Stage 1 | - | - | 1489 |
| Stage 2 | - | - | 1476 |
| Critical Hdwy | - | 4.12 | 6.4 |
| Critical Hdwy Stg 1 | - | - | 5.4 |
| Critical Hdwy Stg 2 | - | - | 5.4 |
| Follow-up Hdwy | - | 2.218 | 3.5 |
| Pot Cap-1 Maneuver | - | 451 | 16 |
| Stage 1 | - | - | 209 |
| Stage 2 | - | - | 212 |
| Platoon blocked, % | - | - | - |
| Mov Cap-1 Maneuver | - | 451 | 12 |
| Mov Cap-2 Maneuver | - | - | 12 |
| Stage 1 | - | - | 209 |
| Stage 2 | - | - | 159 |

| Approach | EB | WB | NB |
|----------------------|----|-----|-------|
| HCM Control Delay, s | 0 | 1.3 | 146.4 |
| HCM LOS | | | F |

| Minor Lane/Major Mvm | NBLn1 | NBLn2 | EBT | EBR | WBL | WBT |
|-----------------------|-------|-------|-----|-----|-------|-----|
| Capacity (veh/h) | 12 | 154 | - | - | 451 | - |
| HCM Lane V/C Ratio | 0.725 | 0.967 | - | - | 0.251 | - |
| HCM Control Delay (s) | 561.9 | 122.1 | - | - | 15.6 | - |
| HCM Lane LOS | F | F | - | - | C | - |
| HCM 95th %tile Q(veh) | 1.6 | 7.2 | - | - | 1 | - |

Intersection

Int Delay, s/veh 9.5

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|--------------------------|------|------|------|------|------|-------|
| Vol, veh/h | 1370 | 14 | 111 | 1150 | 9 | 144 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | Yield |
| Storage Length | - | 100 | 175 | - | 0 | 50 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 2 | 0 | 2 | 0 | 0 | 0 |
| Mvmt Flow | 1489 | 15 | 121 | 1250 | 10 | 157 |

| Major/Minor | Major1 | Major2 | Minor1 |
|----------------------|--------|--------|--------|
| Conflicting Flow All | 0 | 0 | 1489 |
| Stage 1 | - | - | 1489 |
| Stage 2 | - | - | 1491 |
| Critical Hdwy | - | - | 4.12 |
| Critical Hdwy Stg 1 | - | - | 5.4 |
| Critical Hdwy Stg 2 | - | - | 5.4 |
| Follow-up Hdwy | - | - | 2.218 |
| Pot Cap-1 Maneuver | - | - | 451 |
| Stage 1 | - | - | 209 |
| Stage 2 | - | - | 208 |
| Platoon blocked, % | - | - | - |
| Mov Cap-1 Maneuver | - | - | 451 |
| Mov Cap-2 Maneuver | - | - | - |
| Stage 1 | - | - | 209 |
| Stage 2 | - | - | 152 |

| Approach | EB | WB | NB |
|----------------------|----|-----|-------|
| HCM Control Delay, s | 0 | 1.4 | 162.7 |
| HCM LOS | | | F |

| Minor Lane/Major Mvm | NBLn1 | NBLn2 | EBT | EBR | WBL | WBT |
|-----------------------|-------|-------|-----|-----|-------|-----|
| Capacity (veh/h) | 12 | 154 | - | - | 451 | - |
| HCM Lane V/C Ratio | 0.815 | 1.016 | - | - | 0.268 | - |
| HCM Control Delay (s) | 597.8 | 135.5 | - | - | 15.9 | - |
| HCM Lane LOS | F | F | - | - | C | - |
| HCM 95th %tile Q(veh) | 1.8 | 7.8 | - | - | 1.1 | - |

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 4.9

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|--------------------------|------|------|------|------|------|-------|
| Vol, veh/h | 1310 | 15 | 83 | 1190 | 13 | 113 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | Yield |
| Storage Length | - | 100 | 175 | - | 0 | 50 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 96 | 96 | 96 | 96 | 96 | 96 |
| Heavy Vehicles, % | 0 | 0 | 1 | 0 | 0 | 0 |
| Mvmt Flow | 1365 | 16 | 86 | 1240 | 14 | 118 |

| Major/Minor | Major1 | Major2 | Minor1 |
|----------------------|--------|--------|--------|
| Conflicting Flow All | 0 | 0 | 1365 |
| Stage 1 | - | - | 1365 |
| Stage 2 | - | - | 1413 |
| Critical Hdwy | - | - | 4.11 |
| Critical Hdwy Stg 1 | - | - | 5.4 |
| Critical Hdwy Stg 2 | - | - | 5.4 |
| Follow-up Hdwy | - | - | 2.209 |
| Pot Cap-1 Maneuver | - | - | 506 |
| Stage 1 | - | - | 240 |
| Stage 2 | - | - | 227 |
| Platoon blocked, % | - | - | - |
| Mov Cap-1 Maneuver | - | - | 506 |
| Mov Cap-2 Maneuver | - | - | - |
| Stage 1 | - | - | 240 |
| Stage 2 | - | - | 188 |

| Approach | EB | WB | NB |
|----------------------|----|-----|----|
| HCM Control Delay, s | 0 | 0.9 | 96 |
| HCM LOS | | | F |

| Minor Lane/Major Mvm | NBLn1 | NBLn2 | EBT | EBR | WBL | WBT |
|-----------------------|-------|-------|-----|-----|-------|-----|
| Capacity (veh/h) | 17 | 182 | - | - | 506 | - |
| HCM Lane V/C Ratio | 0.797 | 0.647 | - | - | 0.171 | - |
| HCM Control Delay (s) | 450.3 | 55.2 | - | - | 13.6 | - |
| HCM Lane LOS | F | F | - | - | B | - |
| HCM 95th %tile Q(veh) | 2 | 3.7 | - | - | 0.6 | - |

Intersection

Int Delay, s/veh 5.5

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|--------------------------|------|------|------|------|------|-------|
| Vol, veh/h | 1310 | 17 | 90 | 1190 | 14 | 120 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | Yield |
| Storage Length | - | 100 | 175 | - | 0 | 50 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 96 | 96 | 96 | 96 | 96 | 96 |
| Heavy Vehicles, % | 0 | 0 | 1 | 0 | 0 | 0 |
| Mvmt Flow | 1365 | 18 | 94 | 1240 | 15 | 125 |

| Major/Minor | Major1 | Major2 | Minor1 |
|----------------------|--------|--------|--------|
| Conflicting Flow All | 0 | 0 | 1365 |
| Stage 1 | - | - | 1365 |
| Stage 2 | - | - | 1427 |
| Critical Hdwy | - | - | 4.11 |
| Critical Hdwy Stg 1 | - | - | 5.4 |
| Critical Hdwy Stg 2 | - | - | 5.4 |
| Follow-up Hdwy | - | - | 2.209 |
| Pot Cap-1 Maneuver | - | - | 506 |
| Stage 1 | - | - | 240 |
| Stage 2 | - | - | 224 |
| Platoon blocked, % | - | - | - |
| Mov Cap-1 Maneuver | - | - | 506 |
| Mov Cap-2 Maneuver | - | - | - |
| Stage 1 | - | - | 240 |
| Stage 2 | - | - | 182 |

| Approach | EB | WB | NB |
|----------------------|----|----|-------|
| HCM Control Delay, s | 0 | 1 | 102.7 |
| HCM LOS | | | F |

| Minor Lane/Major Mvm | NBLn1 | NBLn2 | EBT | EBR | WBL | WBT |
|-----------------------|-------|-------|-----|-----|-------|-----|
| Capacity (veh/h) | 17 | 182 | - | - | 506 | - |
| HCM Lane V/C Ratio | 0.858 | 0.687 | - | - | 0.185 | - |
| HCM Control Delay (s) | 472.5 | 59.6 | - | - | 13.7 | - |
| HCM Lane LOS | F | F | - | - | B | - |
| HCM 95th %tile Q(veh) | 2.2 | 4.2 | - | - | 0.7 | - |

Intersection

Int Delay, s/veh 10.1

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|--------------------------|------|------|------|------|------|-------|
| Vol, veh/h | 1433 | 13 | 111 | 1167 | 8 | 142 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | Yield |
| Storage Length | - | 100 | 175 | - | 0 | 50 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 0 | 2 | 0 | 0 | 0 |
| Mvmt Flow | 1541 | 14 | 119 | 1255 | 9 | 153 |

| Major/Minor | Major1 | Major2 | Minor1 |
|----------------------|--------|--------|--------|
| Conflicting Flow All | 0 | 0 | 1541 |
| Stage 1 | - | - | 1541 |
| Stage 2 | - | - | 1494 |
| Critical Hdwy | - | - | 4.12 |
| Critical Hdwy Stg 1 | - | - | 5.4 |
| Critical Hdwy Stg 2 | - | - | 5.4 |
| Follow-up Hdwy | - | - | 2.218 |
| Pot Cap-1 Maneuver | - | - | 431 |
| Stage 1 | - | - | 197 |
| Stage 2 | - | - | 207 |
| Platoon blocked, % | - | - | - |
| Mov Cap-1 Maneuver | - | - | 431 |
| Mov Cap-2 Maneuver | - | - | 11 |
| Stage 1 | - | - | 197 |
| Stage 2 | - | - | 150 |

| Approach | EB | WB | NB |
|----------------------|----|-----|-------|
| HCM Control Delay, s | 0 | 1.4 | 181.5 |
| HCM LOS | | | F |

| Minor Lane/Major Mvm | NBLn1 | NBLn2 | EBT | EBR | WBL | WBT |
|-----------------------|-------|-------|-----|-----|-------|-----|
| Capacity (veh/h) | 11 | 143 | - | - | 431 | - |
| HCM Lane V/C Ratio | 0.782 | 1.068 | - | - | 0.277 | - |
| HCM Control Delay (s) | 626.1 | 156.5 | - | - | 16.5 | - |
| HCM Lane LOS | F | F | - | - | C | - |
| HCM 95th %tile Q(veh) | 1.7 | 8.2 | - | - | 1.1 | - |

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 11.9

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|--------------------------|------|------|------|------|------|-------|
| Vol, veh/h | 1433 | 15 | 118 | 1167 | 9 | 149 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | Yield |
| Storage Length | - | 100 | 175 | - | 0 | 50 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 0 | 2 | 0 | 0 | 0 |
| Mvmt Flow | 1541 | 16 | 127 | 1255 | 10 | 160 |

| Major/Minor | Major1 | Major2 | Minor1 |
|----------------------|--------|--------|--------|
| Conflicting Flow All | 0 | 0 | 1541 |
| Stage 1 | - | - | 1541 |
| Stage 2 | - | - | 1509 |
| Critical Hdwy | - | 4.12 | 6.4 |
| Critical Hdwy Stg 1 | - | - | 5.4 |
| Critical Hdwy Stg 2 | - | - | 5.4 |
| Follow-up Hdwy | - | 2.218 | 3.5 |
| Pot Cap-1 Maneuver | - | 431 | 14 |
| Stage 1 | - | - | 197 |
| Stage 2 | - | - | 204 |
| Platoon blocked, % | - | - | - |
| Mov Cap-1 Maneuver | - | 431 | 10 |
| Mov Cap-2 Maneuver | - | - | 10 |
| Stage 1 | - | - | 197 |
| Stage 2 | - | - | 144 |

| Approach | EB | WB | NB |
|----------------------|----|-----|-------|
| HCM Control Delay, s | 0 | 1.5 | 206.2 |
| HCM LOS | | | F |

| Minor Lane/Major Mvm | NBLn1 | NBLn2 | EBT | EBR | WBL | WBT |
|-----------------------|-------|-------|-----|-----|-------|-----|
| Capacity (veh/h) | 10 | 143 | - | - | 431 | - |
| HCM Lane V/C Ratio | 0.968 | 1.12 | - | - | 0.294 | - |
| HCM Control Delay (s) | 753.8 | 173.1 | - | - | 16.8 | - |
| HCM Lane LOS | F | F | - | - | C | - |
| HCM 95th %tile Q(veh) | 1.9 | 8.9 | - | - | 1.2 | - |

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 5.8

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|--------------------------|------|------|------|------|------|-------|
| Vol, veh/h | 1353 | 16 | 87 | 1227 | 13 | 120 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | Yield |
| Storage Length | - | 100 | 175 | - | 0 | 50 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 96 | 96 | 96 | 96 | 96 | 96 |
| Heavy Vehicles, % | 0 | 0 | 1 | 0 | 0 | 0 |
| Mvmt Flow | 1409 | 17 | 91 | 1278 | 14 | 125 |

| Major/Minor | Major1 | Major2 | Minor1 |
|----------------------|--------|--------|--------|
| Conflicting Flow All | 0 | 0 | 1409 |
| Stage 1 | - | - | 1409 |
| Stage 2 | - | - | 1459 |
| Critical Hdwy | - | - | 4.11 |
| Critical Hdwy Stg 1 | - | - | 5.4 |
| Critical Hdwy Stg 2 | - | - | 5.4 |
| Follow-up Hdwy | - | - | 2.209 |
| Pot Cap-1 Maneuver | - | - | 487 |
| Stage 1 | - | - | 228 |
| Stage 2 | - | - | 216 |
| Platoon blocked, % | - | - | - |
| Mov Cap-1 Maneuver | - | - | 487 |
| Mov Cap-2 Maneuver | - | - | 15 |
| Stage 1 | - | - | 228 |
| Stage 2 | - | - | 176 |

| Approach | EB | WB | NB |
|----------------------|----|-----|-------|
| HCM Control Delay, s | 0 | 0.9 | 113.3 |
| HCM LOS | | | F |

| Minor Lane/Major Mvm | NBLn1 | NBLn2 | EBT | EBR | WBL | WBT |
|-----------------------|-------|-------|-----|-----|-------|-----|
| Capacity (veh/h) | 15 | 172 | - | - | 487 | - |
| HCM Lane V/C Ratio | 0.903 | 0.727 | - | - | 0.186 | - |
| HCM Control Delay (s) | 536.1 | 67.5 | - | - | 14.1 | - |
| HCM Lane LOS | F | F | - | - | B | - |
| HCM 95th %tile Q(veh) | 2.2 | 4.5 | - | - | 0.7 | - |

Intersection

Int Delay, s/veh 6.8

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|--------------------------|------|------|------|------|------|-------|
| Vol, veh/h | 1353 | 18 | 94 | 1227 | 14 | 127 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | Yield |
| Storage Length | - | 100 | 175 | - | 0 | 50 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 96 | 96 | 96 | 96 | 96 | 96 |
| Heavy Vehicles, % | 0 | 0 | 1 | 0 | 0 | 0 |
| Mvmt Flow | 1409 | 19 | 98 | 1278 | 15 | 132 |

| Major/Minor | Major1 | Major2 | Minor1 |
|----------------------|--------|--------|--------|
| Conflicting Flow All | 0 | 0 | 1409 |
| Stage 1 | - | - | 1409 |
| Stage 2 | - | - | 1474 |
| Critical Hdwy | - | - | 4.11 |
| Critical Hdwy Stg 1 | - | - | 5.4 |
| Critical Hdwy Stg 2 | - | - | 5.4 |
| Follow-up Hdwy | - | - | 2.209 |
| Pot Cap-1 Maneuver | - | - | 487 |
| Stage 1 | - | - | 228 |
| Stage 2 | - | - | 212 |
| Platoon blocked, % | - | - | - |
| Mov Cap-1 Maneuver | - | - | 487 |
| Mov Cap-2 Maneuver | - | - | - |
| Stage 1 | - | - | 228 |
| Stage 2 | - | - | 169 |

| Approach | EB | WB | NB |
|----------------------|----|----|-------|
| HCM Control Delay, s | 0 | 1 | 127.8 |
| HCM LOS | | | F |

| Minor Lane/Major Mvm | NBLn1 | NBLn2 | EBT | EBR | WBL | WBT |
|-----------------------|-------|-------|-----|-----|-------|-----|
| Capacity (veh/h) | 14 | 172 | - | - | 487 | - |
| HCM Lane V/C Ratio | 1.042 | 0.769 | - | - | 0.201 | - |
| HCM Control Delay (s) | 618.8 | 73.7 | - | - | 14.2 | - |
| HCM Lane LOS | F | F | - | - | B | - |
| HCM 95th %tile Q(veh) | 2.4 | 5 | - | - | 0.7 | - |

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 17.7

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|--------------------------|------|------|------|------|------|-------|
| Vol, veh/h | 1560 | 15 | 124 | 1200 | 10 | 152 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | Yield |
| Storage Length | - | 100 | 175 | - | 0 | 50 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 94 | 94 | 94 | 94 | 94 | 94 |
| Heavy Vehicles, % | 2 | 0 | 2 | 0 | 0 | 0 |
| Mvmt Flow | 1660 | 16 | 132 | 1277 | 11 | 162 |

| Major/Minor | Major1 | Major2 | Minor1 |
|----------------------|--------|--------|--------|
| Conflicting Flow All | 0 | 0 | 1660 |
| Stage 1 | - | - | 1660 |
| Stage 2 | - | - | 1540 |
| Critical Hdwy | - | 4.12 | 6.4 |
| Critical Hdwy Stg 1 | - | - | 5.4 |
| Critical Hdwy Stg 2 | - | - | 5.4 |
| Follow-up Hdwy | - | 2.218 | 3.5 |
| Pot Cap-1 Maneuver | - | 388 | 11 |
| Stage 1 | - | - | 172 |
| Stage 2 | - | - | 197 |
| Platoon blocked, % | - | - | - |
| Mov Cap-1 Maneuver | - | 388 | ~ 7 |
| Mov Cap-2 Maneuver | - | - | ~ 7 |
| Stage 1 | - | - | 172 |
| Stage 2 | - | - | 130 |

| Approach | EB | WB | NB |
|----------------------|----|-----|----------|
| HCM Control Delay, s | 0 | 1.8 | \$ 319.9 |
| HCM LOS | | | F |

| Minor Lane/Major Mvm | NBLn1 | NBLn2 | EBT | EBR | WBL | WBT |
|------------------------|--------|-------|-----|-----|------|-----|
| Capacity (veh/h) | 7 | 122 | - | - | 388 | - |
| HCM Lane V/C Ratio | 1.52 | 1.325 | - | - | 0.34 | - |
| HCM Control Delay (\$) | 1240.7 | 259.3 | - | - | 19 | - |
| HCM Lane LOS | F | F | - | - | C | - |
| HCM 95th %tile Q(veh) | 2.2 | 10.7 | - | - | 1.5 | - |

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 20.1

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|--------------------------|------|------|------|------|------|-------|
| Vol, veh/h | 1560 | 17 | 131 | 1200 | 11 | 159 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | Yield |
| Storage Length | - | 100 | 175 | - | 0 | 50 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 94 | 94 | 94 | 94 | 94 | 94 |
| Heavy Vehicles, % | 2 | 0 | 2 | 0 | 0 | 0 |
| Mvmt Flow | 1660 | 18 | 139 | 1277 | 12 | 169 |

| Major/Minor | Major1 | Major2 | Minor1 |
|----------------------|--------|--------|--------|
| Conflicting Flow All | 0 | 0 | 1660 |
| Stage 1 | - | - | 1660 |
| Stage 2 | - | - | 1555 |
| Critical Hdwy | - | 4.12 | 6.4 |
| Critical Hdwy Stg 1 | - | - | 5.4 |
| Critical Hdwy Stg 2 | - | - | 5.4 |
| Follow-up Hdwy | - | 2.218 | 3.5 |
| Pot Cap-1 Maneuver | - | 388 | ~ 11 |
| Stage 1 | - | - | 172 |
| Stage 2 | - | - | 194 |
| Platoon blocked, % | - | - | - |
| Mov Cap-1 Maneuver | - | 388 | ~ 7 |
| Mov Cap-2 Maneuver | - | - | ~ 7 |
| Stage 1 | - | - | 172 |
| Stage 2 | - | - | 125 |

| Approach | EB | WB | NB |
|----------------------|----|-----|----------|
| HCM Control Delay, s | 0 | 1.9 | \$ 349.1 |
| HCM LOS | | | F |

| Minor Lane/Major Mvm | NBLn1 | NBLn2 | EBT | EBR | WBL | WBT |
|------------------------|--------|-------|-----|-----|-------|-----|
| Capacity (veh/h) | 7 | 122 | - | - | 388 | - |
| HCM Lane V/C Ratio | 1.672 | 1.386 | - | - | 0.359 | - |
| HCM Control Delay (\$) | 1310.5 | 282.6 | - | - | 19.4 | - |
| HCM Lane LOS | F | F | - | - | C | - |
| HCM 95th %tile Q(veh) | 2.4 | 11.4 | - | - | 1.6 | - |

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 9.8

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|--------------------------|------|------|------|------|------|-------|
| Vol, veh/h | 1440 | 18 | 95 | 1300 | 15 | 133 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | Yield |
| Storage Length | - | 100 | 175 | - | 0 | 50 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 96 | 96 | 96 | 96 | 96 | 96 |
| Heavy Vehicles, % | 0 | 0 | 1 | 0 | 0 | 0 |
| Mvmt Flow | 1500 | 19 | 99 | 1354 | 16 | 139 |

| Major/Minor | Major1 | Major2 | Minor1 |
|----------------------|--------|--------|--------|
| Conflicting Flow All | 0 | 0 | 1500 |
| Stage 1 | - | - | 1500 |
| Stage 2 | - | - | 1552 |
| Critical Hdwy | - | 4.11 | 6.4 |
| Critical Hdwy Stg 1 | - | - | 5.4 |
| Critical Hdwy Stg 2 | - | - | 5.4 |
| Follow-up Hdwy | - | 2.209 | 3.5 |
| Pot Cap-1 Maneuver | - | 450 | ~ 14 |
| Stage 1 | - | - | 206 |
| Stage 2 | - | - | 194 |
| Platoon blocked, % | - | - | - |
| Mov Cap-1 Maneuver | - | 450 | ~ 11 |
| Mov Cap-2 Maneuver | - | - | ~ 11 |
| Stage 1 | - | - | 206 |
| Stage 2 | - | - | 151 |

| Approach | EB | WB | NB |
|----------------------|----|----|-------|
| HCM Control Delay, s | 0 | 1 | 188.8 |
| HCM LOS | | | F |

| Minor Lane/Major Mvm | NBLn1 | NBLn2 | EBT | EBR | WBL | WBT |
|-----------------------|-------|-------|-----|-----|------|-----|
| Capacity (veh/h) | 11 | 152 | - | - | 450 | - |
| HCM Lane V/C Ratio | 1.42 | 0.911 | - | - | 0.22 | - |
| HCM Control Delay (s) | 893.9 | 109.3 | - | - | 15.2 | - |
| HCM Lane LOS | F | F | - | - | C | - |
| HCM 95th %tile Q(veh) | 2.7 | 6.4 | - | - | 0.8 | - |

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 11.1

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|--------------------------|------|------|------|------|------|-------|
| Vol, veh/h | 1440 | 20 | 102 | 1300 | 16 | 140 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | Yield |
| Storage Length | - | 100 | 175 | - | 0 | 50 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 96 | 96 | 96 | 96 | 96 | 96 |
| Heavy Vehicles, % | 0 | 0 | 1 | 0 | 0 | 0 |
| Mvmt Flow | 1500 | 21 | 106 | 1354 | 17 | 146 |

| Major/Minor | Major1 | Major2 | Minor1 |
|----------------------|--------|--------|--------|
| Conflicting Flow All | 0 | 0 | 1500 |
| Stage 1 | - | - | 1500 |
| Stage 2 | - | - | 1567 |
| Critical Hdwy | - | - | 4.11 |
| Critical Hdwy Stg 1 | - | - | 5.4 |
| Critical Hdwy Stg 2 | - | - | 5.4 |
| Follow-up Hdwy | - | - | 2.209 |
| Pot Cap-1 Maneuver | - | - | 450 |
| Stage 1 | - | - | 206 |
| Stage 2 | - | - | 191 |
| Platoon blocked, % | - | - | - |
| Mov Cap-1 Maneuver | - | - | 450 |
| Mov Cap-2 Maneuver | - | - | - |
| Stage 1 | - | - | 206 |
| Stage 2 | - | - | 146 |

| Approach | EB | WB | NB |
|----------------------|----|-----|-------|
| HCM Control Delay, s | 0 | 1.1 | 204.5 |
| HCM LOS | | | F |

| Minor Lane/Major Mvm | NBLn1 | NBLn2 | EBT | EBR | WBL | WBT |
|-----------------------|-------|---------|-----|-----|-------|-----|
| Capacity (veh/h) | 11 | 152 | - | - | 450 | - |
| HCM Lane V/C Ratio | 1.5 | 150.959 | - | - | 0.236 | - |
| HCM Control Delay (s) | 934.6 | 121.1 | - | - | 15.5 | - |
| HCM Lane LOS | F | F | - | - | C | - |
| HCM 95th %tile Q(veh) | 2.9 | 7 | - | - | 0.9 | - |

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon