

Appendix G. Transportation Impact Study

This page intentionally left blank.



August 7, 2024

Mr. Darin Neufeld, AICP
 Harris & Associates
 600 B Street, Suite 2000
 San Diego, CA 92101

Updated Transportation Impact Study for The Grange Project

Dear Mr. Neufeld;

W-Trans has completed an evaluation of the potential transportation impacts associated with The Grange to be located on APN 052-010-011 on the west side of Silverado Trail between Hagen Road and Stonecrest Drive in the City of Napa. The purpose of this letter is to set forth the project’s anticipated trip generation and resulting impacts under the criteria detailed in the California Environmental Quality Act (CEQA), as well as conformance with the City’s Crucial Corridor policy.

Project Description

The project as proposed includes 100 fixed recreational lodging units (tents, yurts, and stationary camper trailers), and recreational activity space; no personal trailers or recreational vehicles would be accommodated. Building 1 would consist of guest check-in, gathering space, and a small market, totaling approximately 4,400 square feet. Building 2 would provide approximately 1,440 square feet of indoor/outdoor meeting space. Buildings 3 through 5 would provide administration and maintenance space of up to 640 square feet each. The site is located on the west side of Silverado Trail between Stonecrest Drive and Hagen Road, would take access via a single driveway on Silverado Trail, and is currently undeveloped.

Trip Generation

The anticipated trip generation for the proposed project was estimated using standard rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 11th Edition, 2021, for Campground/Recreational Vehicle Park (LU #416), as this description most closely matches the proposed project. It is noted that the description of this land use indicates that the sites surveyed provide a variety of facilities, often including restrooms with showers and recreational facilities, such as a swimming pool, convenience store, and laundromat. The proposed support facilities such as meeting space, and a small market were therefore assumed to be captured within the rates applied. Further, it was conservatively assumed that 100 percent of sites would be occupied to maximize the trip generation estimate. As there is not a daily rate for the chosen land use, the rate for a Hotel (LU #310), which has the same a.m. peak hour rate and a similar though slightly higher p.m. peak hour rate, was applied. Based on application of these assumptions, the proposed project is expected to generate an average of 549 trips per day, including 21 a.m. peak hour trips and 27 trips during the p.m. peak hour. These results are summarized in Table 1.

Table 1 – Trip Generation Summary

Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
“Glamping” Campground	100 sites	5.49	549	0.21	21	8	13	0.27	27	18	9

Under the City’s policies, any project that generates fewer than 50 peak hour trips during both peak hours is only required to provide a focused traffic analysis. An operational analysis was therefore not performed.

Trip Distribution

The pattern used to allocate new project trips to the street network was determined based on the location of the site and proximity to regional routes. Given that Trancas Street to the north and Lincoln Avenue to the south, along with extensions of Silverado Trail to the north and south, would provide access to the site, it was assumed that trips would be evenly split between the north and south.

Crucial Corridor

The project site is located along Silverado Trail, so is subject to the City's Crucial Corridor policy which limits development to uses that generate no more than 520 trips per day per acre. At 12.5 acres, the site would therefore comply with the policy as long as it generates no more than 6,500 daily trips. As noted above, there is not a daily rate for a campground, though based on a comparison with rates for similar uses, it is anticipated that the project would generate an average of 549 daily trips, or approximately 44 trips per day per acre. Given that this is less than 10 percent of the allowable trips based on the size of the site, the project would be consistent with the Crucial Corridor policy.

Setting

Silverado Trail is a two to four lane highway, per the City of Napa General Plan. Within the project vicinity, it has two 12-foot travel lanes and one-to-two-foot shoulders in both directions. The highway carries about 15,900 vehicles per day on Fridays and 13,600 vehicles per day on Saturdays according to counts obtained on June 2 and 3, 2023, copies of which are enclosed. Vehicles travel at an 85th percentile speed of 40-mph according to a speed survey done on May 12, 2023, while the highway is posted with a 40-mph speed limit.

Alternative Modes

Pedestrian Facilities

Pedestrian facilities are generally lacking along the entirety of Silverado Trail and the connecting roadways, such as Hagen Road and Stonecrest Drive, which impacts convenient and continuous access for pedestrians and presents safety concerns in those locations where appropriate pedestrian infrastructure would address potential conflict points. However, given the rural character of the area, the lack of such facilities is typical.

As part of the project a sidewalk would be constructed along the portion of Silverado Trail fronting the project site. This would connect to the internal trail space.

The collision history for the study area was reviewed based on records available from the California Highway Patrol as published in their Statewide Integrated Traffic Records System (SWITRS) reports. The most current five-year period available is January 1, 2018, through December 31, 2022. There were no pedestrian-related crashes in the study area during the five-year study period.

Finding – There are major gaps in the existing pedestrian facilities in and beyond the study area. However, consistent with City policy, a sidewalk would be constructed along the project frontage as part of the project, improving pedestrian access in the area. The project site is located in a rural area and is auto-centric in both land use and purpose as a campground with additional expected use by food trucks. As such, it is reasonable to expect limited pedestrian activity off-site, so the current pedestrian access is considered adequate.

Bicycle Facilities

In the project area there are Class II bike lanes on Lincoln Avenue and Trancas Street, as well as a Class I Multi-Use Path on the Napa River Trail within one mile of the proposed project site. Installation of bike lanes is planned by the City as noted in the *City of Napa Bicycle Plan*, including along Silverado Trail directly along the project frontage and on Hagen Road to the north. Bicyclists ride in the roadway and/or on sidewalks along all other streets within the project study area. Table 2 summarizes the existing and planned bicycle facilities in the project vicinity, as contained in the *City of Napa Bicycle Plan*.

Table 2 – Bicycle Facility Summary

Status Facility	Class	Length (miles)	Begin Point	End Point
Existing				
<i>Napa River Trail</i>	I	1.2	Lincoln Ave	Trancas St
<i>Lincoln Ave</i>	II	1.4	California Blvd	Silverado Trail
<i>Trancas St</i>	II	0.7	Big Ranch Rd	Monticello Rd
Planned				
<i>Napa River Trail</i>	I	0.9	Third St	Trancas St
<i>Trancas St (Historic Bridge)*</i>	II	0.1	Monticello Rd	Silverado Trail
<i>Silverado Trail</i>	II	2.4	Soscol Ave	Silverado Trail (Northern CL)
<i>Hagen Rd</i>	III	0.4	Silverado Trail	Eastern City Limits

Source: *City of Napa Bicycle Plan*, 2021 except as indicated

* From the *Napa Countywide Bicycle Plans* and under the County's jurisdiction

Using the same study period and data source as indicated above for pedestrians it was determined that there were no bicyclist-related crashes during the five-year study period.

Finding – Bicycle facilities in the project vicinity are considered adequate taking into account the rural location of the project site. The City of Napa will be expanding their existing bicycle network to include bike lanes along the project frontage, so bicycle facilities will be improved once the planned facilities described above are completed by the City. However, the project improvements do not include construction of bike lanes along its frontage. Therefore, the project could inhibit the ability to install the bike lanes along the project frontage on Silverado Trail.

Finding – The proposed project would potentially have a significant impact on planned bike facilities if the existing right-of-way is of insufficient width to accommodate the planned bike lanes on Silverado Trail.

Recommendation – Right-of-way should be dedicated along the project frontage to accommodate the planned Class II bike lane on Silverado Trail if the existing right-of-way is insufficient for this planned future improvement.

Transit Facilities

The Napa Valley Transportation Authority (NVTA) Vine Transit provides fixed route bus service in the City of Napa. No current routes service the project study area or its immediate vicinity. Neither the *City of Napa 2040 General Plan* nor the NVTA has any proposed plans to extend service into the project area.

Finding – The lack of transit facilities serving the project site is considered acceptable for the rural location.

Significance Finding – The proposed project would have a potentially significant impact on bicycle facilities if there is insufficient right-of-way to accommodate the planned future bike lane on Silverado Trail. The impact on pedestrian facilities and transit service would be less than significant as the project does not conflict with any policies for these modes.

Mitigation – If the existing width of the right-of-way is insufficient to accommodate the planned bike lane on Silverado Trail, the additional width needed for this planned improvement should be dedicated as part of the project.

Vehicle Miles Traveled (VMT)

The City of Napa adopted the following VMT thresholds of significance for analyzing transportation impacts under CEQA in May 2021:

- Residential Projects: A proposed project exceeding a level of 15 percent below existing regional VMT per capita may indicate a significant transportation impact.
- Office Projects: A proposed project exceeding a level of 15 percent below existing regional VMT per employee may indicate a significant transportation impact.
- Retail Projects: A net increase in total VMT may indicate a significant transportation impact.

Thresholds for other project types, such as the proposed campground, are to be specified by the City of Napa on a case-by-case basis. City staff provided direction on how VMT for the proposed project should be assessed, relying on guidance provided by the California Governor's Office of Planning and Research (OPR) publication *Technical Advisory on Evaluating Transportation Impacts in CEQA* (referred to herein as the OPR Technical Advisory).

Guest VMT

For land uses not addressed in the OPR Technical Advisory, it is common practice to consider whether the land use of interest has travel characteristics that are similar to the residential, employment-based, or retail land use types that are addressed. If so, similar VMT assessment methodologies can often be used. In some cases, recreation-based uses have similarities to retail, in that the total demand for services (shopping trips, or in this case recreation visits) tends to remain steady at a regional level and customers/visitors often choose to visit a store/facility based on convenience and its proximity to their home. The use of retail-based methods for assessing recreational uses is also consistent with opinions offered by OPR Staff during VMT "office hours" for Rural Areas held on May 27, 2020, during which it was suggested that the analysis could be based on whether the recreational use would draw visitors from the wider region or whether it would be more local-serving.

A park or recreational facility may result in shifts to automobile travel patterns that are similar to those seen with retail uses. Research including that cited by OPR in the Technical Advisory has shown that adding local-serving retail land uses typically redistributes shopping trips rather than creating new trips, improving destination proximity, and thereby reducing trip lengths and total VMT. Although the campground may serve those from outside the local area, visitors wishing to camp in the area would already be able to visit the nearby campgrounds, including the Skyline Wilderness Park, located near the southeast Napa City limits. Therefore, adding a new campground does not necessarily change the total number of people using the camping facilities in the region, but instead redistributes where people choose to visit. The project could also potentially attract visitors who would otherwise stay at alternative lodging, such as hotels or motels, similarly resulting in a redistribution of visitor trips rather than an increase in VMT. Applying this logic, adding the proposed campground can be expected to shift automobile travel patterns but would be unlikely to increase the region's total VMT.

The location of the project also supports reduced VMT by improving destination proximity. The project site is located near central Napa, which would be expected to result in reduced trip lengths in comparison to

campgrounds located in more rural locations in Napa County. The site is approximately 1.5 miles from downtown Napa, where patrons would be able to access restaurants and other destinations via short trips from the project site. Therefore, while most project trips would likely be made using a vehicle, patrons choosing to stay at the project site instead of a campground or other lodging at a more remote location would be expected to generate fewer VMT, resulting in a more efficient travel pattern and a net VMT reduction on a regional scale.

Employee VMT

It is expected that there would be four full-time employees, four part-time housekeeping staff, and five part-time staff for periods of peak occupancy.

VMT projections for the City of Napa were obtained from the Solano Napa Activity Based travel demand Model (SNABM), which is the regional travel demand model jointly operated by the Napa Valley Transportation Authority (NVTA) and Solano Transportation Authority (STA). The SNABM was recently used to assess the potential transportation impacts associated with adoption of the City of Napa 2040 General Plan. Consistent with the City of Napa's adopted VMT significance thresholds, the General Plan EIR applied a significance threshold for office-employment uses that is set at 15 percent below baseline levels. Per the General Plan EIR, the Napa countywide average VMT per employee is 26.90 VMT per employee, and the corresponding significance threshold is 22.87 VMT per employee.

The proposed project site is in traffic analysis zone (TAZ) 56 of the SNABM model. Zone 56 includes a small portion of the west side of Silverado Trail south of Hagen Road and roughly 800 feet north of Stonecrest Drive. The model includes no employment or VMT data for this TAZ zone. Therefore, employee VMT data was estimated by calculating the weighted average VMT per capita for the five TAZs surrounding the project site that have the data. The weighted average VMT per employee was calculated to be 21.40. Since the weighted average VMT per employee in the project's surrounding TAZs is less than the 22.87 VMT per employee significance threshold, the proposed campsite would be considered to have a less-than-significant VMT impact associated with employee travel.

Significance Finding – The proposed project would be presumed to have a less-than-significant impact in terms of VMT.

Safety Considerations

Collision Analysis

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue. Using the collision data detailed above, the collision rate was calculated. The study segment of Silverado Trail between Hagen Road and Stonecrest Drive experienced 14 collisions during the five-year study period, translating to a collision rate of 1.04 collisions per million vehicle miles (c/mvm). This is less than the statewide average of 1.07 c/mvm for similar two-lane facilities, indicating that the segment is operating within normal safety parameters. A copy of the collision rate derivation is enclosed.

Sight Distance

Sight distance along Silverado Trail from the project driveway was evaluated based on sight distance criteria contained in the *Highway Design Manual* published by Caltrans. While sight distance criteria are not strictly applicable to driveways in areas classified as urban (which includes all locations within the limits of a city), to ensure that the driveway could operate safely, the recommended sight distance was evaluated based on stopping sight distance, with approach travel speed used as the basis for determining the recommended sight distance. Additionally, the stopping sight distance needed for a following driver to stop if there is a vehicle waiting to turn

into a side street or driveway was evaluated based on stopping sight distance criterion and the approach speed on the major street.

For a design speed of 40 mph, which is both the posted speed limit and the critical speed obtained through the spot speed survey, the minimum stopping sight distance needed is 300 feet. Field measurements indicate that sight distances are approximately 600 feet to the north and over 300 feet to the south. Similarly sight lines along Silverado Trail for a following vehicle exceed 300 feet, so are adequate for a following driver to observe and react to a vehicle slowing or stopped to turn into the site's driveway. Therefore, sight distances at the proposed project driveway are adequate.

While sight lines are currently adequate, overgrown landscaping can impede visibility to the south. Care should therefore be taken to maintain any landscaping to ensure that open sight lines are retained.

Finding – Sight distances at the proposed project driveway are adequate.

Recommendation – Vegetation along the project frontage near the site's driveway should be maintained at a height of less than three feet or above seven feet to ensure adequate sight lines at the driveway.

Turn Lane Warrants

The need for a left-turn lane on Silverado Trail at the project driveway was evaluated based on criteria contained in the *Intersection Channelization Design Guide*, National Cooperative Highway Research Program (NCHRP) Report No. 279, Transportation Research Board, 1985, as well as an update of the methodology developed by the Washington State Department of Transportation and published in the *Method For Prioritizing Intersection Improvements*, January 1997. The NCHRP report references a methodology developed by M. D. Harmelink that includes equations that can be applied to expected or actual traffic volumes to determine the need for a left-turn pocket based on safety issues.

Upon adding project-generated traffic to existing volumes, a left-turn lane would not be warranted on Silverado Trail at the project driveway during either of the peak periods evaluated. A copy of the warrant spreadsheet is enclosed for reference.

Significance Finding – The proposed project would not result in any hazards associated with its design or operation. It would therefore have a less-than-significant impact with regards to safety.

Emergency Response

The City of Napa Standard Specifications provide requirements to ensure that developments provide adequate access for emergency vehicles. Applicable requirements identified in these plans include minimum roadway widths of 14 feet for one-way traffic and 20 feet for two-way traffic, minimum driveway widths of 12 feet, and a maximum roadway grade of 15 percent. Additionally, at least two points for fire apparatus access shall be provided when it is determined by the Fire Chief that access by a single route might be impaired by vehicle congestion or factors that could limit ingress or egress.

The project site would be accessed via a new driveway on Silverado Trail. It is anticipated that all aspects of the site, including driveway widths and turning radii, would be designed in accordance with applicable standards; therefore, access would be expected to function acceptably for emergency response vehicles. However, coordination with the City Fire Chief regarding the adequacy of one fire apparatus access point is recommended.

While the project would be expected to result in slight increases in delay at nearby intersections, emergency response vehicles can claim the right-of-way by using their lights and sirens; therefore, the project would be expected to have a nominal effect on emergency response times.

Significance Finding – The proposed project would have a less-than-significant impact on emergency response, though the acceptability of a single access point should be reviewed by the City Fire Chief.

Recommendation – The applicant should communicate with the City Fire Chief to confirm whether an additional fire apparatus access point is required or not.

Conclusions and Recommendations

- The proposed project is expected to generate an average of 549 daily trips, including 21 during the morning peak hour and 27 during the evening peak hour.
- The proposed project would be expected to generate approximately 44 trips per day per acre, so is consistent with the City's Crucial Corridor policy.
- There is a lack of transit facilities in the vicinity of the project site, but this is considered adequate due to the location and type of project proposed.
- Pedestrian and bicycle facilities serving the project site are limited but will be improved once the planned facilities are completed. However, the proposed project would have a potentially significant impact on planned bike facilities if there is insufficient right-of-way to accommodate the planned Class II bike lane on Silverado Trail. It is recommended that the project include dedication of right-of-way if necessary to accommodate the planned bike lane.
- The proposed project would be expected to redistribute existing visitor trips rather than increase the level of visitation. Given the project's proximity to downtown Napa, trip distances would be reduced in comparison with nearby campgrounds in more rural locations, resulting in shorter trips lengths. Therefore, the project would not be expected to increase regional VMT. Additionally, the weighted average VMT per employee for the five surrounding traffic analysis zones with employee VMT data is less than the County's VMT per employee significance threshold. Therefore, the impact of the project on VMT would be less than significant.
- Sight distances at the project driveway are adequate though vegetation along the project frontage should be maintained to ensure that adequate sight lines are retained.
- A left-turn lane is not warranted on Silverado Trail at the project driveway.
- It is anticipated that all aspects of the site would be designed in accordance with applicable standards; therefore, access would be expected to function acceptably for emergency response vehicles though the need for a second access should be coordinated with the City Fire Chief.

Please let us know if there are any questions on this analysis. Thank you for giving us the opportunity to provide these services.

Sincerely,

Valerie Haines, EIT
Assistant Engineer



Dalene J. Whitlock, PE, PTOE
Senior Principal

DJW/vrh/NAP161.L1

Enclosure: Traffic Counts, Collision Rate Calculation, Left-turn Lane Warrant Spreadsheet

VOLUME

Silverado Trail Bet. Stonecrest Dr & Hagen Rd

Day: Friday
Date: 6/2/2023

City: Napa
Project #: CA23_080177_001

DAILY TOTALS					NB	SB	EB	WB	Total		
					8,175	7,751	0	0	15,926		
AM Period	NB	SB	EB	WB	TOTAL	PM Period	NB	SB	EB	WB	TOTAL
00:00	5	10			15	12:00	114	126			240
00:15	6	6			12	12:15	131	133			264
00:30	7	3			10	12:30	111	127			238
00:45	9	27	3	22	12	12:45	131	487	134	520	265
01:00	3	5			8	13:00	121	125			246
01:15	2	2			4	13:15	150	124			274
01:30	3	3			6	13:30	142	136			278
01:45	2	10	2	12	4	13:45	150	563	144	529	294
02:00	2	1			3	14:00	141	134			275
02:15	0	3			3	14:15	138	176			314
02:30	7	3			10	14:30	134	152			286
02:45	2	11	3	10	5	14:45	158	571	168	630	326
03:00	6	1			7	15:00	165	193			358
03:15	1	0			1	15:15	143	204			347
03:30	4	4			8	15:30	141	206			347
03:45	2	13	3	8	5	15:45	157	606	176	779	333
04:00	10	7			17	16:00	149	167			316
04:15	11	1			12	16:15	146	176			322
04:30	16	9			25	16:30	155	164			319
04:45	33	70	7	24	40	16:45	154	604	170	677	324
05:00	93	11			104	17:00	140	189			329
05:15	159	14			173	17:15	123	196			319
05:30	139	30			169	17:30	122	168			290
05:45	84	475	29	84	113	17:45	106	491	156	709	262
06:00	78	32			110	18:00	104	131			235
06:15	66	41			107	18:15	94	120			214
06:30	99	57			156	18:30	97	93			190
06:45	109	352	46	176	155	18:45	83	378	101	445	184
07:00	108	52			160	19:00	105	80			185
07:15	113	71			184	19:15	99	74			173
07:30	126	78			204	19:30	74	74			148
07:45	152	499	118	319	270	19:45	64	342	76	304	140
08:00	127	111			238	20:00	72	59			131
08:15	144	153			297	20:15	49	56			105
08:30	127	115			242	20:30	35	58			93
08:45	154	552	121	500	275	20:45	63	219	44	217	107
09:00	121	113			234	21:00	57	45			102
09:15	125	88			213	21:15	50	40			90
09:30	110	106			216	21:30	42	38			80
09:45	130	486	126	433	256	21:45	43	192	44	167	87
10:00	102	111			213	22:00	59	33			92
10:15	112	118			230	22:15	41	34			75
10:30	119	102			221	22:30	23	38			61
10:45	132	465	128	459	260	22:45	26	149	26	131	52
11:00	139	109			248	23:00	29	18			47
11:15	114	143			257	23:15	16	30			46
11:30	142	136			278	23:30	43	17			60
11:45	118	513	131	519	249	23:45	12	100	12	77	24
TOTALS	3473	2566			6039	TOTALS	4702	5185			9887
SPLIT %	57.5%	42.5%			37.9%	SPLIT %	47.6%	52.4%			62.1%

DAILY TOTALS					NB	SB	EB	WB	Total
					8,175	7,751	0	0	15,926

AM Peak Hour	08:00	11:15			08:00	PM Peak Hour	14:45	15:00			15:00
AM Pk Volume	552	536			1052	PM Pk Volume	607	779			1385
Pk Hr Factor	0.896	0.937			0.886	Pk Hr Factor	0.920	0.945			0.967
7 - 9 Volume	1051	819	0	0	1870	4 - 6 Volume	1095	1386	0	0	2481
7 - 9 Peak Hour	08:00	08:00			08:00	4 - 6 Peak Hour	16:00	16:45			16:15
7 - 9 Pk Volume	552	500	0	0	1052	4 - 6 Pk Volume	604	723	0	0	1294
Pk Hr Factor	0.896	0.817	0.000	0.000	0.886	Pk Hr Factor	0.974	0.922	0.000	0.000	0.983

VOLUME

Silverado Trail Bet. Stonecrest Dr & Hagen Rd

Day: Saturday
Date: 6/3/2023

City: Napa
Project #: CA23_080177_001

DAILY TOTALS					NB	SB	EB	WB	Total		
					6,926	6,721	0	0	13,647		
AM Period	NB	SB	EB	WB	TOTAL	PM Period	NB	SB	EB	WB	TOTAL
00:00	8	8			16	12:00	143	127			270
00:15	14	15			29	12:15	142	132			274
00:30	7	11			18	12:30	150	103			253
00:45	4	33	5	39	9	12:45	161	596	121	483	282
01:00	9	5			14	13:00	130	125			255
01:15	4	6			10	13:15	142	130			272
01:30	4	4			8	13:30	122	113			235
01:45	36	53	5	20	41	13:45	125	519	124	492	249
02:00	7	3			10	14:00	144	131			275
02:15	3	1			4	14:15	136	131			267
02:30	3	3			6	14:30	130	127			257
02:45	3	16	0	7	3	14:45	118	528	159	548	277
03:00	4	3			7	15:00	130	157			287
03:15	3	5			8	15:15	151	141			292
03:30	5	2			7	15:30	102	138			240
03:45	4	16	6	16	10	15:45	121	504	134	570	255
04:00	3	2			5	16:00	107	141			248
04:15	10	1			11	16:15	114	170			284
04:30	29	0			29	16:30	90	156			246
04:45	19	61	6	9	25	16:45	100	411	148	615	248
05:00	41	4			45	17:00	91	156			247
05:15	74	8			82	17:15	87	144			231
05:30	74	13			87	17:30	79	153			232
05:45	43	232	10	35	53	17:45	98	355	145	598	243
06:00	36	10			46	18:00	86	130			216
06:15	37	16			53	18:15	68	101			169
06:30	42	17			59	18:30	58	80			138
06:45	59	174	28	71	87	18:45	54	266	108	419	162
07:00	57	32			89	19:00	79	88			167
07:15	52	43			95	19:15	68	86			154
07:30	72	49			121	19:30	58	73			131
07:45	96	277	48	172	144	19:45	77	282	74	321	151
08:00	78	46			124	20:00	66	68			134
08:15	91	76			167	20:15	66	67			133
08:30	101	77			178	20:30	52	42			94
08:45	100	370	78	277	178	20:45	71	255	55	232	126
09:00	107	100			207	21:00	61	44			105
09:15	109	105			214	21:15	64	60			124
09:30	133	117			250	21:30	47	32			79
09:45	107	456	109	431	216	21:45	62	234	24	160	86
10:00	119	125			244	22:00	34	46			80
10:15	128	111			239	22:15	42	58			100
10:30	133	96			229	22:30	35	40			75
10:45	144	524	110	442	254	22:45	22	133	29	173	51
11:00	114	111			225	23:00	29	25			54
11:15	133	118			251	23:15	22	25			47
11:30	136	126			262	23:30	17	18			35
11:45	165	548	153	508	318	23:45	15	83	15	83	30
TOTALS	2760	2027			4787	TOTALS	4166	4694			8860
SPLIT %	57.7%	42.3%			35.1%	SPLIT %	47.0%	53.0%			64.9%

DAILY TOTALS					NB	SB	EB	WB	Total
					6,926	6,721	0	0	13,647
AM Peak Hour	11:45	11:30			11:30	PM Peak Hour	12:00	16:15	14:30
AM Pk Volume	600	538			1124	PM Pk Volume	596	630	1113
Pk Hr Factor	0.909	0.879			0.884	Pk Hr Factor	0.925	0.926	0.953
7 - 9 Volume	647	449	0	0	1096	4 - 6 Volume	766	1213	1979
7 - 9 Peak Hour	08:00	08:00			08:00	4 - 6 Peak Hour	16:00	16:15	16:00
7 - 9 Pk Volume	370	277	0	0	647	4 - 6 Pk Volume	411	630	1026
Pk Hr Factor	0.916	0.888	0.000	0.000	0.909	Pk Hr Factor	0.901	0.926	0.903

Roadway Segment Collision Rate Worksheet

TIS for The Grange Project

Location: Silverado Road

Date of Count: Saturday, June 3, 2023

Average Daily Traffic (ADT): 13,600

Number of Collisions: 14

Number of Injuries: 11

Number of Fatalities: 0

Start Date: January 1, 2018

End Date: December 31, 2022

Number of Years: 5

Highway Type: Conventional 2 lanes or less

Area: Urban

Design Speed: ≤45

Segment Length: 0.5 miles

Direction: North/South

$$\text{Collision Rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times \text{Days per Year} \times \text{Segment Length} \times \text{Number of Years}}$$

$$\text{Collision Rate} = \frac{14 \times 1,000,000}{13,600 \times 365 \times 0.54 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Segment	1.04 c/mvm	0.0%	78.6%
Statewide Average*	1.07 c/mvm	1.1%	43.9%

Notes

ADT = average daily traffic volume

c/mvm = collisions per million vehicle miles

* 2019 Collision Data on California State Highways, Caltrans

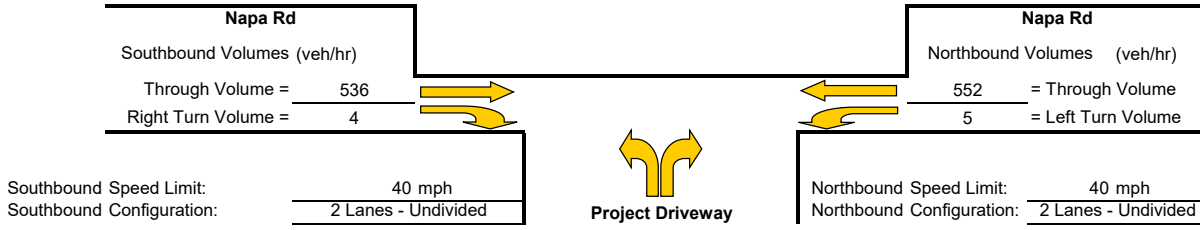
Turn Lane Warrant Analysis - Tee Intersections

Study Intersection: Silverado Trail & Project Driveway

Study Scenario: Existing plus Project AM

Direction of Analysis Street: North/South

Cross Street Intersects: From the West



Southbound Right Turn Lane Warrants

1. Check for right turn volume criteria

Thresholds not met, continue to next step

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold	AV =	1020.1
Advancing Volume	Va =	540
If $AV < Va$ then warrant is met		

Right Turn Lane Warranted: NO

Southbound Right Turn Taper Warrants

(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

2. Check advance volume threshold criteria for taper

Advancing Volume Threshold	AV =	-
Advancing Volume	Va =	540
If $AV < Va$ then warrant is met		

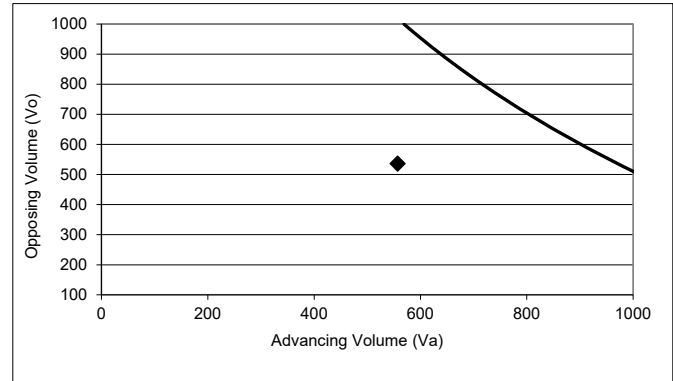
Right Turn Taper Warranted: NO

Northbound Left Turn Lane Warrants

Percentage Left Turns %lt 0.9 %

Advancing Volume Threshold AV 970 veh/hr

If $AV < Va$ then warrant is met



◆ Study Intersection

Two lane roadway warrant threshold for: 40 mph

Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: NO

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements*, January 1997.

The right turn lane and taper analysis is based on work conducted by Cottrell in 1981.

The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

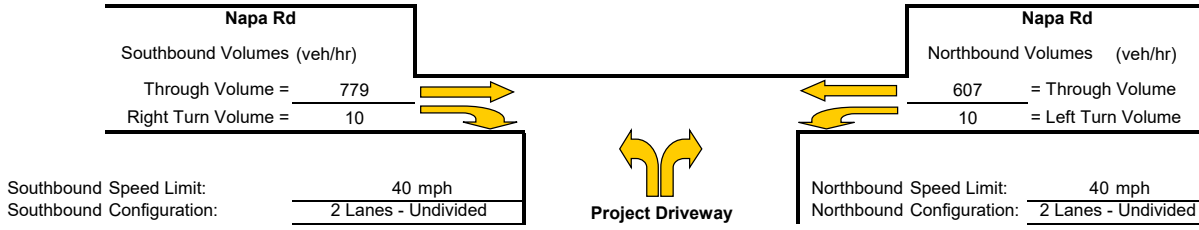
Turn Lane Warrant Analysis - Tee Intersections

Study Intersection: Silverado Trail & Project Driveway

Study Scenario: Existing plus Project PM

Direction of Analysis Street: North/South

Cross Street Intersects: From the West



Southbound Right Turn Lane Warrants

1. Check for right turn volume criteria

Thresholds not met, continue to next step

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold	AV =	975.1
Advancing Volume	Va =	789
If $AV < Va$ then warrant is met		

Right Turn Lane Warranted: NO

Southbound Right Turn Taper Warrants

(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

2. Check advance volume threshold criteria for taper

Advancing Volume Threshold	AV =	-
Advancing Volume	Va =	789
If $AV < Va$ then warrant is met		

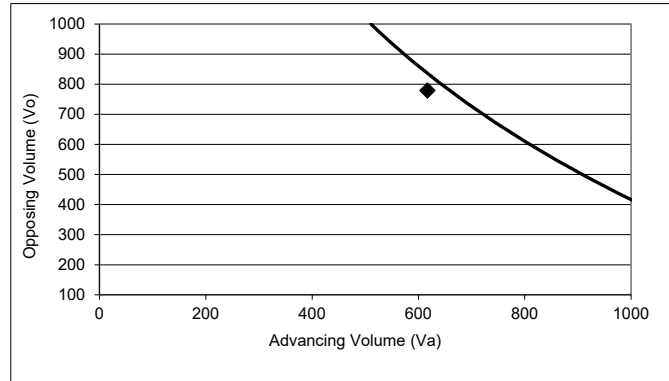
Right Turn Taper Warranted: NO

Northbound Left Turn Lane Warrants

Percentage Left Turns %lt 1.6 %

Advancing Volume Threshold AV 659 veh/hr

If $AV < Va$ then warrant is met



◆ Study Intersection

Two lane roadway warrant threshold for: 40 mph

Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: NO

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements*, January 1997.

The right turn lane and taper analysis is based on work conducted by Cottrell in 1981.

The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.