Traffic Study for the Pacific Knolls Project

Prepared for the City of Sebastopol

Submitted by
W-Trans

July 24, 2024

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Introduction

This report presents an analysis of the potential transportation, traffic, and mobility impacts that would be associated with a proposed residential development to be located on the southeast corner of Healdsburg Avenue (SR 116) and Murphy Avenue in the City of Sebastopol. The traffic study was completed in accordance with the criteria established by the City of Sebastopol and is consistent with standard traffic engineering techniques.

Prelude

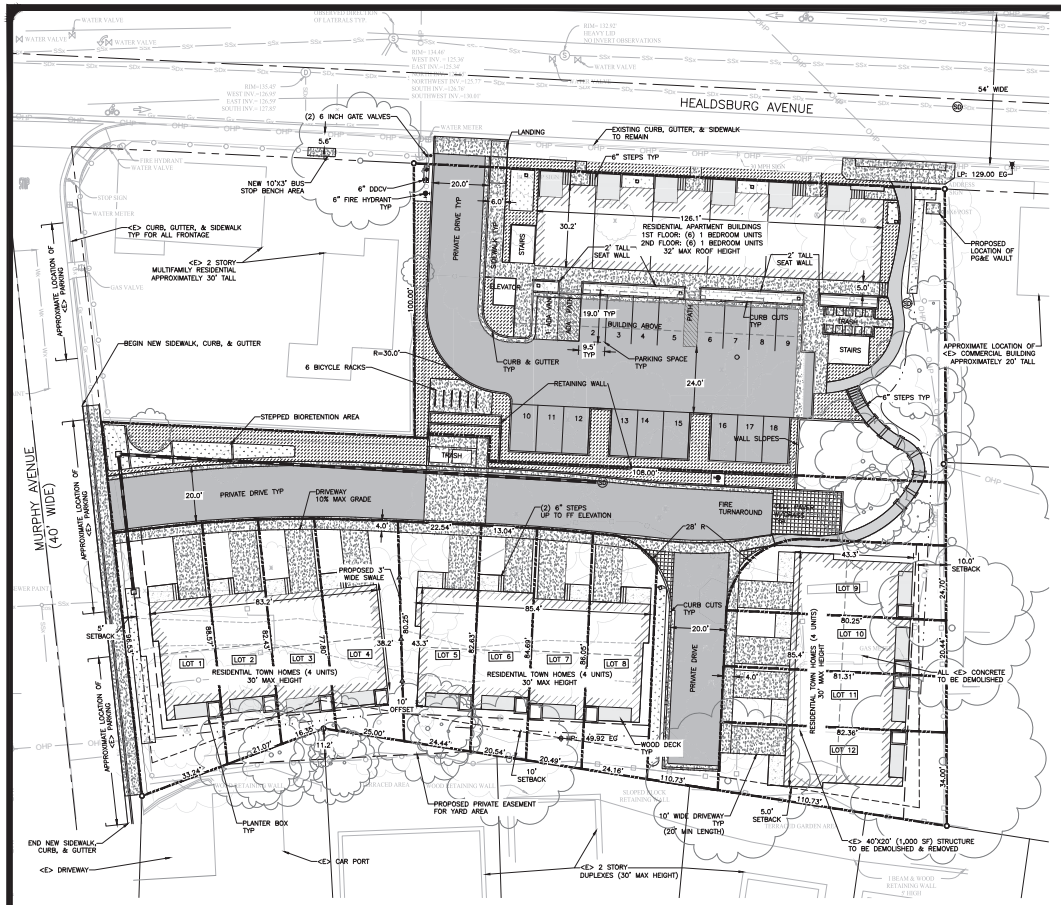
The purpose of a traffic impact study is to provide City staff and policy makers with data that they can use to make an informed decision regarding the potential transportation impacts of the proposed project, and any associated improvements that would be required to mitigate these impacts to an acceptable level under the California Environmental Quality Act (CEQA), the City's General Plan, or other policies. This report provides an analysis of those items that are identified as areas of environmental concern under the CEQA. Impacts associated with access for pedestrians, bicyclists, and to transit; the vehicle miles traveled (VMT) generated by the project; and safety concerns are addressed in the context of the CEQA criteria. While no longer a part of the CEQA review process, vehicular traffic service levels at key intersections were evaluated for consistency with General Plan policies by determining the number of new trips that the proposed use would be expected to generate, distributing these trips to the surrounding street system based on anticipated travel patterns specific to the proposed project, then analyzing the effect the new traffic would be expected to have on the study intersections and need for improvements to maintain acceptable operation.

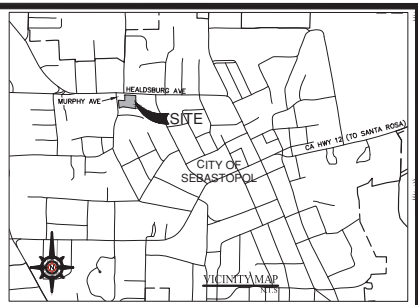
The report is organized to provide background data that supports the various aspects of the analysis, followed by the assessment of CEQA issues and then evaluation of policy-related issues.

Project Profile

Project Description

The proposed residential project site is located on a vacant parcel near the intersection of Healdsburg Avenue/Murphy Avenue. Access would be provided via two new driveways, one on Healdsburg Avenue and one on Murphy Avenue. The project would include 24 residential units, including 12 townhomes with access only onto Murphy Avenue and 12 apartments with access only onto Healdsburg Avenue. The proposed project site plan is shown in Figure 1.





ABBREVIATIONS:

AC	ASPHALT CONCRETE	LF	LINEAL FEET
ADA	AMERICANS WITH DISABILITIES ACT	LP	LOW POINT
BRA	BIO-RETENTION AREA	N	NORTH
DDCV	DOUBLE DETECTOR CHECK VALVE	NA	NOT APPLICABLE
DI	DRAINAGE INLET	R	RADIUS
<E>	EXISTING	S	SOUTH
E	EAST	SCH	SCHEDULE
EG	EXISTING GRADE	SD	STORM DRAIN
EVG	EDGE OF VALLEY GUTTER	SVC	SERVICE
FF	FINISHED FLOOR	SW	SIDEWALK
FL	FLOW LINE	TC	TOP OF CURB
HP	HIGH POINT	TG	TOP OF GRATE
INV	INVERT	TYP	TYPICAL
		W	WEST

PROJECT DATA:

PROJECT NAME: PACIFIC KNOLLS

APPLICANT AND PROPERTY OWNER:

PACIFIC REALTY DEVELOPMENT LLC
1555 GRANT AVENUE, NOVATO, CA 94945
(405) 686-0772

PROJECT SURVEYOR / ENGINEER:

LACO ASSOCIATES
1550 AIRPORT BLVD., SUITE 120
SANTA ROSA, CA 95403
707-525-1222

SITE ADDRESS:

7621 HEALDSBURG AVENUE
SEBASTOPOL, CA 95472

ASSESSOR PARCEL NUMBER: 004-291-019

BASIS OF ELEVATIONS:

THE BASIS OF ELEVATION FOR THIS SURVEY WAS ESTABLISHED FROM STATIC GPS OBSERVATIONS AT PROJECT POINT #1. ELEVATION = 140.79 FEET (NAVD88).

PROPOSED LAND USE:	RESIDENTIAL MULTIFAMILY
ZONING DISTRICT:	OFFICE COMMERCIAL (CO) & MULTIFAMILY RESIDENTIAL (R7)
EXISTING LOT SIZE:	1.28 ACRES
AREA OF SUBDIVISION:	1.28 ACRES

EXISTING LOT COVERAGE: 2% (1,000 SF)

TOTAL NUMBER OF RESIDENTIAL UNITS: 24

GRADING:

EARTHWORK DATA	
CUT	2530 CY
FILL	1515 CY
OFF-HAUL	1015 CY

LEGEND/ABBREVIATIONS:

ROOF RIDGE LINE
SETBACK LINE
PROPOSED EASEMENT
PROPOSED PROPERTY LINE
EXISTING WOOD FENCE
EXISTING WIRE FENCE
EXISTING OVERHEAD POWER
EXISTING STORM DRAIN
EXISTING SEWER PIPE
BRA AREA
LANDSCAPING
CONCRETE
AC
PATHWAY
PATIO
TURF CELL PAVER
STORM DRAIN CLEANOUT
12"X12" CATCH BASIN W/ GRATE
FLOW DIRECTION ARROW
STORM DRAIN MANHOLE
FIRE HYDRANT
DOUBLE DETECTOR CHECK VALVE
GATE VALVE
PRESERVED TREE (26 TREES)
DEMOLISHED TREE (42 TREES)

PROJECT DATA TABLE

LOT	LOT SIZE (SF)	GARAGE AREA (SF)	FIRST FLOOR BUILDING AREA (SF)	SECOND FLOOR BUILDING AREA (SF)	TOTAL BUILDING FLOOR AREA (SF)	FLOOR AREA RATIO	LOT COVERAGE	MAX ALLOWABLE LOT COVERAGE	PROPOSED PARKING SPACES	REQUIRED PARKING SPACES
1	2,995	236	813	700	1513	43%	29%	65%	2	2
2	1,746	236	785	700	1485	72%	48%	65%	2	2
3	1,617	236	785	700	1485	77%	52%	65%	2	2
4	2,165	236	785	700	1485	58%	39%	65%	2	2
5	2,222	236	813	700	1513	57%	40%	65%	2	2
6	1,708	236	785	700	1485	73%	49%	65%	2	2
7	1,742	236	785	700	1485	72%	48%	65%	2	2
8	2,024	236	785	700	1485	62%	42%	65%	2	2
9	1,872	236	813	700	1513	68%	43%	65%	2	2
10	1,649	236	785	700	1485	76%	48%	65%	2	2
11	1,671	236	785	700	1485	75%	47%	65%	2	2
12	2,445	236	785	700	1485	51%	32%	65%	2	2
HEALDSBURG AVE APTS.	20,505	0	3,559	5,077	8636	42%	20%	NA	18	18
COMMON PARCEL	11,336	NA	NA	NA	NA	NA	NA	NA	NA	NA

DATE
NO. REVISION

LACO SURVEYORS | ENGINEERS | PLANNERS | GRANT WRITERS
lacoassociates.com

PACIFIC KNOLLS
SEBASTOPOL, CALIFORNIA
ARCHITECTURAL SITE PLAN

JOB NO. 9272.02
DATE 3/26/2024
DESIGNER DCT
CHECKED PAP DRAWN DCT
SHEET C1.00

Source: LACO Associates 6/24

seb083.ai 6/24

Traffic Study for the Pacific Knolls Project

Figure 1 – Site Plan

W-Trans

Transportation Setting

Study Area and Periods

The study area varies depending on the topic. For pedestrian trips it consists of all streets within a half-mile of the project site that would lie along primary routes of pedestrian travel, or those leading to nearby generators or attractors. For bicycle trips it consists of all streets within one mile of the project site that would lie along primary routes of bicycle travel. For the safety and traffic operational analyses, it consists of the project frontage and the intersection of Healdsburg Avenue (SR 116)/Murphy Avenue and the project access points on both frontages.

Operating conditions during the a.m. and p.m. peak periods were evaluated to capture the highest potential impacts for the proposed project as well as the highest volumes on the local transportation network. The morning peak hour occurs between 7:00 and 9:00 a.m. and reflects conditions during the home to work or school commute, while an extended p.m. peak period between 2:00 and 6:00 p.m. was counted to capture afternoon traffic from the nearby schools including Analy High School as well as traffic typically reflecting the highest level of congestion during the homeward bound commute.

Study Intersection

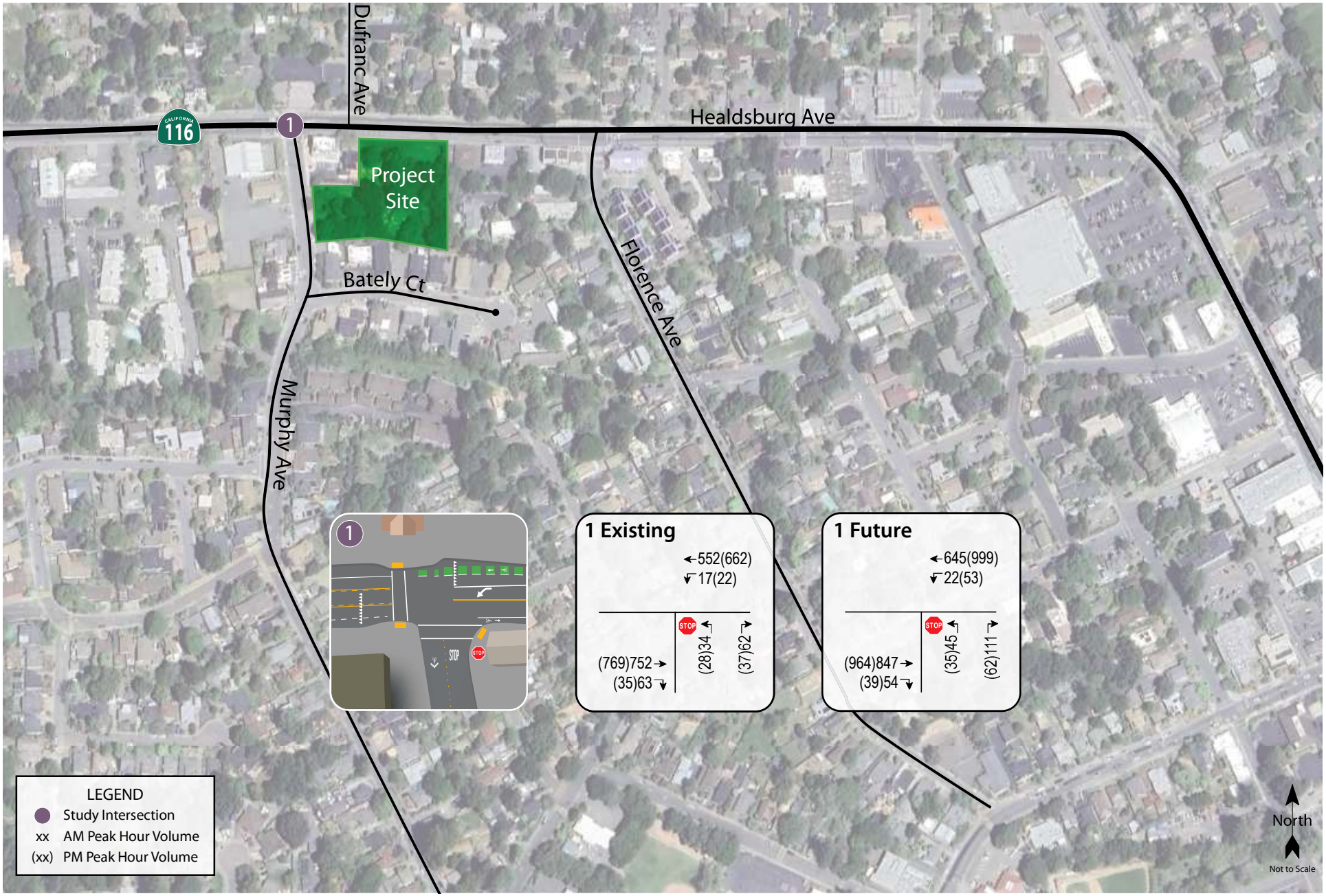
Healdsburg Avenue (SR 116)/Murphy Avenue is a three-legged intersection with stop control on the northbound Murphy Avenue approach. Marked crosswalks exist on the west and south legs of the intersection. There are yield markings on the east and west legs approaching the intersection and Circular Rapid Flashing Beacons are present on the west leg which is the standard crosswalk warning device used in the City of Sebastopol. Class II bike lanes exist on SR 116, while there are sharrow markings on Murphy Avenue which is a city designated bike route.

The location of the study intersection and existing lane configurations and controls are shown in Figure 2.

Collision History

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue. Collision rates were calculated 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 October 1, 2018, through September 30, 2023.

The calculated collision rate for the study intersections was compared to average collision rates for similar facilities statewide, as indicated in *2021 Collision Data on California State Highways*, California Department of Transportation (Caltrans). These average rates statewide are for intersections in the same environment (urban), with the same number of approaches, and the same controls. The study intersection of Healdsburg Avenue/Murphy Avenue had a calculated collision rate of 0.04 collisions per million vehicles entering (c/mve) based on the four reported crashes, which is below the statewide average collision rate of 0.13 c/mve for similar interactions. The collision rate calculations are provided in Appendix A.



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Traffic Study for the Pacific Knolls Project

Figure 2 – Study Area, Existing Lane Configurations, Existing Traffic Volumes and Future Traffic Volumes

Circulation System

This section addresses the first transportation bullet point on the CEQA checklist, which relates to the potential for a project to conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities.

Pedestrian Facilities

Existing and Planned Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, pedestrian signal phases, curb ramps, curb extensions, and various streetscape amenities such as lighting, benches, etc. Existing pedestrian facilities along the proposed project site frontage as well as within a one-quarter mile distance of the project site were reviewed.

A generally connected pedestrian network currently exists along SR 116 near the project site. However, there is no sidewalk on the north side of SR 116 west of its intersection with Lyding Lane until Soll Court. An enhanced crosswalk with Circular Rapid Flashing Beacons is present on the west leg of Healdsburg Avenue (SR 116)/Murphy Avenue, which connects to DuFranc Avenue to the northeast, providing pedestrian access to the West County-Joe Rodota Trail, located 550 feet north of the SR 116/DuFranc Avenue intersection.

Pedestrian Safety

The collision history for the study area was reviewed to determine if any trends or patterns may indicate a potential safety issue for pedestrians. Collision records available from SWITRS reports were reviewed for the most current five-year period available, which was October 1, 2018, through September 30, 2023, at the time of the analysis. During the five-year study period there were no reported collisions involving a pedestrian within a half mile of the project site.

Impact on Pedestrian Facilities

Given the proximity of commercial uses, it is reasonable to assume that some residents will want to walk, bicycle, and/or use transit for trips from and to the project site. Sidewalk connectivity is generally continuous throughout the surrounding neighborhood and along the project frontage. Per the site plan, there is a proposed pathway along the eastern edge of the site, connecting the existing sidewalk along the project frontage on Healdsburg Avenue and the proposed internal pedestrian network.

Finding – Pedestrian facilities serving the project site are adequate. The paths proposed and recommended as part of the project would provide adequate access to the existing pedestrian facilities. The project would not conflict with any existing plans or policies relative to pedestrian facilities.

Bicycle Facilities

Existing and Planned Bicycle Facilities

The *Highway Design Manual 7th Edition*, Caltrans, 2020, classifies bikeways into four categories:

- **Class I Multi-Use Path –** a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flows of motorized traffic minimized.
- **Class II Bike Lane** – a striped and signed lane for one-way bike travel on a street or highway.
- **Class III Bike Route** – signage only for shared use with motor vehicles within the same travel lane on a street or highway.

- **Class IV Bikeway** – also known as a separated bikeway, a Class IV Bikeway is for the exclusive use of bicycles and includes a separation between the bikeway and the motor vehicle traffic lane. The separation may include, but is not limited to, grade separation, flexible posts, inflexible physical barriers, striped buffers, or on-street parking.

In the project vicinity there are several existing Class I, II, and III bikeway facilities, including the Class I multi-use bicycle and pedestrian West County-Joe Rodota Trail. There are existing Class II bicycle lanes along SR 116 between the north city limit and North Main Street, along Gravenstein Highway North and Healdsburg Avenue, along Covert Lane between Ragle Road and SR 116, and along High School Road-North Main Street between Occidental Road and SR 116. DuFranc Avenue to the northeast of the project site provides bicyclist access to the West County-Joe Rodota Trail, which extends north to Occidental Road and east to Analy High School and provides connection facilities to the Joe Rodota Trail. There are also existing Class III bike routes in the project vicinity including along Murphy Avenue, most of which feature sharrow pavement markings.

According to the *Draft Sonoma County Active Transportation Plan* (2024), Class I bicycle facilities are planned on Analy Avenue between North Main Street and Sunset Avenue (in front of and through Analy High School), along Bodega Avenue between Pleasant Hill Road and Nelson Way, on Ragle Road between Covert Lane and Bodega Avenue, along SR 116 between Mill Station Road/West County Trail and Keating Avenue and connecting Willow Street/South Main Street to the Joe Rodota Trail. Class III routes are planned along various streets within one mile of the project vicinity. Bicyclists ride in the roadway and/or on sidewalks along all other streets within the project study area. Table 1 summarizes the existing and planned bicycle facilities in the project vicinity, as contained in the *Draft Sonoma County Active Transportation Plan*.

Table 1 – Bicycle Facility Summary				
Status **Facility**	**Class**	**Length (miles)**	**Begin Point**	**End Point**
Existing				
West County/Rodota Trail	I	1.68	Occidental Rd	N Main St
Covert Ln	II	0.50	Ragle Rd	SR 116
SR 116 (Gravenstein Hwy N)	II	0.52	North City Limit	Covert Ln
SR116 (Healdsburg Ave)	II	0.64	Covert Ln	N Main St
High School Rd/N Main St	II	1.56	Occidental Rd	SR 116
Valentine Ave	III	0.60	Ragle Rd	Murphy Ave
Danmar Dr/Norlee St	III	0.48	SR 116	Covert Ln
Washington Ave	III	0.56	Willard Libby Park	Bodega Ave
Ragle Rd	III	0.52	Covert Ln	Bodega Ave
Pleasant Hill Ave	III	0.50	Covert Ln	Bodega Ave
Zimpher Dr	III	0.21	Covert Ln	Valentine Ave
Murphy Ave	III	0.38	SR 116	Valentine Ave
Planned				
Analy Ave	I	0.18	N Main St	Sunset Ave
Bodega Ave	I	0.34	Pleasant Hill Rd	Nelson Wy
Ragle Rd	I	0.52	Covert Ln	Bodega Ave
SR 116	I/IV	1.29	Mill Station Rd/West County Trail	Keating Ave
Willow St Connection	I	0.07	Willow St/S Main St	Joe Rodota Trail
Dutton Ave	III	0.16	Huntley St	Bodega Ave
Florence Ave	III	0.05	Huntley St	Wilton Ave
Huntley St	III	0.22	Murphy Ave	Florence Ave
Johnson St	III	0.27	Eddie Ln	Laguna Pkwy
McKinley Ave	III	0.22	Morris St	Petaluma Ave
Sunset Ave	III	0.13	Taft St	Johnson St
Washington Ave	III	0.44	Willard Libby Park	Murphy Ave
Wilton Ave	III	0.23	Florence Ave	N Main St

Source: *Draft Sonoma County Active Transportation Plan*, Sonoma County Transportation Authority, 2024

Impact on Bicycle Facilities

The project as proposed would not result in the construction of any new bicycle facilities nor would it impact the ability of the City or Caltrans to construct any planned facilities.

Bicyclist Safety

Collision records for the study area were reviewed to determine if there had been any bicyclist-involved crashes during the five-year study period between January 1, 2019, and December 31, 2023. There were no reported collisions involving bicyclists in the study area, therefore no remedial action is recommended.

Finding – Existing and planned bicycle facilities would provide adequate access for bicyclists traveling to and from the project site. The project would not conflict with any policies or plans for bicycle facilities.

Transit Facilities

Existing Transit Facilities

Sonoma County Transit

Sonoma County Transit (SCT) provides fixed-route bus service in Sebastopol and surrounding areas. SCT Route 20 and Route 24 both have stops within a half mile of the project site. Route 20 runs from the Coddingtown Mall in the City of Santa Rosa to Monte Rio in West County. Route 24 runs from the Sebastopol Transit Hub to the intersection of SR 116/Mill Station Road. Existing transit routes and details regarding their operation are summarized in Table 2.

Table 2 – Transit Routes

Transit Agency Route	Distance to Stop (mi)[1]	Service			Connections
		Days of Operation	Time	Frequency	
Sonoma County Transit					
Route #20	< 0.1	Mon-Fri Sat-Sun	6:30 a.m. - 9:30 p.m. 6:30 a.m. - 9:30 p.m.	50 – 80 min 50 – 105 min	Monte Rio Coddingtown/Santa Rosa
Route #24	< 0.1	Mon-Fri Sat	7:45 a.m. - 6:30 p.m. 7:45 a.m. - 5:30 p.m.	45 – 55 min 45 – 55 min	Sebastopol SR 116/Mill Station Rd

Notes: [1] Defined as the shortest walking distance between the project site and the nearest bus stop
Source: sctransit.com/maps-schedules

Two to three bicycles can be carried on most SCT buses, and bike rack space is provided on a first-come, first-served basis. Additional bicycles are allowed on SCT buses at the discretion of the bus operator.

Dial-a-ride, also known as paratransit or door-to-door service, is available for those who are unable to independently use the transit system due to a physical or mental disability. SCT Paratransit is designed to serve the needs of individuals with disabilities within the City of Sebastopol and the greater Sonoma County area.

Impact on Transit Facilities

Given the size of the proposed project, there is unlikely to be substantial new demand for transit service generated by the development, though it is likely that some residents or visitors will occasionally choose to use transit. The existing pedestrian facilities are adequate to provide access from the project site to the transit stops and there are sufficient routes and headways to accommodate the nominal additional demand.

Finding – Existing public transit routes are adequate to accommodate the additional demand generated by the project, and existing bus stops are accessible via continuous sidewalks. Transit facilities serving the project site are

therefore considered to be adequate and the project would not conflict with any programs or policies regarding transit.

Significance Finding – The proposed project would have a less-than-significant impact relative to pedestrian, bicycle, and transit modes as it would be consistent with existing plans, policies, and programs for these modes.

Vehicle Miles Traveled (VMT)

The potential for the project to conflict or be inconsistent with CEQA Guidelines § 15064.3, subdivision (b) was evaluated based the project's anticipated Vehicle Miles Traveled (VMT). This is the second bullet point in the CEQA checklist.

Background

The Vehicle Miles Traveled (VMT) associated with a project is the primary basis for determining traffic impacts under CEQA. Because the City of Sebastopol has not yet adopted standards of significance for evaluating VMT, guidance provided by the California Governor's Office of Planning and Research (OPR) in the publication *Transportation Impacts (SB 743) CEQA Guidelines Update and Technical Advisory*, 2018, was used (referred to herein as the Technical Advisory). These criteria are consistent with those applied by Caltrans as outlined in the *Vehicle Miles Traveled-Focused Transportation Impact Study Guide*, California Department of Transportation, May 2020.

Significance Threshold

The OPR Technical Advisory provides VMT threshold guidance for several land use types. Residential uses are assessed using a home-based VMT per capita metric, with VMT significance thresholds set at a level of 15 percent below the citywide or regional average. The Technical Advisory indicates that it may be appropriate to apply a countywide, rather than regional, average if most people both live and work within the smaller geographic area. According to data contained in the *Sonoma County Travel Behavior Study*, Fehr & Peers, 2020, approximately 98 percent of Sebastopol's vehicle trips remain within Sonoma County. Use of a common model to produce both project-level and threshold values also allows for a clear "apples to apples" assessment. Accordingly, the applied significance threshold was based on the Sonoma County per-capita VMT average rather than the nine-County Bay Area regional average.

SCTA operates and maintains the regional travel demand model that produces baseline VMT estimates. The VMT thresholds and projections applied in this analysis reflect the SCTM19 model updated in December 2021, which remains the current version as of the June 2024 timeframe of this analysis. Based on output from the SCTA model, the existing average residential VMT per capita in the County of Sonoma is 16.60 miles. VMT significance thresholds are set at 15 percent below this level, or 14.11 miles. Accordingly, the project would have a potentially significant impact on VMT if its projected residential VMT per Capita exceeds 14.11 miles.

Project VMT Assessment

VMT per Capita

The SCTA model includes traffic analysis zones (TAZ) covering geographic areas throughout Sonoma County. The Pacific Knolls project site is located within TAZ 808, which has a baseline VMT per capita of 16.46 miles. For the project to achieve the applied threshold of 14.11 VMT per capita, its projected VMT per capita would need to be reduced by at least 14.3 percent.

Consideration was given to whether adjustments to the baseline per-capita VMT estimates produced by the SCTA model are warranted to reflect the project's characteristics. SCTA has developed and made available a VMT Reduction Tool to assist in making project-specific VMT adjustments as well as quantify VMT mitigation measures. One of the characteristics having the greatest influence on VMT levels, thereby requiring adjustments to baseline values, pertains to the residential density of a development. The SCTA VMT Reduction Tool indicates that average residential densities exceeding 9.1 units per acre can be expected to effectively reduce per capita VMT. The residential density of the proposed project is 18.8 dwelling units per acre, which based on the SCTA VMT Reduction

Tool results in a VMT reduction of 23.3 percent below baseline VMT per capita values. Applying this percentage reduction yields an adjusted value of 12.62 VMT per capita, which is below the applicable significance threshold of 14.11 VMT per capita. Upon including adjustments to account for the project's residential density, the project would therefore be considered to have a less-than-significant impact on VMT. A summary of the VMT analysis is shown in Table 3.

Table 3 – Vehicle Miles Traveled Analysis Summary

VMT Metric	Countywide VMT per Capita		Project VMT per Capita		
	Average	Significance Threshold[1]	Unadjusted (TAZ 808)	Adjusted (Density)[2]	Threshold Met?
Residential VMT per Capita (Countywide Baseline)	16.60	14.11	16.46	12.62	Yes

Notes: VMT Rate is measured in VMT per Capita, or the number of daily miles driven per resident; TAZ=Traffic Analysis Zone; du/acre=dwelling units per acre; [1] equal to 15 percent below Countywide average; [2] includes adjustments for residential density per methodology contained in the SCTA VMT Reduction Tool

Finding – The project would be expected to result in a less-than-significant VMT impact.

Safety Issues

The potential for the project to impact safety was evaluated in terms of the adequacy of sight distance and need for turn lanes at the project access locations, as well as the adequacy of stacking space in the left-turn lane at the study intersection. This section addresses the third transportation bullet on the CEQA checklist which is whether or not the project would substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

Site Access

Access to the site would be provided by two new driveways: one on Murphy Avenue that provides access to only the townhome units and one on Healdsburg Avenue (SR 116) that provides access to only the apartment units. It is understood that the project designers explored an interior project access that connected both driveways; however, the change in topography was challenging so this concept was abandoned.

Queuing

The City of Sebastopol does not prescribe thresholds of significance regarding queue lengths. However, an increase in queue length due to project traffic was considered a potentially significant impact if the increase would cause the queue to extend out of a dedicated turn lane into a through traffic lane, or the back of queue into a visually restricted area, such as a blind corner. If queues would already be expected to extend past a dedicated turn lane or into a visually restricted area without project traffic, the addition of project traffic was considered to constitute a potentially adverse effect only if it would cause a new unacceptable conditions; in other words, if the queue were already beyond the turn lane and the project would cause it to stack into an adjacent intersection or a visually restricted area, and that would not occur without the project, that would be considered an impact.

Queuing in the existing westbound left-turn lane on Healdsburg Avenue at the study intersection was evaluated using a methodology contained in "*Estimating Maximum Queue Length at Unsignalized Intersections*," John T. Gard, *ITE Journal*, November 2001. Queuing was evaluated here to determine if left-turn movements out of the project would be in conflict with queued vehicles in the westbound left-turn lane. Maximum queue lengths were estimated by assuming vehicle lengths of 25 feet and multiplying that by the number of vehicles expected to queue.

Based on Future plus Project volumes, the maximum queue in the Healdsburg Avenue westbound left-turn lane was determined to be two vehicles, or 50 feet during the a.m. peak hour, and three vehicles, or 75 feet during the p.m. peak period. The westbound left-turn lane has approximately 150 feet of storage space preceding the proposed driveway on Healdsburg Avenue. Therefore, the existing turn lane is adequate to accommodate the anticipated queue length and the maximum anticipated queue would not be expected to conflict with left turns out of the project driveway at this location.

Queuing calculations for the study intersection are provided in Appendix C.

Finding – The existing storage space in the turn lanes at the study intersection is adequate to accommodate the maximum anticipated queue.

Driveway Conflicts

Murphy Avenue Access – The project access would be located approximately 120 feet south of the south leg crosswalk at SR 116. Given the stop control on Muphy Avenue and low traffic volumes, the addition of the driveway would not result in significant conflicts with traffic on Muphy Avenue.

SR 116 (Healdsburg Avenue) Access – The project access is proposed approximately 160 feet east of Murphy Avenue and slightly offset to the east with DuFranc Avenue. Turn movements at the driveway were assessed as follows.

- Left turns into the site should operate acceptably as vehicles could queue in the center two-way left-turn lane to make the left turn and should not interfere with left turns onto DuFranc Avenue as the movements do not overlap.
- Left-turn movements onto Healdsburg Avenue from the site could be made by turning into the two-way left-turn lane before merging onto westbound Healdsburg Avenue. However, this movement would present several points of conflict. Exiting vehicles from the project would be turning into the two-way left-turn lane where vehicles are entering for left-turns onto Murphy Avenue. Also, these exiting vehicles would present conflicts with left-turn movements into and out of DuFranc Avenue. A point of access further to the east of the project site would be more optimal.

Significance Finding – The proposed location of the driveway on Murphy Avenue is considered acceptable. The driveway on SR 116 (Healdsburg Avenue) presents conflicts and therefore results in a potential safety impact.

Recommendation – Restricted access to right-turn in/right-turn out only was considered, but was not recommended, since this is the only access for this portion of the project. The project driveway on SR 116 should be relocated to the eastern side of the project site to minimize conflicts with other vehicle movements to and from Healdsburg Avenue.

Significance after Mitigation – With the driveway located to maximize separation from Dufranc Avenue, the project's impact on safety would be less than significant.

Sight Distance

Sight distances along Healdsburg Avenue and Murphy Avenue at the proposed new project driveways were evaluated based on sight distance criteria contained in the *Highway Design Manual* published by Caltrans. Though Caltrans does not indicate a recommended sight distance for driveways in urban areas, for safety reasons the stopping sight distance was evaluated using the approach travel speed 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 the stopping sight distance criterion and approach speed on the major street. Based on a posted speed limit of 30 mph for Healdsburg Avenue, the minimum stopping sight distance needed is 200 feet; for a posted speed limit of 25 mph on Murphy Avenue, the required minimum stopping sight distance is 150 feet.

Using both field measurements and aerial imagery it was determined that sight distance at the driveway on Healdsburg Avenue is more than 250 feet in each direction and exceeds the stopping sight distance needed for vehicles traveling five mph above the posted speed limit of 30 mph. The sight distance at the driveway location on Murphy Avenue was measured at 150 feet or more in each direction which meets the stopping sight distance requirement for the *prima facie* speed limit of 25 mph. As landscaping and signage can impede sight lines, any landscaping or signage placed within the vision triangle at the driveway should be less than three feet in height or more than seven feet above the pavement surface to maintain a clear line of sight.

Finding – Adequate sight distance exists at both the proposed and preferred driveway locations. This could be impacted by the design, however.

Recommendation – Any landscaping or signing proposed near the driveways should either be placed outside the vision triangle of drivers entering from the driveway or be trimmed to lie below three feet in height or above seven feet.

Significance Finding – Sufficient sight distance is anticipated to be available at the new driveways.

Capacity Analysis

Intersection Level of Service Methodologies

Level of Service (LOS) is used to rank traffic operation on various types of facilities based on traffic volumes and roadway capacity using a series of letter designations ranging from A to F. Generally, Level of Service A represents free flow conditions and Level of Service F represents forced flow or breakdown conditions. A unit of measure that indicates a level of delay generally accompanies the LOS designation.

The study intersection was analyzed using the "Two-Way Stop-Controlled" methodology published in the *Highway Capacity Manual* (HCM), 6th Edition, Transportation Research Board, 2016. This source contains methodologies for various types of intersection control, all of which are related to a measurement of delay in average number of seconds per vehicle. This methodology determines a level of service for each minor turning movement by estimating the average delay in seconds per vehicle. Results are presented for the stop-controlled approaches together with the weighted overall average delay for the intersection.

The ranges of delay associated with the various levels of service are indicated in Table 4.

Table 4 – Two-Way Stop-Controlled Intersection Level of Service Criteria	
LOS A	Delay of 0 to 10 seconds. Gaps in traffic are readily available for drivers exiting the minor street.
LOS B	Delay of 10 to 15 seconds. Gaps in traffic are somewhat less readily available than with LOS A, but no queuing occurs on the minor street.
LOS C	Delay of 15 to 25 seconds. Acceptable gaps in traffic are less frequent, and drivers may approach while another vehicle is already waiting to exit the side street.
LOS D	Delay of 25 to 35 seconds. There are fewer acceptable gaps in traffic, and drivers may enter a queue of one or two vehicles on the side street.
LOS E	Delay of 35 to 50 seconds. Few acceptable gaps in traffic are available, and longer queues may form on the side street.
LOS F	Delay of more than 50 seconds. Drivers may wait for long periods before there is an acceptable gap in traffic for exiting the side streets, creating long queues.

Reference: *Highway Capacity Manual*, Transportation Research Board, 2016

Traffic Operation Standards

Caltrans

The study intersection of Healdsburg Avenue (SR 116)/Murphy Avenue is under the jurisdiction of Caltrans, but Caltrans does not have a standard of significance relative to operation as this is no longer a CEQA issue. The *Vehicle Miles Traveled-Focused Transportation Impact Study Guide* (TISG), published in May 2020, replaced the *Guide for the Preparation of Traffic Impact Studies*, 2002. As indicated in the TISG, the Department is transitioning away from requesting LOS or other vehicle operation analyses of land use projects and will instead focus on Vehicle Miles Traveled (VMT). Adequacy of operation was therefore evaluated using the City of Sebastopol's standards for intersections.

City of Sebastopol

The following criteria referenced in the *Draft Environmental Impact Report* (DEIR) *for the 2016 Sebastopol General Plan Update*, May 2016, De Novo Planning Group, were applied in order to determine if the project would have an adverse effect on operation at the three study intersections within the City limits:

- Utilize a Level of Service objective of LOS D at intersections to evaluate conditions and impacts, with primary focus on access and safety.
- At unsignalized intersections, level of service shall be determined for both controlled movements and for the overall intersection. Controlled movements operating at LOS E or F would be considered acceptable if:
  - The intersection is projected to operate at LOS D or better overall; and
  - The projected traffic volume on the controlled movement is relatively low (30 vehicles or less per hour on approaches with single lanes, 30 vehicles or less per hour on lanes serving left turns and through movements).
- For intersections already operating worse than LOS objectives, development projects should not contribute substantially to further decline in LOS (causing the LOS to decline by a letter grade from LOS E to LOS F) or by more than a five percent increase in delay for intersections currently operating at an unacceptable LOS.

It was also considered an adverse effect on operations if project traffic would cause an intersection operating acceptably at LOS D or better to operate unacceptably at LOS E or F. It is also noted Policy CIR 1-5 of the *City of Sebastopol 2040 General Plan*, November 2016, De Novo Planning Group, states that "when analyzing impacts to the circulation network created by new development or roadway improvements, consider the needs of all users, including those with disabilities, ensuring that pedestrians, bicyclists, and transit riders are considered preeminent to automobile drivers." In other words, there should be careful review to ensure that automobile improvements do not negatively affect the experiences of pedestrians, bicyclists, and transit riders.

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the a.m. and p.m. peak periods. This condition does not include project-generated traffic volumes. Existing traffic counts were obtained for the study intersection on May 29, 2024, while area schools were in session.

Under Existing Conditions, the study intersection operates acceptably according to City General Plan standards during both the a.m. and p.m. peak hours. It should be noted that the p.m. peak hour captures the largest traffic volume in a single hour during the extended p.m. peak period between 2:00 and 6:00 p.m. The existing traffic volumes are shown in Figure 2. A summary of the intersection Level of Service calculations is presented in Table 5, and copies of the calculations are provided in Appendix B.

Table 5 – Existing Peak Hour Intersection Levels of Service

Study Intersection ***Approach***	**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**
1. Healdsburg Ave (SR 116)/Murphy Ave	1.7	A	1.0	A
Northbound (Murphy Ave) Approach	*24.9*	*C*	*20.9*	*C*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*

Future Conditions

Future intersection turning movements were obtained from the Circulation Element of the *City of Sebastopol 2040 General Plan* which represents General Plan Buildout conditions. Under anticipated future volumes, the

northbound approach at Healdsburg Avenue/Murphy Avenue is expected to operate at LOS E during the p.m. peak hour, which would not be considered acceptable operation per City General Plan standards. Future volumes are shown in Figure 2, operating conditions are summarized in Table 6, and copies of the calculations are provided in Appendix B.

Table 6 – Future Peak Hour Intersection Levels of Service

Study Intersection ***Approach***	AM Peak		PM Peak	
	Delay	**LOS**	**Delay**	**LOS**
1. Healdsburg Ave (SR 116)/Murphy Ave	3.2	A	2.0	A
NB (Murphy Ave) Approach	*34.1*	*D*	***37.1***	***E***

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics;* **Bold** text = deficient operation

Project Conditions

Trip Generation

The anticipated vehicle 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. Since the site is currently undeveloped, there are no existing trips. The trip generation potential of the project as planned was developed using the published standard rates for Single Family Attached Housing (Land Use #215) and Multifamily Housing (Low-Rise) (Land Use #220), as the description of these land uses most closely matches the proposed project. Based on application of these rates, the proposed project is expected to generate an average of 167 trips per day, including 11 a.m. peak hour trips and 13 trips during the p.m. peak hour during the typical weekday peak hour. These results are summarized in Table 7.

Table 7 – Trip Generation Summary

Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	**Trips**	**Rate**	**Trips**	**In**	**Out**	**Rate**	**Trips**	**In**	**Out**
Single Family (Attached)	12 du	7.20	86	0.48	6	2	4	0.57	7	4	3
Multifamily Housing	12 du	6.74	81	0.40	5	2	3	0.51	6	4	2
Total			**167**		**11**	**4**	**7**		**13**	**8**	**5**

Note: du = dwelling unit

Trip Distribution

The pattern used to allocate new project trips to the street network was determined by reviewing existing turning movements at the study intersection as well as employment patterns for residents of the City of Sebastopol as indicated by the 2010 Census. Since traffic conditions are generally most critical during the weekday p.m. peak hour, these distribution assumptions are primarily based on the expected trip routes during that time. The distribution assumptions shown in Table 8 were used.

Table 8 – Trip Distribution Assumptions				
Route	**Percent**	**Daily Trips**	**AM Trips**	**PM Trips**
SR 116 (To/From the North)	41%	68	5	5
SR 116 (To/From the South)	59%	99	6	8
TOTAL	**100%**	**167**	**11**	**13**

Existing plus Project Conditions

Upon the addition of project-generated traffic to the existing volumes, the study intersection is expected to operate acceptably during both peaks. It should also be noted that traffic signals are not warranted under Existing or Existing plus Project volumes. The analysis results are summarized in Table 9, and copies of the calculations are provided in Appendix B. Project traffic volumes, including at the driveways, and Existing plus Project volumes at the study intersection are shown in Figure 3.

Table 9 – Existing and Existing plus Project Peak Hour Intersection Levels of Service								
Study Intersection ***Approach***	**Existing Conditions**				**Existing plus Project**			
	AM Peak		**PM Peak**		**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
1. Healdsburg Ave (SR 116)/Murphy Ave	1.7	A	1.0	A	1.8	A	1.1	A
Northbound (Murphy Ave) Approach	*24.9*	*C*	*20.9*	*C*	*25.6*	*D*	*21.3*	*C*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*

Finding – The study intersection would be expected to operate acceptably per City standards with the addition of project traffic to existing volumes during both the a.m. and p.m. peak hours.

Future plus Project Conditions

Upon the addition of project-generated traffic to the anticipated future volumes, the northbound approach at Healdsburg Avenue (SR 116)/Murphy Avenue would be expected to continue operating unacceptably during the p.m. peak and deteriorate to LOS E during the a.m. peak. Future plus Project intersection operations are summarized in Table 10, and volumes are shown in Figure 3. Copies of the calculations are provided in Appendix B.

Table 10 – Future and Future plus Project Intersection Levels of Service								
Study Intersection ***Approach***	**Future Conditions**				**Future plus Project**			
	AM Peak		**PM Peak**		**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
1. Healdsburg Ave (SR 116)/Murphy Ave	3.2	A	2.0	A	3.4	A	2.1	A
NB (Murphy Ave) Approach	*34.1*	*D*	***37.1***	***E***	***35.2***	***E***	***38.2***	***E***

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; **Bold** = Unacceptable operation; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*

The northbound approach of SR 116/Murphy Avenue would continue operating at LOS E with the addition of project traffic during the p.m. peak. However, the project's effect would be considered acceptable since the delay would be expected to increase by less than five percent. The project would cause operation to deteriorate from

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Traffic Study for the Pacific Knolls Project

Figure 3 – Project, Existing plus Project, and Future plus Project Traffic Volumes

LOS D to LOS E during the morning peak hour and the approach volumes exceed 30 vehicles, which would be considered unacceptable. However, as the increase in delay is only 1.2 seconds, or 3.5 percent, this would also be considered acceptable.

It is noted that the Peak Hour Volume traffic signal warrant would be met by the future volumes, both without and with the project, during both the a.m. and p.m. peak hours indicating that at some point in the future, a traffic signal may be needed at the intersection of SR 116/Murphy Avenue.

Given that the intersection would operate unacceptably without the project under anticipated future volumes, even though the project would contribute to unacceptable operation during the morning peak hour as well, this project on its own does not cause this condition. Further, Caltrans does not have a standard for operation, and even with the anticipated LOS E operation drivers would be experiencing delays that are relatively minor (less than 40 seconds) so Caltrans may not accept signalization of this location. Finally, model volumes are often overly conservative, in which case the volumes that would warrant signalization may never be achieved. The City may therefore prefer to defer any potential improvements at this location until such time as there is a demonstrated need for them.

Finding – Though the northbound approach of SR 116/Murphy Avenue would operate unacceptably under Future plus Project volumes or without project traffic added, the delay would not increase by more than five percent. Similarly, where operation would deteriorate from low LOS D to high LOS E during the morning peak hour, the 1.2-second increase in delay would not represent an adverse effect. Therefore, based on City standards, the addition of project traffic to future volumes would not result in an adverse effect.

Recommendation – Since the peak hour volumes at SR 116/Murphy Avenue would warrant a traffic signal under future volumes, the City may wish to monitor volumes to determine if traffic signal volume warrants are met for the intersection and signalization should be considered.

Driveway Operation

Although operation is generally not considered for private driveways, an analysis was performed to determine the amount of delay drivers exiting the site would be expected to encounter. For the driveway on Healdsburg Avenue (SR 116) the maximum calculated average delay would occur during the p.m. peak hour when 23.8 seconds of delay would be expected. Drivers exiting via the Murphy Avenue driveway would be expected to experience a maximum of 9.2 seconds of delay based on future a.m. peak hour volumes. These levels of delay would be well within what is expected for entry to a public street.

Conclusions and Recommendations

Conclusions

- The proposed project is expected to generate an average of 167 trips per day, including 11 a.m. peak hour trips and 13 trips during the p.m. peak hour on a typical weekday.
- The existing and planned pedestrian, bicycle, and transit facilities provide adequate access to and from the project site and the project does not conflict with any policies, plans or programs for these modes, therefore having a less-than-significant impact on these modes.
- The project is expected to meet the applicable significance threshold for vehicle miles traveled.
- Left-turn movements onto Healdsburg Avenue from the site would present several points of conflict including with vehicles entering the two-way left-turn lane approaching Murphy Avenue and vehicles making left-turn movements into and out of DuFranc Avenue.
- Sight distances at both the driveway on Healdsburg Avenue and the driveway on Murphy Avenue meet the stopping sight distance requirements for the posted speed limits on either roadway.
- Under existing conditions with and without the project, the study intersection operates acceptably and would continue to do so per City standards.
- The northbound approach at Healdsburg Avenue (SR 116)/Murphy Avenue is expected to operate unacceptably under Future and Future plus Project conditions. The addition of project traffic to future volumes would not result in an adverse impact, per the City's standards since the increase in delay would be less than five percent.
- A traffic signal installation at the intersection of SR 116 (Healdsburg Avenue)/Murphy Avenue is not currently warranted, but would be warranted under future volumes, without or with the project.
- The study driveways would be expected to operate with an acceptable level of delay based on project trips and future volumes.

Recommendations

- The driveway on SR 116 (Healdsburg Avenue) should be relocated to the eastern side of the project site to minimize conflicts with vehicle movements to and from Healdsburg Avenue. Restricted access to right-turn in/right-turn out only was considered, but was not recommended, since this is the only access for this portion of the project.
- The City may wish to monitor volumes at the intersection of Healdsburg Avenue (SR 116)/Murphy Avenue vis-à-vis traffic signal warrants to determine potential timing for a future traffic signal installation.

Study Participants and References

Study Participants

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Appendix A

Collision Rate Calculations

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Intersection Collision Rate Worksheet

Traffic Study for the Pacific Knolls Project

Intersection # 1: Healdsburg Avenue (SR 116) & Murphy Avenue
Date of Count: Wednesday, May 29, 2024

Number of Collisions: 1
Number of Injuries: 0
Number of Fatalities: 0
Average Daily Traffic (ADT): 15500
Start Date: October 1, 2018
End Date: September 30, 2023
Number of Years: 5

Intersection Type: Tee
Control Type: Stop & Yield Controls
Area: Urban

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

$$\text{Collision Rate} = \frac{1 \times 1{,}000{,}000}{15{,}500 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.04 c/mve**	**0.0%**	**0.0%**
Statewide Average*	**0.13 c/mve**	**1.3%**	**47.3%**

Notes
ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2021 Collision Data on California State Highways, Caltrans

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Appendix B

Intersection Level of Service Calculations

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Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	752	63	17	552	34	62
Future Vol, veh/h	752	63	17	552	34	62
Conflicting Peds, #/hr	0	19	13	0	19	13
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	855	72	19	627	39	70

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	946	0	1594	923
Stage 1	-	-	-	-	910	-
Stage 2	-	-	-	-	684	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	725	-	118	327
Stage 1	-	-	-	-	393	-
Stage 2	-	-	-	-	501	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	714	-	111	318
Mov Cap-2 Maneuver	-	-	-	-	245	-
Stage 1	-	-	-	-	387	-
Stage 2	-	-	-	-	480	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	24.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	288	-	-	714	-
HCM Lane V/C Ratio	0.379	-	-	0.027	-
HCM Control Delay (s)	24.9	-	-	10.2	-
HCM Lane LOS	C	-	-	B	-
HCM 95th %tile Q(veh)	1.7	-	-	0.1	-

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	769	35	22	662	28	37
Future Vol, veh/h	769	35	22	662	28	37
Conflicting Peds, #/hr	0	27	19	0	27	19
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	793	36	23	682	29	38

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	856	0	1593	857
Stage 1	-	-	-	-	838	-
Stage 2	-	-	-	-	755	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	784	-	118	357
Stage 1	-	-	-	-	424	-
Stage 2	-	-	-	-	464	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	766	-	110	343
Mov Cap-2 Maneuver	-	-	-	-	245	-
Stage 1	-	-	-	-	415	-
Stage 2	-	-	-	-	440	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	20.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	293	-	-	766	-
HCM Lane V/C Ratio	0.229	-	-	0.03	-
HCM Control Delay (s)	20.9	-	-	9.8	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.9	-	-	0.1	-

Intersection	
Int Delay, s/veh	3.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	847	54	22	645	45	111
Future Vol, veh/h	847	54	22	645	45	111
Conflicting Peds, #/hr	0	27	19	0	27	19
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	873	56	23	665	46	114

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	956	0	1666	947
Stage 1	-	-	-	-	928	-
Stage 2	-	-	-	-	738	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	719	-	106	317
Stage 1	-	-	-	-	385	-
Stage 2	-	-	-	-	473	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	703	-	98	305
Mov Cap-2 Maneuver	-	-	-	-	231	-
Stage 1	-	-	-	-	377	-
Stage 2	-	-	-	-	447	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	34.1
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	279	-	-	703	-
HCM Lane V/C Ratio	0.576	-	-	0.032	-
HCM Control Delay (s)	34.1	-	-	10.3	-
HCM Lane LOS	D	-	-	B	-
HCM 95th %tile Q(veh)	3.3	-	-	0.1	-

Intersection	
Int Delay, s/veh	2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	964	39	53	999	35	62
Future Vol, veh/h	964	39	53	999	35	62
Conflicting Peds, #/hr	0	27	19	0	27	19
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	994	40	55	1030	36	64

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1061	0	2208	1060
Stage 1	-	-	-	-	1041	-
Stage 2	-	-	-	-	1167	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	657	-	49	272
Stage 1	-	-	-	-	340	-
Stage 2	-	-	-	-	296	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	642	-	43	262
Mov Cap-2 Maneuver	-	-	-	-	154	-
Stage 1	-	-	-	-	333	-
Stage 2	-	-	-	-	264	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	37.1
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	209	-	-	642	-
HCM Lane V/C Ratio	0.478	-	-	0.085	-
HCM Control Delay (s)	37.1	-	-	11.1	-
HCM Lane LOS	E	-	-	B	-
HCM 95th %tile Q(veh)	2.3	-	-	0.3	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	753	64	18	553	36	64
Future Vol, veh/h	753	64	18	553	36	64
Conflicting Peds, #/hr	0	19	13	0	19	13
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	856	73	20	628	41	73

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	948	0	1599	925
Stage 1	-	-	-	-	912	-
Stage 2	-	-	-	-	687	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	724	-	117	326
Stage 1	-	-	-	-	392	-
Stage 2	-	-	-	-	499	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	713	-	110	317
Mov Cap-2 Maneuver	-	-	-	-	244	-
Stage 1	-	-	-	-	386	-
Stage 2	-	-	-	-	478	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	25.6
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	286	-	-	713	-
HCM Lane V/C Ratio	0.397	-	-	0.029	-
HCM Control Delay (s)	25.6	-	-	10.2	-
HCM Lane LOS	D	-	-	B	-
HCM 95th %tile Q(veh)	1.8	-	-	0.1	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	771	37	24	663	29	39
Future Vol, veh/h	771	37	24	663	29	39
Conflicting Peds, #/hr	0	27	19	0	27	19
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	795	38	25	684	30	40

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	860	0	1602	860
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	761	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	781	-	116	356
Stage 1	-	-	-	-	423	-
Stage 2	-	-	-	-	461	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	763	-	107	342
Mov Cap-2 Maneuver	-	-	-	-	243	-
Stage 1	-	-	-	-	414	-
Stage 2	-	-	-	-	436	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	21.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	291	-	-	763	-
HCM Lane V/C Ratio	0.241	-	-	0.032	-
HCM Control Delay (s)	21.3	-	-	9.9	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.9	-	-	0.1	-

Intersection	
Int Delay, s/veh	3.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	848	55	23	646	47	113
Future Vol, veh/h	848	55	23	646	47	113
Conflicting Peds, #/hr	0	27	19	0	27	19
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	874	57	24	666	48	116

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	958	0	1671	949
Stage 1	-	-	-	-	930	-
Stage 2	-	-	-	-	741	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	718	-	105	316
Stage 1	-	-	-	-	384	-
Stage 2	-	-	-	-	471	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	702	-	97	304
Mov Cap-2 Maneuver	-	-	-	-	230	-
Stage 1	-	-	-	-	376	-
Stage 2	-	-	-	-	445	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	35.2
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	278	-	-	702	-
HCM Lane V/C Ratio	0.593	-	-	0.034	-
HCM Control Delay (s)	35.2	-	-	10.3	-
HCM Lane LOS	E	-	-	B	-
HCM 95th %tile Q(veh)	3.5	-	-	0.1	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	966	41	55	1000	36	64
Future Vol, veh/h	966	41	55	1000	36	64
Conflicting Peds, #/hr	0	27	19	0	27	19
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	996	42	57	1031	37	66

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1065	0	2216	1063
Stage 1	-	-	-	-	1044	-
Stage 2	-	-	-	-	1172	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	654	-	48	271
Stage 1	-	-	-	-	339	-
Stage 2	-	-	-	-	294	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	639	-	42	261
Mov Cap-2 Maneuver	-	-	-	-	153	-
Stage 1	-	-	-	-	332	-
Stage 2	-	-	-	-	262	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	38.2
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	208	-	-	639	-
HCM Lane V/C Ratio	0.496	-	-	0.089	-
HCM Control Delay (s)	38.2	-	-	11.2	-
HCM Lane LOS	E	-	-	B	-
HCM 95th %tile Q(veh)	2.5	-	-	0.3	-

Appendix C

Queuing Calculations

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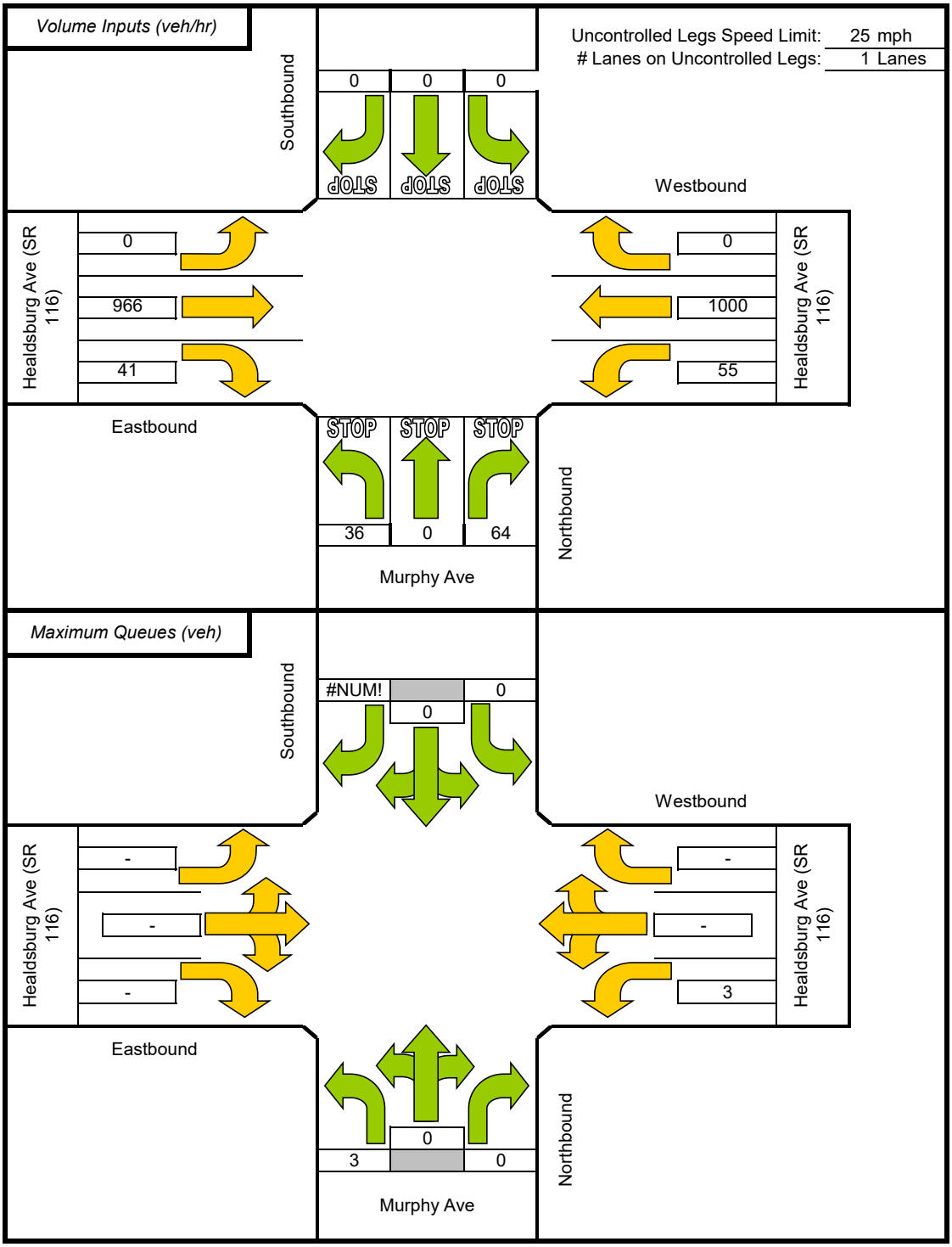
Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: Healdsburg Ave (SR 116)
Side Street: Murphy Ave

Scenario: Future plus Project PM
Stop Controlled Legs: North/South

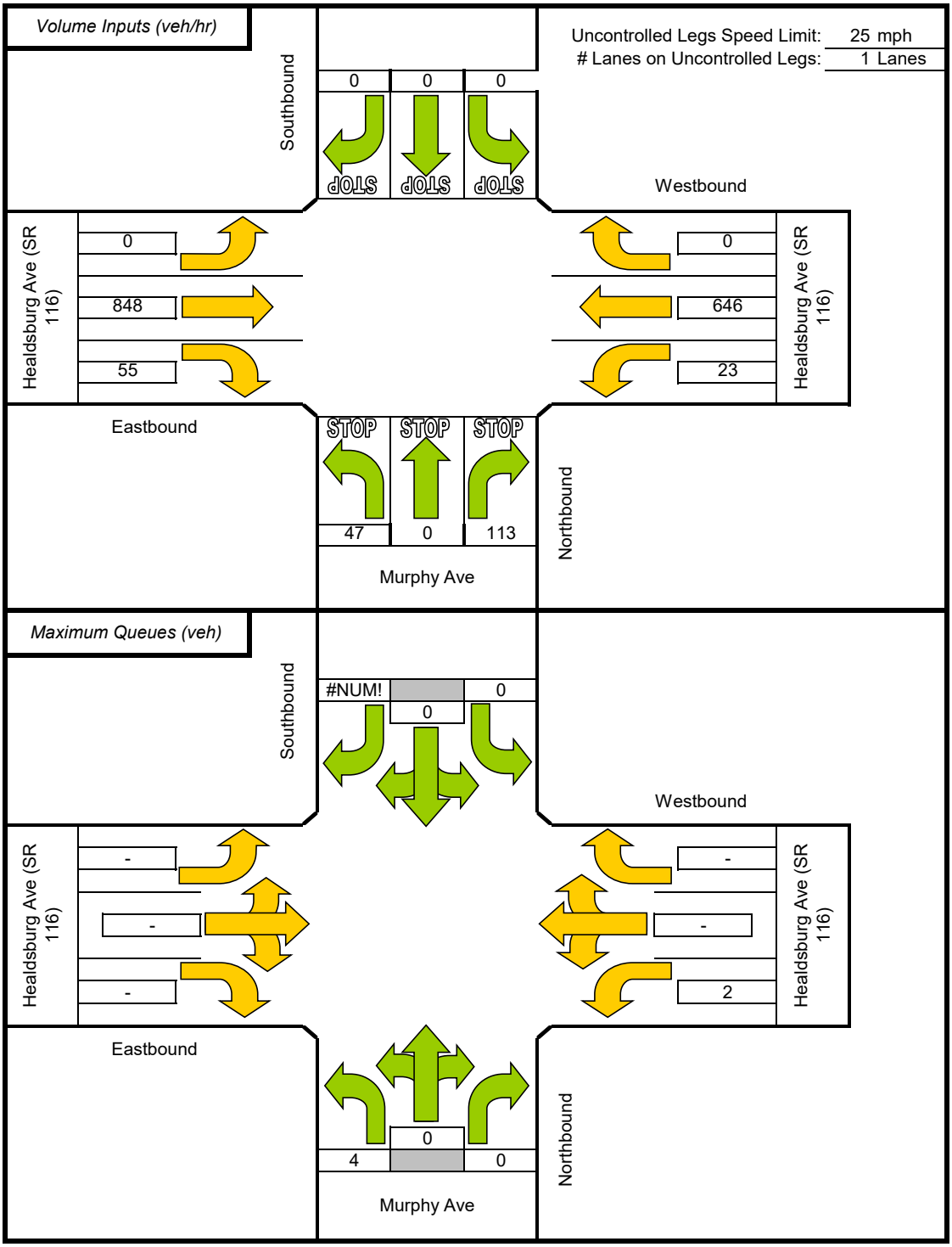


Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"

Maximum Queue Length
Two-Way Stop-Controlled Intersections

Through Street: Healdsburg Ave (SR 116)
Side Street: Murphy Ave

Scenario: Future plus Project AM
Stop Controlled Legs: North/South



Source: John T. Gard, ITE Journal, November 2001, "Estimating Maximum Queue Length at Unsignalized Intersections"