



Planning & Transportation Commission

Staff Report (ID # 7229)

Report Type: Study Session **Meeting Date:** 11/9/2016

Summary Title: Citywide Engineering and Traffic Speed Surveys

Title: Study Session to Present the Findings of the Citywide Engineering and Traffic Speed Surveys and Discuss Alternatives to the Establishment of Speed Limits and Requirements for Enforcement

From: Hillary Gitelman

Recommendation

This is a study session and no formal action is recommended. The Planning and Transportation Commission (PTC) may discuss and provide comments.

Report Summary

The purpose of this study session is to familiarize the Planning and Transportation Commission with the Engineering and Traffic Surveys. Speed limits in California are governed by the California Vehicle Code (CVC) section 627, 22348 through 22413 and 40802. In conformance with state law, vehicle speed laws can only be enforced when speed limits are determined by an Engineering and Traffic Survey. An Engineering and Traffic Survey is an engineering analysis of the prevailing speeds and a review of the traffic conditions of the roadway. Engineering and Traffic Surveys for many Palo Alto streets are currently expired and, hence, the Police Department is unable to enforce the speed limits using radar.

The updated Engineering and Traffic Surveys are intended to serve as the basis for the establishment and enforcement of speed limits for certain street segments within the City of Palo Alto.

Background

Speed zones are primarily established to protect the public from the unreasonable behavior of reckless, unreliable, or otherwise dangerous drivers. Speed limits are generally established at or near the 85th percentile speed, which is defined as the speed at or below which 85 percent of traffic is moving. Speed limits established on this basis conform to the consensus of those who drive on the roadways as to what speed is reasonable and safe, and are not dependent on the

judgment of one or a few individuals. An Engineering and Traffic Survey, as defined in Section 627 of the CVC, must consider the prevailing speeds, collision records, pedestrian and bicyclist safety, and roadway traffic and roadside conditions. Speed zones are also established to advise motorists of road conditions or hazards, which may not be readily apparent to a reasonable driver. For this reason, a field review of related road and traffic variables is conducted which is considered in combination with the statistical data and collision history of a particular roadway segment to determine a safe and reasonable speed limit.

As per California Vehicle Code 40802, the speed limit of 25 miles per hour (mph) has been established on designated local streets in Palo Alto that are less than 40 feet in width. In 2014, speed surveys were conducted for 34 residential arterial and collector street segments within the City. The results of that study indicated a recommendation to increase speed limits along 18 street segments and validated 16 remaining street segments. These results were not brought forward for review in 2014, and new surveys are currently underway. In the future, staff intends to establish a consolidated and reoccurring Engineering and Speed Survey cycle for all street segments every 5 to 7 years as required.

The objective of the ongoing surveys is to analyze all arterial and collector streets (70 street segments) in Palo Alto's Street Network system and to recommend appropriate speed limits for each of these street segments consistent with the laws and practices of the State of California. In addition, as a part of this project, an aspirational target speed will be identified if the survey recommends increasing the speed limit along a particular roadway segment. The target speed is not based on operating or prevailing speeds but considered factors such as residential density, bicycle safety, roadside conditions, adjacent land use, and potential conflicts with pedestrians, bicyclists, and residential or business districts. Staff intends to use the target speed to determine various physical characteristics, geometric design features and implement traffic calming measures for streets within Palo Alto in the future. When identifying recommended speed limits, staff also considered the findings of the study completed in 2012, per California Assembly Bill (AB) 321, to reduce the speed limit to 15 or 20 mph within 500 feet of the school grounds, under certain conditions.

This report presents the results of the analysis performed in preparing Engineering and Traffic Surveys for the City of Palo Alto for 70 street segments (Attachment A). These surveys were authorized by the City and conducted by the consulting firm Stantec. These surveys were performed in accordance with the requirements of the California Vehicle Code and the California Manual of Uniform Traffic Control Devices (CA-MUTCD). The link below provides the 2014 California Manual for Setting Speed Limits published by Caltrans.

<http://www.dot.ca.gov/hq/traffops/engineering/mutcd/pdf/california-manual-for-setting-speed-limits.pdf>

Discussion

This report and the procedures used to formulate its recommendations fully meet the requirements of the California Vehicle Code and the California Manual of Uniform Traffic Control Devices (CA-MUTCD) and will allow the Police Department to enforce speed limits with

the use of radar. However, some of the surveys recommend specific modifications to speed limits within the City of Palo Alto. Based on the data and results of the survey, 14 street segments require raising speed limits, which may not be desired by the community.

Conducting Radar Surveys

Speed data was collected using manual radar surveys and were performed by a sub-consultant to Stantec, National Data and Surveying Services (NDS), at 70 locations during off-peak hours on a weekday (Monday through Friday). NDS also collected the average daily traffic (ADT) data for the 70 project locations during a weekday (Tuesday, Wednesday or Thursday). The radar surveys and ADT counts were collected in September 2016.

Radar surveys were conducted on street sections where the traffic speeds, the traffic volumes, the street width or other significant factors were different from an adjacent section. Thus a residential arterial such as Middlefield Road required speed surveys at several locations to account for changes in these factors. Each of the radar speed survey have a minimum sample size of 100 vehicles and was conducted by a person whose presence was unknown and did not affect the speed of the traffic being surveyed.

Analysis of Data

Observed conditions include the direction of travel and number of vehicles surveyed, the date and day of the week, the time period during which the survey was conducted and the existing posted speed limit.

Calculated values include the 85th percentile speed, the 10-mph pace speed, the percent of vehicles observed within the 10-mph pace speed, the range of speeds observed and the total number of vehicles observed. An explanation of these terms is as follows:

The 85th Percentile or Critical Speed is that speed at or below which 85 percent of the observed vehicles are travelling. It is generally well recognized fact that at least 85 percent of the drivers operate at speeds which are reasonable and prudent for the conditions of each roadway. Therefore, this factor is the primary guide in determining what speeds the majority of safe and reasonable drivers are traveling.

Hence, the practice is to set the speed limit to the nearest five-mile-per-hour increment from the critical speed unless other factors require a lower limit. Speed limits set on this basis provide law enforcement officials with a means of controlling reckless or unreliable drivers who will not conform to what the majority finds reasonable.

The 10-mph Pace is the 10-mile-per-hour increment range, which contains the largest number of recorded vehicles. The pace is a measure of the dispersion of speeds within the sample surveyed. Speed limits should normally be set to fall within the 10-mph Pace. However, conditions not readily apparent to the driver or adhering to state-mandated limits such as in residential districts may require setting speed limits below the 10-mph pace.

The *Percent of Vehicles in Pace Speed* is an indication of the grouping of vehicular speeds. Ideally, if all vehicles were traveling at or about the same speed, there would be a reduced likelihood of vehicular collisions. In speed limit analysis, the higher the percent of vehicles within the pace speed, the more favorable the speed distribution. The percent of vehicles within the 10-mph Pace is often between 60 and 90 percent.

Collision History

The Engineering and Traffic Survey forms summarize the recent collision information for each of the street segments. The collision information was obtained from the California Statewide Integrated Traffic Records System (SWITRS) from January 2011 to December 2015. The collisions were reviewed and summarized for each segment. Based upon the number of total collisions studied over the five-year period and ADT counts, a collision rate per million vehicle miles was calculated for each segment. To provide a general comparison of the collision rates on the segments to expected collisions rates for similar types of local roadways, the collision rates for each segment were compared to the statewide average rate listed in the 2012 collision data on California State Highways (road miles, travel, collisions, collision rates) as listed in Table 1.

Table 1: 2012 California State Highways Collision Rates

Lane Type	Total Collision Rate Per Million Vehicle Miles (3-year rate for 2010, 2011 and 2012)
Two and three Lanes	1.22
Four Lanes (undivided highway)	1.70
Four Lanes (divided highway)	1.42

Source: Collision Data on California State Highways Report published by State of California in 2015

Results and Recommendations

State regulations prescribe that a speed limit shall be established at the nearest five-mile-per-hour increment to the critical 85th percentile speed. The speed limit may be reduced by five miles per hour from this nearest five-mile-per-hour increment, based upon factors such as collision experience or other factors not apparent to the driver. For cases in which the nearest five-mile-per-hour increment of the 85th percentile speed would require a rounding up, then the speed limit may be rounded down to the nearest five-mile-per-hour increment below the 85th percentile speed, but no further reduction is allowed.

Attachment A presents the results of evaluation of the available data and indicates a recommended speed limit for each of the 70 street segments surveyed. This survey validates

the existing speed limit for 56 locations and recommends an increase in existing speed limit for 14 locations.

Policy Implications

The following Goals and Policies from the Comprehensive Plan are directly related to this discussion:

- Goal T-4: An Efficient Roadway Network for All Users
- Goal T-6: A High Level of Safety for Motorists, Pedestrians, and Bicyclists on Palo Alto Streets
- Policy T-39: To the extent allowed by law, continue to make safety the first priority of citywide transportation planning. Prioritize pedestrian, bicycle, and automobile safety over vehicle level-of-service at intersections.
- Policy T-41: Vigorously and consistently enforce speed limits and other traffic laws.

Environmental Review

As this is a study session and no action will be taken, environmental review is not required.

Attachments:

- Attachment A: Evaluation Results of 2016 Engineering and Traffic Surveys (PDF)

2016 City of Palo Alto Engineering and Traffic Survey

Road Segment Number	Road Segment Name	Roadway Type	Direction	# of Lanes	Posted Speed Limit (mph) [A]	Determination of the Recommended Speed										
						ADT	Number of Collisions (Apr 09 - Apr 12)	Length(mi)	Collision Rate (RSP) [B]	State Average Collision Rate [C]	10 MPH Pace	Number in Pace	% in Pace	50%tile Speed	85%tile Speed [D]	Recmd. Speed (mph)
1	Alma St from University Ave to Lincoln Ave	Arterial	NB/SB	4	25	28,716	121	0.53	4.4	0	28 - 37	158	76%	32 mph	37 mph	30
2	Alma St from Lincoln Ave to Oregon Expy	Arterial	NB/SB	4	35	30,168	138	1.16	2.2	0	34 - 43	178	89%	38 mph	42 mph	35
3	Alma St from Oregon Exp to E Meadow Dr	Arterial	NB/SB	4	35	29,235	55	1.18	0.9	0	34 - 43	197	80%	38 mph	42 mph	35
4	Alma St from E Meadow Dr to South City Limit	Arterial	NB/SB	4	35	28,895	39	1.11	0.7	1.42	32 - 41	171	66%	37 mph	42 mph	35
5	Amaranta Ave from Los Robles Ave to Maybell Ave	Collector	NB/SB	2	25	9,379	3	0.32	0.5	0	22 - 31	122	75%	26 mph	30 mph	25
6	Arastradero Rd from Purissima Road to Deer Creek Road	Arterial	EB/WB	2	35	6,698	4	0.50	0.7	0	30 - 39	149	74%	36 mph	41 mph	35
7	Arastradero Rd from Deer Creek Road to Foothill Exp	Arterial	EB/WB	2	35	1,759	18	0.85	6.6	1.42	31 - 40	169	81%	36 mph	40 mph	35
8	Arastradero Rd from Foothill Exp to El Camino Real	Residential Arterial	EB/WB	2 to 4	25	20,328	91	1.05	2.3	0	26 - 35	183	81%	30 mph	34 mph	30
9	Arboretum Rd from Sandhill Rd to Quarry Rd	Collector	NB/SB	4	25	11,403	28	0.19	6.9	1.42	22 - 31	157	83%	27 mph	30 mph	25
10	Birch St from California Av to Page Mill Exp	Collector	NB/SB	4	25	5,702	31	0.23	12.7	1.42	13 - 22	163	83%	18 mph	21 mph	25
11	California Av from Park Blvd to El Camino Real	Collector	EB/WB	2	25	4,310	36	0.27	16.7	0	15 - 24	121	98%	19 mph	21 mph	25
12	California Av from El Camino Real to Hanover St	Collector	EB/WB	2	25	4,322	5	0.49	1.3	0	21 - 30	170	75%	24 mph	29 mph	25
13	Channing Av from W Bayshore Rd to Newell Rd	Collector	EB/WB	2	25	3,600	18	0.84	3.3	0	21 - 30	143	83%	27 mph	30 mph	25
14	Channing Av from Newell Rd to Guinda Av	Collector	EB/WB	2	25	4,243	10	0.60	2.2	0	21 - 30	179	87%	25 mph	28 mph	25
15	Channing Av from Guinda Av to Alma St	Collector	EB/WB	2	25	3,418	61	0.74	13.2	0	19 - 28	94	92%	23 mph	26 mph	25
16	Charleston Rd from El Camino Real to Alma St	Residential Arterial	EB/WB	4	25	16,014	81	0.40	6.9	1.42	28 - 37	150	77%	33 mph	37 mph	30
17	Charleston Rd from Alma St to Middlefield Rd	Residential Arterial	EB/WB	2	25	14,961	31	0.59	1.9	0	24 - 33	190	82%	29 mph	32 mph	25
18	Charleston Rd from Middlefield Rd to Fabian Way	Residential Arterial	EB/WB	2	25	16,126	26	0.36	2.5	0	25 - 34	191	81%	30 mph	34 mph	30
19	Churchill Av from Embarcadero Rd to Alma St	Collector	EB/WB	2	25	2,394	39	0.50	17.9	0	25 - 34	179	96%	30 mph	32 mph	25
20	Churchill Av from Alma St to El Camino Real	Collector	EB/WB	2	25	7,995	32	0.27	8.0	0	23 - 32	186	89%	28 mph	31 mph	25
21	Colorado Av from W Bayshore Rd to Middlefield Rd	Collector	EB/WB	2	25	2,166	30	0.91	8.3	0	19 - 28	76	70%	25 mph	29 mph	25
22	Coyote Hill Rd from Page Mill Rd to Hillview Av	Collector	NB/SB	4	35	1,940	5	0.67	2.1	0	37 - 46	99	66%	41 mph	46 mph	40
23	Deer Creek Rd from Page Mill Rd to Arastradero Rd	Collector	NB/SB	2	35	5,243	5	0.70	0.7	0	34 - 43	103	68%	38 mph	44 mph	40
24	E Bayshore Rd from Embarcadero Rd to Bay Lands Frontage	Collector	NB/SB	2	35	5,115	26	0.74	3.8	0	36 - 45	161	66%	42 mph	47 mph	40
25	E Bayshore Rd from Bay Lands Frontage to San Antonio Rd	Collector	NB/SB	2	35	4,957	20	1.14	1.9	0	37 - 46	109	60%	41 mph	46 mph	40
26	E Meadow Dr from W Bayshore Rd to Louis Rd	Collector	EB/WB	2	25	3,125	5	0.27	3.2	0	21 - 30	121	86%	26 mph	29 mph	25
27	E Meadow Dr from Louis Rd to Alma St	Collector	EB/WB	2	25	7,098	60	1.10	4.2	0	24 - 33	144	81%	29 mph	32 mph	25
28	El Camino Way from Los Robles Av to Maybell Av	Collector	NB/SB	2	25	4,047	51	0.37	18.7	0	19 - 28	96	86%	24 mph	27 mph	25
29	Embarcadero Rd from Embarcadero Rd to Highway 101	Residential Arterial	EB/WB	4	25	5,948	33	0.59	5.2	1.42	29 - 38	132	72%	32 mph	37 mph	30
30	Embarcadero Rd from Highway 101 to Middlefield Rd	Residential Arterial	EB/WB	4	25	27,867	120	1.21	2.0	1.42	28 - 37	150	79%	32 mph	37 mph	30
31	Embarcadero Rd from Middlefield Rd to Alma St	Residential Arterial	EB/WB	4	25	26,222	76	0.75	2.1	1.42	28 - 37	166	79%	32 mph	37 mph	30
32	Foothill Exp from Page Mill Rd to South City Limit	Expressway	NB/SB	4	45	20,602	39	1.31	0.8	1.42	42 - 51	144	68%	47 mph	52 mph	45
33	Guinda Av from Lytton Av to Channing Av	Collector	NB/SB	2	25	2,101	25	0.44	14.8	0	19 - 28	116	90%	24 mph	27 mph	25
34	Hamilton Av from Middlefield Rd to Alma St	Arterial	EB/WB	2	25	7,986	127	0.64	13.6	0	15 - 24	151	85%	20 mph	24 mph	25
35	Hansen Way from El Camino Real to Page Mill Exp	Collector	EB/WB	2	30	3,635	22	0.58	5.7	0	27 - 36	149	88%	30 mph	33 mph	30
36	High St from Lytton Av to Channing Av	Collector	NB/SB	2	25	2,363	62	0.44	32.7	0	16 - 25	88	91%	20 mph	24 mph	25
37	Hillview Av from Foothill Exp to Arastradero Rd	Arterial	NB/SB	2	35	4,815	7	0.70	1.1	0	30 - 39	121	71%	35 mph	40 mph	35
38	Homer Av from Guinda Av to Alma St	Collector	EB/WB	2	25	3,437	58	0.74	12.4	0	19 - 28	78	78%	23 mph	27 mph	25
39	Laguna Av from Matadero Av to Los Robles Av	Collector	NB/SB	2	25	924	0	0.45	0.0	0	22 - 31	74	73%	25 mph	29 mph	25
40	Lambert Av from Park Blvd to El Camino Real	Collector	EB/WB	2	25	1,487	10	0.28	13.4	0	18 - 27	70	68%	23 mph	29 mph	25
41	Loma Verde Av from W Bayshore Rd to Middlefield Rd	Collector	EB/WB	2	25	2,173	20	0.84	6.0	0	23 - 32	156	83%	28 mph	31 mph	25
42	Loma Verde Av from Middlefield Rd to Alma St	Collector	EB/WB	2	25	4,633	11	0.65	2.0	0	24 - 33	179	83%	28 mph	32 mph	25
43	Los Robles Av from Laguna Av to El Camino Real	Collector	EB/WB	2	25	2,200	34	0.59	14.4	0	23 - 32	95	79%	27 mph	32 mph	25
44	Louis Rd from Embarcadero Rd to Oregon Exp	Collector	NB/SB	2	25	4,469	43	0.45	11.8	0	25 - 34	117	87%	29 mph	32 mph	25
45	Louis Rd from Oregon Exp to Loma Verde Rd	Collector	NB/SB	2	25	4,097	7	0.82	1.1	0	21 - 30	88	82%	26 mph	29 mph	25

Road Segment Number	Road Segment Name	Roadway Type	Direction	# of Lanes	Posted Speed Limit (mph) [A]	Determination of the Recommended Speed										
						ADT	Number of Collisions (Apr 09 - Apr 12)	Length(mi)	Collision Rate (RSP) [B]	State Average Collision Rate [C]	10 MPH Pace	Number in Pace	% in Pace	50%tile Speed	85%tile Speed [D]	Recmd. Speed (mph)
46	Louis Rd from Loma Verde Rd to Charleston Rd	Collector	NB/SB	2	25	2,734	8	1.05	1.5	0	21 - 30	91	78%	26 mph	31 mph	25
47	Lytton Av from Alma St to Middlefield Rd	Arterial	EB/WB	2	25	10,770	86	0.64	6.9	0	19 - 28	164	85%	24 mph	28 mph	25
48	Matadero Av from El Camino Real to Laguna Av	Collector	EB/WB	2	25	1,081	7	0.55	6.5	0	19 - 28	91	78%	24 mph	28 mph	25
49	Middlefield Rd from Embarcadero Rd to Oregon Exp	Residential Arterial	NB/SB	2	25	9,298	47	0.71	3.9	0	23 - 32	172	82%	27 mph	31 mph	25
50	Middlefield Rd from Oregon Exp to E Charleston Rd	Residential Arterial	NB/SB	4	25	14,003	133	1.67	3.1	0	28 - 37	189	81%	33 mph	37 mph	30
51	Middlefield Rd from E Charleston Rd to South City Limit	Residential Arterial	NB/SB	4	25	14,578	67	0.45	5.6	0	26 - 35	156	74%	32 mph	37 mph	30
52	Newell Rd from East City Limit to Channing Av	Collector	EB/WB	2	25	3,886	8	0.44	2.5	0	20 - 29	92	88%	25 mph	28 mph	25
53	Newell Rd from Channing Av to Embarcadero Rd	Collector	EB/WB	2	25	5,132	14	0.39	3.9	0	24 - 33	159	82%	28 mph	32 mph	25
54	N California Av from Embarcadero Rd to Middlefield Rd	Collector	EB/WB	2	25	3,010	12	0.77	2.8	0	21 - 30	95	84%	24 mph	28 mph	25
55	N California Av from Middlefield Rd to Alma St	Collector	EB/WB	2	25	1,666	26	0.64	13.4	0	21 - 30	99	75%	25 mph	29 mph	25
56	Oregon Exp from Middlefield Rd to Alma St	Arterial	EB/WB	4	35	40,830	122	0.63	2.6	1.42	30 - 39	167	68%	35 mph	40 mph	35
57	Park Blvd from California Av to Lambert Av	Collector	NB/SB	2	25	5,432	27	0.58	4.7	0	22 - 31	126	90%	27 mph	30 mph	25
58	Peter Coutts Rd from Stanford Av to Page Mill Rd	Collector	NB/SB	2	25	2,786	5	0.56	1.8	0	24 - 33	102	85%	29 mph	32 mph	25
59	Porter Dr from Hillview Av to Page Mill Rd	Collector	NB/SB	2	25	3,645	11	0.41	4.0	0	24 - 33	114	75%	28 mph	32 mph	25
60	Quarry Rd from El Camino Real to Campus Dr	Collector	EB/WB	4	25	16,083	67	0.75	3.0	1.42	23 - 32	158	74%	27 mph	32 mph	25
61	Sandhill Road from El Camino Real to Arboretum	Arterial	EB/WB	2	30	14,431	16	0.45	1.4	0	27 - 36	180	85%	30 mph	34 mph	30
62	Sandhill Road from Arboretum to West City limit	Arterial	EB/WB	4	35	25,298	18	1.20	0.3	1.42	31 - 40	152	72%	36 mph	42 mph	35
63	Stanford Av from El Camino Real to Peter Coutts Rd	Collector	EB/WB	2	25	5,818	39	0.86	4.3	0	23 - 32	193	86%	27 mph	31 mph	25
64	Stanford Av from Peter Coutts Rd to Junipero Serra Blvd	Collector	EB/WB	2	25	5,220	0	0.56	0.0	0	24 - 33	181	83%	28 mph	32 mph	25
65	University Av from East City Limit to Middlefield Rd	Residential Arterial	EB/WB	2	25	21,658	190	1.04	4.6	0	28 - 37	163	81%	31 mph	36 mph	30
66	University Av from Middlefield Rd to Alma St	Arterial	EB/WB	2	25	11,717	166	0.64	12.2	0	18 - 27	128	82%	24 mph	27 mph	25
67	Waverley St from Lytton Av to Channing Av	Collector	NB/SB	2	25	2,664	36	0.44	16.9	0	18 - 27	159	84%	22 mph	26 mph	25
68	Waverley St from Channing Av to Embarcadero Rd	Collector	NB/SB	2	25	3,230	19	0.41	7.9	0	20 - 29	151	84%	25 mph	29 mph	25
69	W Bayshore Rd from Oregon Exp to Loma Verde Ave	Collector	NB/SB	2	30/35	4,886	21	1.07	2.2	0	29 - 38	152	69%	34 mph	38 mph	30/35
70	W Meadow Dr from Alma St to El Camino Way	Collector	EB/WB	2	25	6,658	36	0.26	11.4	0	22 - 31	160	81%	28 mph	32 mph	25

Note:

Bold Values: Recommended Speed Limit Change