



MEMORANDUM

May 19, 2016

TO: David M. Campbell, City Manager
Jeff D. Cameron, Public Works Director

FROM: Manuel Abarca, Traffic Engineer

SUBJECT: 30th Avenue/Pacific Way/Glenwood Drive Traffic Signal Operation

Background

On Nov 17, 2015, the traffic signal at Pacific Way and 30th Avenue was knocked out of service by a vehicle crash. The City responded by installing a temporary service to return power to the intersection and energize the street lights, but restoring the traffic signal would be a longer process. The intersection was signed as four-way stop and the City began to receive comments from users who preferred the intersection as a four-way stop. While the signal was being repaired, traffic data was collected, and based on the data collected it was determined that a four-way stop should function satisfactorily for all but a few peak hours of the day. If the City was willing to accept a lower level of performance for a few hours, a four-way stop may be a feasible alternative to restoring the traffic signal to full operation.

On March 17, 2016, the traffic signal repair was completed and the signal put into flashing operation. The City prepared an opinion survey and issued a press release on March 28, 2016, asking users which option was preferred:

- Four-Way Stop with Overhead Flashing Beacons
- Return Traffic Signal to Full Operation.

The results from 1,324 survey respondents showed 68% in favor of restoring the signal to full operation as of April 21, 2016. However, a number of residents responded that they didn't know about the survey and would have voted if they had received notice. In an effort to increase the exposure of the opinion survey, the City placed reader boards on Pacific Way and 30th Avenue advertising the survey. The number of responses almost doubled the first week after putting the reader boards in place.

On April 28, 2016, the City Council discussed the next steps and directed staff to return with more information to assist the Council to make a final decision.

This report from staff discusses the following topics:

- Traffic Data Collection
- Opinion survey results
- Operational Analysis
- Recommendation on intersection control treatment
- Recommendation on need and feasibility of adding left-turn lanes
- Long-term options

For the purposes of this report, Pacific Way is assumed to be aligned East-West and Glenwood Drive and 30th Avenue are aligned North-South. See Figure 2 at the end of the report for an aerial of the intersection.

Traffic Data Collected

Average Daily Traffic / 24-Hour Counts

Average Daily Traffic is collected by placing tube counters in the road to collect 24-hour counts, generally on a Tuesday, Wednesday, or Thursday. The 24-hour counts are used to identify the peak hours used in operational analysis. The 24-hour counts can be adjusted by seasonal factors to get Average Daily Traffic. Traffic counters were placed the week of December 14, 2015, one week prior to winter break for Longview School District. The average daily entering volume from all four approaches was 14,250. Traffic counters were placed again the week of May 2, 2016, with the average daily entering volume determined to be 15,500. The May volume represents an 8-percent increase from last December. Seasonal variations, proximity to the school district winter break, and an improving economy may explain the volume increase. The recent count in May is still 5 to 8 percent below counts collected in 2002 and in 2003. This suggests that the area is still recovering economically and traffic volumes have not reached pre-recession levels.

Turning Movement Counts

Turning movement counts are a count of vehicle maneuvers at an intersection and are used to perform operational analysis. The operational analysis is used to determine the appropriate number of through lanes, turning lanes and turn pocket lengths at an intersection. Turning movement counts also include bicycle and pedestrian crossings, although pedestrian and bicycle crossings are usually not high enough to influence operations at an intersection. Turning movement counts were collected for three one-hour time periods:

- AM Peak Hour (9:00 AM)
- PM Peak Hour (6:00 PM)
- CVG and Mint Valley Elementary Dismissal (3:00 PM)

The following table presents the turning movements for each of the hours above.

Table 1-Turning Movement Counts

	Pacific Way			Pacific Way			30th Avenue			Glenwood Drive		
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
AM Peak	37	261	94	42	119	12	55	58	110	35	88	52
PM Peak	46	133	38	40	219	22	85	146	79	11	75	70
CVG & MV	40	148	42	58	203	39	104	150	72	27	131	27

Speed

Traffic speed was measured using the City's Speed Sentry device which measures speed using radar. The Speed Sentry device was placed about a quarter-mile west of the 30th Avenue to measure eastbound speed and a quarter mile east of 30th Avenue to measure westbound speed. A software package made by Speed Sentry prepares a statistical report. The most commonly reported statistic is the 85th-percentile speed. The 85th-percentile speed is used to set speed limits and for design of roadway features.

The 85th-percentile speed is shown in the following table:

Table 2: Pacific Way Speed Data

Direction	85 th Percentile Speed
Eastbound Pacific Way	36 mph
Westbound Pacific Way	39 mph

Pedestrian and Bicycle Counts

Pedestrians and bicycle were counted for the same three hours used in the turning movement counts. The pedestrian and bicycle activity does not appear to be significant in terms of impacting operations. However, many of the respondents to the survey expressed concern for the lack of a controlled crossing with the traffic signal on flash. Most of the pedestrians appeared to be adults out walking or jogging. The bicyclists also appeared to be adults. No children were observed crossing or bike riding during the 3 hours observed. Below is the tabulation of the pedestrian and bicycle crossings observed:

Table 3: Pedestrian and Bicycle Crossings

Hour	Pedestrian Crossing	Bicycle Crossing
AM Peak Hour	2	1
PM Peak Hour	1	3
CVG and Mint Valley Dismissal	2	5

Crash History

A three-year crash history of intersection related crashes was reviewed for the three year period prior to the November 17, 2015 crash, there was one injury crash and 5 property damage only crashes. The collision database only contains reported crashes where a police report was filed. It does not capture crashes where drivers may have just exchanged insurance information.

After November 17, 2015, there have been two property damage only collisions. There didn't appear any significant patterns that may suggest considering mitigation.

Opinion Survey

The opinion survey results presented below are from March 28 to May 17, 2016. As of the morning of May 17, 2016, 3,752 responses were recorded on the opinion survey. The results are as follows:

Table 4: Opinion Survey Breakdown

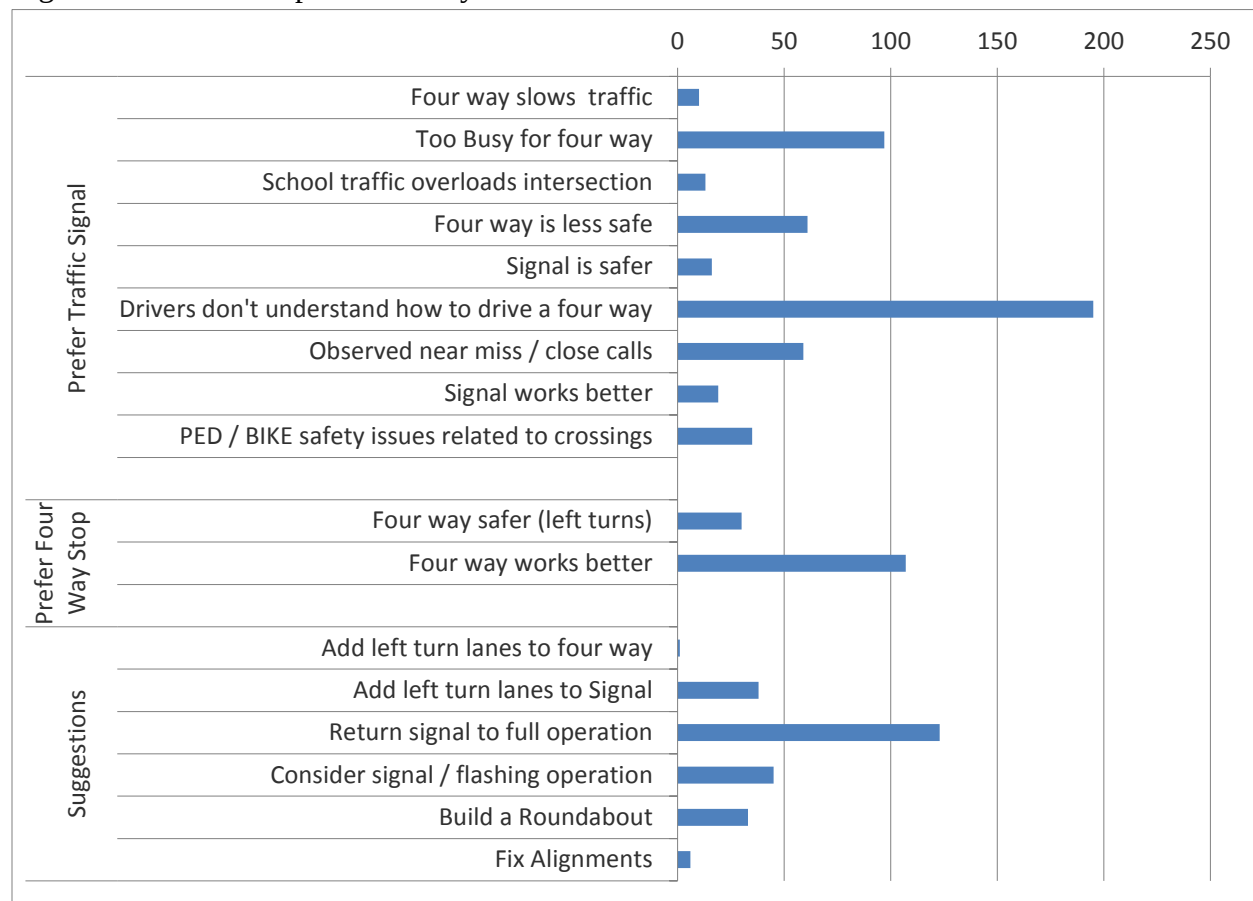
Four-way Stop with overhead red flashing lights	25.9%
Return traffic signal to full operation	74.1%

The opinion survey included a general comment box. The comments are summarized into three categories:

- Prefer Traffic Signal
- Prefer Four-Way Stop
- Suggestions

The following Figure 1 shows the range of suggestions that were compiled. The raw comments are included as an attachment.

Figure 1: Tabulated Opinion Survey Comments



Operational Analysis

Highway Capacity Manual (HCM) methodology was used to evaluate intersection alternatives. HCM methods are based on the concept of average control delay. Average control delay is the delay experienced by vehicles because of the presence of a traffic control device such as a stop sign, traffic signal, or roundabout. Turning movement counts, intersection lane configuration, and control devices are input into a computer model that calculates the average control delay. The average control delay is used to find the Level of Service for the intersection, which is reported as a letter grade A through F that is related to the average control delay; with A being the best and F being the worst. The operational analysis includes information from the opinion survey to round out the discussion.

Intersection Alternatives

Two-way stop

A two way stop was immediately dropped from consideration because the minor street Level of Service is F for each of the three hours.

Option 1: Four-Way Stop with Overhead Flashing Beacons

The Level of Service (LOS) for a four-way stop for each of the three hours is shown in the table below.

Table 5: Four-Way Stop Level of Service

Hour	Level of Service	Average Control Delay (seconds)
AM Peak Hour	C	17.1
PM Peak Hour	C	18.6
CVG and Mint Valley Dismissal	C	18.1

The Level of Service is C for each of the three hours. Level of Service C is considered a reasonable operational level during a peak hour. We assume that during the remaining hours of the day, the Level of Service will not be any worse and should be better during non-peak hours because the traffic volumes will be considerably less.

Issues with Option 1

The survey shows respondents are concerned with drivers being confused, being too timid, going out of turn, the frequency of near miss/close calls that diminishes the efficiency of the intersection. Many of the concerns expressed in the survey were observed while collecting data. There appears to be an overall lack of responsiveness and comfort shown by many of the drivers and this may explain the queues that develop. With any change in traffic control there is expected to be a settling period where drivers adjust to the change. We would expect that drivers have had sufficient time to adjust and the operation of the intersection as a four-way stop and the intersection should be at its highest efficiency. Instead, there were drivers still stopping and not taking their turns because they appear to be unsure what other drivers are going to do. The backups observed during the PM Peak Hour were between 10 to 15 cars. Based on operational analysis the maximum observed backup should be 3 to 4 cars.

Why Survey Respondents Prefer the Four-Way Stop

The survey comments show that many respondents feel the intersection operates more efficiently during the time they drive through the intersection. There were several respondents that commented it is easier to make left turns with the intersection as a four-way stop. Others commented that side street traffic on 30th Avenue and Glenwood Drive has less delay than with a signal.

Option 2-Traffic Signal

The Level of Service for a traffic signal for each of the three hours is shown in the table below:

Table 6-Traffic Signal Level of Service

Hour	Level of Service	Average Control Delay (seconds)
AM Peak Hour	A	8.5
PM Peak Hour	A	9.6
CVG and Mint Valley Dismissal	A	9.7

The Level of Service for the traffic signal is A with an average control delay below 10 seconds. This compares with the Level of Service C for the four-way stop and average control delay below 20 seconds.

Issues with Option 2

The survey respondents commented that making a left turn from Pacific Avenue feels less safe under signalized operation because of the speed of opposing traffic and pressure from same direction through traffic queuing behind them. Respondents also commented the traffic signal creates too much delay for side streets during off peak periods.

Why Survey Respondents Prefer Traffic Signal

The survey respondents feel that a traffic signal controls traffic better during peak hours and the respondents made frequent references to lines of cars forming on Pacific during the peak hours and on 30th Avenue during the school dismissal. The survey respondents also feel the signal does a better job at providing crossing opportunities for bicycles and pedestrians. Survey respondents identifying as pedestrians and bicyclists say that under four-way stop conditions, traffic is too focused on getting through the intersection and paying less attention to pedestrians and bicyclists.

Recommendation for Intersection Control

The survey results show that the majority of the respondents support returning the traffic signal to full operation. The operational analysis shows that during peak hours the traffic signal performs better than the four-way stop. The data we collected and analyzed leads to a recommendation to return the traffic signal to full operation during the peak hours. While staff supports having the signal in full operation 24/7, the traffic signal could be put into flashing operation during non-peak hours. We recommend that if flashing operations is used for non-peak hours, the hours should be from 9:00 PM to 7:00 AM. We do not recommend alternating from full signal to all-way flash multiple times during a 24-hour period.

Recommendations for Additional Improvements

Adding Left-Turn Lanes:

Based on the data collected and analyzed, the intersection does not meet warrants to install left turns on Pacific Avenue because the volume of left turn traffic is not high enough. Additionally, there is not enough crash history in the last three years to support installing left-turn lanes to mitigate for crash history. However, a number of the survey respondents preferred the four-way stop because they felt it was easier and more comfortable to make a left-turn under stop conditions. Many of these respondents may feel more comfortable turning from a left-turn lane under signal control if there is a left-turn lane. The left-lane lane may provide a benefit of a storage-refuge area and alleviate the frustration expressed by respondents that are delayed behind left turn traffic.

Feasibility of adding Left-Turn Lanes

The traffic signal operation should not change by adding left turn lanes on Pacific Way. It is not feasible to install left turn lanes on the 30th Ave/Glenwood Dr. approaches because there is insufficient roadway width and due to the significant approach angles. The table below shows a comparison of Level of Service of signal operation under existing conditions and adding left turn lanes.

Table 7: Level of Service Comparison between Existing Conditions and Adding Left-Turn Lanes

	Existing Conditions		Adding Left-Turn Lanes	
Hour	Level of Service	Average Control Delay (seconds)	Level of Service	Average Control Delay (seconds)
AM Peak Hour	A	8.5	A	8.6
PM Peak Hour	A	9.6	A	8.9
CVG and Mint Valley Dismissal	A	9.7	A	9.0

Options for Adding Left-Turn Lanes:

Convert Existing Lanes

The most expedient way to add left turns is to convert the left-through lanes on Pacific Avenue to left only lanes, and convert the right-turn lanes to right-through lanes. This could be accomplished with restriping. If we just convert the lanes, we can operate the signal without adding or relocating the detection. There may need to be some minor adjustment of the placement of signal heads to get them to line up with the new through lane.

One negative of this approach is that the left turn lanes will be offset from each and not line up opposite each other in the ideal location in the center of the roadway. The offset left turn lanes may have line of sight issues because there will be a left-turn lane blocking the line of sight of

the opposing through traffic. See Figure 3-Lane Conversion at the end of the report for a left turn lane concept.

Centering Left-Turn Lanes:

Centering the left-turn lanes puts the lanes in the ideal location for the best line of sight for left turning vehicles. However, the detection loops in the roadway would have to be replaced and the signal heads would need to be moved to line up with the new turn lane locations. Another issue to deal with is the skewed angles of the intersection and the result on vehicle tracking. Because of the skew angle vehicles like school buses need more room for off tracking of the rear of the vehicle during the turn. The receiving lane on 30th Avenue must be widened to handle buses. This is accomplished by restriping the approach on 30th Avenue from two lanes to one lane, eliminating the right turn lane. Changing the number of lanes on 30th Avenue does not measurably change the Level of Service. The Level of Service is still A for all three hours and the average control delay is still under 10 seconds.

We estimate cutting in new traffic loops for both Pacific Way approaches and for 30th Avenue approach at a cost of \$9,500 with City crews doing the work. Restriping the intersection will cost \$5,000. Total cost to add turn lanes centered in the roadway is \$14,500. See Figure 4-Center Left Turn Lanes with New Detector Loops at the end of this report.

Recommendation for Adding Left-Turn Lanes

Adding turn lanes does not adversely affect or notably improve the operation of the intersection. However, motorist perception will likely be improved. Therefore, staff recommends installing left turn lanes centered in the middle of Pacific Way and installing new loops and moving the signal heads.

Long Term Solutions

A number of survey respondents suggested the City consider a roundabout. Staff has looked at installing a roundabout in the past and didn't move forward because of right of way issues. Brian Walsh, subject matter expert on roundabouts for WSDOT, believes a mini-roundabout may work at this location. He will prepare a hand sketch of what a compact-roundabout would look like, and estimates a mini-roundabout could be built for \$350,000. We would be supportive of considering a roundabout as a long term solution to this location provided we are confident we can work out the right of way issues, or a mini-roundabout, and there is strong community support for introducing roundabouts to Longview.

Report Attachments

Figure 2-Existing Conditions

Figure 3-Lane Conversion

Figure 4-Center Left Turn Lanes with New Detector Loops

NTS



FIGURE 2- EXISTING & CONDITIONS

NTS



FIGURE 3- LANE CONVERSION

NTS



FIGURE 4- CENTER LEFT TURN LANES WITH NEW DETECTOR LOOPS