



To: Desiree Morgan, LMC

From: Matt Fralick, PE, PTOE; Tobin Bonnell, PE, PTOE, Alta Planning + Design

Date: April 22, 2021

Re: Traffic Analysis Memorandum – Horton Street and 40th Street Improvements

Traffic Analysis Memorandum – Horton Street & 40th Street Improvements

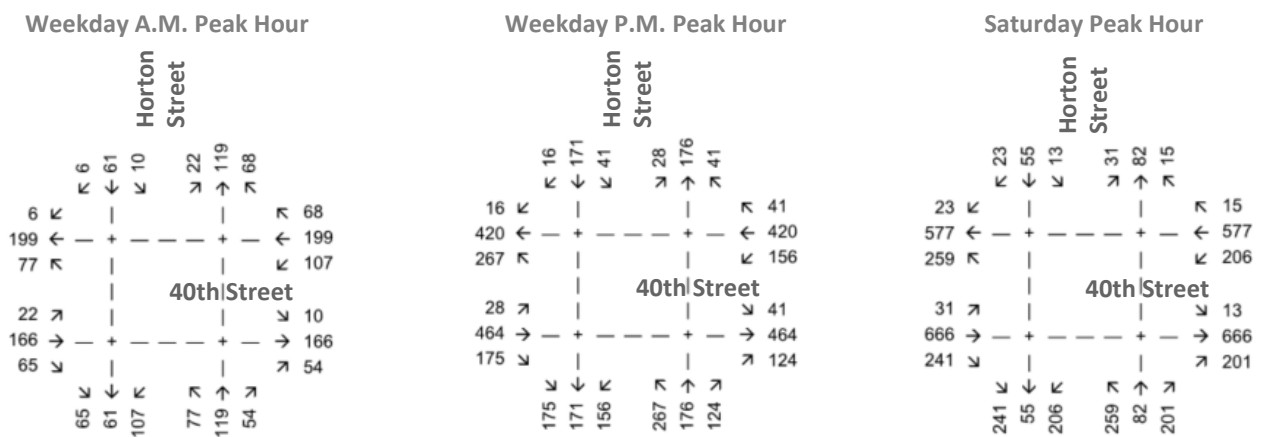
In accordance with your request, Alta has prepared the following assessment of traffic safety and operations associated with the active transportation improvements at the intersection of Horton Street and 40th Street. The purpose of this memorandum is to provide the City of Emeryville with an evaluation of traffic impacts of the proposed active transportation improvements to the intersection. The results of this evaluation will help inform any proposed signal phasing, signal timing, and turn restriction recommendations.

The proposed intersection improvements are based on measures recommended with the 2015 Traffic Impact Analysis of the Sherwin-Williams Development. These measures were recommended in an effort to mitigate the project's impact upon Horton Street's planned designation as a bicycle boulevard. At the intersection, a barrier would be located on the east side of Horton Street, north of 40th Street, prohibiting the northbound through, eastbound left-turn, and westbound right-turn motor vehicle movements. The barrier will allow for these movements to be made via active transportation. This evaluation will explore how the newly-introduced bicycle movements can be safely integrated into the intersection's signal operations.

Peak Hour Traffic Volumes

In accordance with discussions with the City of Emeryville, peak hour traffic volumes that were collected at the intersection of Horton Street and 40th Street as a part of the 2015 Traffic Impact Analysis prepared by Fehr & Peers were permitted to be utilized for this analysis. In this study, weekday AM, weekday PM, and Saturday peak hour traffic volumes were analyzed. The existing peak hour traffic volumes at the intersection are shown below in Figure 1.

Figure 1 – Existing Peak Hour Traffic Volumes

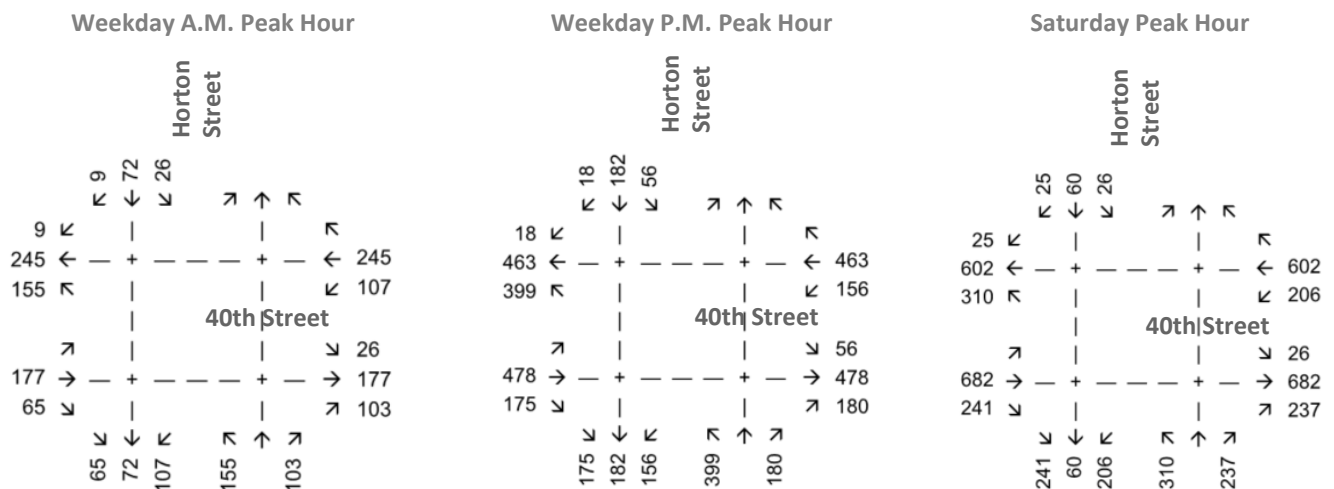


To reflect the proposed movement restriction mitigation measures, Alta re-assigned these peak hour traffic volumes, based on knowledge of the existing roadway network and assumptions regarding trip origins and destinations. In general, northbound through movement volumes were re-assigned to the corresponding right and left turn movements, based on the existing traffic distribution percentages. Approximately half of the eastbound left-turn movement volumes were assumed to have made the movement prior to reaching the intersection, while the remaining volumes were assumed to continue through the intersection via the eastbound through movement. Likewise, approximately half of the westbound right-turn movement volumes were assumed to have made the movement prior to reaching the intersection, while the remaining volumes were assumed to continue through the intersection via the westbound through movement.

Peak hour traffic volumes associated with trips generated by the proposed Sherwin-Williams development were applied to the intersection, based on the trip generation and distribution detailed within the 2015 Traffic Impact Analysis prepared by Fehr & Peers. However, Alta also re-assigned these traffic volumes to reflect the proposed movement restriction mitigation measures. These re-assignments were based on the location of the proposed Sherwin-Williams development in relation to the intersection. All northbound project-generated through movement volumes at the intersection were re-assigned to the corresponding left-turn movement. All eastbound project-generated left-turn movement volumes were assumed to have made the movement prior to reaching the intersection. All westbound project-generated right-turn movement traffic volumes were re-assigned to the westbound through movement.

The existing plus development peak hour traffic volumes, re-assigned to the roadway network based on proposed movement restriction mitigation measures, are shown below in Figure 2.

Figure 2 - Existing plus Development (W/ Proposed Movement Restriction Mitigation)
Peak Hour Traffic Volumes



Traffic Analysis

An assessment of traffic operations at the intersection was made for the scenarios listed below:

- Existing Conditions
- Existing plus Development Conditions (W/ Proposed Movement Restriction Mitigation)

The study intersections were evaluated using the Synchro 10 traffic analysis software package. Calculations were performed based on the 2000 edition of the Highway Capacity Manual (HCM), which is published by the Transportation Research Board. The operating conditions at an intersection are graded by the “level of service” experienced by drivers. Level of service (LOS) describes the quality of traffic operating conditions and is rated from “A” to “F”. LOS A represents the least congested condition with free-flow movement of traffic and minimal delays. LOS F generally indicates severely congested conditions with excessive delays to motorists. LOS E generally indicates an intersection at or nearing capacity. Intermediate grades of B, C, and D reflect incremental increases in the average delay per stopped vehicle. Delay is measured in seconds per vehicle.

The results of the existing conditions intersection analyses are summarized below in *Table 1*. The intersection was evaluated using the existing lane configurations, the traffic volumes shown in Figure 1, and traffic signal phasing and timings provided by the City of Emeryville.

Table 1. Intersection Operational Analysis – Existing Conditions

Intersection	Weekday AM		Weekday PM		Saturday	
<i>Traffic Control</i>	LOS ¹	Delay ²	LOS ¹	Delay ²	LOS ¹	Delay ²
Horton Street and 40 th Street						
<i>Traffic Signal</i>	<i>C</i>	<i>31.2</i>	<i>D</i>	<i>41.0</i>	<i>D</i>	<i>39.7</i>

1 – Level of Service

2 – Delay in seconds per vehicle

Table 1 shows that the intersection of Horton Street and 40th Street currently operates at acceptable levels during all three peak hour scenarios. However, it was noted that the existing weekday AM and PM peak period signal timing plans do not provide for the appropriate pedestrian clearance times, as required by the California Manual on Uniform Traffic Control Devices (CA MUTCD), with respect to the northbound pedestrian crossing. Likewise, the existing Saturday peak period signal timing plan does not provide the appropriate pedestrian clearance times for the southbound pedestrian crossing.

Existing plus development intersection analyses were evaluated using the traffic volumes shown in Figure 2. Lane configurations were assumed to be as described above, with the proposed movement restriction mitigation measures at the intersection. Traffic signal phasing assessments were made assuming that the existing traffic signal cycle lengths are to be maintained with any proposed changes. Initial attempts at traffic signal modifications were aimed at providing a “bike-only” phase, to be paired with a bike signal. It was determined that the accommodation of this phase could not be accomplished by reducing green times due to there not being enough time remaining in the signal cycles to provide for the required pedestrian crossing times. Removal of the existing north-south split phase was also explored as a way to accommodate this “bike-only” phase, but it was determined that the PM and Saturday peak traffic volumes were too high to not provide for a protected northbound left turn phase. Therefore, the chosen proposed traffic signal phasing incorporates protected/permissive operations for both the northbound left turn and the northbound right turn. Northbound bike and pedestrian movements would be provided a protected phase, running with the protected northbound left turn. The northbound right turn would be provided a protected phase via an overlap with the westbound left turn phase. The signal phase sequencing would allow for the eastbound-to-northbound two-stage left-turn box proposed for cyclists to be clear during operation of the protected and permissive northbound right turn phases. Proposed traffic analyses were also performed assuming that northbound and southbound traffic would not be permitted to make right turns on red. Proposed traffic signal timing schemes were devised to accommodate pedestrian clearance times required by the CA MUTCD. A conceptual intersection design plan, including the proposed signal improvements as described above, has been included with this memorandum for reference.

The results of the existing plus development conditions intersection analyses are summarized below in *Table 2*. The intersection was evaluated assuming the aforementioned movement restriction mitigation measures, the re-distributed traffic volumes shown in Figure 2, and the proposed traffic signal phasing described above.

Table 2. Intersection Operational Analysis – Existing plus Development Conditions (W/ Proposed Movement Restriction Mitigation)

Intersection	Weekday AM		Weekday PM		Saturday		
	<i>Traffic Control</i>	LOS ¹	Delay ²	LOS ¹	Delay ²	LOS ¹	Delay ²
Horton Street and 40 th Street							
	<i>Traffic Signal</i>	<i>C</i>	<i>26.7</i>	<i>D</i>	<i>40.1</i>	<i>D</i>	<i>44.7</i>

1 – Level of Service

2 – Delay in seconds per vehicle

Table 2 shows that the intersection of Horton Street and 40th Street, given the traffic signal phase changes discussed above and the additional traffic volumes to/from the Sherwin-Williams development, would operate at levels of service comparable to those of the existing condition. The proposed scenario results in an increase in the overall delay with respect to the Saturday peak period at the intersection, but there is no change to the level of service, which is within the acceptable range. It should be reiterated that all of the proposed signal timing plans provide these levels of service while accommodating pedestrian clearance times required by the CA MUTCD.

Recommendations

The conceptual intersection design plan included with this memorandum shows the improvements recommended for the intersection. The most significant proposed change to the existing traffic signal infrastructure is to remove the existing light standard on the northeast corner of the intersection and replace it with a traffic signal pole with a 35-foot mast arm. The northbound left turn movement will be controlled by four-section flashing yellow arrow signal heads. The inclusion of the mast arm and flashing yellow arrows help mitigate any potential issues with introducing the permissive left turn movement at the intersection. The northbound right turns will be controlled by five-section traffic signal heads and no right turn on red signage. Existing traffic signal heads for the eastbound left turn movement will be removed, and the southbound left-turn arrow signal heads will be replaced with three-section flashing yellow arrow signal heads. The conceptual plan details other signage required for the intersection improvements.

These recommendations assume that the existing traffic signal controller can accommodate the proposed signal operations, including the proposed right-turn overlap. Further development of the design of the proposed signal modifications can confirm these assumptions, as well as other existing controller capabilities. A bike signal could be considered for the northbound bike movement, which could operate with the northbound left turn and pedestrian signal phase. However, inclusion of the bike signal further complicates the proposed phasing scheme, and more consideration and investigation of the capabilities of the existing signal controller and cabinet would need to occur. Right-of-way and line-of-sight limitations on the northeast corner of the intersection also complicate placement of the potential bike signal. Therefore, the final recommended improvements indicate that modifications to signal phasing and timing be made within the existing controller, and the northbound bike movements will be controlled with the corresponding pedestrian signal.