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M E M O R A N D U M

To: Adam Varat

From: Jeremy Nelson and Francesca Napolitan

Date: June 1, 2009

Subject: DRAFT Conceptual Analysis of Transportation Impacts of Mission Streetscape Plan Improvements

Introduction

As part of the Mission Streetscape Plan (MSP) the City of San Francisco Planning Department is evaluating a number of streetscape amenity and traffic calming improvements, including the feasibility of implementing a "four-to-three" traffic lane conversion on either Folsom Street or Bryant Street between 16th Street and 24th Street.

Nelson\Nygaard was asked to provide a conceptual analysis of the feasibility of potential (MSP) improvements, focusing especially on identifying potential transit and auto traffic impacts and design or operational mitigations.

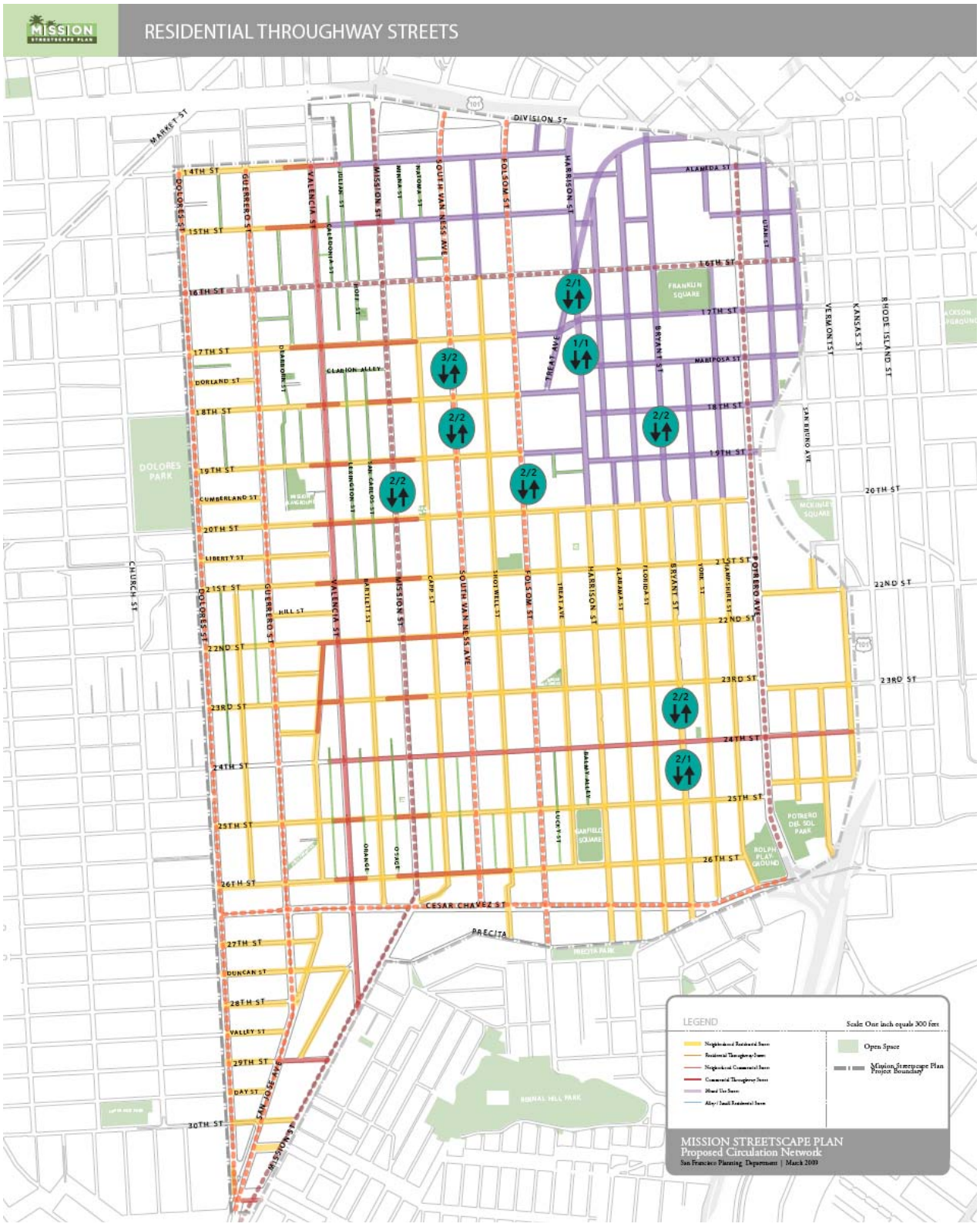
This memo provides a summary of Nelson\Nygaard's analysis, including:

- Overview of the traffic data collected (both through and turning movements).
- Review of applicable traffic operations guidelines and street design standards.
- Conceptual evaluation of the potential feasibility of reducing number of traffic lanes on Folsom or Bryant Streets.
- Discussion of potential mitigation measures (if necessary) to minimize the diversion of vehicles from Folsom or Bryant Streets to surrounding streets.
- Next steps for the project.

Study Area

Figure 1 shows the study area which falls within the boundaries of the Mission Streetscape Plan. This diagram highlights the Planning Department's proposed street typology for the streets evaluated as part of this analysis and also highlights the number of lanes and directionality of traffic for each of the Study streets.

Figure 1-1 Study Area



Methodology

Data Collection

In order to determine the potential traffic impacts of a four to three lane conversion, *turning movement* data for the AM peak period of 7am to 9am and the PM peak period of 4pm to 6pm was collected for the following 15 intersections (see Figure 1-2):

- Bryant Street at 16th Street, 20th Street, and 24th Street
- Harrison Street at 16th Street, 20th Street, and 24th Street
- Folsom Street at 16th Street, 20th Street, and 24th Street
- South Van Ness Avenue at 16th Street, 20th Street, and 24th Street
- Mission Street at 16th Street, 20th Street, and 24th Street

In addition, *traffic volume* data was collected at the same intersections (Bryant St, Harrison St, Folsom St, South Van Ness Ave, and Mission St at 16th St, 20th St, and 24th St.). This data included total volumes on all four approaches to each intersection and was collected over a 24 hour period (see Figures 1-3 through 1-9).

Conceptual Feasibility Analysis

Nelson\Nygaard analyzed the traffic data, proposed project list, and local and national street operations and design guidelines to conduct a conceptual analysis of the feasibility of proposed changes under consideration in the MSP.

Figure 1-2 Total Daily Traffic Volumes

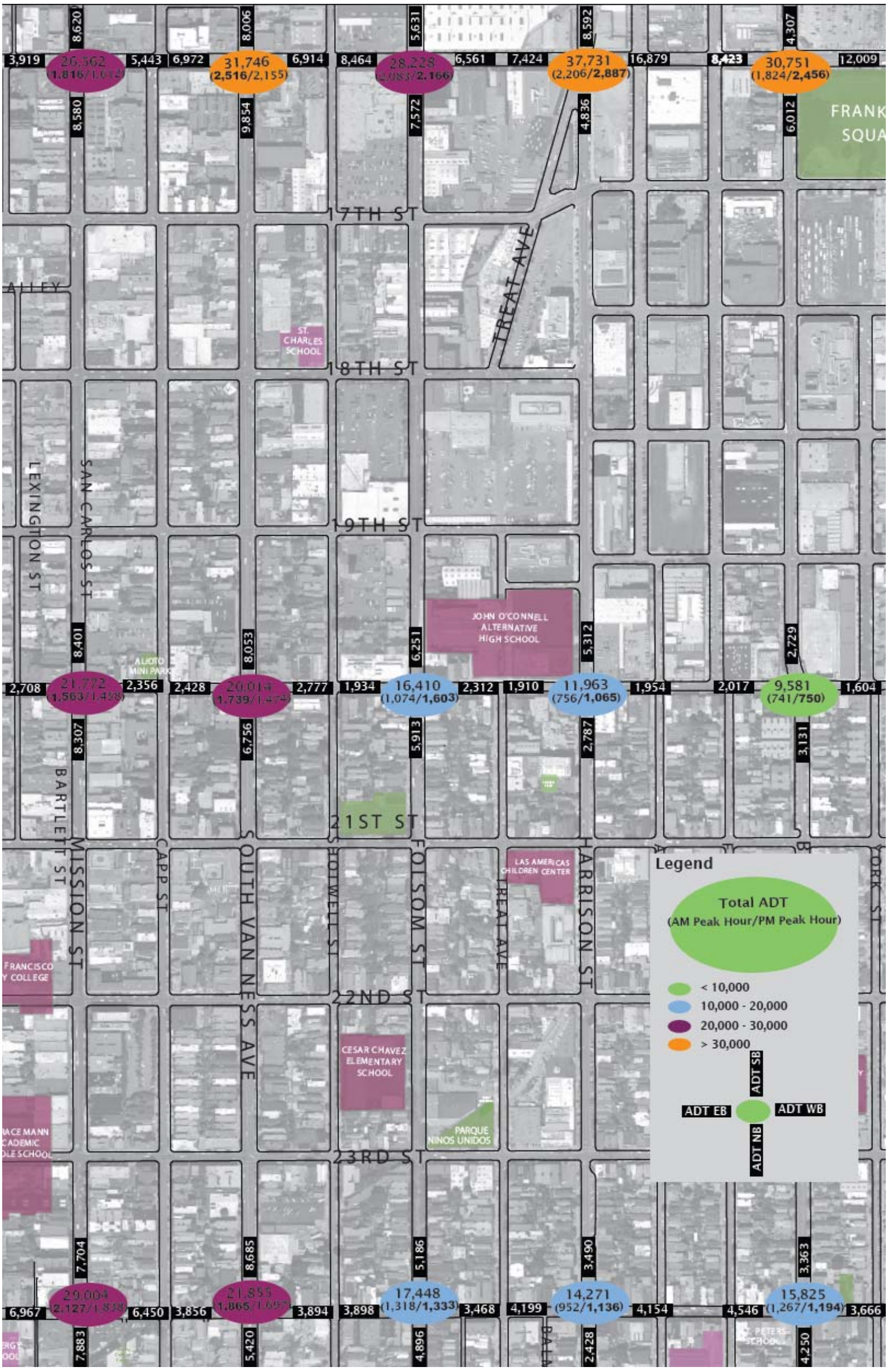


Figure 1-3a Sample Turning Movement Data Output

All Traffic Data
(916)771-8700

CITY OF SAN FRANCISCO

File Name : F-BRYANT-20TH
Site Code : 00000000
Start Date : 4/30/2009
Page No : 2

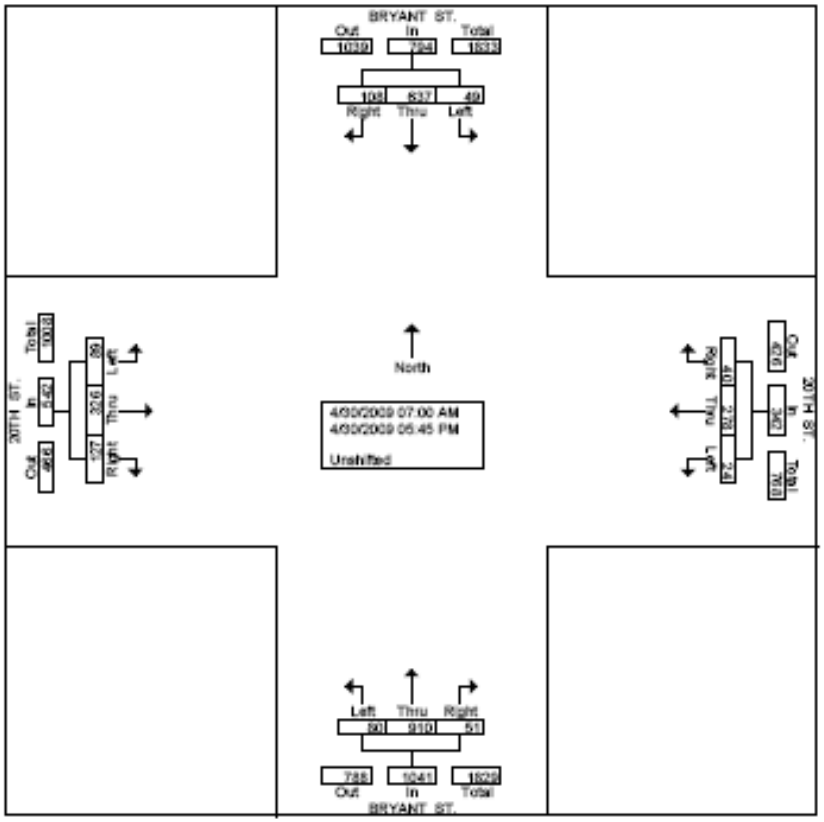


Figure 1-3b Sample ADT Data Output

Prepared by NDS / ATD

Project #: 09-7179-014 City: San Francisco

Location: Bryant St & 20th St Date: Tuesday, May 05, 2009

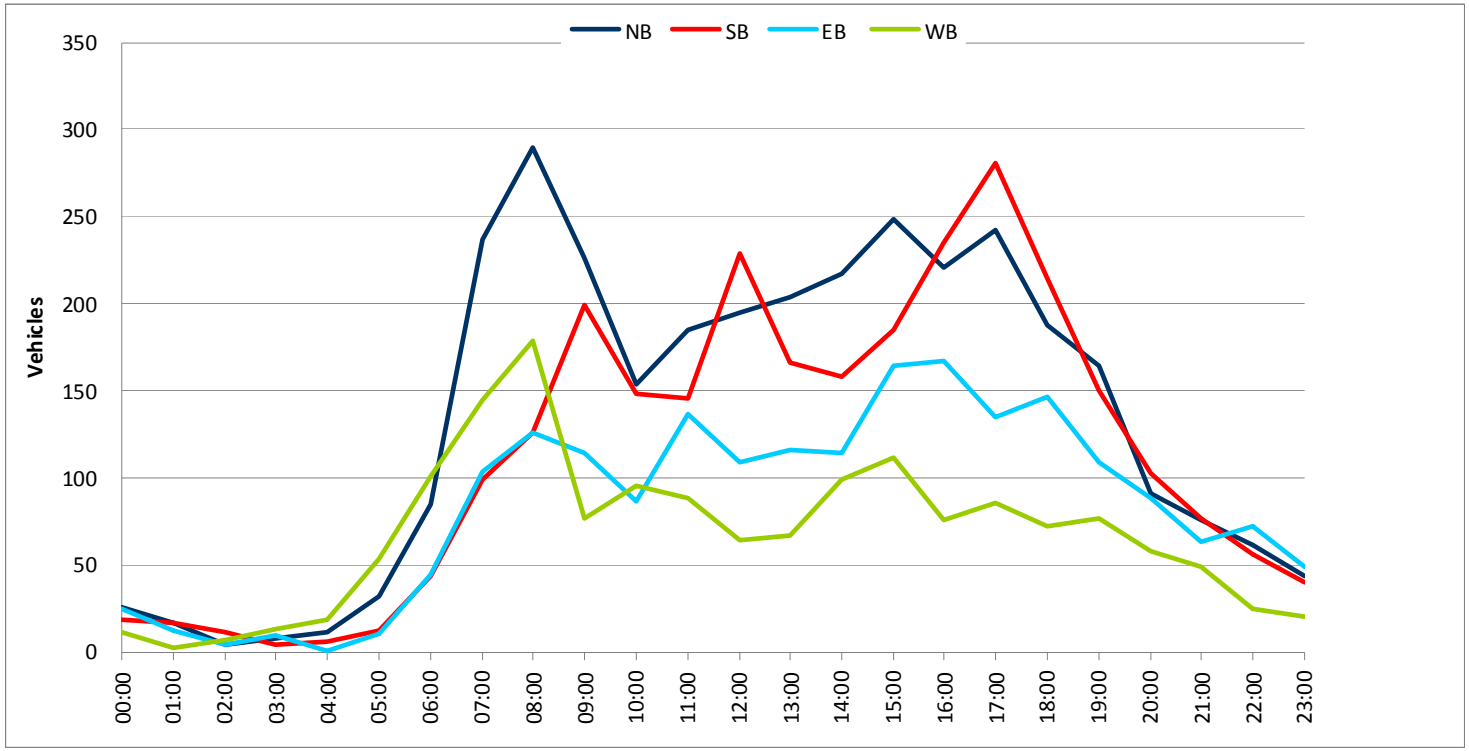


Figure 1-4 AM Peak Hour Turning Movement Counts at 16th Street

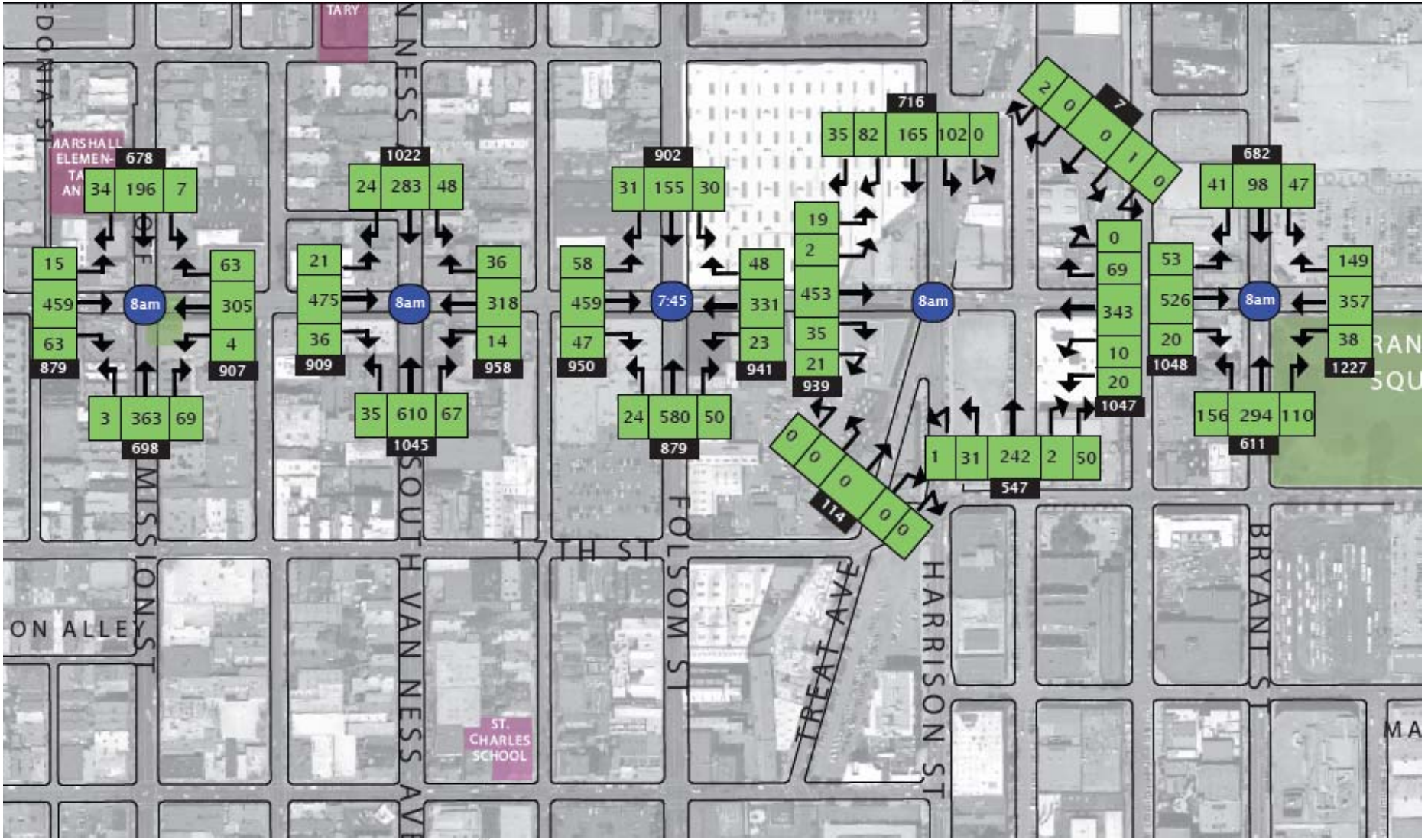


Figure 1-5 AM Peak Hour Turning Movements at 20th Street

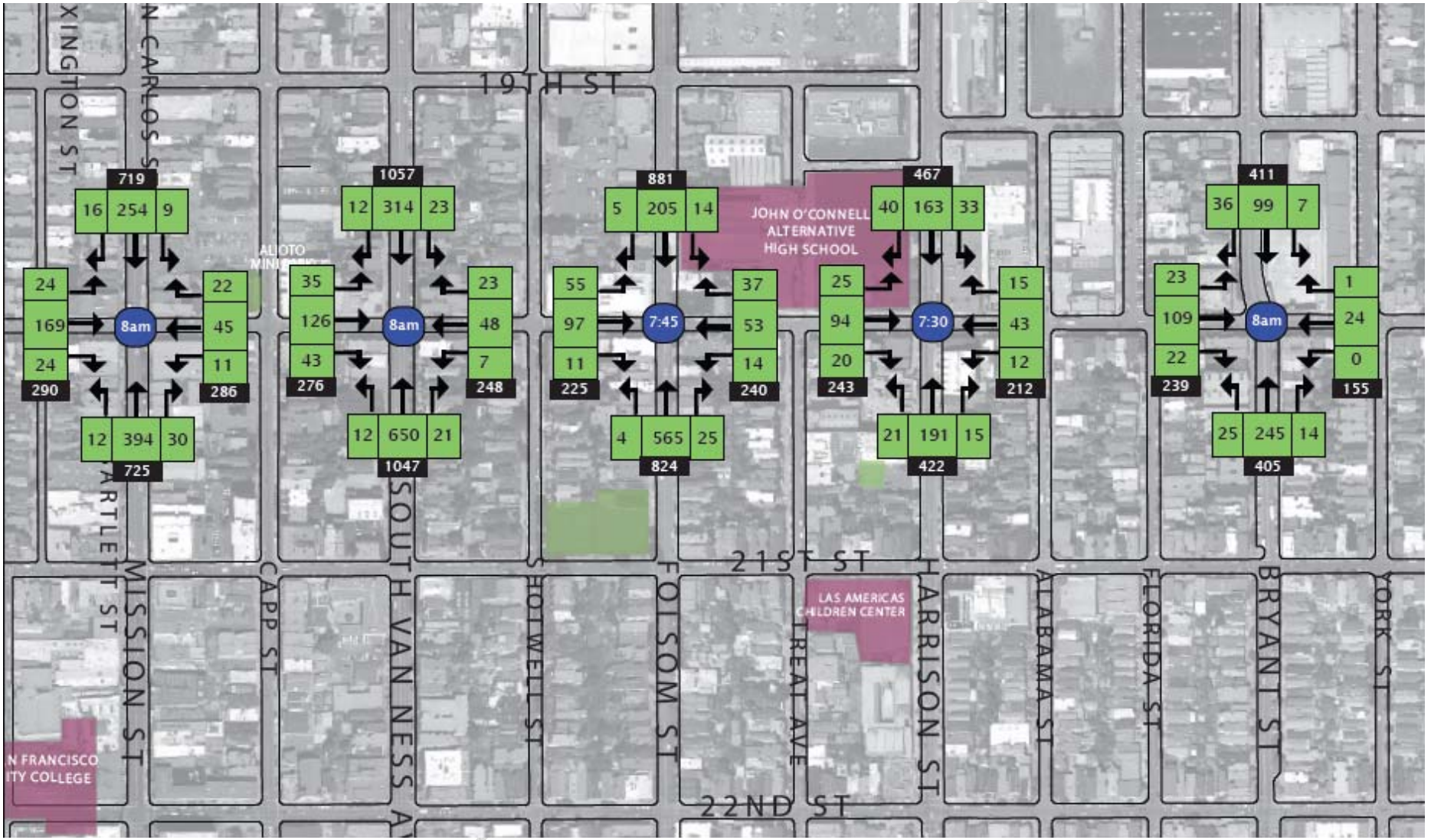


Figure 1-6 AM Peak Hour Turning Movements at 24th Street

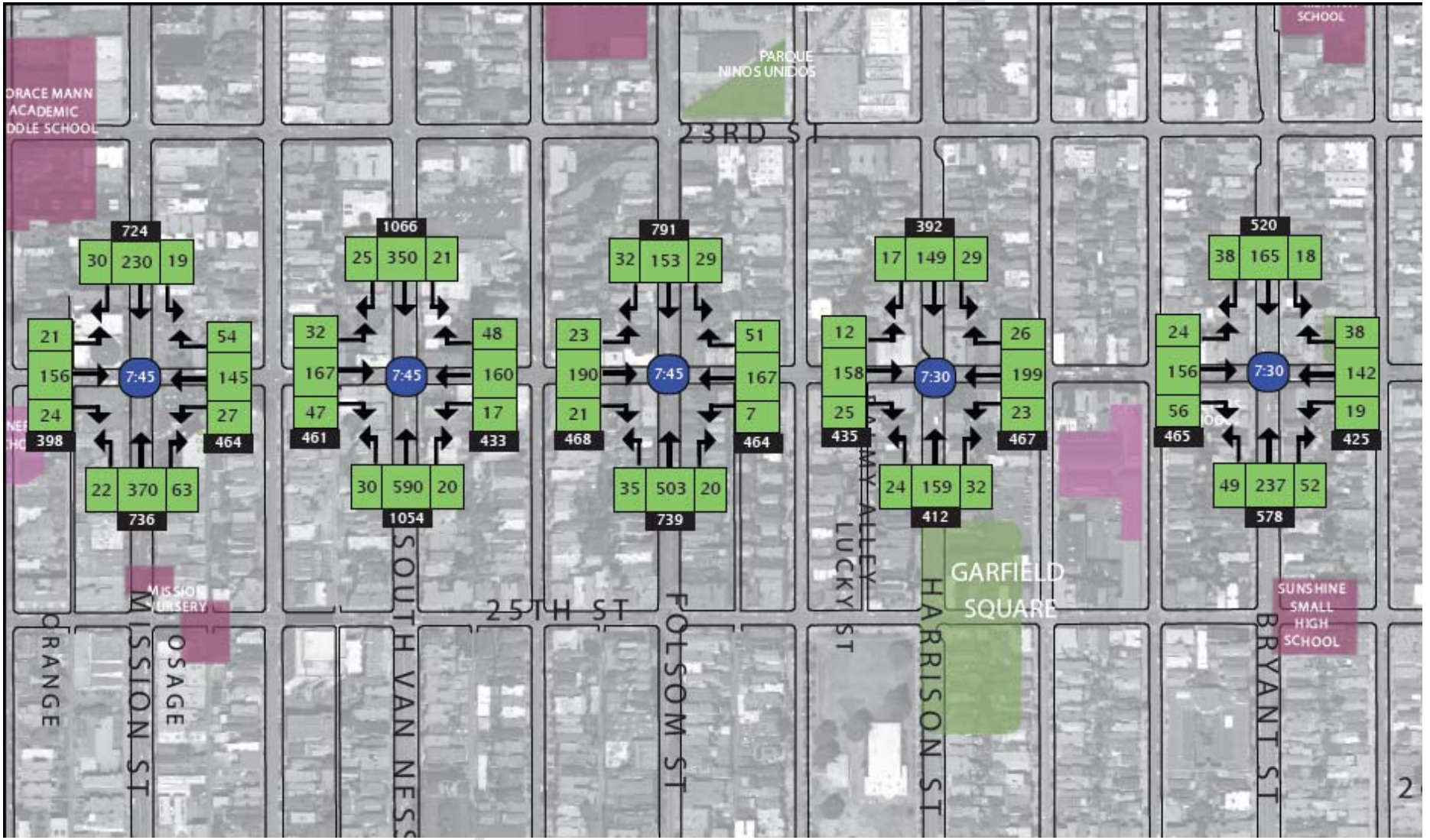


Figure 1-7 PM Peak Hour Turning Movements at 16th Street

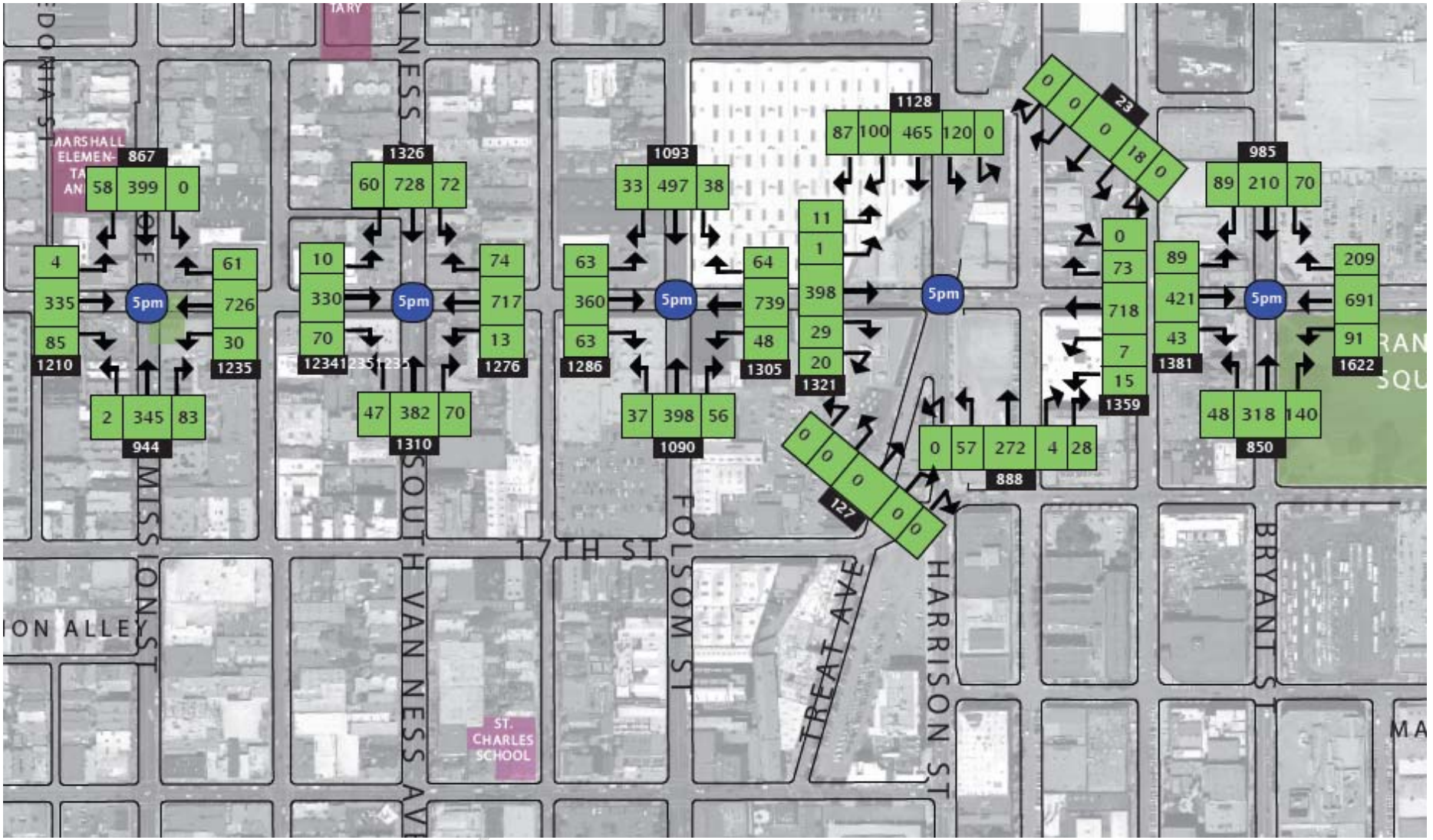
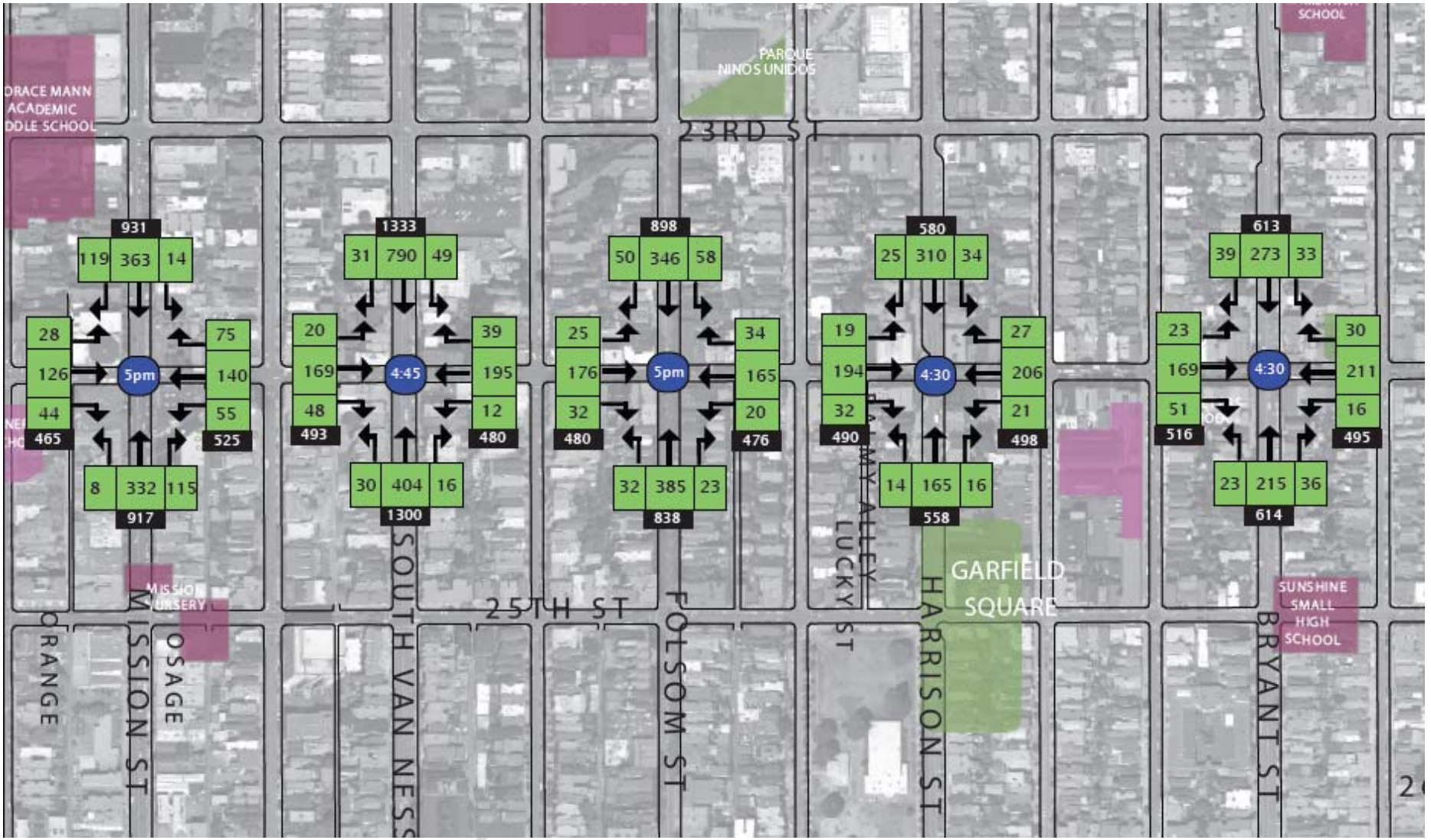


Figure 1-8 PM Peak Hour Turning Movements at 20th Street

Figure 1-9 PM Peak Hour Turning Movements at 24th Street



Summary of Data

Average Daily Traffic (ADT)

As shown in Figure 1-2, 16th Street has the highest ADT with three out of the five evaluated intersections carrying more than 30,000 cars daily. The segment of 20th Street between Bryant St and Folsom St has the lowest ADT, ranging from less than 10,000 cars travelling through the intersection at Bryant St. to approximately 16,500 cars at Folsom St. The traffic volumes along 24th St between Bryant and Folsom all fall below 20,000 cars per day, with volumes increasing at South Van Ness Ave. and Mission St.

In the north-south direction, Bryant St, Harrison St, and Folsom St all have an ADT of less than 20,000 at 24th St and 20th. The ADT for all three streets increases significantly at 16th St, however this is due to high traffic volumes in east-west traffic along 16th St, as the ADT in the north-south direction only increases slightly at 16th St.

Turning Movements

In the AM peak hour there is clear directionality in the flow of thru traffic as the number of cars travelling in the northbound direction is greater for all of the north-south streets evaluated in this analysis. On Mission St, South Van Ness Ave, and Folsom St, the number of cars travelling northbound is approximately double the number of cars travelling southbound at each intersection. On Bryant St. and Harrison St. there is relatively less difference in the number of cars travelling northbound vs. southbound. In the east-west direction there is slightly more traffic in the westbound direction for the majority of the intersections evaluated.

In PM peak hour there is no clear directionality trend for the north-south streets evaluated. On Mission St. and Bryant St. thru traffic is roughly the same in either direction. On South Van Ness Ave and Harrison St. thru traffic in the southbound direction is approximately double traffic in the northbound direction. On Folsom Ave. the directionality varies between 16th St and 24th St.

The greatest number of turning movements occurs in the PM peak period on Mission St. at 24th St and Bryant at 16th St. For the majority of intersections, AM peak period turning movements are lower than PM peak period turning movements. The intersection of Bryant at 16th has the greatest number of AM peak period turning movements.

Operational Comparison

Table 1-1 provides a comparison of the current operational characteristics of streets in the study area and their typology designations.

Table 1-1 Comparison of Data Collected and Street Designations

Street	ADT	Peak Hour	General Plan Street Designation[1]	MSP Designation
Bryant	9,581 - 30,751	741 - 2,456	NA	Neighborhood Residential
Harrison	11,963 - 37,731	756 - 2,887	Bike Network	Neighborhood Residential
Folsom	16,410 - 28,228	1,074 - 2,166	Neighborhood Network Connection Street	Residential throughway
S. Van Ness	20,014 - 31,746	1,474 - 2,516	Major Arterial	Residential throughway
Mission	21,772 - 29,004	1,458 - 2,127	Transit Conflict Street Primary Transit Network Neighborhood Commercial St.	Commercial Throughway
16th	26,562 - 37,731	1,612 – 2,516	Secondary Arterial Primary Transit Network Neighborhood Commercial St.	Commercial Throughway
20th	9,581 - 21,772	741 - 1,739	Neighborhood Commercial Street	Neighborhood Residential
24th	14,271 - 29,004	952 - 2,127	Neighborhood Commercial Street	Commercial Throughway

[1] San Francisco Planning Department, General Plan Transportation Element.

Potential Impacts

The San Francisco Planning Department has developed a draft list of projects for the Mission Streetscape Plan area. Grouping these projects based on their potential impacts on transit and auto level of service, these projects fall into one of three categories.

No Reduction in Capacity and Low Potential for Diversion

Traffic calming measures such as traffic circles, chicanes, bulb-outs and raised intersections at major cross-streets, and greening will slightly reduce travel speeds (without significantly reducing end-to-end travel times) but will not reduce capacity. As a result, we believe these kinds of measures will result in minimal (if any) traffic diversion.

Reduce Capacity in a Context with Low Potential for Diversion

Measures such as converting from parallel to perpendicular parking can reduce throughput capacity. However when implemented in a context where there is low likelihood of traffic diversion – such as the mixed-use streets – we believe these kinds of measures will result in minimal if any traffic diversion.

Reduce Capacity where there is Potential for Diversion

Measures such as implementing a four lane to three lane conversion of Folsom St or Bryant St will reduce the roadway capacity and has the potential for traffic diversion. The remainder of this memo focuses on potential impacts and mitigations for this category of projects.

Preliminary Findings

Diversion

If total travel time on one of the redesigned streets increases to the point that average end-to-end travel time on an adjacent corridor is significantly quicker, some motorists may divert to that corridor. This is especially a concern if it causes transit delays on high-capacity transit corridors (designated as part of SFMTA's "Rapid Network" such as Mission St. or 16th St.) or a significant degradation of auto level of service that can't be mitigated.

The impacts of reducing auto capacity on travel times and auto level of service are highly context-dependent. Factors that would affect the feasibility of capacity reductions could include: physical characteristics of the street grid (such as block length), intersection geometry (such as presence of turn lanes), operational characteristics (such as dedicated signal phase for turning movements), and traffic characteristics (such as the 85th percentile travel speed, proportion of large vehicles, and the degree traffic volumes are highly peaked).

The SFMTA has shared the local guidelines they use as a starting point for evaluating the feasibility of a 4-to-3 conversion on a particular corridor without significant impacts to auto LOS, travel times, and diversion to other corridors. These guidelines are tailored to the unique San Francisco context and are based on the experience of the 4-to-3 conversion of Valencia St. in the study area, as follows:

- 20,000 ADT for all lanes (both directions)

- 1,000 vehicles per lane per hour (1 direction)
  - 800 – 900 per through lane
  - 100 to 200 per turning lane

Based on these guidelines, Nelson\Nygaard's analysis of the current traffic data and existing operations found that diversion will likely not occur if a 4-to-3 conversion occurs on Folsom or Bryant Streets. Subsequent traffic modeling will test this preliminary conclusion.

Transit Delays

Nelson\Nygaard's analysis of the traffic data suggests that if any diversion did occur due to 4-to-3 conversion on Folsom and Bryant Streets, it would not likely occur on primary transit corridors in the study area (Mission or 16th Streets) due to the relative slow travel times and high traffic volumes on those corridors compared to alternatives in the study area. Subsequent traffic modeling will test this preliminary conclusion.

Auto Level of Service (LOS)

Table 1-2 below shows existing auto levels of service for study intersections where data was available. In the City and County of San Francisco, the significance threshold for this performance measure is LOS D.[2] Currently no intersection meets that threshold and Nelson\Nygaard's analysis of the traffic data suggests that additional a 4-to-3 conversion on Folsom or Bryant Streets would not *itself* cause LOS at these intersections to degrade below LOS D. Subsequent traffic modeling will identify potential level of service impacts based on proposed changes.

Table 1-2 Existing Intersection LOS[3]

Street	Cross Street	Intersection LOS
Mission	16th	C
Mission	24th	C
S. Van Ness	16th	B

Potential Mitigation Measures (if needed)

If subsequent traffic modeling shows potential impacts due to diversion (e.g. transit delays on Mission St.) or significant degradation of auto LOS, mitigations could include the following.

Mitigations on project streets (e.g. Folsom or Bryant Streets)

- Signal retiming on affected streets in the primary direction (at intersections where cross-street volumes are low to moderate):
  - Extend signal phase to improve travel time.
  - Consider dedicated turn phase to reduce turn lane queues.

[2] Source: San Francisco Planning Department, Transportation Impact Analysis Guidelines.
[3] Source: San Francisco Planning Department, Eastern Neighborhoods Environmental Impact Report, Part 7 – Transportation, Noise, Air Quality Impacts.

- Extended turn lane pockets on affected streets to reduce intersection delays due to turning movements:
  - Left turns: extend length of proposed center turn lanes to accommodate longer queues.
  - Right turns: remove on-street parking at corners to provide a right-turn pocket.
- For streets with significant "peak directionality" consider peak-hour parking tow-away restrictions to provide additional capacity in the peak direction parking lane.

Mitigations on affected streets (e.g. Mission Street)

- Optimization of transit operations on primary transit network streets such as pre-paid/all door boarding, signal pre-empts, transit-only lanes, etc. to reduce transit travel times.
- Forced right turns on Mission Street (except transit and taxis) to reduce vehicle volumes and reduce transit delays.
- Traffic calming treatments on streets that connect to an affected street to disincentivize diversion

Next Steps

Next steps for the project include:

- Based on the conceptual analysis presented in this memo, the Planning Department in coordination with SFMTA will refine the proposed project list and street designs.
- Fehr and Peers under contract to Nelson\Nygaard and in coordination with the Planning Department and SFMTA will conduct a traffic modeling analysis for a select number of intersections to evaluate any potential impacts of proposed projects.
- Based on the results from the traffic modeling, the Planning Department will revise the designs for feedback from community members, SFMTA, and other stakeholders.