



# Lombard Study: Managing Access to the "Crooked Street"

## DRAFT EXISTING CONDITIONS TECHNICAL MEMORANDUM



SEPTEMBER, 2016





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## INTRODUCTION

The San Francisco County Transportation Authority is leading a Neighborhood Transportation Improvement Program (NTIP) study on Managing Access to the Crooked Street at the request of Supervisor Mark Farrell, District 2. The purpose of the study is to identify and evaluate a range of options to manage visitor access and circulation on the “Crooked Street” (Lombard Street between Hyde and Leavenworth) while maintaining the character of the street, managing vehicle and pedestrian congestion, avoiding spillover effects into adjacent streets, and other goals. These full project goals include:

- Manage Pedestrian Congestion
- Manage Auto Congestion
- Ensure Traffic Safety
- Maintain Access to the Crooked Block
- Maintain Livability of the Surrounding Neighborhood
- Preserve Tourism
- Implement a Financially Viable Solution

## I. REVIEW OF PAST STUDIES/ DATA COLLECTION AND OTHER MANAGEMENT EFFORTS

There have been several past efforts to collect data and examine the challenges on the Crooked Street.

### FINAL STUDY, CROOKED STREET TASK FORCE, AUGUST 2000

The most recent full study of challenges around vehicle and pedestrian congestion on the Crooked Street was completed in 2000.<sup>1</sup> The study methodologies included:

- Traffic volume counts
- Motorist and pedestrian behavior observations
- Speed, license plate, and collision data collection
- Monitoring of driveway access delay and blockages on street segments around the Crooked Street and specifically at the two homes at the eastern end of the Crooked Street
- Frequency of violation of tour bus restrictions on Chestnut and Larkin Streets
- Analysis of bottlenecks and traffic backups caused by pedestrians and vehicles
- Analysis of air pollution and noise pollution

<sup>1</sup> The Crooked Street Traffic Study Report, by Tom Folks and Amanuel Halle, August 22, 2000. Reviewed by Crooked Street Task Force as Final Report on September 20, 2000.



The key findings from the 2000 study's data collection efforts were:

- **AVERAGE DAILY TRAFFIC (ADT):** 24-hour vehicle volumes were collected for the segments shown in Table 1.

**TABLE 1. AVERAGE DAILY TRAFFIC**

STREET SEGMENT	ADT
Lombard Street eastbound, between Van Ness and Polk	4,078
Lombard Street eastbound, between Polk and Larkin	3,709
Lombard Street eastbound, between Larkin and Hyde	3,488
Lombard Street eastbound, between Hyde and Leavenworth	1,560
Chestnut Street westbound, between Polk and Hyde	901

- **VEHICLE TRENDS:** Demand to access the Crooked Street by vehicle was highest on weekends from 1:00 PM to 5:00 PM, and there would consistently be blockages of Muni service from vehicles turning right off of Van Ness at the intersection with Lombard. The highest demand weekend in May 1999 was Labor Day, when vehicular traffic capacity of the Crooked Street was 350 vehicles per hour. Queues formed since the traffic volumes west were higher than the capacity of the Crooked Street, and the traffic delay was approximately 35–40 minutes (to drive the three blocks from Van Ness to Hyde, 1,230 feet long).
- **VEHICLE ORIGINS:** A license plate study from Memorial Day weekend of 1999 found that 13% of vehicles on the Crooked Street were from San Francisco, 41% from the rest of the Bay Area, and 40% from outside the Bay Area; an additional 6% were rented vehicles.
- **PEDESTRIAN VOLUMES:** 10-minute counts were conducted between 1:00 PM–4:30 PM on high tourist season weekends in May 1999, with the results shown in Table 2.

**TABLE 2. PEDESTRIAN VOLUMES**

STREET SEGMENT	PEDESTRIAN ACTIVITY	NUMBER OF PEDESTRIANS CROSSING LOMBARD ST (10 MIN COUNT)	NUMBER OF PEDESTRIANS CROSSING SIDE STREET (10 MIN COUNT)
Leavenworth	High	62	46
Hyde	High	54	40
Larkin	Low	6	10
Polk	Low	3	7
Van Ness	Moderate	15	21

- **PEDESTRIAN COLLISIONS:** There were 14 pedestrian-vehicle collisions in the blocks surrounding the Crooked Street from 1994–1998. The cause for most accidents was driver's inattention. Half of the collisions were at Lombard and Van Ness. Notably, despite their very high pedestrian activity, there were no collisions at either Lombard and Hyde or Lombard and Leavenworth.

- **DRIVEWAY ACCESS:** Access to driveways was not a major concern, aside from the ongoing nuisance of driveways at the base of the Crooked Street being blocked for short periods by people who park their cars to take photographs.
- **TOUR BUSES:** Tour bus restrictions on Chestnut and Larkin were found to be violated occasionally; one challenge in addressing this was that only SFPD could cite tour bus violations (i.e., not officers of DPT, which is now part of SFMTA).
- **MUNI CABLE CAR:** The northbound cable car stop at Hyde and Lombard sometimes blocked vehicles from entering the Crooked Street, exacerbating the queue. It was deemed unfeasible to move the stop further south, however, since the cable car operator must be able to see the following block before proceeding, and only one cable car can be on the steep grade north of Lombard at a time for safety reasons.
- **ENFORCEMENT OFFICERS:** SFPD's Central Station had limited budget and staffing and needed to direct most of its resources elsewhere, including Fisherman's Wharf, Telegraph Hill, and Coit Tower. There was also the perception that enforcement will not have a lasting effect on tourists, who are not typically repeat violators/visitors. The DPT (now SFMTA) Enforcement Division had a budget of \$17,000 in 1999 for a PCOs overtime budget to fund enforcement on the weekend, when queues were worst. The budget was only able to cover about nine weekends, and being overtime this required PCOs to volunteer for shifts, which was challenging given the generally stressful nature of the assignment.
- **AIR POLLUTION:** Air pollution (carbon monoxide) was monitored at one site along the vehicle queue to enter the Crooked Street and also mid-block on the Crooked Street during particularly busy times. Carbon monoxide levels posed no public health hazard, averaging less than one part per million (ppm) in both locations, compared to California ambient air quality standards of 9 ppm over an eight-hour period or occupational health safety standards of 25 ppm. A previous study from August 1997 found carbon monoxide levels averaging 2–3 ppm.
- **NOISE:** The Task Force agreed that noise pollution on and around the Crooked Street was difficult to quantify and was "primarily a matter of enforcing existing laws."



The Task Force examined a number of potential solutions:

- **EXTEND MUNI ROUTE 39:** The possibility was discussed of extending Muni Route 39 to the Crooked Street to provide another non-vehicular way to access the street. Route 39 runs between Fisherman's Wharf and Coit Tower. It was determined that an extension to the Crooked Street would overextend the running distance of the line. Muni staff suggested a "wait-and-see" approach to see if the then-new F-line historic streetcar service on the Embarcadero along with the cable car connection could provide sufficient transit access.
- **NEW SHUTTLE SERVICE:** As a second suggestion by Muni staff, in addition to a wait-and-see approach on transit access with the F-line and cable car, the city could encourage development of a shuttle service by a private operator. The shuttle would need an exemption from the prohibition on and around the Crooked Street of buses and vans with capacity over eight passengers. No further details were studied.
- **PART-TIME PARKING PROHIBITION ON VAN NESS:** The task force recommended a part-time parking prohibition on the east side of Van Ness, south of Lombard Street, to alleviate the queuing of traffic turning right onto Lombard Street. The prohibition would be in effect from 9:00 AM–9:00 PM Friday–Sunday from May to September.
- **INCREASED ENFORCEMENT:** The task force recommended increasing the Parking Control Officer (PCO) budget (\$17,000 in FY1999) by at least 50% and also allocating more nighttime SFPD presence, particularly to enforce noise-related infractions.
- **STREET CLOSURE:** The task force members were split on support of a street closure. At the Russian Hill Neighborhood Director's meeting in January 2000, the board voted in favor of a closure. A 1998 DPT postcard survey found that among residents who responded they supported some form of road restrictions three to one, though only 26% of residents of the single block of the Crooked Street supported such a proposal. The report notes that California Vehicle Code Section 21101.6 prohibits the closure of a public street to allow local access only; it is illegal to gate a public street and selectively allow access to residents. State Senator Quentin Kopp introduced a bill in March 1987 to amend the Vehicle Code to allow a gate on the Crooked Street, but the bill was never acted upon. Any street closure would also require consensus among a majority of neighbors, and would need to consider gate placement, delivery access, guest ac-

cess, turnaround space, and financial issues. Specific closure alternatives considered were:

- » **MID-BLOCK CLOSURE:** Make the street two-ways by widening it by five feet, and place barriers mid-block. Turn-arounds would use private driveways. Construction was projected to cost \$1.8 million.
- » **AUTOMATIC GATE:** A gate would be placed at the top of the street; residents would use a remote control key, and visitors would use a telephone entry system. This type of gate was projected to cost \$50,000.
- » **GATE WITH SECURITY PERSONNEL:** An alternative gating arrangement would be staffed by security personnel part-time or full-time. A gate could be installed for \$19,000, and the cost of security personnel would also need to be covered.
- » **SIGNAL SYSTEM:** A signaling system could be installed to alternate the one-way direction of the Crooked Street. This would greatly reduce the capacity of the street.
- » **VACATING THE CROOKED STREET:** The adjacent property owners could purchase the street, converting it to a private street. This would require a permit from the Department of Public Works and approval of the Board of Supervisors. Residents would then assume all responsibility including maintenance and repairs of the street.

Lastly, the report notes that California Vehicle Code, Section 21101.2 "Local Authority to Divert Traffic" provides that if the peace officer finds that a significant number of vehicles are not promptly moving when the opportunity arises to do so, then the peace officer may divert vehicles subject to traffic congestion until reasonably flowing traffic is restored. Captain Alex Fagan, in his memo dated August 9, 2000, gave DPT's Enforcement Division full authority to close as deemed necessary the 1300 block of Lombard Street, from Van Ness to Polk Street, to alleviate congestion from vehicles turning to access the Crooked Street.



## LOMBARD STREET TEMPORARY CLOSURE, SUMMER 2014

With the support of the Lombard Hill Improvement Association and Russian Hill Neighbors, SFMTA conducted a pilot closure of the Crooked Street in Summer 2014. The closure was intended to prevent queuing and conflicts with pedestrians, and reduce impacts on regional transit that occur when the queue reaches Van Ness. The pilot closure occurred for four weekends, including the July 4th holiday weekend, and consisted of a closure of eastbound Lombard for the block west of the Crooked Street and closure of the Crooked Street. The street segments were closed during summer PCO deployment hours, roughly noon to 7:00 PM, with residents exempt from the restrictions.

The evaluation examined the performance of the Hyde and Leavenworth intersections with Lombard during the closure, whether the closure eliminated or displaced the vehicle queue, residents' access to Lombard Street, and whether pedestrian conflicts with traffic increased. The closure successfully eliminated the vehicle queue during the closure hours. Sidewalks were also less crowded on the Crooked Street, and there were fewer vehicular-pedestrian conflicts during the closure due to reduced vehicle volumes. However, there were also concerns about having to navigate through pedestrians for the residents who drove down the Crooked Street. The closure also caused more tourists to look for parking in the neighborhood, and traffic also dispersed to before and after the closure.

The evaluation report also enumerated a number of alternatives to consider for future action, including:

- Gate the street so only residential vehicles can use Lombard, requiring action from the State legislature.
- Pedestrianize the street, which would entail removing all vehicular access including for current residents, deemed infeasible.
- Limit access to the street based on license plate numbers, which would be difficult to enforce and would require state legislation.
- Privatize the street, vacating it so it would become the responsibility and property of residents.
- Prohibit right turns from Hyde northbound onto Lombard, which PCOs already implement at times, which reduces backups on Hyde Street but does not address queues on Lombard.
- Close Lombard Street between Van Ness and Polk during peak periods, as discussed during the 2000 Final Study of the Crooked Street Task Force, to discourage queuing on Lombard. However, this could simply shift congestion to neighboring streets.

- Implement congestion pricing, charging a variable toll to drive down the Crooked Street, with revenues to pay for area patrols and maintenance. This would require legislative approval and toll-related infrastructure improvements.

## SFMTA TRAFFIC COUNTS

Traffic counts were collected for the Crooked Street in June 2013 and again in June 2014 during the first weekend of the closure. In June 2013, the highest hourly volume of vehicles observed was 316 vehicles per hour, on Saturday from 1:00 PM–2:00 PM.

During most of the closure hours in June 2014, there were less than 10 vehicles per hour on the street, providing local access for residents. Vehicle volumes were very high however before and after the 12:00 PM–6:00 PM closure hours, with over 300 vehicles per hour in the hour before the closure on Friday, Saturday, and Sunday, and a peak observed vehicle flow of 383 vehicles per hour from 8:00 PM–9:00 PM on Saturday, the highest count observed for the Crooked Street from all available count data. The count data demonstrated that the pilot closure did appear to displace some vehicle traffic to the hours directly before and after the daily closure.

## AMBASSADORS PROGRAM

Modeled on the ambassadors at Fisherman's Wharf, Union Square, and elsewhere, an Ambassadors Program for Lombard's Crooked Street was initiated at the request of District 2 Supervisor Mark Farrell and SFPD Central Station's Captain David Lazar. At Fisherman's Wharf, the most well established ambassadors program in the city, the ambassadors are focused on cleaning, safety, and hospitality. The ambassadors were called for on the Crooked Street particularly to manage pedestrian and vehicle safety and proactively address crime and vehicle break-ins. The ambassadors also provide tourist information and instructions and encourage good behavior. They cannot issue citations, but they report to SFPD to coordinate on crime and security. Ambassadors provide very detailed, quantified reporting on their services performed.

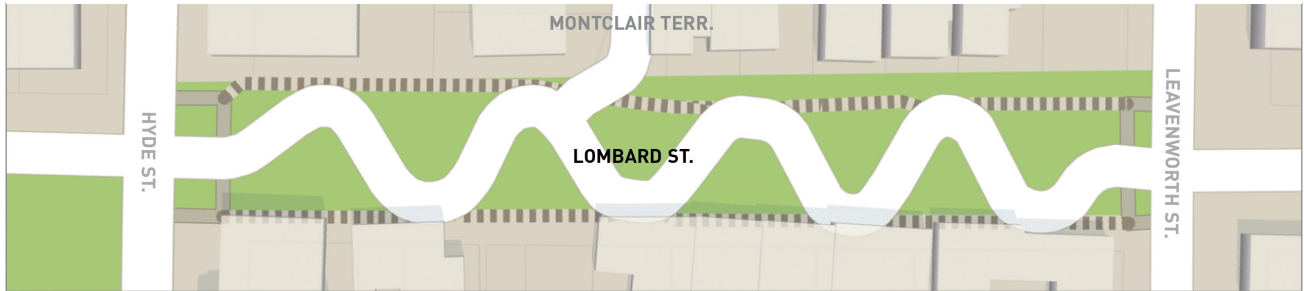
The Crooked Street Ambassadors Program launched on August 29, 2015, after most of the data collection for this report. It is funded by a grant managed by the Office of Economic and Workforce Development, with the Fisherman's Wharf Community Benefit District acting as the fiscal agent for the grant.



## II. ORIENTATION TO THE CROOKED STREET

The Crooked Street is located between Hyde and Leavenworth streets on Lombard Street, as shown in the map in Figure 1.

**FIGURE 1. MAP OF THE CROOKED STREET**



The Crooked Street is a residential street. Its distinctive switchbacks, flowers, and vistas are famous around the world, and as a result the street draws many visitors from both far and near. As overall tourism levels have increased in recent years, so have the number of tourists on the Crooked Street, and crowd control issues around the Crooked Street have become more challenging.

**FIGURES 2 AND 3. VISITORS AT THE INTERSECTION OF LOMBARD AND LEAVENWORTH**



Large numbers of people congregate, particularly at the top of the Crooked Street (the east side of Hyde Street), across from the bottom of the Crooked Street (the east side of Leavenworth Street, shown in Figures 2 and 3), and throughout the interior of the block, on the stairways but also often on driveways, doorways, and in the roadway (see Figure 4).

Vehicle traffic on the Crooked Street operates one-way eastbound, though the surrounding blocks of Lombard have two-way traffic. Many people drive down the street each day and SFMTA PCOs staff the intersections at either end of the Crooked Street during summer weekend peak visitor hours (roughly 10:00 AM–6:00 PM) to keep vehicles moving through, avoid conflicts with the cable car on Hyde Street, and enforce parking regulations to keep travel lanes clear. PCOs also cover other intersections as needed, such as the intersection of Lombard and Van Ness.

Due to high demand and the street's limited capacity, a queue often forms on the blocks to the west of the street. During particularly high demand times, the queue extends all the way to and across Van Ness Avenue and sometimes

**FIGURE 4. VISITORS IN THE ROADWAY ON THE INTERIOR OF THE CROOKED STREET**





also north and south on the side streets of Larkin, Chestnut, and Polk.

To manage high volumes of visitor vehicles, PCOs usually institute a no right turn restriction from northbound Hyde Street for all but local access vehicles (see Figure 10, next page). This reduces queue impacts on the cable car on Hyde Street and gives residents a reliable way to get to their homes without waiting in the queue of visitors. Left turns from southbound Hyde Street at this intersection are never permitted.

### III. STAKEHOLDER AND COMMUNITY INTERVIEWS

More than a dozen interviews were conducted with city staff, community groups, local residents, and business and tourism groups to understand the challenges around transportation and visitor impacts around the Crooked Street. Stakeholders and community members described their experiences with the Crooked Street, their opinions of past efforts to manage access to the Crooked Street, and their insights and opinions on potential improvements. The following key messages came across in the various interviews.

#### **TOURISM HAS INCREASED SUBSTANTIALLY IN RECENT YEARS, THOUGH RESIDENTS HAVE CONFLICTING OPINIONS ON THE IMPACTS OF TOURISM AND WHETHER IT SHOULD BE RESTRICTED.**

Residents perceive that levels of tourism have increased dramatically over the past five years of global economic recovery, and visitor levels at the Crooked Street are substantially higher than they have ever been. SFMTA staff and PCOs also perceive the street to be more crowded than in the past. City staff pointed out that the Crooked Street has not been able to address the increase in tourism in the same way as most tourist attractions because, unlike a private business, public park, or other typical attraction, there is no single entity to act as a property manager for the site in the case of the Crooked Street because the attraction itself is a public street in a residential neighborhood.

During busy periods, a vehicle queue forms on the blocks to the west of the Crooked Street, sometimes extending past Van Ness Avenue. Resident interviews and a 311 complaint also noted that the vehicle queue also backs up Larkin, Chestnut, and Polk at times. Vehicles also often try to illegally unload passengers in front of driveways on Hyde and Leavenworth. On Leavenworth in particular, a long stretch of driveways on the west side of the street directly south of the Crooked Street is routinely blocked by passenger vehicles, taxis, and limousines.

FIGURE 5. PCO DIRECTS VEHICLE TRAFFIC AT HYDE AND LOMBARD



FIGURE 6. PCO ENFORCES PARKING RESTRICTIONS ON LEAVENWORTH SOUTH OF LOMBARD STREET



FIGURE 7. VEHICLE QUEUE EXTENDING WEST ON LOMBARD PAST VAN NESS





**FIGURE 8. PCO MANAGING VEHICLE QUEUE TRAFFIC AT LOMBARD AND VAN NESS**



**FIGURE 9. VEHICLE TRAFFIC EXTENDING ONTO LARKIN STREET**



**FIGURE 10. RIGHT TURN RESTRICTIONS ON NORTHBOUND HYDE STREET**



Aside from the vehicle queue, residents also complain that tour buses and vans frequently violate the restrictions on tour buses on the blocks around the Crooked Street. Many tour buses also off-load visitors on Columbus Avenue nearby, which is permitted, but the result is that a large number of tourists arrive at the street all at once.

Visitors on foot congregate in certain areas on and around the Crooked Street. Sometimes pedestrians will stop in the middle of the street, blocking the roadway taking pictures, while at other times the entire crowd of pedestrians on the sidewalk extends into the street. The latter is especially the case at the intersection of Lombard and Leavenworth, where large crowds gather at the bottom of the Crooked Street for a particularly scenic view of the street's flowers and switchbacks.

Aside from general crowding and lingering in the roadway, some residents complain about impolite behavior from tourists. There are reports of tourists walking through flowerbeds, climbing onto carports and roofs for photos, and otherwise wandering onto private property on and around the Crooked Street. Some residents also complained about noise from tourists.

However, all residents interviewed recognized that at least a moderate level of tourism was acceptable, and multiple residents noted that they enjoyed the presence of tourism. Multiple residents said they would be sad to see any restrictions placed on tourism in the area, and one resident said "I think that the atmosphere of tourists is why people were drawn to the neighborhood. I certainly was."

The board of the Lombard Hill Improvement Association, a group representing residents of the Crooked Street, voiced support for the idea of tolling the street, not for revenue so much as to moderate visitor demand to the street. Some residents supported the idea of exploring a toll, while others expressed doubts about the feasibility of tolling a public street or general opposition to restricting tourism.

#### **WHILE THERE ARE IMPACTS OF BOTH PEDESTRIAN AND VEHICLE VISITATION, MOST COMPLAINTS FROM RESIDENTS ARE CENTERED ON PEDESTRIANS.**

In previous years, residents of the Crooked Street had difficulty driving to their homes. However, since PCOs started instituting right turn restrictions from northbound Hyde Street for all vehicles except residents, this has essentially given residents a way to bypass the vehicle queue. Residents of the blocks of Lombard west of the Crooked Street also expressed that the ability to make right turns off southbound Hyde Street was critical to them being able to avoid the queue (though there are no restrictions for any vehicles on this turning movement).



As such, most residents are able to access their homes by vehicle, and since most residents have off-street parking there are few complaints from residents about parking impacts of tourism in the neighborhood. Most complaints focused on the impacts of pedestrian visitation.

The three primary needs articulated by the Lombard Hill Improvement Association were for:

1. A more orderly environment and curtailing impolite behavior,
2. Improved security, and
3. Reducing pedestrian and vehicle volumes to acceptable levels.

**THE CONCERNS AND PERCEIVED NEEDS OF RESIDENTS ARE NOT LIMITED TO CONGESTION AND CROWDING. RESIDENTS ARE CONCERNED ABOUT THE LEVEL OF PUBLIC SERVICES THEIR STREET RECEIVES, AND ABOUT SAFETY IN THE AREA.**

Some residents expressed that tour operators and the city economy benefit from Lombard Street without helping to maintain it. Garbage collection is insufficient, and the city does not clean the Crooked Street despite having hand-powered street cleaning machines. The residents fund the cleaning, maintenance, and gardening of the street themselves, while tourism and entertainment industries use and benefit from images of the Crooked Street.

Residents also voiced safety concerns. Late night pranksters occasionally drive recklessly down the street, or drive up it the wrong way. Theft from vehicles has been increasing dramatically in San Francisco, and there is a particular problem around Lombard Street and other tourist destinations with “smash and grab” thieves who target tourist vehicles. In a particularly worrisome incident, one tourist was mugged of their camera on the block east of the Crooked Street in August 2015, and was non-fatally shot when he chased after the suspects.

**THE HISTORIC CABLE CARS ON HYDE STREET PRESENT UNIQUE SAFETY AND OPERATIONAL CHALLENGES.**

The cable cars are unable to stop midblock on the steep grades of Hyde Street, and as such, one of the critical roles of the PCOs is to keep traffic moving on Hyde Street so the cable cars are able to reach the (flat) intersections where they are able to stop.

At the Crooked Street, the northbound cable car is required to stop for safety reasons at a particular line on the pavement that corresponds to safety infrastructure in the trackway below. At this spot, the cable car blocks the southern crosswalk, making it difficult for PCOs to manage pedestrians crossing the street.

In general, PCOs and others remarked that many pedestrians and drivers are resistant to following the directions of PCOs. This dynamic is difficult and stressful for PCOs, particularly when the southbound cable car is ascending the hill and PCOs encounter resistance to clearing the intersection of Lombard and Hyde. This prompted at least one PCO to suggest that Hyde Street in this area be transit and local access only for safety reasons.

**THERE IS NOT A CONSENSUS ABOUT THE SUCCESS OF THE 2014 PILOT CLOSURE OF LOMBARD STREET.**

Both residents and city staff had a variety of views on the pilot closure. Some noted that the street was quieter without vehicle traffic and that there was less tension on the block. This prompted some to deem the pilot a success.

Others disagreed, arguing that the closure turned the street into a “zoo,” with tourists treating the Crooked Street more like a park than a street and wandering freely in the roadway and onto private property. Some residents complained that it was difficult to access their driveways, or that they were treated disrespectfully while driving to their homes by the tourists on foot. In addition, some



claimed that there was increased double parking around the Crooked Street as a result of the closure.

Still others disliked the closure, not because of negative impacts on residents, but because they disagreed with the premise of limiting or restricting tourist visitation to the Crooked Street. One resident said that this is a public street and there is "no precedent" for such a closure.

It was also noted that the closure may have been more successful in addressing residents' concerns if it had been paired with a program like the new Ambassadors program being introduced to the street in August 2015. The Ambassadors are specifically trained in crowd management and safety for pedestrians, and are able to help with encouraging visitors to be respectful of neighbors.

#### **RESIDENTS AND STAKEHOLDERS NOTE A LACK OF ENFORCEMENT AROUND THE CROOKED STREET.**

Residents, PCOs, and others are quick to note that PCOs are unable to issue pedestrian or moving violations, and can only cite vehicles for parking violations. In addition, there is not a frequent San Francisco Police Department presence on the Crooked Street.

One result of this is that there is effectively little to no enforcement of the restriction on tour buses and vans with more than eight seats, which are not allowed on the blocks around the Crooked Street. In addition, vehicle "smash and grab" break-ins continue to happen frequently around the Crooked Street.

Many residents and stakeholders expressed that it would be helpful to have a greater police presence to enforce tour bus restrictions, curb crime, and cite dangerous vehicle behavior. Residents and stakeholders had varying and conflicting opinions on whether it would be productive or fair to increase citations to pedestrian visitors.

#### **OTHER PARTS OF THE CITY HAVE ALREADY EMPLOYED STRATEGIES THAT ADDRESS POTENTIAL NEEDS OF THE CROOKED STREET, INCLUDING CROWD MANAGEMENT, PUBLIC SAFETY, AND REVENUE GENERATION.**

Fisherman's Wharf in particular has been creative in how it pursues safety and crowd management. Fisherman's Wharf has a community benefit district (CBD) that brings together property owners and merchants to fund programs and improvements that benefit all the businesses in the area.

The "10-B" program from the San Francisco Police Department allows for organizations to pay for overtime police officers. The program essentially provides organizations

with private security, except that the security officers are actual San Francisco police officers who have the ability to provide enforcement. The Fisherman's Wharf CBD uses 10-B officers to strategically supplement the schedule of regular beat officers they receive from SFPD.

In addition to 10-B officers, the Fisherman's Wharf CBD contracts with Block by Block, a national company, to provide Ambassadors at the Wharf. The Ambassadors are focused on cleaning, safety, and hospitality. As noted earlier in this report, an Ambassadors Program was launched on the Crooked Street on August 29, 2015. During interviews in summer 2015, many residents and stakeholders on Lombard's Crooked Street expressed enthusiasm about the introduction of Ambassadors to the Crooked Street.

The 10-B officers and Ambassadors are complementary to each other, and serve different roles. It is helpful to have enforcement to back up the Ambassadors. Also, due to their price differential (\$100 per hour for 10-B officers versus \$15 per hour for Ambassadors), it is possible to contract more Ambassadors on a fixed budget, and they are able to serve as the eyes and ears for enforcement, while also performing other tasks such as cleaning that would not be performed by police officers. Both Ambassadors and 10-B officers provide the CBD with detailed reporting on their activities and services performed.

Green Benefits Districts provide another interesting opportunity to consider for the Crooked Street. Green Benefits Districts are a neighborhood-based special assessment district. Gardening and security (including Ambassadors) are eligible expenses, and as such they would provide one possible revenue source to fund improvements on the Crooked Street. The Board of Supervisors voted in August 2015 to establish the nation's first Green Benefit District, the Dogpatch and Northwest Potrero Hill Green Benefit District.





## IV. DATA AND INTERPRETATION

Data collection was conducted in summer 2015 to supplement previous efforts and gather more current data that reflects recent growth in tourism. Data collection activities included:

- Camera-based data collection to gather visitor volumes as well as counts of specific vehicle and pedestrian behaviors
- A vehicle profile of the occupancy and origins of vehicles driving down the Crooked Street
- An intercept survey of visitors on foot and in vehicles
- Information on parking conditions and safety

### COUNTS AND SPATIAL ANALYSIS OF VISITORS

Visitor volumes were measured using camera-based data collection during peak tourism weekends (Friday-Sunday, 9:00 AM–8:00 PM) in July 2015. Data collected included:

- Pedestrian volumes entering/exiting the Crooked Street
- Vehicle volumes entering/exiting the Crooked Street,
- Instances of vehicles being unable to enter/exit the Crooked Street due to pedestrians blocking the roadway
- Instances of illegal left turns onto the Crooked Street from southbound Hyde Street
- Instances of pedestrian crowding on the sidewalk extending into the roadway

**TABLE 3. PEDESTRIAN AND VEHICLE VISITOR VOLUMES (9:00 AM–8:00 PM)**

DAY	PEDESTRIANS*	VEHICLES	VEHICLE PASSENGERS*	PEDESTRIANS PLUS VEHICLE PASSENGERS
Friday	7,640	2,700	9,230	16,870
Saturday	9,610	2,362	8,080	17,690
Sunday	8,930	2,683	9,180	18,110

\* Estimated. See footnotes 2 and 3.

### PEDESTRIAN VOLUMES

Pedestrians were counted as entering the Crooked Street when they crossed the threshold of the beginning of the stairs at either end of the block. Pedestrians entering or exiting were counted separately at each end of the street over five-minute intervals. These cordon counts from each end of the block are used to estimate the number of unique visitors on the Crooked Street.<sup>2</sup>

Since vehicles only travel in one direction on the block, their numbers are certain. Average vehicle occupancy is used to estimate total vehicle passengers.<sup>3</sup>

There are very high levels of visitation on Lombard Street on the weekend, with nearly 10,000 daily pedestrian visi-

<sup>2</sup> The technology used (counting the number of people entering or exiting at each end of the block using camera footage) does not allow for tracking individuals, and it is not possible to know with certainty how many times each person would be counted. A person who enters on one side of the block and exits on the other would be counted twice (one entrance plus one exit). A person who enters on one side, exits on the other, lingers taking photos, and then re-enters the block and exits on the original side would be counted four times (two entrances, two exits). Because some tourists walk straight through while others return to the end of the block at which they started, in this analysis the number of pedestrians seen entering or exiting is divided by 3 (the average of 2 and 4) to estimate the total daily pedestrian volume.

<sup>3</sup> The number of vehicles is multiplied by an average vehicle occupancy of 3.42 (from the vehicle profile later in this report) to estimate the total number of vehicle passengers on the Crooked Street. The average occupancy is based on 416 vehicle observations.



FIGURE 11. PEDESTRIAN ENTRANCES AND EXISTS ON THE CROOKED STREET

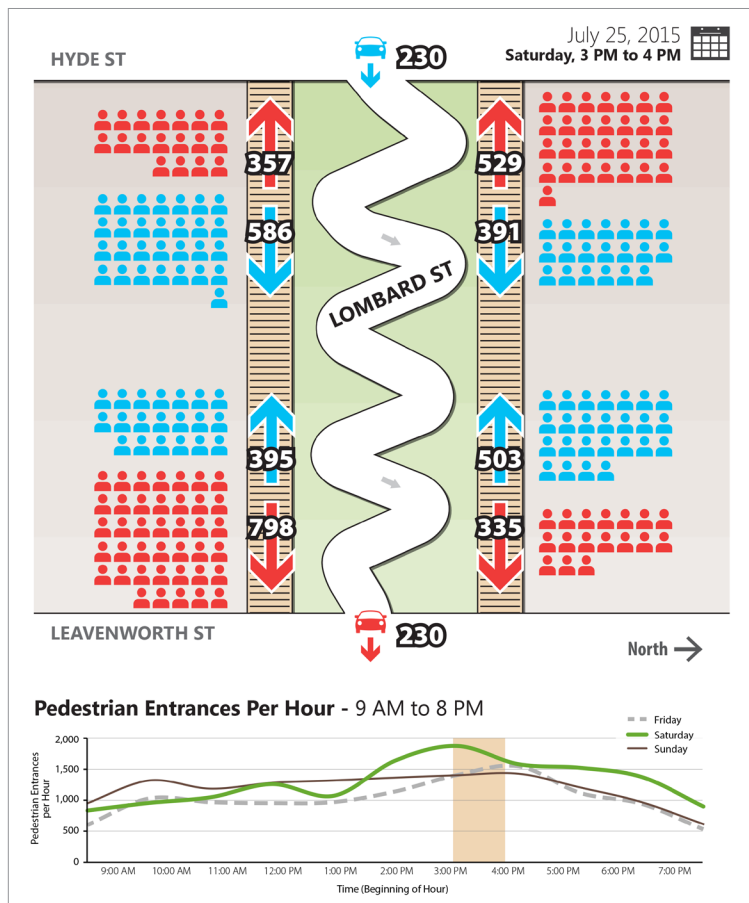


Figure 11 shows the observed number of pedestrians entering and exiting the Crooked Street during the peak time period on Saturday from 3:00 PM to 4:00 PM. The most popular pedestrian path of travel into and out of the Crooked Street was eastbound (downhill) along the southern stairway, with entrances from Hyde Street totaling 586 pedestrians and exits onto Leavenworth Street totaling 798 pedestrians. Pedestrian volumes in the westbound (uphill) direction along the northern stairway were also fairly high, with 503 pedestrians entering from Leavenworth Street and 529 pedestrians exiting onto Hyde Street. Total pedestrian volumes during the peak Saturday time period were observed to be higher than total vehicle volumes, with 1,875 people entering the Crooked Street on foot versus 230 vehicles entering the Crooked Street.

Figure 11 also shows the trends in the number of pedestrian entering the Crooked Street over the course of the day on the observed Friday, Saturday, and Sunday in July 2015. Morning pedestrian visits were most popular on Sunday, but Saturdays saw the highest number of pedestrian visits in the afternoon and evening.

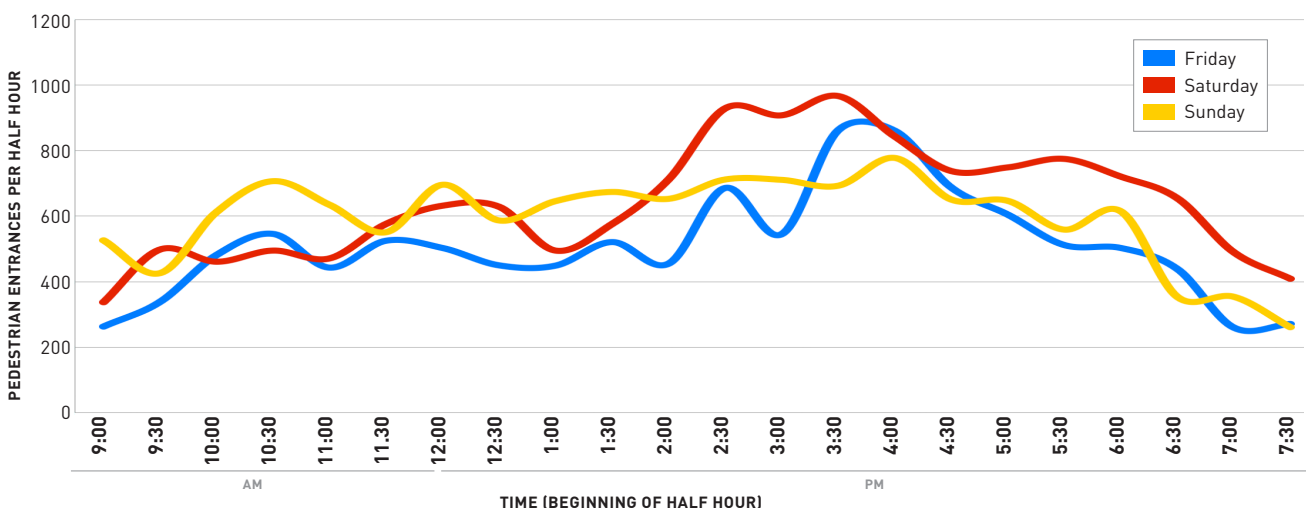
As shown in Figure 12, pedestrian activity<sup>4</sup> has different temporal patterns by day of week. Volumes are highest on the weekend (Friday to Sunday), and tend to peak in the afternoon between 2:30 PM and 4:00 PM. The most sustained periods of particu-

tors (28,843 entrances and exits counted) on Saturday. While there are many more pedestrians counted than vehicles, the two modes actually are responsible for a similar number of visitors per day, since there are multiple passengers per vehicle.

Sunday), and tend to peak in the afternoon between 2:30 PM and 4:00 PM. The most sustained periods of particu-

<sup>4</sup> Pedestrian activity here is portrayed as the number of pedestrian entrances onto the Crooked Street. This metric is higher than the number of unique visitors to the Crooked Street, since many visitors enter the block more than once during their visit, and as such are counted more than once.

FIGURE 12. PEDESTRIAN ENTRANCES PER HALF HOUR (9AM-8PM)



larly high visitor levels occurred on Saturday, when there were more than 700 pedestrian entrances per half hour for 4.5 hours (from 2:00 PM to 6:30 PM). On all days, visitor levels tapered off substantially by 7:00 PM.

The pedestrian entrances in Figure 11 are counted by half hour to clearly show the overall trends throughout the day. Even at the half hour level, there is a fair amount of volatility in these counts. However, the source data used to produce this figure was recorded at the five-minute level, and by considering this more granular data, it is clear that visitor volumes can be quite volatile. Figure 13 shows this more granular, five-minute level data for two subsets of the pedestrian volume data collection.

Friday morning is a relatively lower demand part of the weekend on Lombard Street, yet pedestrian entrances still varied substantially from one five-minute interval to the next. Random variation is expected, but there are some particularly large spikes. For instance, from 9:30 AM–9:34 AM, there were three times as many visitors entering at Hyde Street as in the previous time period (98 versus 32 visitors). From video footage, this appears to be partially due to a tour group of about 40 to 50 people on foot seen heading up Hyde Street and walking onto the Crooked Street.

Meanwhile, on Friday from 10:45 AM–10:49 AM, 59 people entered the block, while over the next five-minute interval 152 people entered the block. From video footage however, this particular spike in visitors appears to be a combination of random variation and the arrival of one southbound and one northbound cable car during this time period. There do not appear to have been any large tour groups entering the Crooked Street at this time.

Meanwhile, Saturday afternoon was the time period with the highest overall level of pedestrian demand. While entrances during most of Saturday afternoon hovered

around 150 people every five minutes, there were three substantial spikes that saw entrances at a level about a third higher. For instance, from 3:45 PM–3:49 PM, 112 people entered the Crooked Street. Just ten minutes later, 219 people entered, almost twice as many. From video footage, this appears to be partially due to a tour group of about 30 to 40 people seen entering the Crooked Street. Of the previous two spikes that afternoon, there was at least one school-aged tour group during one spike, but the other did not appear to have any large tour groups.

Spikes in the number of visitors were not always caused by tour groups, and none of the incidents examined with video footage showed tour buses offloading visitors directly adjacent to the Crooked Street. Rather, tour groups for the most part appeared to arrive on foot. In addition, even when tour groups were seen in video footage, they could not explain the full magnitude of spikes in pedestrian volumes, suggesting that while tour groups may exacerbate crowding on the Crooked Street, they are just one subset of visitor demand.

#### PEDESTRIAN SPATIAL PATTERNS

The occupancy of the Crooked Street was measured directly by counting the number of pedestrians along the Crooked Street every 15 minutes from 12:00 PM to 3:00 PM on a Friday and Saturday. This direct measure of the occupancy of the Crooked Street and adjacent areas allows for crowding to be quantified.

Pedestrians gather in certain areas of the Crooked Street more than others. Figure 14 (next page) shows the occupancy of the Crooked Street by the zones in Figure 15 (next page).

The zones with the most pedestrians, as shown in Figure 14, are the interior of the block as well as the two other zones with the best vistas and photo opportunities: the

**FIGURE 13. PEDESTRIAN ENTRANCES PER FIVE MINUTE INTERVAL FOR SUBSETS OF DATA COLLECTION**

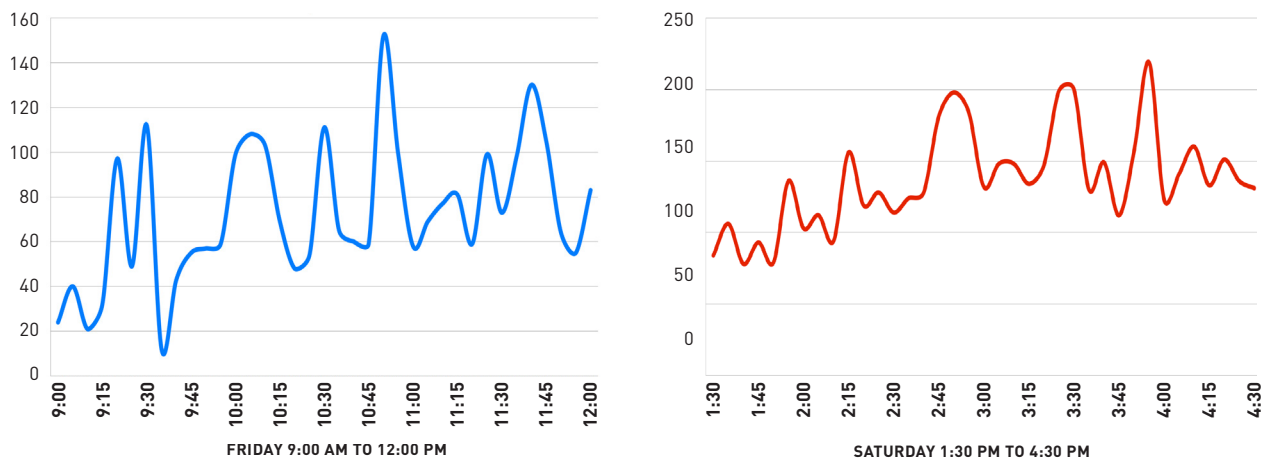
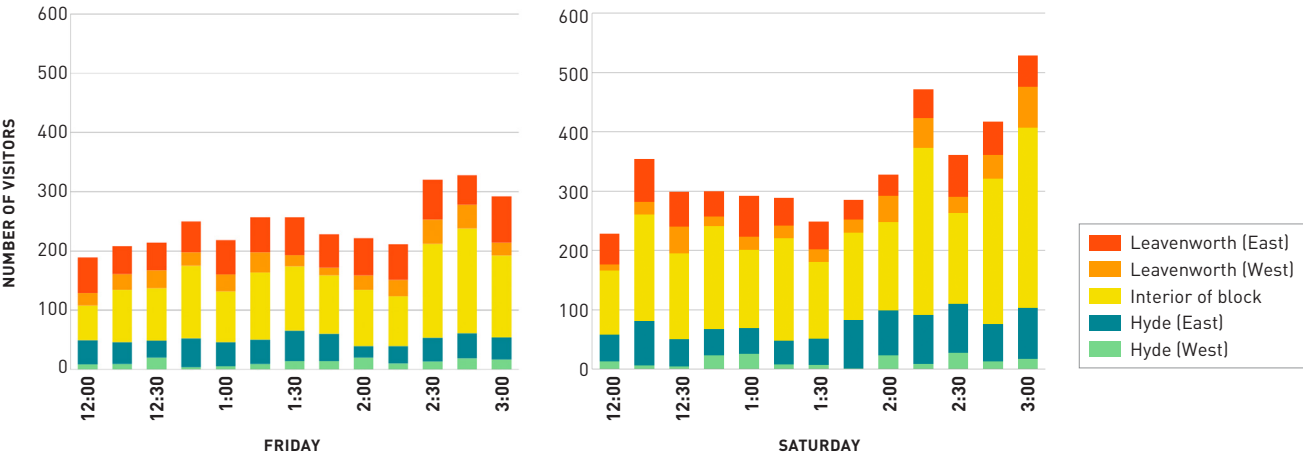




FIGURE 14. OCCUPANCY OF CROOKED STREET, FRIDAY AND SATURDAY (12PM-3PM)



east side of Hyde Street at the top of the Crooked Street (Hyde East) and the east side of Leavenworth Street at the bottom of the Crooked Street (Leavenworth East). On average across the six hours of occupancy observations, 85% of pedestrians were in these three zones (with half of all pedestrians on the interior of the block, and close to 20% in Hyde East and Leavenworth East).

In terms of the actual number of people on the street, the maximum observed number of people was at 3:00 PM on Saturday, with 529 people present across all five zones. Based on the video-based pedestrian volume data collected on the same day, the 15 minutes preceding the 3:00 PM occupancy observation was the time period with the greatest number of pedestrian entrances observed all weekend, and the pedestrian activity generally trended downward for the rest of the day, so it is reasonable to assume that the peak observation on Saturday was representative of the most crowded conditions that occur on the Crooked Street. Table 4 shows the occupancy of the different zones of the Crooked Street at 3:00 PM on Saturday, the peak of the block's occupancy, as well as the highest occupancy observed in each zone across all time periods.

TABLE 4. PEAK OCCUPANCY OF CROOKED STREET

ZONE	SATURDAY 3:00PM	ZONE HIGHEST OBSERVED
Hyde (West)	17	27
Hyde (East)	86	86
Interior of Block	304	304
Leavenworth (West)	69	69
Leavenworth (East)	53	78
<b>Total</b>	<b>529</b>	<b>564</b>

These high visitor levels result in significant crowding at points along the interior of the block, at either end of the block, and on the east side of Leavenworth.

Pedestrian crowding on the Crooked Street was measured using Level of Service (LOS), which grades pedestrian crowding conditions on a scale of A to F.<sup>5</sup> LOS A conditions are defined as those where each pedestrian has more than 60 square feet of space. Under LOS A conditions, pedestrians move in desired paths without altering their movements in response to other pedestrians, walking speeds are freely selected, and conflicts between pedestrians are

5 Caltrans Highway Design Manual, Chapter 18 Pedestrian Facility Design, Exhibit 18-3 Pedestrian Level-of-Service, 2013.

FIGURE 15. AREAS ON AND ADJACENT TO THE CROOKED STREET

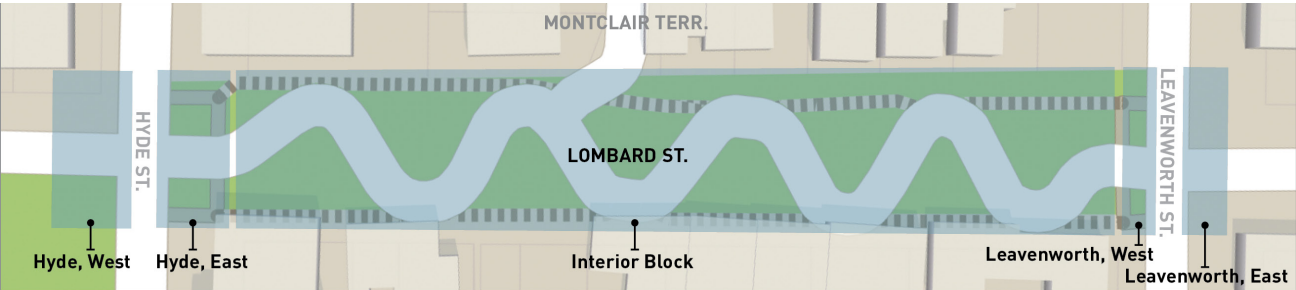
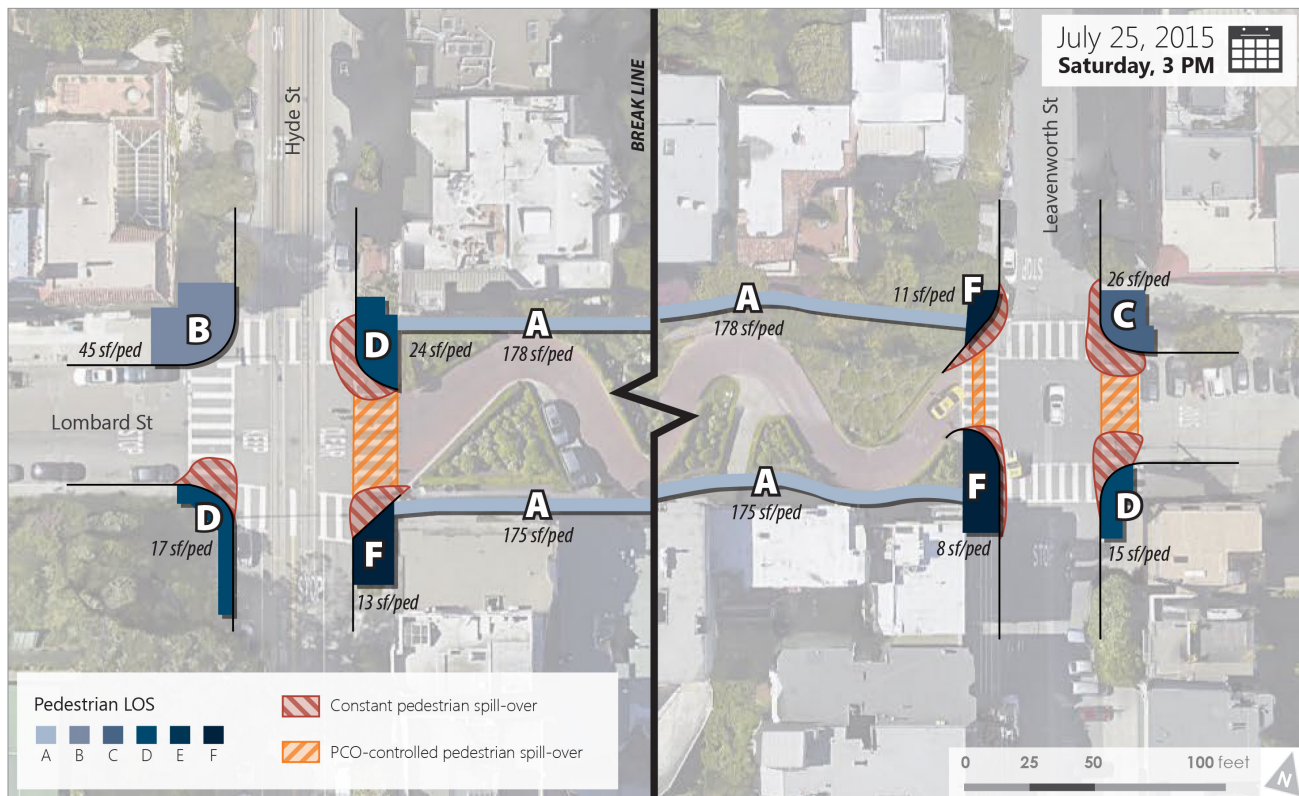


FIGURE 16. CROOKED STREET PEDESTRIAN CROWDING CONDITIONS



unlikely. LOS F conditions are defined as those where each pedestrian has less than eight square feet of space. Under LOS F conditions, walking speeds are severely restricted, there is frequent unavoidable contact with other pedestrians, and cross or reverse-flow movements are virtually impossible. Figure 16 “Crooked Street Pedestrian Crowding Conditions” visualizes pedestrian crowding LOS within the zones shown in Figure 15, based on observations conducted in July 2015.

In the interior of the block, where pedestrian crowding is LOS A, pedestrians have ample space to move along desired paths and at desired speeds. On the intersection corners at the west and east ends of the Crooked Street, pedestrian conditions are generally more crowded, with the lowest LOS grades on the four corners immediately adjacent to the Crooked Street. The southeast corner of Lombard Street and Hyde Street (Hyde East) and the northwest and southwest corners of Lombard Street and Leavenworth Street (Leavenworth West) experienced LOS F pedestrian crowding conditions during the peak occupancy time at 3:00 PM on Saturday.

Figure 16 also presents observed pedestrian spill-over from the sidewalk into the street during peak occupancy. Constant pedestrian spill-over is differentiated from PCO-controlled pedestrian spill-over based on the level of

fluctuation in pedestrian presence at those locations. Constant pedestrian spill-over was observed on all but one of the corners at the intersections at the west and east ends of the Crooked Street. Due to a lack of sufficient sidewalk space, reflected in crowding conditions of LOS C or lower, pedestrians occupy adjacent street space. The boundaries of the adjacent street space were observed to be the extent of excess pavement that lies outside of the typical vehicle path of travel at the corners, and pedestrian presence in the spaces did not interfere with vehicle operations.

PCO-controlled pedestrian spill-over was observed at the top of the Crooked Street in the east crosswalk (Hyde East) and at the bottom of the Crooked Street in the east and west crosswalks (Leavenworth East and Leavenworth West). At these locations, pedestrians take advantage of the breaks in vehicle traffic created by PCO control to observe the Crooked Street and take pictures from the best vista points at the top and bottom of the hill. Pedestrians generally vacate the crosswalks when vehicle traffic resumes, with the exception of the east crosswalk at Lombard Street and Leavenworth Street. Vehicle volumes are very low on Lombard Street east of Leavenworth Street, so pedestrians occupy the crosswalk space most of the time, moving only when a vehicle infrequently inches its way through.



## VEHICLE VOLUMES AND SPATIAL PATTERNS

As shown in Figure 17, vehicle volumes on the Crooked Street are relatively high compared to capacity for much of the day. The capacity of the Crooked Street is limited because of its geometry, and fluctuates also based on the conditions on cross streets (particularly Hyde, on which the Cable Car runs) and traffic management activities by SFMTA Parking Control Officers who are present at both ends of the block during peak summer hours on Friday-Sunday. The Crooked Street usually operates at about 250 vehicles per hour, going as high as 300 vehicles per hour in isolated circumstances. By comparison, the 2000 Crooked Street Task Force report observed a capacity of 350 vehicles per hour during the May 1999 Labor Day weekend, and the June 2014 SFMTA traffic counts measured a maximum of 383 vehicles per hour in the evening after the closure hours.<sup>6</sup> One possible explanation for the lower hourly vehicle volumes on the Crooked Street may be that PCOs, for safety and operational reasons, prioritize keeping traffic moving on Hyde Street to avoid negatively impacting the Hyde Street cable car, which cannot stop on the steep mid-block grades on Hyde Street. Prioritizing operations on Hyde Street essentially reduces the capacity on Lombard Street.

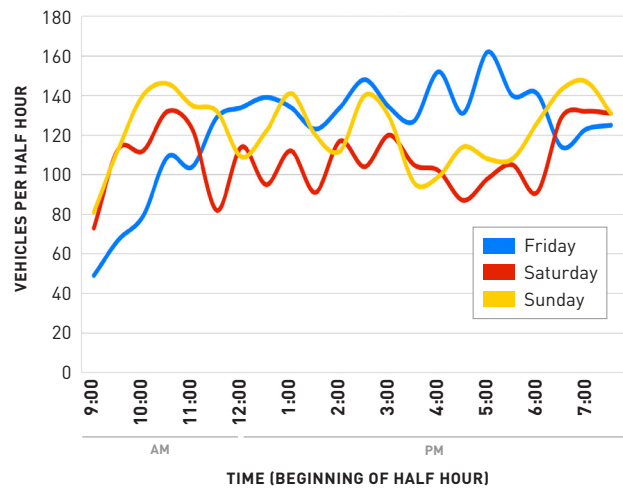
When the Crooked Street is at vehicle capacity, further increases in vehicle demand will manifest themselves in the propagation of the vehicle queue, which is examined later in this section. On all three days, demand is relatively lower at 9:00 AM but approaches capacity by about 11:30 AM on Friday, 10:30 AM on Saturday, and 10:00 AM on Sunday.

Demand is more peaked on Fridays, gradually increasing until tapering off starting around 6:30 PM. By contrast, Saturday and Sunday are more volatile, but remain within the same range throughout the day through the end of observations at 8:00 PM, with overall the highest volume on Sunday.

While the hourly capacity of the street appears to be lower than in previous years, the overall level of vehicle demand has certainly increased. The Average Daily Traffic (24 hour vehicle count) in 1999 for the Crooked Street was 1,560 vehicles. By contrast, ADT reached 2,630 in 2013. In 2014, the day before the first closure weekend saw 3,723 vehicles, and the Saturday of the closure still saw 2,751 vehicles (since the street was only closed from 12:00 PM–6:00 PM). In summer 2015, up to 2,700 vehicles were observed just between the hours of 9:00 AM to 8:00 PM.

<sup>6</sup> The 383 vehicles per hour was observed from 8:00 PM–9:00 PM on a Saturday, when the effective capacity of the Crooked Street may have been higher due to lower volumes of cross-traffic on Hyde in the late evening. Lower volumes of cross-traffic mean that east-bound traffic on Lombard faces less of a bottleneck at the entrance to the Crooked Street, the intersection of Lombard and Hyde.

FIGURE 17. VEHICLE VOLUMES PER HALF HOUR (9AM-8PM)



Vehicle queue lengths and travel times on Lombard Street were recorded in summer 2015. The hourly queue lengths and estimated travel times to the Crooked Street entrance are presented in Figure 18 (next page). During the morning hours, vehicle queue lengths were less than one block, and the time to reach the Crooked Street was under six minutes. Vehicle queue lengths and travel times to the Crooked Street began to increase around 12:00 PM. They reached a maximum between 4:00 PM and 6:00 PM, with queues extending west of Van Ness Avenue and travel times to the Crooked Street reaching over 20 minutes, before tapering off into the evening.

Based on July 2015 observations, the estimated time required to travel on Lombard Street from Van Ness Avenue to the Crooked Street entrance is between 16 and 22 minutes, reflecting a faster queue service rate than that observed in 1999, when vehicles were observed to wait 35 to 40 minutes to clear the same queue length.

The combination of high pedestrian volumes and high vehicle congestion can lead to pedestrian-vehicle conflicts on and around the Crooked Street. While low traffic speeds from congestion mean that severe vehicle-pedestrian collisions are infrequent, traffic operations can create stressful conditions for pedestrians and motorists. Among all vehicles entering or exiting the Crooked Street from 9:00 AM–8:00 PM on one peak July weekend, 3.4% (266 vehicles) were delayed when entering the Crooked Street at Lombard and Hyde because of tourists standing in the roadway, even though PCOs were present for the majority of these hours. At the bottom of the Crooked Street, at Lombard and Leavenworth, 1.5% of vehicles (120 vehicles) were delayed from exiting the Crooked Street.

Vehicle turn restrictions are in place on Hyde Street for safety and operational reasons. Left turns from south-

FIGURE 18. AVERAGE VEHICLE QUEUE LENGTH ON LOMBARD STREET



bound Hyde Street onto Lombard Street are prohibited at all times to avoid vehicle queues forming that could block the southbound cable car, which is unable to stop mid-block on the steep grades of Hyde Street. Over the course of Friday-Sunday 9:00 AM–8:00 PM, 2.4% of all cars that accessed the Crooked Street (190 vehicles) did so via this illegal left turn.

Right turns from northbound Hyde Street onto Lombard Street are also prohibited at times by PCOs' discretion. While PCOs are present, there is often a temporary sign indicating no right turns except for local access. This ensures that a vehicle queue to visit the Crooked Street does not impact the northbound cable car operations on Hyde Street, and also provides reliable local access for residents who are exempted from the restriction. Residents of both the Crooked Street and blocks west emphasized that their ability to make right turns from either direction on Hyde Street was critically important to them, since these turning movements allow them to access their homes without waiting in the vehicle queue for the Crooked Street.

## VEHICLE PROFILE

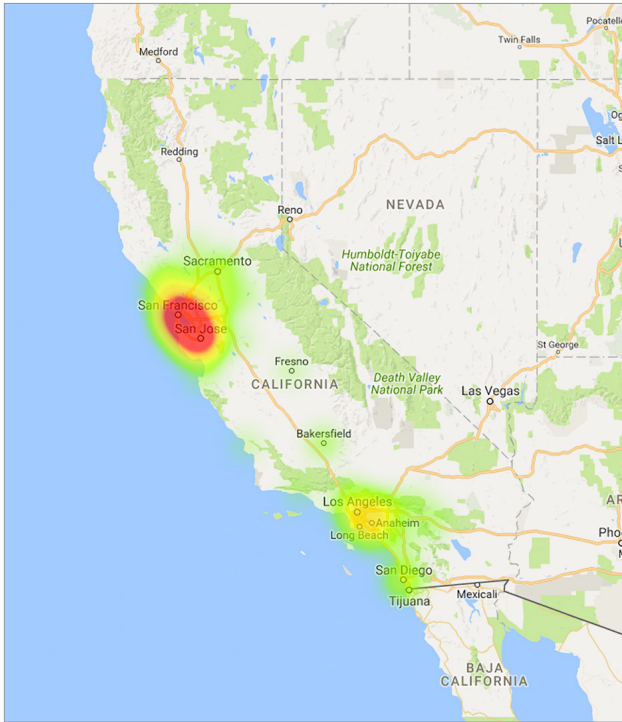
License plates and occupancy of 416 vehicles entering the Crooked Street was collected during peak Friday and Saturday visitor hours (12:00 PM–6:00 PM). As shown in Table 5, just over half of all vehicles entering the Crooked Street were visitors in either California rental cars or out of state cars. Privately owned out of state vehicles cannot be distinguished from out of state rental cars, but both categories primarily represent non-local visitors. The other half was privately owned vehicles registered in California.

TABLE 5. VEHICLE TYPES

VEHICLE TYPE	COUNT	PERCENT
Private (CA)	198	48%
San Francisco	30	7%
Elsewhere in Bay Area	113	27%
Elsewhere in California	55	13%
Rental cars (CA)	145	35%
Out of State	73	18%
<b>Total</b>	<b>416</b>	



**FIGURE 19. CITY OF REGISTRATION FOR PRIVATE CALIFORNIA VEHICLES VISITING LOMBARD'S CROOKED STREET**



Among private California vehicles, more than half were from the nine-county Bay Area outside of San Francisco, about half as many were from the rest of California, and the smallest share was from San Francisco. The composition of vehicles on the street has changed dramatically since the 1999 figures from the Crooked Street Task Force report. San Francisco drivers were twice as large a share (13%), and those from elsewhere in the Bay Area were also more significant (41%). Visitors from elsewhere in California or other states, currently 31%, comprised 40% in 1999.

The most dramatic difference is an increase in rental cars, whose share has increased by a factor of almost six since 1999 (6% in 1999). Today, 35% of vehicles on the Crooked Street are California rental cars. The vast majority (89%) of those rental cars were owned by Enterprise, Hertz, or Avis, with Enterprise alone representing 42% of rental cars.

Figure 19 shows the city of registration of privately registered California vehicles on the Crooked Street.

Vehicles driving the Crooked Street were generally high occupancy. The average occupancy of vehicles was 3.42 passengers (median: three passengers), and only 4% of vehicles were single-occupant, while 45% of vehicles had four or more passengers. The occupancy of vehicles did not vary substantially by vehicle type.

## INTERCEPT SURVEY

An intercept survey was developed to better understand visitors to the Crooked Street. The survey was administered verbally by SFCTA staff using iPads to record responses from visitors. The full survey was administered to pedestrian visitors, and a smaller subset of the survey was administered to passengers in automobiles waiting in the queue. The full survey had 15 questions and was designed to take less than five minutes to complete.

The survey was administered in person on the Crooked Street on Friday, July 10, 2015 and Saturday, July 11, 2015, and received 296 responses (122 from pedestrians and 174 from vehicle passengers), all of whom were visitors to the street. It was administered in English, Spanish, French, Mandarin, and Cantonese.

What are the access modes to the Crooked Street? Are they correlated at all with where people are staying?

Among the respondents intercepted on foot, there was a variety of access modes used to arrive at the Crooked Street. As shown in Table 6, by far the most popular way to arrive at the Crooked Street was on foot, with 49% of visitors who were intercepted on the sidewalk having walked, while 28% arrived by private or rental cars, 13% took transit, and only 5% arrived by tour bus drop-off nearby.

The access modes were somewhat different depending on what neighborhood the respondent was staying in due to the relative convenience of different modes by neighborhood. Tourists staying in nearby Fisherman's Wharf were particularly likely to walk (71%) or take the cable car (14%). Those who lived in the Bay Area were particularly likely to come by private car (57%). The most popular neighborhood among tourists was Union Square, and from there 66% had walked, 14% took a Muni bus, 3% the cable car, and 7% a tour bus; none arrived in a privately owned car, and only 7% used rental cars.

**TABLE 6. ACCESS MODES TO THE CROOKED STREET (FOR PEDESTRIANS)**

ACCESS MODE	MODE SHARE
Walk	49%
Private car (parked here)	14%
Rental car	14%
Cable Car	8%
Muni Bus	5%
Tour bus drop-off nearby	5%
Taxi	2%
TNC (Lyft, Uber)	2%
Dropped off	1%

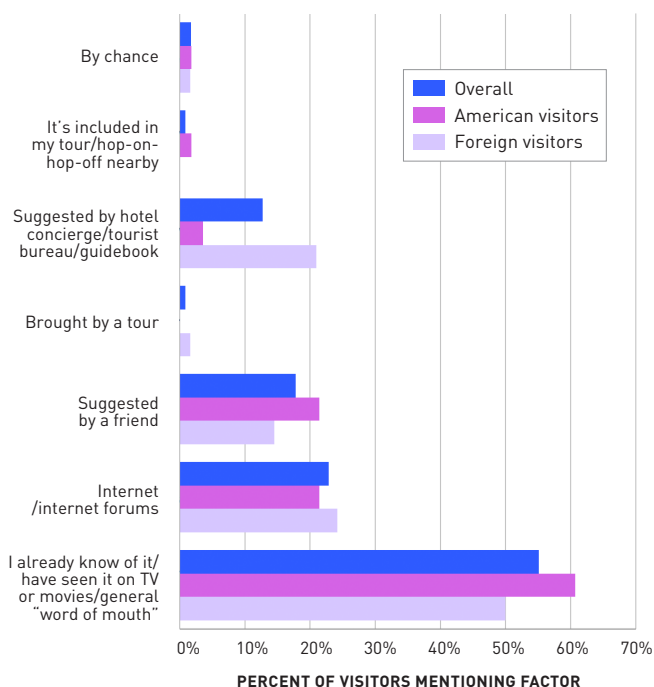
Why did people who drove make that choice? What about users of other modes?

The majority of people who drove a private or rental car to the Crooked Street said they did so because it was convenient (64%), with 39% also stating that they already had a car available to them, and 12% saying that public transportation was a slow or inconvenient option. Convenience could mean many different things—for some tourists, driving is convenient because they are going to or from other more distant destinations or ones poorly served by transit (such as Napa). Tourists travelling in larger groups also tended to choose driving as an access mode. The average group size among pedestrians arriving by private or rental car was 4.9, while the average group size for all other access modes was 3.2, with this difference being highly statistically significantly different ( $p=0.000$ ).

Among those who walked or took the cable car or Muni bus, half said that they chose that mode because it was fun and enjoyable. Those who walked also cited its convenience (41%) and difficulty parking or lack of a car (7%). As is shown further below, the convenience of walking likely stems from the fact that many tourists are visiting businesses and attractions nearby before and after their visit to the Crooked Street, making walking the easiest access mode.

Those who took Muni or the cable car also cited their convenience (27%), the difficulty of parking in the area (13%), avoiding traffic (13%), and suggestions by their hotel concierge, tourist bureau, or a guidebook (13%).

**FIGURE 20. HOW TOURISTS RECEIVE INFORMATION AND LEARN ABOUT THE CROOKED STREET**



How do people get information about and decide to visit the Crooked Street? How influential are tour groups or buses and official visitor information?

Tourists cited many different ways that they received information about and decided to visit the Crooked Street, but by far the most common response was that they already knew about the Crooked Street through general cultural knowledge (images in films and TV) or word of mouth; 55% of tourists overall said this, while the rates were 61% for American tourists and 50% for foreign tourists.

Internet forums were the second-most important source of information for all visitors, with more than 20% of all tourists saying they consulted internet forums. Hotel concierges, tourist bureaus, and guidebooks were mentioned by more foreign visitors than American visitors (21% of foreign tourists compared to 4% of American tourists).

Tours on foot or nearby tour bus drop-offs seemed to play a very minor role on the block overall in comparison to the majority of visitors who arrive at or learn about the Crooked Street by other means. Overall, only 6.6% of tourists visiting on foot either said they learned about the Crooked Street from a tour or tour bus drop-off nearby, or reported a tour bus as their travel mode for arriving at the street. This was slightly higher for foreign versus American tourists, with 7.9% of foreign tourists interacting with a tour in some way regarding either their information or travel mode to the street, compared to 5.1% of American tourists.

What is the feasibility of any type of reservation system? How likely are visitors to receive information in advance?

Overall, tourists were very flexible in what time they chose to visit the Crooked Street, but were not enthusiastic about using a reservation system for their visit.

Overall, 97% of visitors said they were either "very" or "somewhat" flexible on the time they could choose to visit the Crooked Street, with the vast majority being "very" flexible (82%). However, visitors were relatively evenly split on whether they would be willing to visit if they were required to make an appointment, with about one third each saying "yes," "no," or "maybe."

As shown in Figure 20, only a somewhat small subset of visitors mentioned learning about and deciding to visit the Crooked Street by consulting internet forums, hotel concierges, tourist bureaus, or guidebooks. Since the most significant way tourists learned about the Crooked Street was through general knowledge/portrayals in TV and movies/word of mouth, there would need to be very proactive messaging to tourists to ensure awareness of any reservation



system if implemented. Active messaging through rental car companies could be effective in reaching many tourists who choose to drive—as shown in the vehicle profile analysis, 35% of cars driving down the Crooked Street were California rental cars, with 89% of those being just Enterprise, Hertz, or Avis.

Survey respondents were able to make comments at the end of the survey, and the most common comment that was made was in response to the question they were asked about whether they would be willing to make a reservation. One person said, “They can’t require reservations for a public street!” Another said they wouldn’t mind reservations if some type of perk were attached, while another said they wouldn’t mind reservations as long as they didn’t have to pay.

What kinds of places are tourists going to or from before and after their visit?

This question is examined to assess whether there are common destinations that a potential shuttle could serve if this were considered to be a useful strategy.

The vast majority of those visiting the Crooked Street on foot were coming from and going to other attractions or businesses (75% coming from and 80% going to), with at least half of those tourists (41% and 43%) coming from or going to attractions or businesses in nearby neighborhoods such as the Marina, Russian Hill, and Fisherman’s Wharf. This popularity of nearby destinations is also reflected in tourists’ access mode choice. As shown earlier, 49% of pedestrians on the Crooked Street got there by walking.

A substantial number of tourists came to the Crooked Street from their hotels (21%), but many fewer were returning to their hotels after (5%).

FIGURE 21. VISITOR FLEXIBILITY AND WILLINGNESS TO VISIT WITH APPOINTMENT

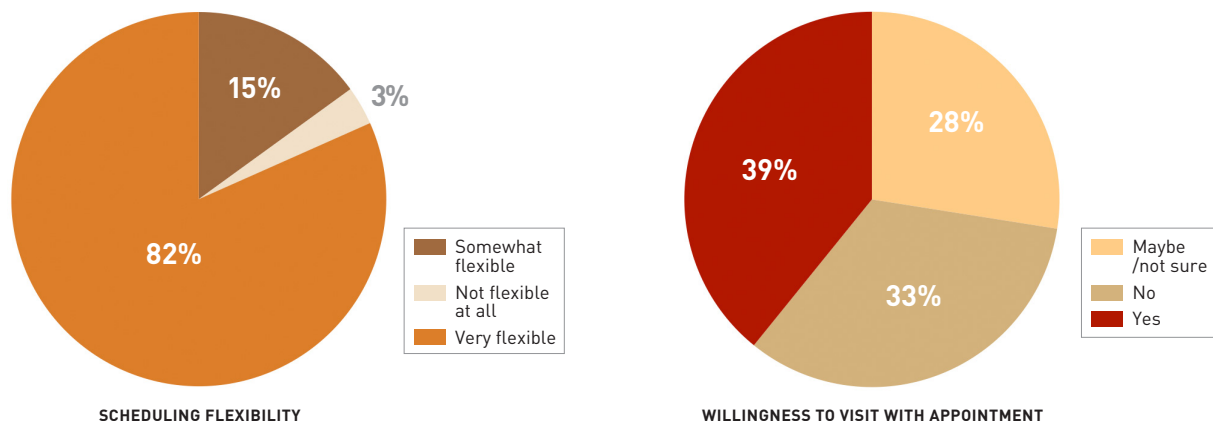
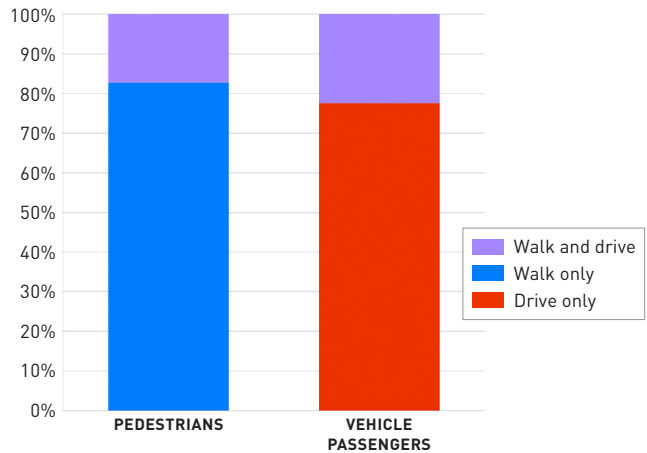


FIGURE 22. MODES OF VISITING: WALKING, DRIVING, OR BOTH



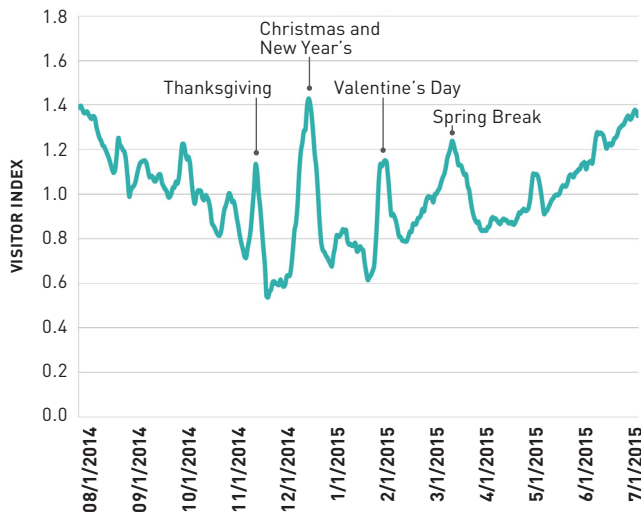
Does allowing people to drive down the Crooked Street divert some people away from visiting on foot? Are there differences between these two groups of tourists?

Pedestrians and vehicle passengers in the queue were asked if they were only driving, only walking, or both walking and driving down the Crooked Street as part of their visit.

Interestingly, the majority of visitors, including those coming in vehicles, are unimodal. About 80% of both visitors on foot and in vehicles (83% and 78%, respectively) reported that they were only walking or only driving down the Crooked Street.

Among those who did both walk and drive down the Crooked Street, 74% said it was “somewhat” or “very” important for them to drive down, suggesting that it is a valued experience for tourists. People who were driving down the street versus walking were also somewhat different. Among those only driving, 37% were from California (including 22% Bay Area); among those only walking, 17% were from California (11% Bay Area). By contrast, foreign

**FIGURE 23. VISITOR VOLUME INDEX FOR FISHERMAN'S WHARF, AUGUST 2014-JULY 2015**



tourists were 23% of those only driving and 58% of those only walking on the Crooked Street.

The walking and driving behavior of visitors to the Crooked Street makes it likely that allowing people to drive down the Crooked Street does reduce the total number of people walking on the street. The vast majority of vehicle passengers only drive down the Crooked Street. If the street were closed to vehicle traffic and, for example, only a quarter of those vehicles continued to come to visit the Crooked Street, that would still result in a net increase in the number of pedestrians visiting the Crooked Street.

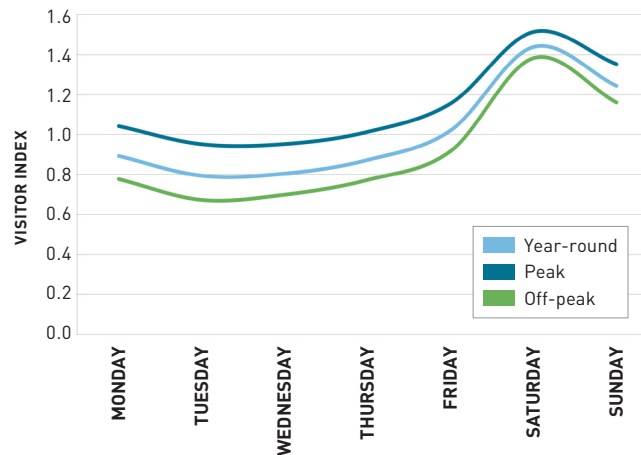
The count data analyzed earlier showed that 9,614 people visited on foot and approximately 8,078 by vehicle (in 2,362 vehicles) on a busy Saturday. Applying the intercept survey results, this means that about 6,267 people visited the street only by car, a substantial portion of whom would likely switch to visiting on foot if the street were closed to vehicles.

#### **TOURISM: SEASONAL, WEEKLY, AND DAILY PATTERNS**

Many residents and stakeholders asserted that tourist visitation to the Crooked Street has increased in recent years and is less seasonally peaked than in the past. Direct counts of visitor levels for the Crooked Street aside from those already presented are not available, but visitor volumes are available for Fisherman's Wharf, shown in Figure 23. Since survey results indicated that many visitors to the Crooked Street also visit or stay near Fisherman's Wharf, this volume data is likely correlated to show similar peaks and valleys to the volumes on the Crooked Street.

The visitor index shows the level of average weekly visitation as a ratio to the median visitor volume. As such,

**FIGURE 24. VISITOR VOLUME INDEX BY DAY OF WEEK FOR FISHERMAN'S WHARF, AUGUST 2014-JULY 2015**



a value of 1.0 is the same as the median visitor volume, meaning that half of days were busier than this level and half were less busy.

There are still overall trends in tourism levels at Fisherman's Wharf, with December and January in particular having the lowest tourism volumes of the year outside of holiday periods. However, high levels of tourism do indeed occur year round. During the traditional off-peak season, there are large spikes above the median level of tourism around Thanksgiving, Christmas and New Year, Valentine's Day, and the end of March which is typically the time of schools' spring breaks.

Figure 24 shows the visitor volume index (defined the same as above) by day of week. Patterns by day of week are essentially the same throughout the year. Tuesdays and Wednesday have the lowest visitor volumes. By comparison, Mondays and Thursdays are about 10% higher, Fridays about 30% higher, Saturdays about 80% higher, and Sundays about 60% higher.

Figure 25 (next page) shows the counts of visitors observed by hour at Fisherman's Wharf during the same week as pedestrian counts were collected for Lombard's Crooked Street. Unlike the data for the Crooked Street, data at Fisherman's Wharf is collected continuously 24 hours per day, so this data can supplement the understanding of general levels of tourism demand during a peak summer week outside the 9:00 AM–8:00 PM timeframe of Lombard Street's data.

In general, Figures 24 and 25 shows the same patterns of overall peak demand as Lombard Street, with the highest demand occurring on Saturdays, and Fridays still being noticeably busier than Mondays through Thursdays. Across



all days of the week, tourism is at a similar level at 8:00 AM and increases relatively constantly until 1:00 PM, though at a faster rate on the weekends. Demand tapers off about an hour earlier on weekdays compared to Friday through Sunday, and weekend demand at Fisherman's Wharf is substantial until 11:00 PM.

## PARKING CONDITIONS

In interviews, residents indicated that on-street parking availability was not a primary concern in the neighborhood. Though surveys showed that the Crooked Street does attract a number of visitors that park on-street nearby and experience the block on foot, residents perceive that visitor's relatively short time spent in the neighborhood contribute to a high rate of turnover among blockfaces subject to Residential Parking Permit (RPP) restrictions. Additionally, many residents have access to and utilize private off-street parking for their own vehicles, and often are not in the position to find a space on the street.

In September 2015, SFMTA collected parking occupancy data for a number of the blocks surrounding the Crooked Street. Overall, this data validated the experiences that residents reported in interviews. For the data collected on a Saturday afternoon at 2:00 PM, one of the peak times for visitors to the Crooked Street, parking occupancy on the blocks nearest to the Crooked Street ranged from 67% (Lombard, between Leavenworth and Jones) to 94% (Leavenworth, between Greenwich and Lombard). No blocks immediately adjacent to the Crooked Street were 100% occupied during this data collection. Blocks also varied in the percentage of parked vehicles displaying an 'A' Permit, the zone permit required to park for longer than two hours on most blocks, from 12% (Leavenworth, between Greenwich and Lombard) to 60% (Leavenworth, between Chestnut and Lombard).

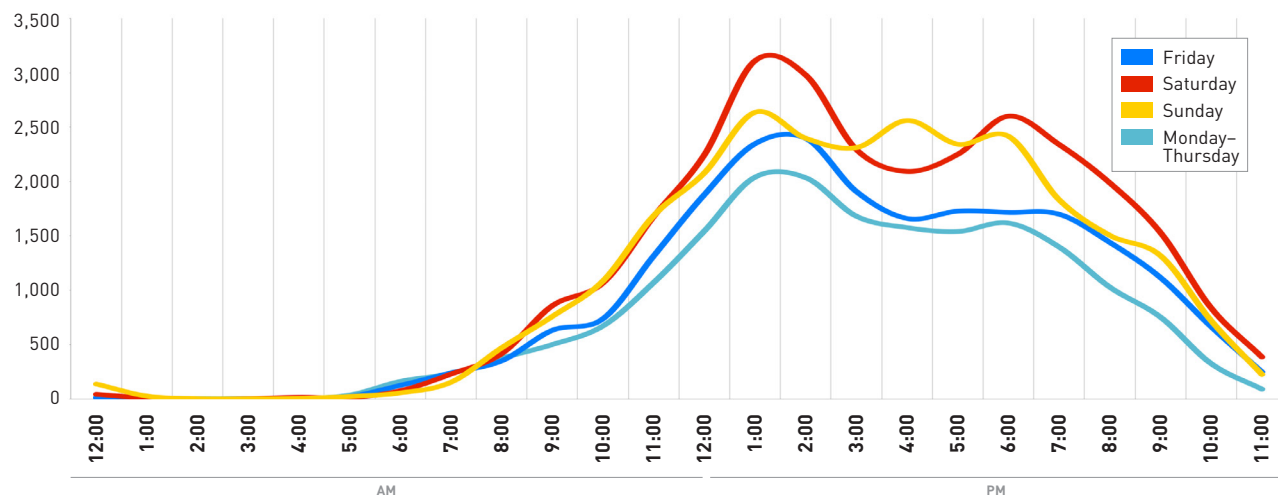
The average on-street occupancy in the broader Russian Hill neighborhood during the same Saturday 2:00 PM time-frame was 85%, which generally equates to one or two open spaces per block. Overall resident occupancy (determined by those vehicles displaying a valid 'A' Permit) was 51%.

## SAFETY AND COLLISIONS

A review of recent collision data confirms that the Lombard/Hyde and Lombard/Leavenworth intersections are not a significant hot spot for pedestrian safety based on a vision zero analysis. However, as noted previously, the combination of high pedestrian volumes and high vehicle congestion can lead to the perception of frequent pedestrian-vehicle conflicts on and around the Crooked Street. While low traffic speeds from congestion mean that severe vehicle-pedestrian collisions are extremely infrequent, traffic operations can create stressful conditions for both people walking and people driving.

Additionally, cable car operators face many challenges when traveling northbound on Hyde Street to approach the intersection at Lombard Street and Hyde Street. For safety and operational reasons, the cable car operators must stop in the middle of the intersection; however, stopping in this location blocks through traffic on Lombard and the south crosswalk across Hyde. Additionally, during peak times, the cable cars often find themselves and stop-and-go traffic, which is problematic since repeated stops and starts can fray cables in the street. Frayed cables can result in the cable cars being dragged forward if not caught as part of the cable's continuous inspection. Despite the presence of PCOs, pedestrian and vehicle crowding in the intersection remains a hazard for the cable car operators and many operators have reported near-misses as a result of both pedestrians and vehicles not obeying the traffic regulation signage or the PCO's directions.

FIGURE 25. VISITOR VOLUME BY TIME OF DAY FOR FISHERMAN'S WHARF, JULY 13-19, 2015



## V. FINDINGS

There have been several past attempts to better understand the issues relating to the transportation and livability concerns on and around the Crooked Street. The most recent full study of the challenges around vehicle and pedestrian congestion on the Crooked Street was completed in 2000, which provided key information on traffic and pedestrian volumes, vehicle origins, effectiveness of enforcement, and other key indicators. SFMTA revisited this Crooked Street study in 2013, and, in June 2014, conducted a temporary street closure, with the intent of preventing queuing and conflicts with pedestrians. SFMTA conducted traffic counts during the closure finding that while the street closure pilot reduced the queue during the actual hours of the closure, much demand was pushed to the hours just before and after the closure was in effect.

This study, in summer 2015, collected data through several methods such as camera-based data collection, on-street observation, visitor surveys, and resident interviews to gather visitor volumes, counts, and specific vehicle and pedestrian behaviors; a vehicle profile of the occupancy and origins of vehicles driving down the Crooked Street; an intercept survey of visitors on foot and in vehicles; and, an analysis on parking conditions and safety. This data collection effort yielded several key findings related to each project goal. A discussion of the goals and their related findings is explored in more detail below.

**MANAGE PEDESTRIAN CONGESTION:** The data collected proved that the crowding and congestion on the Crooked Street is most similar to the congestion seen in a downtown area,

not a residential neighborhood. Despite this, congestion levels are inconsistent, meaning that there are many peaks and valleys in the number of visitors arriving at any time. These peaks do not consistently align with the observed arrival of tour groups, cable cars, or other vehicles. Additionally, during peak periods (10:00 AM–6:00 PM), pedestrian congestion is present not only on the Crooked Street, but around it as well. The pedestrian congestion spills over into adjacent crosswalks, particularly at the Lombard and Leavenworth intersection.

**MANAGE AUTO CONGESTION:** During peak periods, a significant queue forms along Lombard Street west of Hyde, as cars wait to access the Crooked Street. At its peak, this queue can stretch past the Lombard and Van Ness intersection and take over 20 minutes to traverse by car. The queue also affects the vehicle circulation and resident access on not just Lombard, but also Larkin, Polk, Van Ness, and other neighborhood streets. Additionally, for those visitors that arrive by car but choose not to wait in the queue, vehicle loading and parking activity creates congestion and blocks sidewalks and driveways at the top and bottom of the block.

**ENSURE TRAFFIC SAFETY:** An analysis of collision data shows that the Crooked Street is not a Vision Zero Safety Concern—that is, there is not an abnormally high incidence of collisions on the block or at the intersections at both ends. While this result could be a result of the congestion and low speeds, both pedestrians and drivers report that the area is stressful to navigate and does not feel safe during congested conditions. Additionally, the presence of Parking Control Officers may also contribute to increased safety.



**MAINTAIN ACCESS TO THE CROOKED STREET BLOCK:** Within the last few years, residents of the Crooked Street were given a path to bypass the queue when PCO's began restricting right turns from NB Hyde to the Crooked Street to residents only. As a result, resident access on the Crooked Street has improved. Visitors, however, continue to queue and load/unload their vehicles in ways that block driveways on Lombard and neighboring streets. A lack of designated loading zones contributes to the parked and loading vehicles which block many of the driveways on the surrounding streets.

**MAINTAIN LIVABILITY OF THE SURROUNDING NEIGHBORHOOD:** The primary livability concern of residents of the Crooked Street neighborhood was pe-



destrian visitor behavior. Residents expressed that parking availability is not a significant concern on and around the block. It is the pedestrian crowding and vehicle loading that creates circulation, as well as potential safety issues, while also threatening the livability of the area for nearby residents.

**PRESERVE TOURISM:** Given the unique characteristics of the Crooked Street, the block will likely remain a tourist destination; however, it is important to balance the resident livability concerns with the preservation of tourism. The volume of visitors at Lombard Street is comparable to other regional attractions such as Fisherman's Wharf or Muir Woods, though both of these locations have a dedicated management agency to assist in organizing visitors and minimizing neighborhood impacts.

## VI. NEXT STEPS

The results of this existing condition analysis will be used to develop and evaluate a list of potential interventions and improvements that could help address some of the key issues and concerns on the Crooked Street and surrounding blocks. Once this initial list is developed, the project team will conduct outreach to residents on and around the Crooked Street through an open house in summer 2016, as well as solicit feedback through an online survey. This outreach will help shape the potential solutions and assist in determining what recommendations are carried forward to development for implementation.

