

# San Francisco Shared Lane Pavement Marking Study

## Summary of Findings September 2004

[http://www.dicycle.stgov.org/site/  
uploadedfiles/dpt/bike/Bike\\_Plan/  
Shared%20Lane%20Marking%20Full%20Report-052404.pdf](http://www.dicycle.stgov.org/site/uploadedfiles/dpt/bike/Bike_Plan/Shared%20Lane%20Marking%20Full%20Report-052404.pdf)

# Types of Bicycle Facilities



**Shared use paths**



**Bicycle Lanes**



**Shared Roadways**

**All three types of facilities work together to form a cohesive and comprehensive network that attracts the most users possible.**

# The problem: shared lane roadways

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- High incidence of "dooring,"
- Wrong-way riding,
- Sidewalk riding, and
- Motorists squeezing cyclists against the curb or parked cars, or exhibiting other aggressive behaviors.

## History

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- 1995 – Denver develops “bike-in-house”
- 1998 – SF applies elongated version of bike-in-house in green
- 2000 – SF goes to California Traffic Control Device Committee
- 2001 – Plan for experiment approved
- 2002 – Funds obtained for study and Alta Planning + Design selected
- 2003 – Study completed
- 2004 – CTCDC approves study and recommends language for MUTCD California Supplement



SF Mayor Willie Brown - 1998



## International Cities

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Buenos Aires, Argentina



Freiburg, Germany



Troisdorf, Germany



Copenhagen, Denmark



Zurich, Switzerland

# International Cities



Brisbane & Adelaide, Australia



Paris

# Study Goals

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1. Improved position of cyclists and motorists
2. Reduction in aggressive motorist behavior
3. Reduction in improper cyclist behavior
4. Reduction in accidents (over time)

## Methodology: Human Factors Testing

- All three markings encouraged motorists to be more aware of bicycles.
- The bike-and-separate-arrow marking frequently conveyed the incorrect message “bike straight only at the intersection ahead.”
- The bike-and-chevron marking was more likely to elicit the response to slow down than the bike-in-house symbol.
- Significantly more respondents thought the bike-and-chevron marking indicated a shared use lane than the bike-and-separate-arrow marking.
- About half of the surveyed bicyclists thought they should stay in the right lane and follow the arrow.

*Bike-and-chevron marking*



*Bike-and-separate-arrow marking*

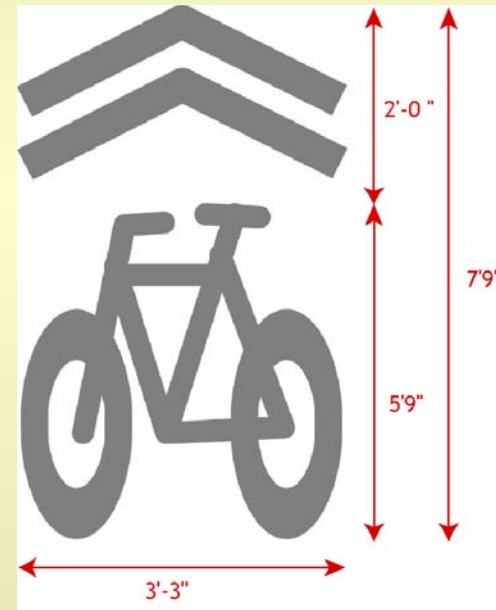
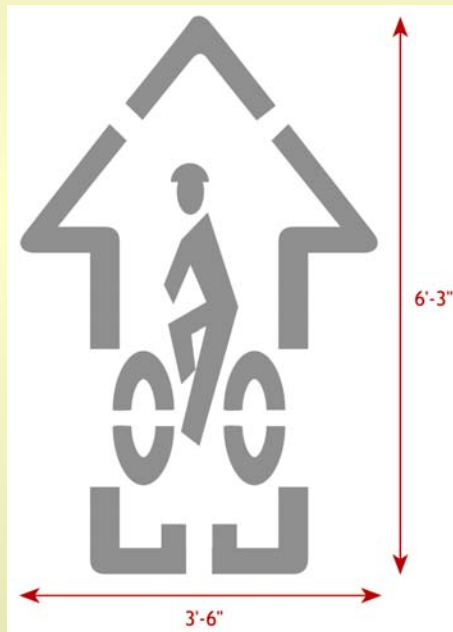


*Bike-in-house marking*

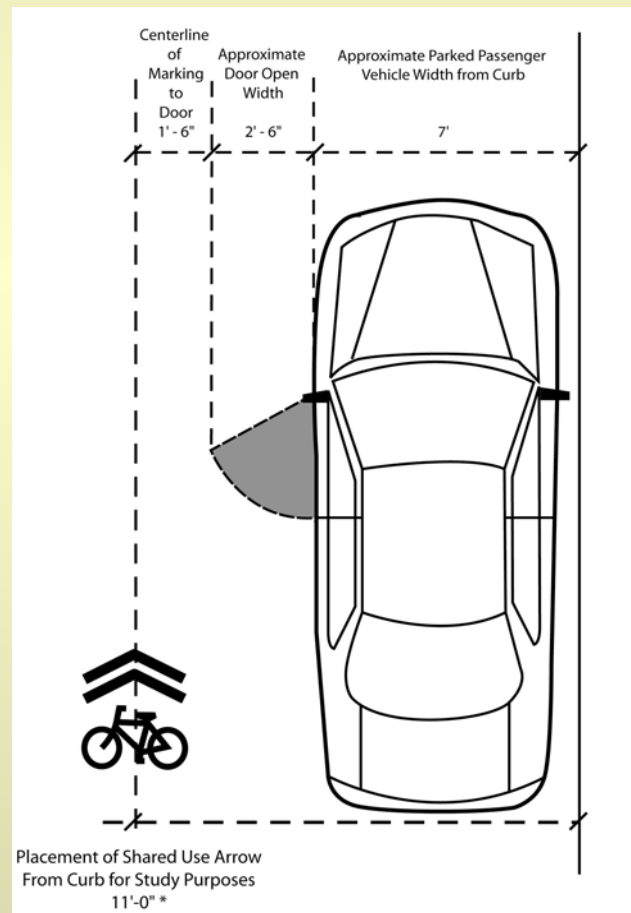


## Selected Test Markings

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## Plan View of Marking Placement



## Test Locations

Street	Location	# of Lanes	Curb Lane Width (includes parking)	ADT <sup>1</sup> (Volume)
Polk Street	between Washington and Sacramento	two-lane road	22'	high ADT/lane
17th Street	between S. Van Ness and Dolores <sup>2</sup>	two-lane road	22'	moderate ADT/lane
Second Street	between Mission and Howard	four-lane road	17'	moderate ADT/lane
Market Street	between Van Ness and Octavia <sup>2</sup>	four-lane road	18' to 19'	high ADT/lane
JFK Drive	between 8 <sup>th</sup> and 10 <sup>th</sup> Ave.	four-lane road	17' to 19'	moderate ADT/lane
Stanyan Street	between Haight and Frederick	four-lane road	16'-10"	moderate ADT/lane

<sup>1</sup> Heavy ADT is defined as more than 4000 vehicles per day per lane of traffic. Moderate ADT is defined as between 2000 and 4000 vehicles per day per lane of traffic.

<sup>2</sup> 17th Street (between Dolores and Valencia) and Market Street (between Octavia and Gough) were marked by DPT with green pavement arrows years prior to the Before/After Study. These green test arrows were removed prior to the initiation of the "Before" video documentation.

Note: Other streets—Fell St., 8th Ave., Transverse St., Page St.—were considered but not selected for analysis as the budget allowed for only six streets. The selected streets offer a good range of comparable issues.

## Test Locations

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17<sup>th</sup> Street

## Test Locations

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22<sup>nd</sup> Street

## Test Locations

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Market Street

## Test Locations

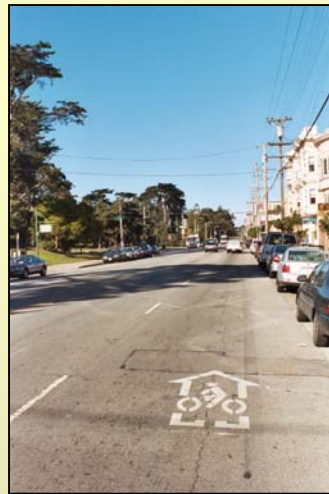
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Polk Street

## Test Locations

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Sanyan Street

## Test Locations

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JFK Dr

# Methodology

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- Video Analysis
  - Before/After study at six locations
  - Total of 140 hours of video
  - Recorded cyclists' and motorists' positions
  - Statistical analysis of results
- Surveys to Cyclists and Motorists
  - Questions about perceptions and preference
  - Small sample: 105 cyclists, 23 motorists

## Methodology

### Sample Size

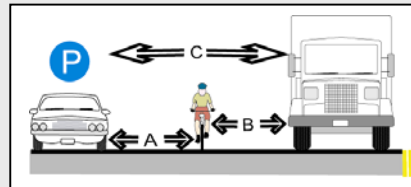
- 6 locations
- 140 hours of videotaping
- "Before" study:
  - 1100 cyclists
  - 1000 motor vehicles
- "After" study:
  - 1300 cyclists
  - 1400 motor vehicles

### Time of Study

- Spring-Summer 2003
- Various times during the day, depending on street

### Variables Studied

- Number of travel lanes
- Traffic volume
- Curb lane width
- Location
- Time of day
- Marking type



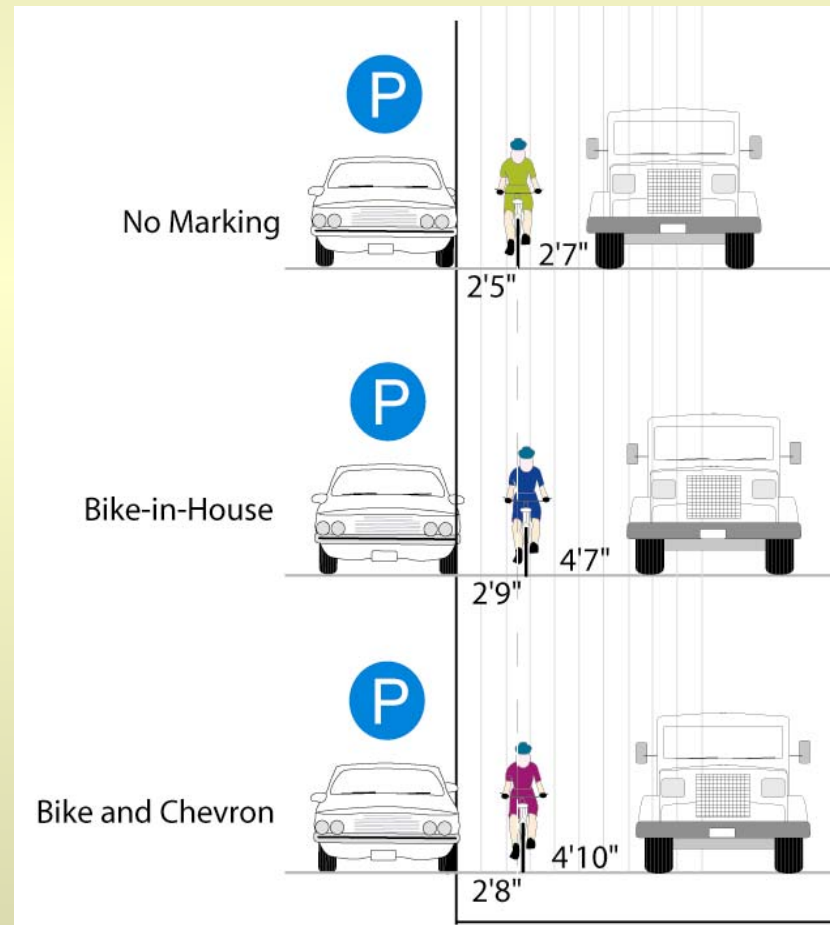
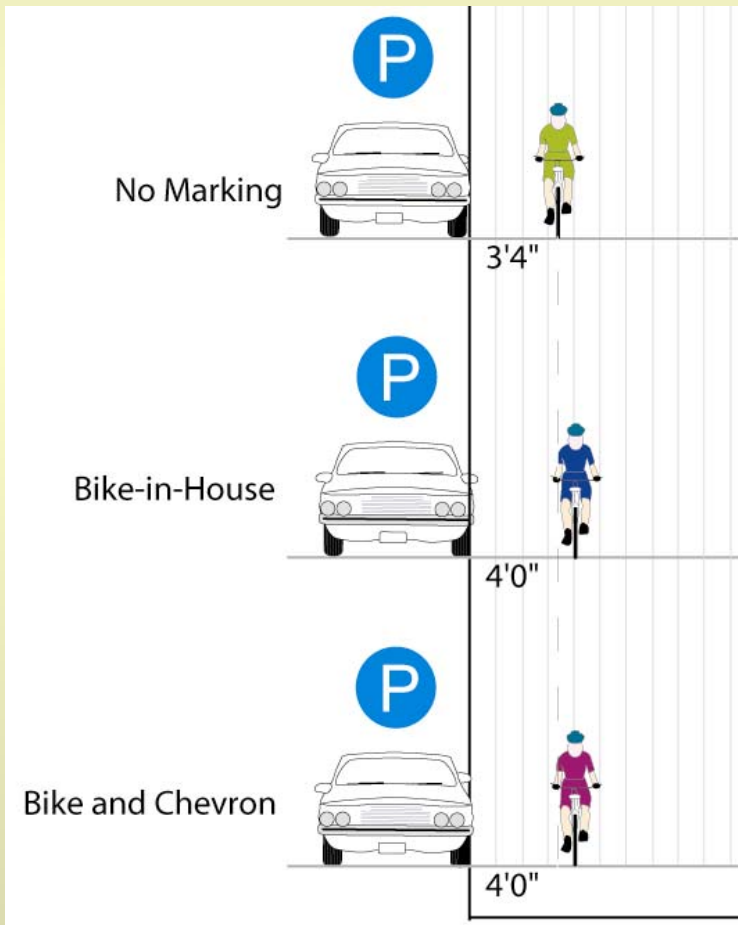
### Recorded Behaviors

- Cyclists' positions (A and B in the above diagram)
- Motorists' positions (B and C in the above diagram)
- Cyclist direction
- Cyclist location (street vs. sidewalk)
- Visible conflicts between cyclists and motorists

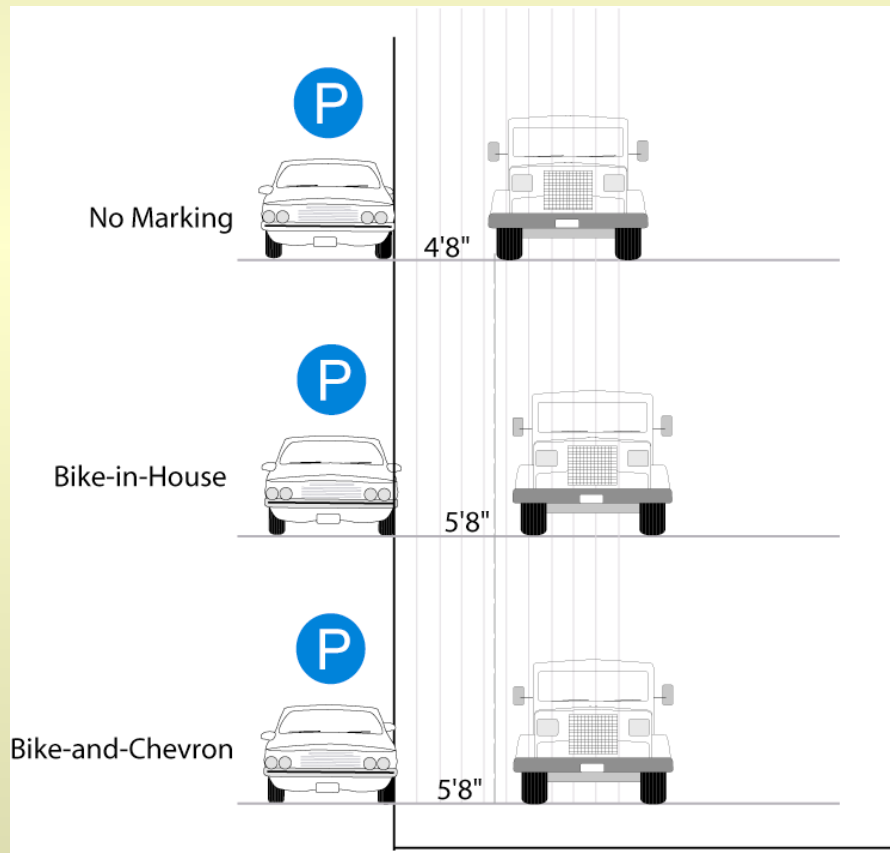
Both markings caused an 8” increase in distance between cyclists and parked cars AND an approx 2’ increase between passing vehicles and cyclists

## Bicycle to Parked Car

## Passing Vehicle Present



## Motor Vehicle to Parked Car



Both markings caused increase in distance between motor vehicles and parked cars by 1 foot

## Results of Video Analysis (continued)

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- Neither marking had a significant effect on aggressive motorist behavior
- Both the markings significantly reduced the number of **sidewalk riders**: the bike-and-chevron by 35% and the bike-in house by 25%.
- The bike-and-chevron reduced the number of **wrong-way riders** by 80%. (the bike-and-house marking did not)

# Summary of Video Analysis

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<b>Study Issues</b>	<b>Bike-in-House</b>	<b>Bike-and-Chevron</b>
1. Did the marking increase the distance of bicyclists from adjacent parked cars?	YES	YES
2. Did the marking increase the distance between passing motorists and cyclists?	YES	YES
3. Did the marking reduce observable hostile behaviors?	NO	NO

## Summary of Video Analysis (continued)

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<b>Study Issues</b>	<b>Bike-in-House</b>	<b>Bike-and-Chevron</b>
4. Did the marking reduce incidences of sidewalk riding?	YES	YES
5. Did the marking reduce incidences of wrong-way riding	NO	YES

## With Markings in Place, Significant Street Characteristics Affecting Behavior

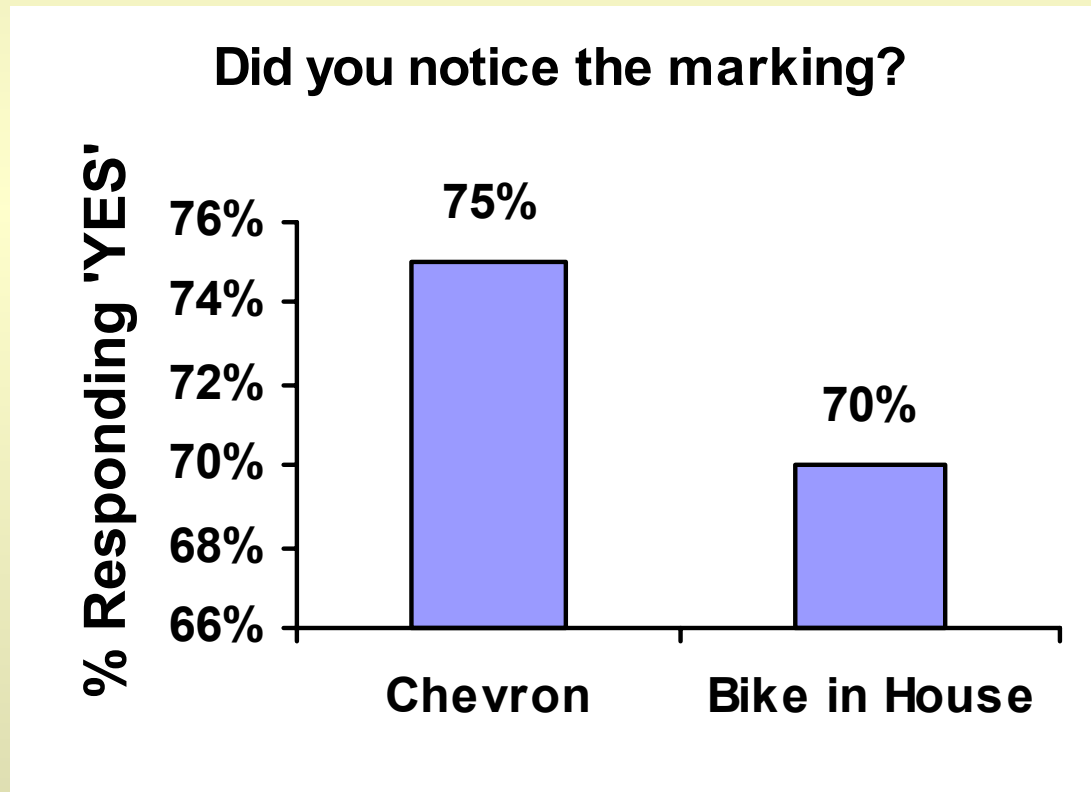
Factor	Effect on Distance between Bicyclists and Parked Cars	Effect on Distance between Bicyclists and Passing Vehicles
More lanes (4 vs. 2)	increase	decrease
Higher traffic volume	no effect	no effect
Wider curb lane	decrease	increase
AM vs. PM	no effect	no effect
Peak Periods	decrease	decrease

# Cyclist and Driver Surveys

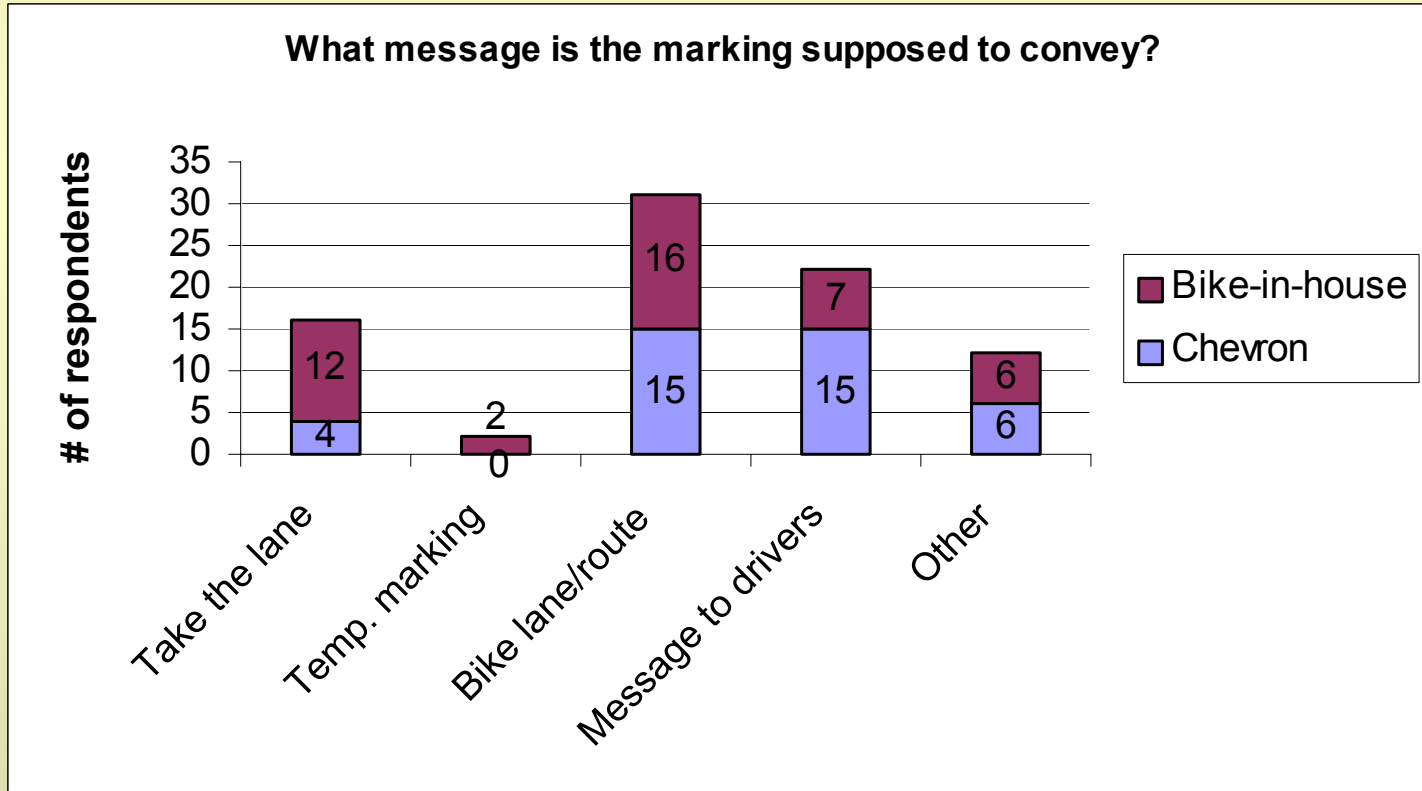
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- Cyclists were questioned at 3 locations:
  - Polk Street
  - 2<sup>nd</sup> Street
  - Market Street
- Motorists were questioned at 1 location:
  - Polk Street

# Cyclists' Responses to Survey

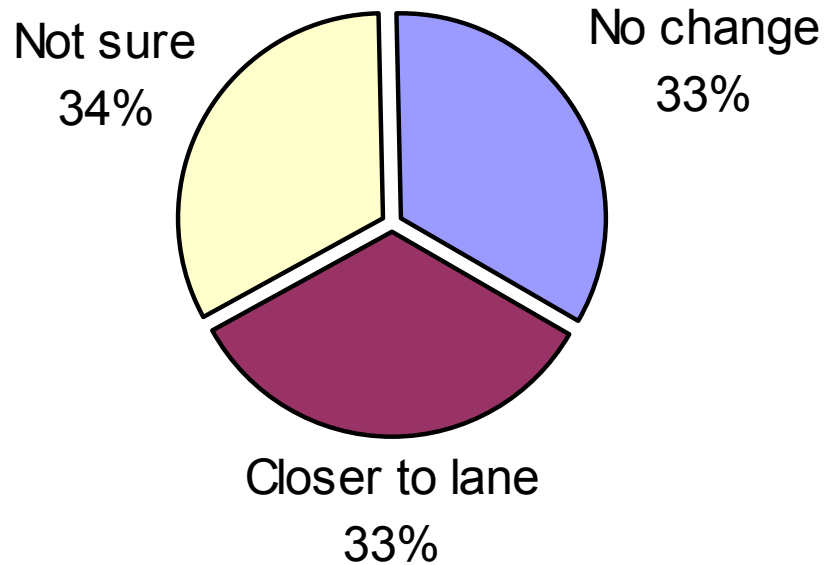


# Cyclists' Responses to Survey



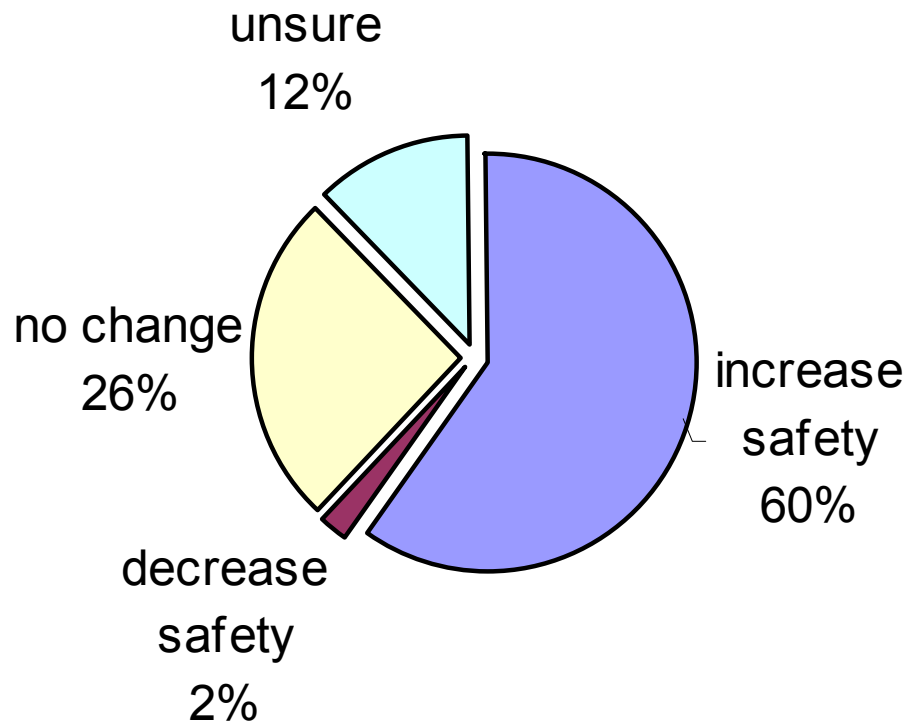
# Cyclists' Responses to Survey

**How did the markings affect your riding behavior?**



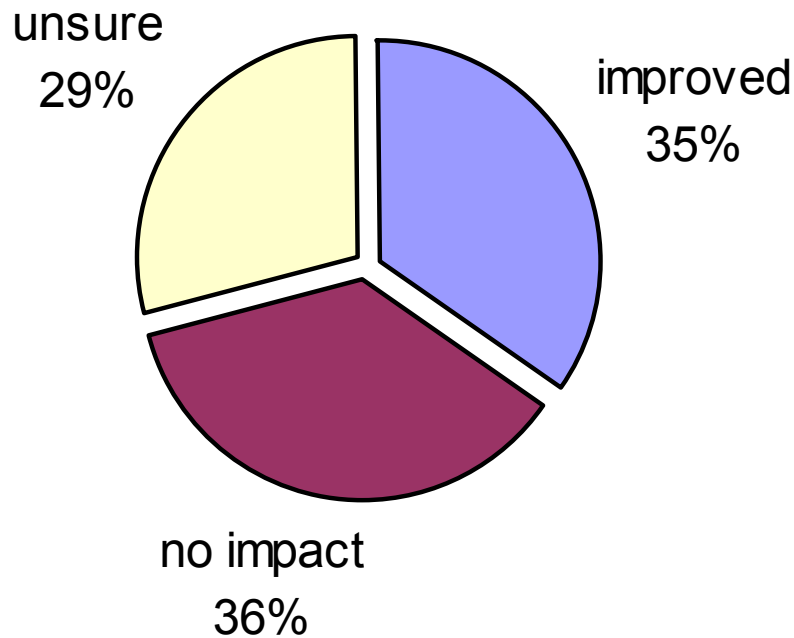
# Cyclists' Responses to Survey

**Did the markings affect your sense of safety?**



# Cyclists' Responses to Survey

**Do you think that the markings affected motorists' behavior?**



# Conclusion & Recommendations

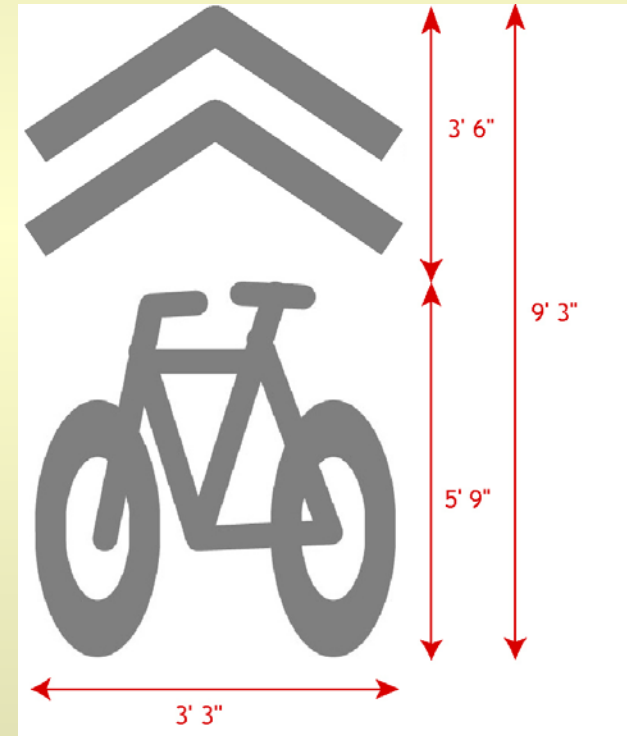
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- Study demonstrates that the markings positively affect cyclist and motorist behavior
- Bike-and-chevron had a stronger impact on cyclists' and motorists' positions
- Surveyed cyclists preferred bike-and-chevron by a 2:1 margin

# Conclusion & Recommendations

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Based on these findings, the consultants **recommend the use of the bike-and-chevron marking** as the standard marking for shared-use lanes in San Francisco.



# Status of Marking

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- **CA Traffic Control Device Committee approved report and recommended language to Caltrans**
- **Caltrans to finalize language and specifications**
- **Caltrans to review and accept/deny change to MUTCD California Supplement (early 2005?)**
- **Bicycle Technical Committee of National Committee of Uniform Traffic Control Devices spearheading national effort**  
[www.ncutcd.org](http://www.ncutcd.org)
- **Goal: marking in MUTCD in 2008**

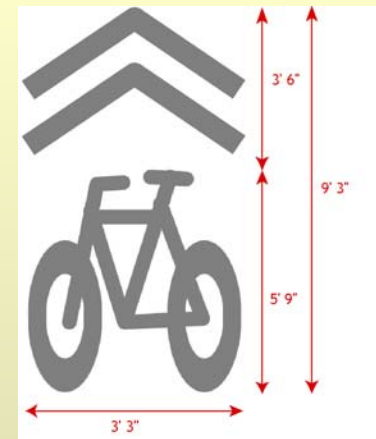


# MUTCD CA Supplement Language

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## Marking:

- Encourages cyclists to ride further from door zone
- Encourages motorists to give more space
- Reduces sidewalk riding
- Reduces wrong way riding
- Use on roadways is optional
- If used on streets with parking, must place marking 11' from curb
- Distance may be increased: downhill grades, wider vehicles, and higher speeds
- Markings should be spaced 250' along roadway



# Next Steps for San Francisco

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- 1) Finalize warrants and placement guidelines
- 2) Install 2500 markings around city over next year  
(~60 miles or half of remaining signed/shared roadways)
- 3) Launch outreach campaign at same time

