M E M O R A N D U M

DATE: January 24, 2017

TO: File

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SUBJECT: Market Street Raised Bikeway Demonstration Project: Findings Report

EXECUTIVE SUMMARY

Introduction

The SFMTA worked with San Francisco Public Works to build the city's first raised bikeway on a two-block stretch of Market Street between 12th Street and Gough Street in the eastbound/downtown direction. Four slightly different raised bikeway designs were incorporated into the demonstration project and are detailed in Figure 1. Raised bikeways are common in cities internationally but very few currently exist in the United States and they have never been constructed in San Francisco prior to this demonstration project. From November 2015 through May 2016, the SFMTA conducted a multi-pronged evaluation of the different raised bikeway designs.

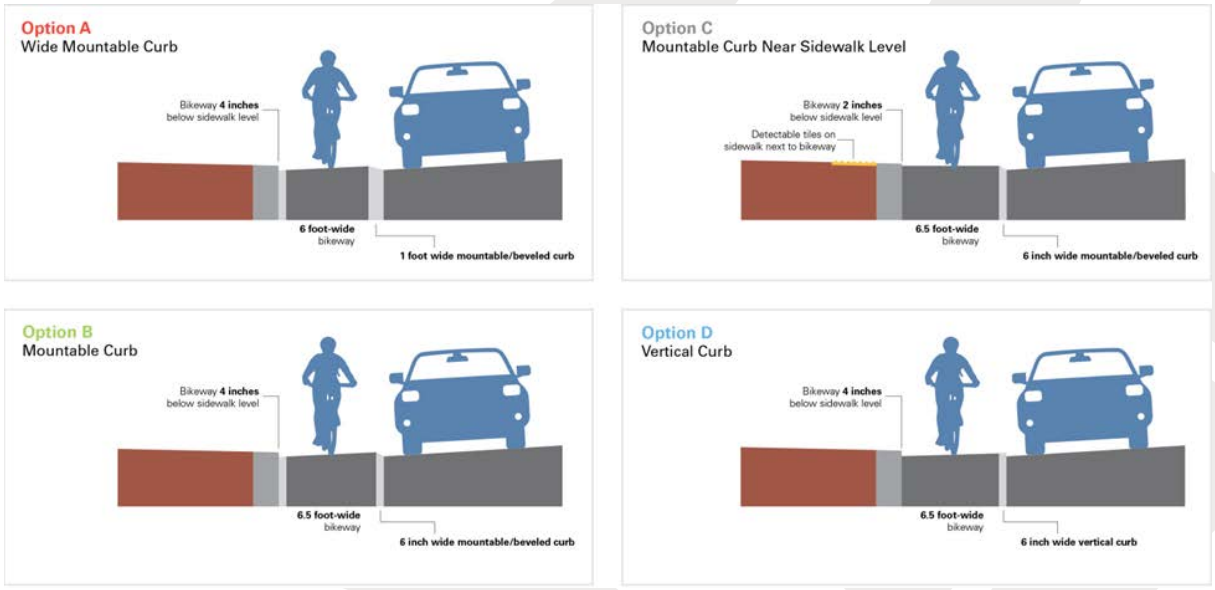


Figure 1: Raised Bikeway Demonstration Project- Design Options

Recommendations

Near term recommendations and future design considerations for raised bikeways in San Francisco were formulated based on findings from the Market Street Raised Bikeway Demonstration project evaluation. Recommendations and considerations are detailed below.

Near Term Recommendations

Near term recommendations to improve the demonstration project include incorporating green paint onto the Market Street raised bikeway and noting any resulting improvements in actual and perceived safety as well as vehicle incursion into the bikeway. Safe-hit posts will also be added to portions of the bikeway to create further separation from the vehicle travel lanes.

Future Design Considerations

Recognizing both the strengths and weaknesses of the four designs tested, this evaluation recommends that raised bikeways in San Francisco generally adhere to the following considerations:

- Raised bikeways should be painted green, with safe-hit posts added where appropriate.
- Raised bikeways with mountable curbs generally should not be built in commercial areas due to vehicle incursion and loading issues. If there are situations in which raised bikeways with mountable curbs are built or pass through commercial areas, the bikeway should include sufficient loading zones and/or sections of bikeway with a vertical curb to prevent incursion at key points where loading issues may occur.
- Protected bikeways in commercial areas should be one of the following:
    - Parking-protected bikeways.
    - Street-level protected bikeway with a concrete curb or median separation (similar to the Fell and Oak Street bikeways).
    - Sidewalk-level raised bikeways with pavement treatment or a buffer between the sidewalk and bikeway, and a buffer between the bikeway and roadway. These sidewalk-level raised bikeways should include a vertical curb. In areas with high bicycle volumes, the width of the bikeway should adequately prevent cyclists from entering the sidewalk or pedestrians entering the bikeway.

In correlation with these considerations, SFMTA staff recommends testing a sidewalk-level bikeway in San Francisco on a street with a width that allows for appropriate buffers between the sidewalk, bikeway, and roadway.

Evaluation Key Findings

Level of Support:

- An online public survey showed support for the raised bikeway, especially from bicyclists who often ride in the city**.** Of 242 people surveyed, 66 percent supported installing raised bikeways in other San Francisco locations.
- Interviews with stakeholder groups showed mixed support for raised bikeways. Almost all participants felt safe while bicycling on or traveling adjacent to the raised bikeway and the majority of participants felt that raised bikeways should be installed in other locations in San Francisco. However, participants also felt the design should be adjusted to address vehicles blocking the bikeway with improvements, such as painting the bikeway green.

- When the bicycle stakeholder group was asked if they felt more or less safe riding on the raised bikeway than when riding on a typical curbside buffered bike lane with green paint and safe-hit posts (a configuration present elsewhere on Market Street), the group predominately answered that they felt safer in the bikeway with green paint and safe hit posts.

Preferred Design Option:

- "Option D: Vertical Curb" was preferred by 31 percent of people surveyed, making it the most preferred design by a narrow margin. However, opinions on Option D were also the most divided. While many respondents believe the vertical curb deters vehicles, many others felt it presented serious safety issues for bicyclists entering and exiting the bikeway.
- "Option B: Mountable Curb" and "Option C: Mountable Curb near Sidewalk Level" were perceived as very similar since both options have six inch mountable curbs. Combined, Options B and C were preferred by 41 percent of people surveyed making it the most popular curb type.
- Of the pedestrian stakeholders, 80 percent did not support "Option C: Mountable Curb near Sidewalk Level" because they were concerned about bicyclists mounting and using the sidewalk; however, observations show this does appear not occur.
- Visually impaired stakeholders did not support the tactile domes in "Option C: Mountable Curb near Sidewalk Level" because of debris collected (which can be a safety hazard), inconsistent messaging (tactile domes are typically used at curb ramps), and because the two inch curb between the bike lane and sidewalk was detectable using a cane.
- "Option D: Vertical Curb" presents issues for paratransit vehicles that need to pull close to the curb to unload passengers.

Key Concerns:

- Two primary issues were noted in almost all data collection efforts: (1) vehicle incursion into the bikeway, and (2) tension between whether raised bikeways and more severe curb angles should be built to deter vehicles or whether gentler curbs/slopes should be built so that bicyclists can easily get in and out of the bikeway.
- The large street sweeping machines that regularly clean Market Street are not able to effectively clean the raised bikeway; raised bikeways will likely need to be manually swept similar to typical bike lanes with safe-hit posts or swept by a narrow street sweeper. In addition, the truncated domes located adjacent to "Option C: Mountable Curb near Sidewalk Level" require manual sweeping due to debris from street trees and street sweepers getting caught in the panels.[1]
- A typical curbside bikeway with green paint and safe-hit posts (buffered bikeway) costs an estimated $10/linear foot. A buffered bike lane with a raised median planters costs an estimated $75-$100/linear foot. The Polk Street raised bikeway is estimated to cost approximately $400/linear foot. The cost differentials of both buffered and raised bikeway treatments vary greatly based on existing conditions and construction methods.

[1] The Department of Public Works is procuring new street sweepers which will likely be able to effectively sweep the raised bikeway.

BACKGROUND AND PURPOSE

Raised bikeways are facilities vertically separated from motorists and vehicle travel lanes. As demonstrated in other cities nationally and internationally, a raised bikeway can provide a protected space for bicyclists and potentially improve actual and perceived comfort and safety. Benefits of raised bikeways include:

- Helps distinguish a zone for bicycles that is separate from both vehicular space and sidewalk.
- Provides a means of separation where there is not sufficient for a raised buffer between the bikeway and vehicle travel lanes.
- Encourages bicyclists to ride in the bikeway rather than on the sidewalk.

The purpose of the Market Street Raised Bikeway evaluation is to measure the level of support for raised bikeways in San Francisco and for each of the individual design options. The evaluation also documents actual and perceived safety issues, as well as the accessibility, maintenance and cost of the bikeway. Lastly this evaluation compares findings to the previous condition and alternative designs such as buffered bike lanes.

The evaluation findings described in this memo will guide the SFMTA on how to best implement raised bikeways in the future and identify recommended design adjustments needed for future applications.

DATA COLLECTION SUMMARY

This evaluation included in-depth data collection with the purpose of soliciting feedback from a wide range of user groups. Collection methods, objectives, and timelines are detailed in *Table 1* below. Information was gathered November 2015 - May 2016.

Table 1: Data Collection Summary Table

	DATA COLLECTION METHOD	OBJECTIVE
1	Video and Staff Observations	Review bicycle/vehicle/pedestrian conflicts and loading issues.
2	Raised Bikeway Testing and Interviews	Conduct interviews to gain feedback from specific groups including: - Maintenance (Street Sweeping) - Taxi - Paratransit - Muni - Public Works engineers/Key SFMTA staff
3	Online Public Survey	Gain public input on feeling of safety when interacting with the raised bikeway as a bicyclist, pedestrian, or motorist.
4	Stakeholder Guided Tours /Group Discussions	Receive specific feedback on the four different raised bikeway designs from specific stakeholders including: bicyclists, pedestrians, and people with disabilities.
5	Option Preference Intercept Survey/ On-Site Outreach Event	Gain feedback from public on raised bikeway designs and preferred option.
6	Open Comments	Feedback from: - Public Online Survey - On-site outreach event

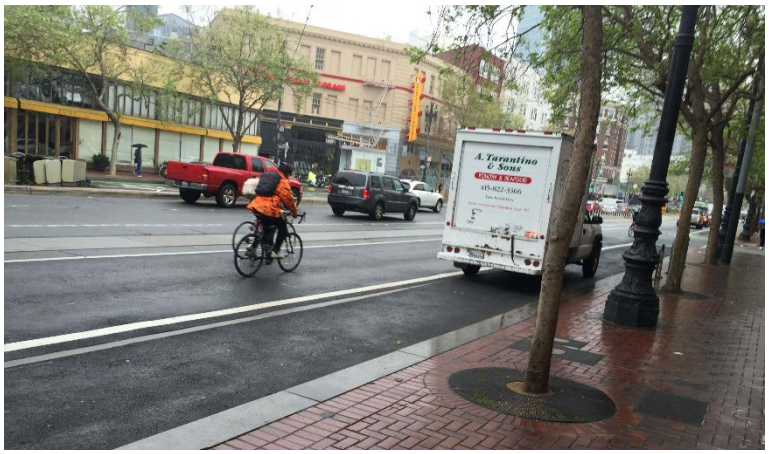
		- 311 reports and emails/personal reports - Better Market Street Community Advisory Committee - Multimodal Accessibility Advisory Committee - Muni Operator Monthly Safety Meeting

1. Video and Staff Observations

Through video and staff observations, the SFMTA identified key behavior patterns, potential issues, and successes regarding people interacting with and bicycling on the raised bikeway. Behaviors observed are summarized by user group (bicyclist, pedestrian, and motorist) below.

Bicyclists

The majority of bicyclists ride in the center of Options A, B, and C of the raised bikeway. However, when approaching Option D near 12th Street, bicyclists move towards the left to position themselves for the jog in the eastbound bike lane as it approaches Van Ness Avenue.



Bicyclist Passing Delivery Truck

Overall bicyclists navigate the bikeway with no issues, especially during off-peak hours when both vehicle and bicyclist traffic is light. However, some conflicts arise when there is a need for weaving. If the bikeway is blocked by parked/loading vehicles, a bicyclist moves to the left in the adjacent travel lane and then often weaves back into the bikeway before the signal at 12th Street (see photo). Also, because the width of the bikeway (6 to 6.5 feet) can only accommodate two side-by-side bicycles, bicyclists sometimes move to the vehicle travel lane during peak hours when there are many bicyclists using the bikeway. Problems sometime occur if bicyclists are unaware of the change in height level between the bikeway and the travel lane and are unable to navigate the bikeway curb. There also appears to be a lack of awareness that the bikeway is raised for this portion of Market Street and riders are unaware that there are multiple curb designs. These two factors may be making any transitions on and off the bikeway unpredictable for bicyclists.

SFMTA staff has received two reports of bicyclist collisions on the bikeway, both taking place at the section of the bikeway that contains the 90 degree vertical curb. One of the collisions resulted in a major injury and was caused when the cyclist attempted to enter the raised bikeway in the section with the vertical curb.

Motorist Behavior

Generally, motorists have no issues or behavior changes due to the installation of the raised bikeway. The existing striping between the raised bikeway and the travel lane is successfully keeping vehicles within their lane.

However, there has been a reoccurring issue with vehicles and delivery trucks parking on and blocking the bikeway. Staff observations have consistently noted vehicles pulling to the curb to unload and load instead of stopping in the adjacent travel lane. The video and staff observations included eleven incidences of vehicles blocking the bikeway, manly occurring in morning and afternoon off-peak hours.

Pedestrian Behavior

No atypical pedestrian behavior was reported or observed due to the raised bikeway.

2. Raised Bikeway Testing and Interviews

Maintenance

Through interviews with members of the San Francisco Public Works maintenance crews and through observations, the SFTMA found that the large street sweeping machines that regularly clean Market Street are not able to effectively clean the raised bikeway. Because the bikeway is not wide enough, the sweeper is forced to drive on a tilt and is unable to get a secure seal for the vacuum in the sweeper to work. Therefore street debris is recirculated and not removed, or blows onto the travel lane. At times the debris can also collect on the sidewalk because of the more shallow difference between the bikeway and the sidewalk. Maintenance staff believes that if widened from seven to eight feet, the raised bikeway could be properly cleaned by the larger sweeper.

There is a smaller bicycle lane street sweeper, called the “helicopter” sweeper, which can effectively sweep the bikeway. However, this smaller sweeper has many issues. First, the city owns only one, and it needs maintenance relatively often. Second, the machine is slow and cumbersome and the maintenance crew does not use it for any distance longer than approximately a mile away from the maintenance yard in the Bayview District. Therefore it is not realistic that the “helicopter” sweeper be used to clean the Market Street bikeway or many other future raised bikeways. However, the Department of Public Works maintenance crews have procured a new model of sweeper that will likely be able to sweep the raised bikeway. Raised and protected bikeways will need to be hand-swept until the new sweeper is in use and proven effective.

The truncated domes located adjacent to Option C of the bikeway are often dirty due to street trees, debris getting caught in the panels, and from occasional debris being kicked back onto the sidewalk by the large sweepers. The portion of Market Street which includes the raised bikeway is not swept by a sidewalk sweeper due to the presence of sidewalk basements, which make sidewalks susceptible to collapse. Therefore the truncated dome panels need to be manually swept. This issue is likely to be replicated if future raised bikeways also require adjacent panels of truncated domes.

Accessibility

The SFMTA conducted on-site tests to understand how well each raised bikeway option performs when an accessible vehicle needs to pull up to the sidewalk curb to unload a passenger. A test was conducted for both a paratransit vehicle and an accessible taxi. Test participants included San Francisco Paratransit staff, SFMTA Accessibility Planners, experienced paratransit and accessible taxi drivers, and wheelchair users.

Paratransit Test

Paratransit vehicles were observed to have little to no issues with Option A, B, or C. While passengers generally were able to feel the vehicle enter the raised bikeway, passengers felt no significant discomfort. In Options A, B, and C, the vehicles were able to mount the curb, pull up close to the sidewalk curb, and deploy the ramp/unload passengers with no issues. The vehicle was also not tilted while parked on the raised bikeway to any noticeable degree in Option A, B, or C. Option A was preferred overall by test participants because it was the easiest for the paratransit vehicle to mount.

Paratransit vehicle "Perched" on Vertical Curb

Option D presents a problem for paratransit vehicles. Vehicles have to enter at an intersection or an area with a mountable curb because drivers prefer not to directly mount the vertical curb due to possible vehicle damage and discomfort for passengers. The option is also not wide enough for the vehicle to pull close to curb without being "perched" on bikeway (see photo). Therefore at Option D, paratransit vehicles must block the vehicle lane and straddle the raised bikeway, parking at least a foot from the sidewalk curb. This parking position makes it harder for passengers to reach and mount the sidewalk and causes some conflict with oncoming cyclists. For these reasons, Option D was preferred the least by test participants.

Accessible Taxi Test

An accessible taxi unloads wheelchair users from the rear of a minivan directly onto the street. Passengers using wheelchairs are assisted in unloading directly onto the street and then need access to a curb ramp to get onto the sidewalk to reach their final destination. The raised bikeway ramps down near intersections, therefore when accessible taxis are unloading near intersections, the raised bikeway performs similar to typical painted curbside bike lanes. However, for passengers that have mobility issues but are ambulatory, it is helpful for accessible taxis to pull to the curb. Similar to paratransit vehicles, accessible taxis have no issues mounting Option A, B, or C, but prefer not to directly mount the vertical curb option (Option D) due to possible vehicle damage and discomfort for passengers.

Because they allow vehicles to pull to the curb, both paratransit and accessible taxi test participants prefer the options with mountable curbs (Options A, B, and C) to the typical curbside buffered bikeway (previous condition on this part of Market Street), where drivers must pull over at an intersection to unload passengers.

Construction Considerations and Issues

The Department of Public Works (Public Works) was interviewed to understand constructability considerations and lessons learned from building the demonstration project. Major construction considerations for raised bikeways include:

- Existing utilities around a proposed raised bikeway may impact a raised bikeway's widths and lengths therefore must be considered when scoping a raised bikeway project.
- Adequate existing gutter flow drainage should be considered for raised bikeway sites as low drainage can result in drastic slope changes, grade breaks within a raised bikeway, additional drainage infrastructure, or reconstructing the curb and sidewalk.

- Obtaining necessary permits (i.e. BART, MUNI, Caltrans) can cause delay and should be considered early on to ensure a raised bikeway project advances on time.
- Raised bikeways require detailed land surveys because they impact the entire roadway.

Public Works was also asked to describe major issues encountered when constructing the Market Street Raised Bikeway Demonstration Project. Major issues included coordinating construction with the Muni street car tracks on Market Street, which made it difficult to provide the needed traffic lanes/bike access required, and prohibiting the removal and reconstruction of curb and sidewalk, which made it difficult to meet the needed grades the raised bikeway. Both of these issues are unique to the Market street site, but may inform the construction of new raised bikeways elsewhere.

Bikeway Costs

Through interviews and researching past projects, costs were estimated for typical curbside bikeways, buffered bikeways, and raised bikeways. A typical curbside bikeway with green paint and safe-hit posts costs an estimated $10/linear foot. A buffered bike lane with a raised median planters costs an estimated $75-$100/linear foot. The Polk Street raised bikeway is estimated to cost approximately $400/linear foot. The cost differentials of both buffered and raised bikeway treatments vary greatly based on existing conditions and construction methods. Cost factors will need to be considered when including raised bikeways in upcoming future streetscape projects.

3. Online Public Survey

The Market Street Raised Bikeway Demonstration Project online public survey collected responses from November 2015 to May 2016. The survey generally shows support for the raised bikeway, especially from bicyclists who ride often in the city**.**

Survey participants were asked if the raised bikeway made them feel safer as a bicyclist and/or safer while walking on the sidewalk. Out of 246 responses, 51% of participants strongly or somewhat agreed with the statement, 30% strongly or somewhat disagreed, and 19% felt no change in safety. Survey participants were also asked if City of San Francisco should install raised bikeways at other locations. Out of 242 responses, 66% of participants strongly or somewhat agreed with the statement, 29% strongly or somewhat disagreed, and 5% did not have a preference. These results are shown in *Figure 2*.

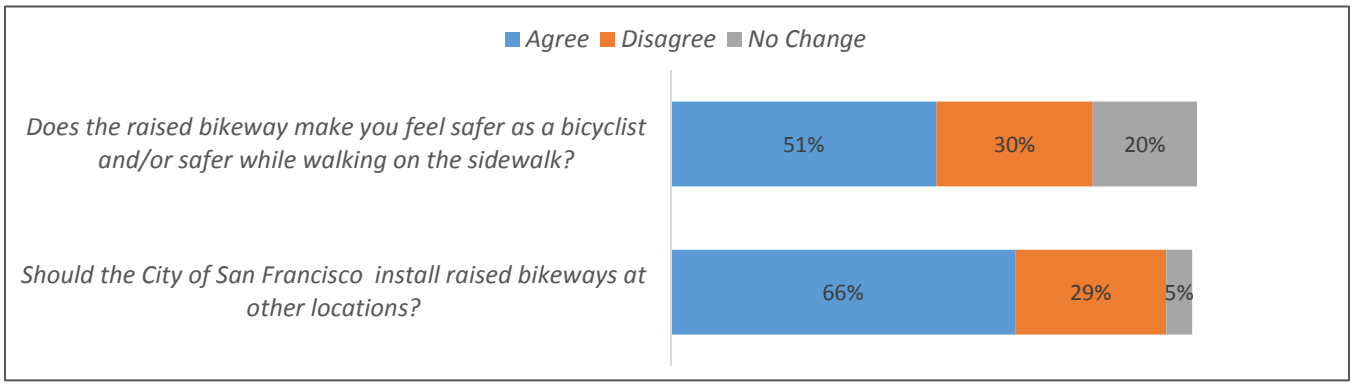


Figure 2: Key Results from On-Line Public Survey: Level of Support

Out of the 279 people that responded to the public survey and answered questions and/or submitted comments, 72% answered as a bicyclist, 18% answered as a pedestrian, and 10% answered as a motorist. The majority of respondents were men between the ages of 24 and 44 who ride a bicycle four or more days per week. It should be noted that this was not a scientific or statistically significant survey utilizing a

random sampling technique, but rather was implemented to get a general indication of perceived safety on the raised bikeway.

4. Stakeholder Guided Tours/Group Discussions

The SFMTA coordinated three guided tours/group discussions to get focused feedback from different user groups including bicyclists, pedestrians, and people with disabilities. This feedback was used to both gauge support for raised bikeways and evaluate the performance of the different design options (*see Table 2*). Each group included five to seven participants with different perspectives regarding raised bikeways. The groups also each included people of varying genders and age groups.

The overall level of support for raised bikeways from these stakeholders was mixed. Almost all participants felt safe while bicycling on or traveling adjacent to the raised bikeway, and the majority of participants felt that raised bikeways should be installed in other locations in San Francisco. However, participants included the caveat that the design should be adjusted to address major issues including vehicles blocking the bikeway and requested the bikeway to be painted green.

Perhaps most notably, when the bicycle stakeholder group was asked if they felt more or less safe riding on the raised bikeway than when riding on a typical curbside buffered bike lane (with green paint and safe-hit posts), the group predominately answered that they felt less safe on the raised bikeway than the buffered bike lane. The feedback from the Stakeholder Groups is tabulated in *Table 2* below.

Table 2: Key Results from Stakeholder Guided Tours/Interviews: Level of Support

DO YOU FEEL SAFE WHILE RIDING ON OR TRAVELING ADJACENT TO THE RAISED BIKEWAY?		
	Bicyclists (5 Responses)	Pedestrians (12 Responses)*
Yes	100%	92%
No	0%	8%
SHOULD THE CITY OF SAN FRANCISCO SHOULD INSTALL RAISED BIKEWAYS AT OTHER LOCATIONS?		
	Bicyclists (5 Responses)	Pedestrians (11 Responses)*
Yes	100%	55%
No	0%	45%
DO YOU FEEL MORE OR LESS SAFE WHILE RIDING ON OR TRAVELING ADJACENT TO THE RAISED BIKEWAY THAN A TYPICAL PROTECTED BIKE LANE (WITH GREEN PAINT AND SAFE HIT POSTS)?		
	Bicyclists (5 Responses)	Pedestrians (11 Responses)*
More Safe	20%	36%
Less Safe	80%	9%
No Difference	0%	55%

** Pedestrians answering from perspective of walking or traveling in a wheelchair adjacent to the raised bikeway*

The guided tour participants identified certain key issues and preferences with each of the raised bikeway options including the following:

- Bicyclist participants did not feel adequately separated from the vehicle lane when riding in the raised bikeway as currently designed. When asked their preferred option, the bicyclist participants chose Option D because it offers the most separation.
- Option C (Mountable Curb near the Sidewalk Level) presents issues for some pedestrians who are concerned about bicyclists mounting and using sidewalks. However, observations show this does appear not occur.
- Visually impaired participants were able to detect the transition from the sidewalk to the bikeway in all options. However, they preferred the bikeway options that were further below the sidewalk level (4 inches below sidewalk level) because the height difference was more detectable.
- Visually impaired participants did not like Option D (Vertical Curb) because they felt that taxis would not enter bikeway and pull to the bikeway at the vertical curb. If true, this would make it harder for passengers to reach and mount the sidewalk, and causing some conflict with bicyclists.
- Stakeholders would like to see green paint on the bike lanes to help people with low/limited vision.
- Visually impaired participants did not like the tactile domes because of debris collection and inconsistent messaging (tactile domes are typically used at curb ramps).

5. Preferred Option Survey

One of the major goals of the demonstration project and evaluation is to determine a preferred design for how raised bikeways should be implemented across the city. Option preferences were recorded in the Stakeholder Guided Tours/Interviews and at an on-site outreach event held on May 17, 2016 in the peak morning commute hour. Primarily through the outreach event, the SFMTA was able to survey 125 people regarding their preferred design option.

As seen in *Figure 3*, the results were varied. "Option D: Vertical Curb" is preferred by 31 percent of the people surveyed, making it the most preferred design by a very narrow margin. It is followed closely by "Option A: Wide Mountable curb", preferred by 28 percent people surveyed. However, Option D was also the most divisive option because while the vertical curb is thought to deter vehicles, many felt it presented serious safety issues for bicyclists getting on and off the bikeway. If "Option B: Mountable Curb" and "Option C: Mountable Curb near Sidewalk Level" are aggregated because they are very similar and both maintain a 6 inch mountable curb; the two options together are preferred by 41 percent of people surveyed (See *Figure 4*). Of the people surveyed, 89 percent answered as a bicyclist, and 11 percent answered as a pedestrian or other user.

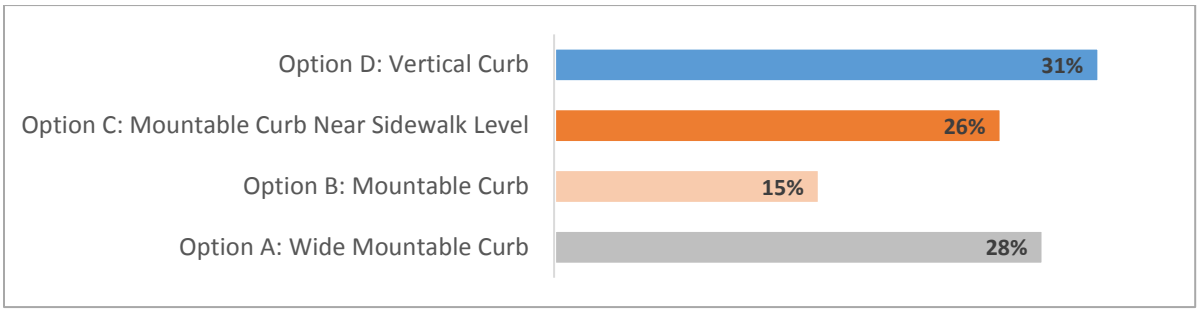


Figure 3: Preferred Design Option- By Option

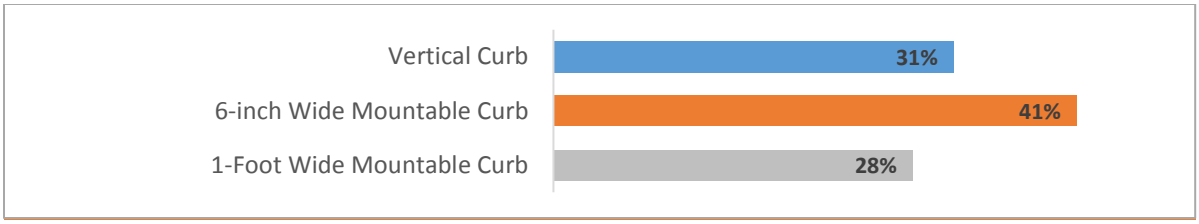


Figure 4: Preferred Design Option – By Curb Type

6. Key Public Comments/Qualitative Feedback

Through the online public survey, the on-site outreach event, attending various meetings, and 311 reports, the SFMTA received a large number of qualitative comments regarding the Market Street Raised Bikeway Demonstration Project. A number of consistent themes became apparent when reviewing recorded comments and are detailed in *Table 3* below.

Table 3: Qualitative Feedback Results

Contained positive feedback	37
Suggested a preference for physical barriers and/or safe-hit posts	83
Would prefer a more visible bikeway (i.e., green paint)	45
Would prefer a wider bikeway	14
Would appreciate less bumpy pavement	10
TOTAL QUALITATIVE RESPONSES REVIEWED	**312**

In addition to these themes, the comments reflected two primary concerns that were also noted in almost all data collection efforts:

1.) There is a major concern about vehicle incursion into the bikeway; this has been the primary issue with the Raised Bikeway Demonstration Project and potentially will continue to be an issue for future raised bikeway projects.
2.) There is a divided tension on whether higher bikeways and more severe curb angles (i.e., "Option D: Vertical Curb") should be built to deter vehicles, or whether gentler curbs/slopes should be built so that bicyclists can easily get in and out of the bikeway.

FINDINGS SUMMARY

A series of performance metrics for each raised bikeway option was developed in correlation with the primary goal of the demonstration project, which is to provide a protected space for bicyclists and potentially improving actual and perceived comfort and safety for all street users. Other goals were also considered including allowing for sidewalk curb access for people with disabilities, maintenance efficiency, and using vertical separation to maximize both bicycle and vehicle lane widths.

Utilizing all of the data collected (see *Table 1*), each raised bikeway design option was carefully evaluated against the different performance metrics. The options were then scored and summarized in a summary matrix detailed in *Table 4*.

Table 4: Option Performance Summary Matrix

PERFORMANCE METRICS	OPTION A: Wide Mountable Curb	OPTION B: 6" Mountable Curb	OPTION C: 6" Mountable Curb Near Sidewalk Level	OPTION D: Vertical Curb	EVALUATION NOTES
Separation from vehicles/ Deters vehicles from parking on bikeway	Poor	Medium	Medium	Good	-Wide curb offers the least separation from vehicles with an easy transition from bike lane to vehicle lane; can be perceived as "inviting" -6" Mountable curb creates slightly more separation -Vertical curb offers the most separation/deterrent to vehicles entering the bikeway
Width Requirements/Space Impacts	Medium	Good	Good	Good	-All options are efficient at maximizing horizontal space (more efficient than a typical curbside bike lane), however the 6" curb options offer a wider bike lane (6'6" bike lane). -Wider bikeway widths are more comfortable for cyclists.
Impacts on Pedestrian	Good	Good	Medium	Good	-Option C presents some issues to pedestrians who are concerned about cyclist using sidewalks. -Pedestrians prefer any option that discourages bicyclists from using the sidewalk
Impacts on Bicyclists	Good	Medium	Medium	Poor	-Issues for bicyclists vary; while the vertical curb offers the greatest deterrent from vehicles entering the bikeway, it also presents the most challenging situation for cyclists who need to exit or enter the bikeway at the vertical curb because of a crowded bikeway or vehicles blocking the bikeway. -At least two bicycle crashes were reported due to bicyclists having trouble navigating the vertical curb.
Impacts on the blind or people with low vision and people with mobility challenges	Good	Good	Medium	Medium	- Visually impaired stakeholders can detect a 2" height difference between the sidewalk and bikeway, but prefer options further from the sidewalk (4" from sidewalk level). - Visually impaired stakeholders did not like Option D (Vertical Curb) because they felt that taxis would not enter bikeway and pull to the bikeway vertical curb, making it harder for passengers to reach and mount the sidewalk and causing conflict with oncoming bicyclists. - Visually impaired stakeholders prefer green paint on the bike lanes to help people with low/limited vision.

PERFORMANCE METRICS	OPTION A: Wide Mountable Curb	OPTION B: 6" Mountable Curb	OPTION C: 6" Mountable Curb Near Sidewalk Level	OPTION D: Vertical Curb	EVALUATION NOTES
					- Visually impaired stakeholders did not like the tactile domes because of debris collection and inconsistent messaging.
Impacts on Accessible Vehicles (paratransit vehicles and accessible taxis)	Good	Good	Good	Poor	Paratransit Vehicles: -In Options A, B, and C, the vehicles were able to mount the curb, pull up close to the sidewalk curb, and deploy the ramp/unload passengers with no issues. -Option D (Vertical Curb) presented issues because paratransit vehicle drivers preferred not the mount the curb due to potential vehicle damage and passenger discomfort. The vertical curb option was also not wide enough to accommodate paratransit vehicles, therefore causing loading/unloading problems for passengers. Accessible Taxis: - The options with mountable curbs (Options A, B, and C) allow accessible taxis to park close to curb ramps and mount the bikeway as needed to unload both ambulatory passengers from side doors, and wheelchair users from the rear of the taxi. -Option D (Vertical Curb) presented issues because accessible vehicle drivers preferred not the mount the curb due to potential vehicle damage and passenger discomfort.
Constructability/Cost	Poor	Poor	Medium	Medium	- All Options: Issues encountered included coordinating construction with the muni street car tracks on Market Street and prohibiting the removal and reconstruction of curb and sidewalk. Option B: Scheduling utility companies proved difficult. Option A & B: Constructing the concrete gutter was additional form work needed (but may not be a concern on typical streets with adequate flow) Option C & D: Potholing here required some base repair. - Some raised bikeway designs will require new base which can increase costs and impact the construction schedule.
Maintenance	Medium	Medium	Poor	Medium	-The city's typical street sweepers (that clean streets like Market St.) are not able to clean the raised bikeway due to the width of the bikeway. -Option C (Mountable Curb near Sidewalk Level) is the most problematic as debris can blow onto the sidewalk because of the more shallow difference between the bikeway and the sidewalk.

PERFORMANCE METRICS	OPTION A: Wide Mountable Curb	OPTION B: 6" Mountable Curb	OPTION C: 6" Mountable Curb Near Sidewalk Level	OPTION D: Vertical Curb	EVALUATION NOTES
					-The street sweepers are able to properly sweep an 8 foot wide bike lane; therefore if widened, the raised bikeway can be swept by the typical/regular Market Street sweeping machines. -Most future raised bikeways will need to be manually swept; they will be maintained in a similar way as typical curbside bikeways with safe-hit posts.
Public Opinion: Preferred Option	Preferred by 28% of people surveyed	Preferred by 15% of people surveyed	Preferred by 26% of people surveyed	Preferred by 31% of people surveyed	-Primarily through the outreach event, the SFMTA was able to survey 125 people regarding their preferred design option. -People surveyed included a wide range of users, since the outreach event targeted morning commute bicyclists and pedestrians.