TELEGRAPH AVENUE COMPLETE STREETS PLAN

DRAFT FINAL PLAN

CITY OF OAKLAND

ALAMEDA County Transportation Commission

SEPTEMBER 2014

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CITY OF OAKLAND

ALAMEDA County Transportation Commission

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SEPTEMBER 2014

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EXECUTIVE SUMMARY

This DRAFT Final Plan presents complete street improvements (i.e.; the "Recommended Project"), for the Telegraph Avenue Corridor (primarily from 57th Street to 20th Street). The process leading to this Recommended Project included analysis of existing conditions and prior planning studies[1], a public survey to solicit broad community input[2], development of alternative roadway design options[3], and stakeholder meetings and public open houses to study design options[4]. Based on these work products and events, the City of Oakland developed this DRAFT Final Plan comprising of the following sections:

- **Project Purpose and Need:** The Recommended Project purpose statement guides the redesign of Telegraph Avenue to be a more complete street as follows: improving safety and accessibility of all modes; making the street more comfortable and enjoyable for walking and bicycling; and balancing the needs and convenience of all users, including transit and motorists.

  The project's existing conditions analysis, as well as over 1,100 responses from community members submitted via a public survey, demonstrate the need for these improvements on Telegraph Avenue, and provided valuable input into the design options developed by the project.

- **Alternative Roadway Design Analysis:** The project divided the corridor into segments and developed alternative cross section options for each, as well as variations on those alternatives to study conditions at bus stops and major intersections. The project developed more detailed design options for improving transit stops and service, as well as pedestrians' and bicyclists' safety and comfort. The alternative roadway design options were presented to members of the public at a series of community open houses to solicit input on preferred options for the Recommended Project.

- **Recommended Project:** Informed by community and stakeholder input, the project narrowed the alternative options developed to arrive at a Recommended Project. The recommendation centers on implementing a "road diet" to calm traffic and improve conditions for pedestrians, bicyclists and transit, as well as motor vehicles. New lane striping and a combination of permanent and interim improvements will better balance the needs and convenience of all Telegraph Avenue users. Table 1 summarizes the Recommended Project elements.

- **Phasing Plan and Cost Estimates:** The proposed improvements cover 2.4 miles of Telegraph Avenue. As such, implementation of the project will be phased and coordinated with opportunities to leverage planned and budgeted roadway improvements. This Plan anticipates that phasing will be divided into two primary parts: 20th Street to 38th Street, and 38th Street to 57th Street. Cost estimates are similarly divided. The initial phases of the project will focus on 20th Street to 38th Street, including already planned and budgeted roadway resurfacing between 16th Street and 27th Street. As part of the project's phasing, certain improvements could be implemented in an interim format, using temporary and/or movable materials, such as paint, flex-posts and planters. Note that the scheduled re-paving would cover only the paving and roadway striping portion of project costs.

1 The full Existing Conditions Report and figures can be found on the City's Telegraph Avenue project website at http://www.oaklandnet.com/TelegraphAvenue

2 The Stakeholder Outreach and Public Survey Report that analyzes and summarizes stakeholder input and responses to the public online survey can be found at http://www2.oaklandnet.com/n/OAK046218

3 The full Roadway Design Options Report can be found on the City's Telegraph Avenue project website at http://www2.oaklandnet.com/n/OAK046665

4 Public open house exhibits can be found on the City's Telegraph Avenue project website at http://www.oaklandnet.com/TelegraphAvenue

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Table 1: Summary of Recommended Project Elements

LOCATION	REMOVE	PROVIDE
SEGMENT A (52ND – 57TH STREET)	▪ Center turn lane (left turn pockets maintained at signalized intersections)	▪ Transit islands ▪ Combination of buffered and standard bike lanes
SEGMENT B (46TH - 52ND STREET)	▪ N/A	▪ Bulb-outs at transit stops and pedestrian crossings ▪ Shared lane markings (sharrows)
SEGMENT C (20TH - 46TH STREET)	▪ One travel lane in each direction	▪ Transit islands ▪ Buffered bike lanes
CORRIDOR-WIDE (20TH – 57TH STREET)	▪ Selected crosswalks ▪ Selected underutilized bus stops	▪ New high visibility crosswalks and upgrades to existing crosswalks ▪ Bulb-outs and mid-block refuges ▪ New crossing beacons at key pedestrian and bicycle crossings ▪ Improved connections with parallel and cross-town bike routes ▪ Traffic signal upgrades and selected bus stop relocation for more reliable transit service

Table 2 summarizes the Recommended Project design elements and expected benefits by travel mode.

Table 2: Key Multimodal Performance Improvements

TRAVEL MODE	KEY DESIGN ELEMENTS	KEY BENEFITS
PEDESTRIAN	▪ Road Diet ▪ Bulb-outs and mid-block refuges ▪ Additional and upgraded high visibility crosswalks ▪ New signals at key pedestrian crossings ▪ Improved signal operation	▪ Reduce "multiple threat" crashes ▪ Shorten crossing distances and protect pedestrians in crosswalks ▪ Calm vehicle speeds ▪ Create more accommodating pedestrian realm ▪ Provide placemaking improvements
TRANSIT	▪ Stop consolidation ▪ Transit islands and bus bulb-outs ▪ Signal upgrades and adjusted bus stop locations to prioritize transit	▪ Meet or exceed current transit speeds ▪ Improve transit boarding/alighting and passenger waiting experience ▪ Improve transit operating safety by reducing bus-bike conflict points
BICYCLE	▪ Combination of buffered bike lanes, standard bike lanes, and shared lane markings ▪ Green pavement color at conflict points and bike route junctures ▪ Cycle tracks behind transit islands	▪ Improve bicyclist safety and comfort ▪ Reduce bike-vehicle conflict points ▪ Reduce bus-bike conflict points ▪ Improve connections with parallel and cross town bike routes
MOTOR VEHICLES	▪ Road Diet ▪ Protected left turns (i.e., left-turn arrows) ▪ New right-turn lanes ▪ Limited on-street parking impact ▪ Maintain acceptable vehicle operations, per City of Oakland standards	▪ Improve driver and passenger safety ▪ Improve compliance with posted speed limits ▪ Maintain on-street parking for local businesses ▪ Maintain adequate vehicle capacity and travel time ▪ Reduce vehicle-bike conflict points

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PROJECT PURPOSE AND NEED

The project's purpose statement guides the redesign of Telegraph Avenue to be a more complete street as follows: improving safety and accessibility of all modes; making the street more comfortable and enjoyable for walking and bicycling; and balancing the needs and convenience of all users, including transit and motor vehicles. Public survey results and existing conditions analysis demonstrate Telegraph Avenue's need for these improvements, and provide valuable input that has helped to shape the design options developed by the project. This section of the Plan provides the purpose statement and a summary of survey results and existing conditions, as well as an outline of plan objectives based on these materials.

PURPOSE STATEMENT

A project purpose statement was presented for public review and comment as part of the web-based survey. Based on comments received and other input from project stakeholders, the purpose statement has been revised to read as follows:

The Telegraph Avenue Complete Streets Plan will design Telegraph Avenue to be a better street for walking, bicycling, riding transit, and driving between 20th Street and the Berkeley border, with a focus on the area south of 57th Street. In its current state, Telegraph Avenue has safety challenges for all users, including speeding, a lack of space for bicyclists, inadequately-sized bus stops, difficult pedestrian crossings, and public safety concerns.

A redesign of Telegraph Avenue must improve the safety and accessibility of all modes, make the street more comfortable and enjoyable for walking and bicycling, and balance the needs and convenience of all users. The project will consider not only through-travel but also access to the businesses, residences, restaurants, and gathering spaces that make Telegraph Avenue a great destination.

The Complete Streets Plan will use an extensive outreach process including surveys, stakeholder interviews, and public meetings to create a design that meets the community's needs. When completed in late 2014, the Plan will provide a long-term design concept for the corridor, as well as a funding and phasing plan with near-term action items that the City can pursue immediately.

Note: Existing City of Oakland policy statements and resolutions provided a basis for the above statement.

STAKEHOLDER OUTREACH AND PUBLIC SURVEY REPORT

STAKEHOLDER OUTREACH

As part of the project's overall outreach efforts, City staff conducted or attended over 30 stakeholder interviews and meetings with neighborhood associations, advocacy groups, and transit agencies to better understand the opportunities, challenges, and concerns of people who use and visit Telegraph Avenue. Stakeholder interview participants represented a variety of perspectives and experiences, including new and long time residents, business owners, transit drivers, and active transportation advocates. Input from the City's stakeholder interviews is included in the survey report and played a critical role in the development of design options and the final recommended plan.

PUBLIC SURVEY

The project collaborated on a web-based community survey that received over 1,100 individual responses during the two months that it was active (December 3rd, 2013 through February 7th, 2014). The survey asked community members how they use Telegraph Avenue, what they believe to be the strengths and weaknesses of the corridor, and what improvements they would most like to see. The information from the survey was used to inform the development of design options that increase the safety and comfort of all users on the corridor.

Stakeholder groups were asked to circulate the survey link to their constituents via email lists and social media (e.g., Twitter). Groups to whom the survey was provided for wider distribution include:

- Longfellow Neighborhood Association
- KONO Community Benefits District
- Greater Mosswood Neighborhood Association
- Nextdoor.com neighborhood groups (Rockridge, Shafter, Temescal, Longfellow, Bushrod, Santa Fe, Piedmont Avenue)
- Rockridge Community Planning Council
- Temescal Business Improvement District
- Temescal Merchant's Association
- Walk Oakland/Bike Oakland (WOBO)
- Bike East Bay (formerly named the East Bay Bicycle Coalition)

The survey was also advertised via flyers distributed to local business and posters located within view of bus stops and popular destinations along the corridor. Finally, the East Bay Express published an article about the project and provided the survey link to its readers.

The complete survey report is available online[5] and includes an appendix with the survey instrument, a summary of survey responses, and the raw response data.

SUMMARY OF SURVEY REPORT

The following key findings provide an overview of the survey results that shaped the development of design options and the final recommended plan for Telegraph Avenue:

- Survey respondents largely live and work within or nearby the immediate project area.
- Survey respondents represent an evenly distributed range of users of the four primary travel modes (for all trips – commuting, errands, recreation, etc.). As a result, survey responses provide substantial feedback from users of all of the primary transportation options along the corridor. Of all respondents:
  - 26.3 percent most frequently ride a bicycle
  - 25.2 percent most frequently walk
  - 24.1 percent most frequently take transit (BART or AC Transit)
  - 22.1 percent most frequently drive.
- Survey respondents and stakeholders value Telegraph Avenue as a neighborhood commercial corridor because of the many destinations and services available, and because of the direct and convenient connection it provides between these places.
- Survey respondents and stakeholders dislike the auto-oriented nature of the Telegraph Avenue corridor and the conflicts that exist between transportation modes. They would like to see improvements for bicycling and walking, as well as riding transit, prioritized over improvements for driving.
- The most requested improvements include:
  - Continuous bicycle facilities, specifically protected lanes and green pavement color to promote safety and visibility;
  - Pedestrian realm and safety improvements, including better pedestrian lighting and crossing improvements;
  - Better bus stop amenities and more reliable bus service;
  - Improvements to roadway conditions, including better roadway lighting, repaired pavement and improved striping visibility; and,
  - Traffic calming and less vehicle speeding, including traffic signal synchronization to reduce congestion and manage vehicle speeds.
- Survey respondents representing all travel modes overwhelmingly agree with regard to the above key survey findings (i.e., responses by frequent motorists closely mirror the responses from frequent transit riders, bicyclists, and pedestrians).

5 The Stakeholder Outreach and Public Survey Report that analyzes and summarizes stakeholder input and responses to the public online survey can be found at http://www2.oaklandnet.com/n/OAK046218

SUMMARY OF EXISTING CONDITIONS

The following highlights key findings from the project's Existing Conditions Analysis; the full Existing Conditions Report is available in its entirety on the project website[6].

CRASH DATA

The project analyzed crash data from 2007 to 2011 between 20th Street and Alcatraz Avenue. During this period, the most common collision on Telegraph Avenue involved motorists colliding with other motorists, with 138 reported collisions. 66 motorist-bicyclist collisions and 68 motorist-pedestrian collisions were also reported during this period, all of which resulted in injuries. Collisions resulted primarily from drivers speeding, failing to yield and/or signal when making turns, failing to yield to bicyclists when opening car doors ("dooring") and when turning, and failing to yield to pedestrians in crosswalks. Collisions were dispersed throughout the corridor, suggesting that corridor-wide solutions should be provided.

SPEED DATA

Speed data were collected on Telegraph Avenue in July 2014 using a calibrated radar speed gun at the following locations in both the northbound and southbound directions:

1. Between 27th Street and Sycamore Street
2. Between 34th Street and 36th Street
3. Between 40th Street and West MacArthur Boulevard
4. Between 52nd Street and 55th Street

The surveys were conducted on a typical weekday between 10:00 am and 2:00 pm to capture free flow speed and avoid peak periods of congestion that result in lower speeds. Each location, northbound and southbound, was surveyed for one hour, capturing between 80 and 140 vehicles. Table 3 presents the 85th percentile speed and median speed at each survey location. The 85th percentile speed is the speed at which 85 percent of vehicles are traveling less than or equal to, and is one of the metrics used to determine the speed limit of a roadway. Telegraph Avenue has a 25 mph posted speed limit south of Claremont Avenue and 30 mph north of Claremont Avenue.

The data shows that the majority of the drivers on Telegraph are speeding; traveling in the range of 2 to 10 miles per hour over the speed limit. This difference in speed may appear to be minimal, but it actually has a significant effect on the severity of accidents on Telegraph.

Table 3: Existing Motor Vehicle Travel on Telegraph Avenue

LOCATION	POSTED SPEED LIMIT (MPH)	SURVEYED SPEEDS (MPH) (BOTH LANES COMBINED)					
		NORTHBOUND			SOUTHBOUND		
		MEDIAN SPEED	85TH PERCENTILE	% TRAVELING OVER SPEED LIMIT	MEDIAN SPEED	85TH PERCENTILE	% TRAVELING OVER SPEED LIMIT
BETWEEN SYCAMORE ST AND 27TH ST	25	27	30	64%	29	29	44%
BETWEEN 34TH ST AND 36TH ST	25	30	34	83%	35	35	92%
BETWEEN 38TH ST AND 40TH ST	25	30	33	87%	32	32	67%
BETWEEN 52ND ST AND 55TH ST	30	29	34	34%	34	34	41%

Source: Fehr & Peers, 2014

6 https://www.oaklandnet.com/TelegraphAvenue

Speeding is one of the behaviors contributing to Telegraph Avenue having a relatively high frequency of vehicular accidents, as speeding contributes to the frequency and severity of crashes, see Table 4. The differences between a vehicle driving at 25 mph versus 35 mph are significant: over an 85% increase in stopping distance, a 267% increase in crash risk, and 800% increase in fatality risk.

Table 4: Relationship of Vehicle Speed to Accidents

VEHICLE SPEED	STOPPING DISTANCE	CRASH RISK	FATALITY RISK
10-15	25 feet	5%	2%
20-25	40 feet	15%	5%
30-35	75 feet	55%	45%
40+	118 feet	90%	85%

Notes
**Stopping distance includes how far it takes to perceive, react, and brake*
***Source: Traditional Neighborhood Development: Street Design Guidelines (1999), Institute of Transportation Engineers Planning Council Committee 5P-8.*
Source: National Association of City Transportation Officials (NACTO), Urban Street Design Guide, 2014

BICYCLE VOLUMES

Bicycle tube counts were collected on Telegraph Avenue between 40th Street and 41st Street over a nine-day period in October 2013. On average over 1,200 bicycle trips were counted on weekdays and nearly 700 on weekends, the highest recorded bicycle volume to date in the City of Oakland. The Telegraph Avenue bicycle counts are nearly twice as high as parallel continuous routes (e.g., Webster Street), despite higher auto volumes on Telegraph Avenue, indicating the appeal of the corridor's many destinations and direct connections for people riding bicycles.

PEDESTRIAN CROSSINGS

The project corridor currently has 30 marked crossings over approximately 2.3 miles, for an average spacing of over 400 feet between crossings. The I-580 and HWY-24 underpasses create crossing spacing of over 700 feet. Other large gaps between crossings exist in the commercial/retail districts of Temescal and KONO where retail businesses line both sides of the street. At unsignalized crossings, only 20 to 38 percent of drivers were observed to yield to pedestrians. This analysis suggests that crossing conditions should be improved by increasing the number of crossings per mile, shortening crossing distances with bulb-outs and median refuges, and considering additional treatments such as high-visibility markings, flashers, overhead and hybrid beacons. See Appendix B for more information on bicycle and pedestrian volumes.

TRANSIT TRAVEL TIME AND DELAY

AC Transit operates the Line 1 and 1R bus routes within the project corridor, with average stop spacing of 850 feet and 2,500 feet, respectively. The following stops shared by the Line 1 and 1R have the highest passenger activity: 20th Street, 24th Street, 30th Street/31st Street, 40th Street, and 49th Street. Line 1 speeds average between 7.8 and 11.4 mph, while Line 1R speeds average between 10.3 and 14.7 mph. Bus stops feature a range of amenity levels with some stops featuring shelters, seating, and next-bus displays, while others have only flag signs.

TRAFFIC OPERATIONS

Motor vehicle, pedestrian and bicycle volumes were collected at key intersections in the corridor in October 2013, and supplemented with previously reported data. It is City of Oakland policy that Telegraph Avenue should perform at Level of Service (LOS) E or better (see definition on opposite page). Motorists currently experience low to moderate delay throughout the corridor. All signalized intersections perform at LOS C or better during the AM and PM peak hour, with the exceptions of Telegraph Avenue and 51st Street, and Telegraph Avenue and 52nd Street, which operate at LOS D in the PM peak hour.

PAST STUDIES

The project reviewed relevant documents, including past BRT and AC Transit studies, streetscape plans, parking analysis, and City of Oakland policies. Highlights from these studies, plans and policies were used to inform the range of design options developed by the project to improve the Telegraph Avenue corridor.

Level of Service – Definition

Level of service (LOS) is a term used to describe the operating conditions of a roadway or intersection. The level of service of a facility is designated with a letter, A to F, based on motorist delay with A representing the most free flowing operating conditions; LOS A is not necessarily the ideal condition as it can indicate that an intersection is overbuilt. City of Oakland policy requires that Telegraph Avenue maintain an intersection LOS of E or higher.

PLAN OBJECTIVES

Based on the project purpose statement, stakeholder interviews, public survey results, and existing conditions analysis, the project developed the following plan objectives to guide development of design options and the final recommended plan:

- **Design a street that promotes Telegraph Avenue as both:**
  - A destination for neighbors and visitors
  - A connection between neighborhoods and districts
- **Design a street that supports the health and growth of retail and commercial businesses**
- **Design a street that supports healthy living and sustainability, with a focus on creating a better balance of travel mode choices for all users:**
  - Create design options that include pedestrian realm and safety improvements
    - *Incorporate better pedestrian crossing facilities to protect pedestrians and create a more walkable and attractive pedestrian realm*
  - Implement traffic calming and reduce vehicle speeding
    - *Incorporate a road diet and other design options to manage vehicle speeds while maintaining acceptable capacity for existing and anticipated vehicle volumes*
  - Create a better and more reliable transit experience
    - *Incorporate better bus stop designs, locations and signal systems to make service more reliable and reduce bus-bike conflicts*
  - Create design options that include continuous bicycle facilities for the length of the corridor
    - *Incorporate dedicated bike lanes and green pavement color to promote safety and visibility*
    - *Reduce bus-bike and vehicle-bike conflicts*

ANALYSIS OF STREET DESIGN OPTIONS

This section summarizes the process by which alternative street design options were developed, presented to the public, and evaluated.

ALTERNATIVE ROADWAY DESIGN OPTIONS

CORRIDOR SEGMENTS

For the purposes of developing design options, the project divided Telegraph into three primary segments based on traffic volumes and Level of Service (LOS – see definition in previous inset box), land use context and connections with the surrounding multimodal transportation network. Table 5 provides an overview of general characteristics for each segment, relative to one another.

Table 5: Corridor Segment Characteristics

SEGMENT	INTERSECTION LOS[1]	AVERAGE HOURLY VEHICLE TRAFFIC VOLUME[2]	POTENTIAL FOR ROAD DIET	PEDESTRIAN & COMMERCIAL ACTIVITY
SEGMENT A (52ND - 57TH STREET)	Good	1,800 (AM); 2,200 (PM)	Medium	Medium
SEGMENT B (46TH - 52ND STREET)	Fair	1,300 (AM); 1,500 (PM)	Low - Medium	High - Medium
SEGMENT C (20TH – 46TH STREET)	Good - Excellent	1,000 (AM); 1,300 (PM)	High	High - Medium

[1] Relative to the other segments in the corridor
[2] Calculated as the sum of vehicle volumes at signalized intersections divided by the number of signalized intersections per segment; Segment A: 57th Street to 52nd Street; Segment B: 52nd Street to 46th Street; Segment C: 46th Street to 20th Street.

CROSS SECTIONS

Based on each segment's characteristics, the project explored the potential to implement a lane reduction (i.e., "road diet") to calm vehicle traffic and create space for improvements targeted to pedestrians, transit and bicyclists. Based on the standard vehicle travel lane parameters, the project developed and evaluated fifteen different cross section configurations over the length of the corridor. Likely options were identified based on context and existing conditions analysis, engineering judgment, and input from stakeholders and responses from community members through the project's online survey. Table 6 provides an overview of these options.

Table 6: Summary of Most Likely Roadway Design Options by Corridor Segment

SEGMENT	EXISTING CONDITION	TRAFFIC OPERATIONAL REQUIREMENTS[1]	DESIGN OPTION 1	DESIGN OPTION 2
SEGMENT A (52ND - 57TH STREET)	▪ Two travel lanes in each direction ▪ Continuous center turn-lane ▪ Parking on both sides	▪ Two through lanes in each direction	Remove: ▪ Center turn-lane ▪ Parking under SR-24 overpass Add: ▪ Striped bike lanes	Remove: ▪ Center turn-lane ▪ Parking on one side of street and under SR-24 overpass Add: ▪ Protected cycle track
SEGMENT B (46TH - 52ND STREET)	▪ Two travel lanes in each direction ▪ Continuous center turn-lane ▪ Parking on both sides	▪ Two through lanes in each direction ▪ Center turn lane	Remove: ▪ N/A Add: ▪ Shared lane markings for bicycles	Remove: ▪ Parking on one side of street Add: ▪ Striped bike lanes
SEGMENT C (20TH - 46TH STREET)	▪ Two travel lanes in each direction ▪ Continuous center turn-lane ▪ Parking on both sides	▪ One through lane in each direction ▪ Center turn lane	Remove: ▪ One travel lane in either direction Add: ▪ Buffered bicycle lanes	Remove: ▪ One travel lane in either direction Add: ▪ Protected cycle tracks

[1] Operational requirements necessary to meet City of Oakland policy for efficient traffic flow based on Level of Service

BUS STOP AND TRANSIT OPTIONS

Existing transit service on Telegraph Avenue consists of the AC Transit Line 1 and 1R. With the opening of BRT service between Uptown Oakland and San Leandro, AC Transit is exploring the potential to consolidate the Line 1 and 1R into a single line between downtown Oakland and Berkeley. The project developed a range of physical and operations options for implementation of such a consolidated line for the Oakland portion of that corridor (20th Street to Alcatraz Avenue).

STOP CONSOLIDATION

A consolidated Line 1 would provide more consistent headways between buses, reduce bus bunching, and maintain more consistent transit stop spacing. The project recommends that certain stops be maintained and others be relocated or consolidated. The resulting stop locations were determined with respect to current ridership data, and destinations such as BART stations, hospital/medical centers, commercial clusters, and schools, as well as proximity to other AC Transit lines. The spacing of consolidated stops averages approximately 1,100 feet, with a maximum distance of 1,650 feet.

TRANSIT DESIGN TREATMENT OPTIONS

To further improve transit reliability and improve the transit rider and operator experience (better stop amenities, easier boarding/alighting, fewer conflicts between buses and vehicles/bicycles), the project developed a suite of transit design options:

- **Relocation of bus stops to intersection far side:** This strategy improves bus speed and reliability by preventing buses from missing a green phase on the near-side of a signalized intersection. It also reduces delay and improves safety by positioning the bus beyond crosswalks, reducing the likelihood of transit riders and other pedestrians crossing in front of the bus.
- **Transit Signal Priority (TSP):** In combination with far side bus stops, using existing TSP or upgrading the feature improves bus speed and reliability by giving buses longer green phases to proceed through traffic signals with less delay.
- **Bus bulb-outs and transit islands:** Bus bulb-outs improve bus speed and reliability by reducing the time required to serve a bus stop, providing more room for amenities at bus stops, improving the ease of boarding and alighting buses, and reducing pedestrian crossing distances. Where bus bulb-outs

are separated from the curb as "transit islands" they provide space for a bicycle facility between the curb and bus stop to eliminate conflicts between bicyclists and buses pulling into and away from stops.

- **Queue-jump lane (potential future improvement):** Queue jump lanes improve speed and reliability by providing a separate lane for buses approaching a traffic signal (typically shared with right-turning vehicles) to reduce transit delay due to roadway congestion. Queue-jump lanes can be implemented in conjunction with parking lanes to serve transit during peak-hour commute times without reducing parking capacity during other times. The current Recommended Project does not include queue jump lanes, pending further analysis of their desirability on Telegraph. However, curb extensions and other design elements are compatible with future queue jumps at Grand Avenue, 27th Street, MacArthur Boulevard, and 40th Street.

CONSOLIDATED LINE 1 PERFORMANCE

The project analyzed the expected performance of transit under three alternatives:

- **Transit Alternative 1:** Consolidated Line 1 with no other changes;
- **Transit Alternative 2:** Consolidated Line 1 with proposed road diet; and
- **Transit Alternative 3:** Consolidated Line 1 with proposed road diet and transit design treatments.

As a complete package as analyzed in Transit Alternative 3, the proposed transit and roadway improvements would provide substantial multi-modal benefits to all users of the corridor, including transit riders and operators, pedestrians, and bicyclists, while maintaining or improving transit operating speeds.

PEDESTRIAN CROSSING OPTIONS

Standard crosswalk striping at signal-controlled intersections is typically a sufficient indication of where pedestrians should cross a street and provides good visibility of crossings to drivers. At unsignalized crosswalks, which occur frequently throughout the project corridor, motorists must legally yield to pedestrians crossing the street but often fail to do so. To make these locations more visible and convenient, additional design enhancements options were identified, including high-visibility striping and signs; curb extensions or "bulb-outs" and median refuges; and special pedestrian traffic signals called rectangular rapid flashing beacons (RRFB) and pedestrian hybrid beacons (PHB).

STREETSCAPE AND URBAN DESIGN OPTIONS

The project included design options from the 2005 Telegraph Avenue Pedestrian Streetscape Improvement Project, including more pedestrian-scaled lighting, corner bulb-outs, median refuges, and high-visibility crosswalks, additional street tree plantings, parking meter repair/replacement with kiosks, bus bulb-outs, and sidewalk repair/repaving.

Bike lanes present additional placemaking and urban design opportunities for Telegraph Avenue beyond those envisioned by the 2005 Streetscape Project. These include transit islands and planters. The project also revisited the 2005 Streetscape Project concept of vacating Shattuck Avenue between 45th and 46th Streets, incorporating a "pavement to parks" strategy with green infrastructure and an improved connection between Telegraph Avenue and Shattuck Avenue.

PUBLIC OUTREACH FOR ROADWAY DESIGN OPTIONS

PUBLIC OPEN HOUSES

Following publication of the Roadway Design Options Report, a series of public open houses were held in April and May 2014 to allow community members, stakeholders, and elected officials to learn more about the alternative options and provide feedback to the project on reaching a preferred concept for the corridor.

Public open houses were held on April 24 at Beebe Memorial Cathedral near the MacArthur BART station, April 26 at Faith Presbyterian Church in the Temescal neighborhood, and May 1 at Humanist Hall in the KONO neighborhood. The open houses included a series of exhibits.

Participants were provided with a comment card to submit input, and also had access to copies of the full existing conditions reports, public survey reports, and design options reports. At the three events, brief background presentations were given and tables were provided to allow small group discussion as participants learned about and considered the alternative design options.

Over 250 people attended the open houses and submitted over 200 comment cards. Following the events, the exhibit boards were posted on the City's project website[7] and an electronic version of the comment card was made available to people who were not able to participate in one of the public events. Approximately 35 comment cards were received electronically.

PUBLIC OPEN HOUSE FEEDBACK

In all, 240 comment cards were received from the public open houses and subsequent electronic posting. The comment cards demonstrated overwhelming consensus in favor of implementing a road diet from 20th Street to 46th Street on the Telegraph Avenue corridor. Comments indicated a strong desire for traffic calming and pedestrian safety measures in addition to the road diet, such as bulb-outs and other crossing improvements, to slow vehicle speeds and improve the safety and quality of the pedestrian experience on Telegraph Avenue.

Approximately 90 percent of respondents supported a road diet to calm traffic between 20th Street and 48th Street. Of these, roughly 70 percent supported dedicating roadway space from the road diet to create a parking-protected cycle track option, with the remaining 30 percent supporting buffered bike lanes.

Respondents also expressed broad support for transit islands to minimize bus-bicycle conflict at bus stops, and also supported the design of separated bus pads to allow vehicles to easily pass stopped buses. Features such as transit signal priority (TSP) and moving buses to the far side of signalized intersections was also favored.

Respondents had mixed responses regarding on-street parking. A majority supported the removal of on-street parking as necessary to create more robust pedestrian, transit and bicycle improvements. A minority of respondents did express concern about maintaining adequate parking for local businesses. Participants also generally agreed that double parking for loading and delivery should be discouraged, with trucks using dedicated loading zones and hours, or using the center turn lane and accessing the sidewalk via adjacent marked crosswalks.

See Appendix C for a detailed summary of responses from the Public Open Houses.

7 See the project website at: http://www.oaklandnet.com/TelegraphAvenue

TELEGRAPH AVENUE
Drivers&
Bicyclists&
Bus Riders&
Pedestrians.
public
open house
today

PIZZA

RECOMMENDED PROJECT

The Recommended Project is depicted in a series of illustrative plans in Appendix A.

DESCRIPTION OF THE RECOMMENDED PROJECT

The Recommended Project is based largely on "Design Option 1," as described in Table 6 above. Table 7 summarizes the Recommended Project, with an overview of the key features for each segment as well as corridor-wide features. These corridor-wide features include:

- new high visibility crosswalks and upgrades to existing crosswalks,
- bulb-outs and mid-block refuges,
- new flashing signals at key pedestrian and bicycle crossings,
- additional crosswalks to reduce distance between crossings along corridor,
- improved connections with parallel and cross-town bicycle routes,
- traffic signal upgrades to improve safety and transit speeds, and
- bus stop relocations at selected sites for more reliable transit service.

The following descriptions provide a summary of the key roadway design features of each segment.

RECOMMENDED PROJECT: SEGMENT A

Segment A, from 52nd Street to 57th Street, maintains two through lanes to accommodate peak hour vehicle volumes. The center turn lane is removed for portions of Segment A, though left turn pockets are maintained as necessary at intersections and the SR-24 interchange. Removal of the center turn lane provides space to construct new transit islands to make transit service more reliable and continue striped bike lanes, which are already present north of 57th Street. The transit islands also allow bicycles to travel behind the bus stops, to eliminate bus-bike conflicts. In certain locations, buffered bike lanes can be accommodated to provide even greater separation between moving vehicles and bicyclists. To accommodate the proposed improvements, parking is removed from one side under SR-24 and along portions of Telegraph Avenue between 52nd Street and 56th Street.

To minimize the impact of this parking removal, a new parking lot is recommended under SR-24, providing 39 replacement parking spaces. The time frame, and possibility, for this parking lot is difficult to predict as an agreement would be needed with Caltrans and a planning approval process providing opportunity for public input would be needed.

RECOMMENDED PROJECT: SEGMENT B

Segment B maintains two through lanes in each direction and also maintains a center turn lane. A difference between the Design Options Alternatives Report and the Recommended Project, due to public feedback, is that Segment B was extended to include the area between 46th Street and 48th Street.. This shift addresses merchant and community member concern about roadway capacity during the peak hour in Segment B, maintaining two through lanes in each direction between 46th Street and 52nd Street to account for heavy traffic volume and queues at the Telegraph Avenue/51st Street intersection Also, having bicycle lanes extend from 46th Street south provide an opportunity for a continuous bicycle lane connection between downtown and the bicycle lanes on Shattuck Avenue.

Transit bulb-outs are provided at relocated stops to improve transit performance and the transit passenger experience, and a third northbound travel lane is provided between 51st Street and 52nd Street, which serves as a right-turn only lane, to help

clear the intersection of 51st Street and Telegraph Avenue during the peak hour. The high-speed "slip lane" onto northbound Claremont Avenue is removed, served instead by the new right-turn lane. A new plaza area can be created in the space formerly occupied by the slip lane and pedestrian refuge island. Shared lane markings, or "sharrows" are included through Segment B to increase awareness of bicyclists.

RECOMMENDED PROJECT: SEGMENT C

Segment C extends from 46th Street to 20th Street. This segment features a "Road Diet" to calm traffic and increase safety for all roadway users, especially pedestrians crossing Telegraph Avenue, but also motorists and bicyclists. The road diet is achieved through the removal of one through lane in each direction. The remaining roadway space is devoted to accommodating a collection of multimodal transportation enhancements, including providing transit islands to make bus service more reliable and improve the transit passenger experience, and providing right turn pockets for motorists at locations with high right turn demand. Buffered bike lanes are also provided to separate bicyclists from motorists and transit vehicles, which in conjunction with the recommended transit islands greatly reduce the prevalence of bus-bike and vehicle-bike conflicts along the Telegraph Avenue corridor.

Closing the last block of Shattuck Avenue between 45th and 46th Streets to standardize the intersection of Telegraph Avenue and 45th Street, a concept carried over from the 2005 Pedestrian Streetscape Master Plan, is further developed as part of the Recommended Project to include a pedestrian plaza that could accommodate a new café use, outdoor seating and potentially stormwater management planters. This improvement would also eliminate the awkward intersection of Shattuck and Telegraph Avenues and 45th Street. A further targeted study of the Telegraph Avenue/Shattuck Avenue intersection is recommended to refine the design options in this area. This recommendation is due to the complexity of this intersection as well as the importance of the location as a Temescal gateway.

Smaller scale pedestrian open space improvements are recommended at the high-speed slip lanes at the intersection of Telegraph Avenue and MacArthur Boulevard, as well as the wide eastern leg of 22nd Street, which has an expansive area of road pavement for a minor one-way street. Grant funding is being provided in connection with the MacArthur Transit Village for the construction of improvements to "fill in" the slip lanes.

KEY ELEMENTS OF THE RECOMMENDED PROJECT

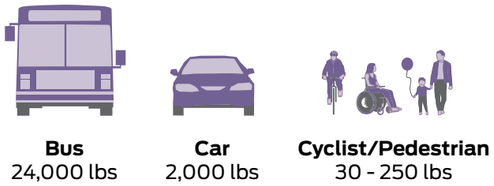
The Recommended Project includes a suite of transportation and safety improvements. The key elements of the project are listed and described in Table 7.

Table 7: Recommended Project - Key Elements

TREATMENT	SEGMENT A	SEGMENT B	SEGMENT C	DESCRIPTION	BENEFITS	MODES
HIGH-VISIBILITY CROSSWALK STRIPING AND SIGNS	√	√	√	▪ "Ladder" or "zebra" crosswalk striping, or other custom format ▪ Signs indicating the location of crossings	▪ Improves visibility of crossings to roadway users ▪ Improves driver yield rates compared to standard crosswalks	▣ Pedestrians ▣ Drivers ¤ Bicyclists
CURB BULB-OUTS	√	√	√	▪ Extension of the sidewalk towards the edge of the adjacent parking lane ▪ Also referred to as "curb extensions"	▪ Provides better visibility between pedestrians and motorists ▪ Shortens the pedestrian crossing distance ▪ Potential to reduce vehicle turning speeds with reduced effective curb radius	▣ Pedestrians ▣ Drivers ¤ Bicyclists
PROTECTED LEFT TURNS	√	√	√	▪ Add left-turn phasing at high-volume intersections	▪ Reduce "right-hook" collisions between turning vehicles and cyclists by providing location guidance	▣ Drivers
RIGHT TURN LANES	√	√	√	▪ Add right-turn pockets at high-volume intersections	▪ Eliminating permitted left-turns has safety benefit for all modes	▣ Drivers
MEDIAN REFUGES	√	√	√	▪ Physical or painted island adjacent to the pedestrian crossing in the middle of the street ▪ Also referred to as "median nose"	▪ Protects pedestrians from vehicles in travel lanes ▪ Pedestrians can cross one half of street at a time	▣ Pedestrians ¤ Drivers
RECTANGULAR RAPID FLASHING BEACONS		√	√	▪ Push-button activated flashing lights mounted to pedestrian crossing signs along the side of the street	▪ On-demand, high-visibility indication to drivers and bicyclists that a pedestrian is crossing the street ▪ Addresses multiple-threat condition on multi-lane roadways by providing active notification that is visible to vehicles in all travel lanes ▪ Improves driver yield rates compared to standard flashing beacons or in-roadway warning lights	▣ Pedestrians ▣ Drivers ¤ Bicyclists
PEDESTRIAN HYBRID BEACON	√			▪ Push-button activated overhead flashing lights mounted on mast arms above the roadway ▪ When activated, drivers see a flashing yellow light followed by a solid yellow light, then a solid red light, requiring them to stop The beacon than goes to flashing red, allowing drivers to proceed after stopping	▪ On-demand, high-visibility indication to drivers and bicyclists that a pedestrian is crossing the street ▪ Addresses multiple-threat condition on multi-lane roadways by requiring all vehicles to stop ▪ May result in less vehicle delay compared to a full traffic signal by allowing vehicles to proceed after stopping once pedestrians are clear	▣ Pedestrians ▣ Drivers ¤ Bicyclists
PEDESTRIAN RECALL AT SOME TRAFFIC SIGNALS	√	√	√	▪ Pedestrian "walk" phase is automatically initiated every cycle, without the need for a pedestrian to push a button	▪ Allows pedestrians to cross intersection even if they arrive at the intersection after the vehicle phase has started	▣ Pedestrians
TRANSIT SIGNAL PRIORITY (TSP)	√	√	√	▪ A system at traffic signals that detects buses and either extends the green time (if the signal is already green) or shortens the red time (if the signal is red)	▪ Reduces transit signal delay ▪ Improves transit reliability	▣ Transit Riders
RELOCATING BUS STOPS FROM NEAR-SIDE TO FAR-SIDE OF INTERSECTIONS	√	√	√	▪ Moves the bus stop after the intersection so that buses pick up and drop off passengers after they travel through the traffic signal, instead of before	▪ Reduces likelihood of missing a traffic signal's green phase ▪ Improves transit reliability ▪ Reduces likelihood of pedestrians crossing in front of the bus (intersection crosswalks located behind the bus stop)	▣ Transit Riders ¤ Pedestrians
BUS BULBS/CURB EXTENSIONS		√		▪ Extension of the sidewalk into the roadway (typically into the parking lane) at a bus stop	▪ Reduces the time required to serve a bus stop ▪ Provides more room for amenities at bus stops ▪ Reduces pedestrian crossing distance	▣ Transit Riders ▣ Pedestrians
TRANSIT ISLANDS	√		√	▪ Similar to a bus bulb as it places the bus stop adjacent to the travel lane, but in addition provides space behind the bus stop to allow bikes to continue in a dedicated lane around the bus stop	▪ Eliminates the bus-bike conflict at bus stops ▪ Reduces the time required to serve a bus stop ▪ Provides more room for amenities at bus stops ▪ Reduces pedestrian crossing distance	▣ Transit Riders ▣ Bicyclists ▣ Pedestrians
STANDARD BIKE LANE	√		√	▪ Defines a lane for bicycle travel in the roadway	▪ Provides dedicated space for bicyclists and makes it easier for bicyclists to position themselves outside of the "door zone" of parked vehicles	▣ Bicyclists ¤ Drivers
BUFFERED BIKE LANES	√		√	▪ Similar to a standard bike lane but with additional striping width or "buffer" along one or both sides of the bike lane	▪ Creates more physical distance between bicyclists in the bicycle lane and moving and/or parked vehicles ▪ Creates a more visible boundary between bicycles and motor vehicles	▣ Bicyclists ¤ Drivers
SHARROWS		√		▪ Shared lane markings or "sharrows" at bicycle symbols positioned on bicycle routes, within vehicle travel lanes, where a bicycle lane is not provided	▪ Alerts other roadway users to the potential presence of bicyclists	▣ Bicyclists
BIKE BOXES	√		√	▪ Defines a zone for bicyclists to wait at traffic signals in line with, but ahead of vehicles, when turning left with traffic	▪ Allows bicyclists to position themselves in front of vehicles during a red light to make left turn ▪ Reduces the need to merge with moving vehicle traffic to make left turns	▣ Bicyclists
2-STAGE LEFT TURN QUEUE BOXES			√	▪ Defines a zone for bicyclists to wait at traffic signals outside the path of other bicyclists, to queue for a two-stage turn left movement ▪ Requires prohibition of right turn on red for traffic that has a "bike box" in front of them	▪ Allows bicyclists to make left turns without merging into the traffic lane ▪ Allows bicyclists to position themselves outside the path of travel of other bicyclists on a green signal phase, and in line with other vehicles waiting through a red signal phase	▣ Bicyclists
GREEN "PAINT"	√	√	√	▪ Green roadway surface coloring to mark merging zones or potential conflict points between bicycles and other roadway users ▪ Used where vehicle right turn pockets must cross the bike lane, and as a backing for sharrows, bike boxes, 2-stage left turn queue boxes, and behind transit islands	▪ Increases the visibility of bicycle infrastructure ▪ Alerts other roadway users and bicyclists to the potential conflict points	▣ Bicyclists ¤ Drivers

Legend: √ Throughout segment √ Select segment locations ▣ High benefit ¤ Moderate benefit

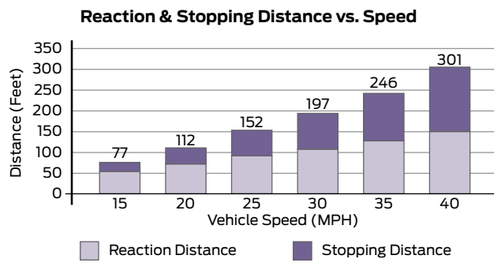
Sources: TCQSM, 3rd Edition; Fehr & Peers, 2014



MULTIPLE-THREAT COLLISIONS

On multi-lane roads, pedestrians can be hidden by vehicles in the travel lane, and by parked cars.

On Telegraph Avenue, a person crossing the street is at risk crossing two lanes in the same direction, which occurs twice on the five-lane roadway (two lanes in each direction).



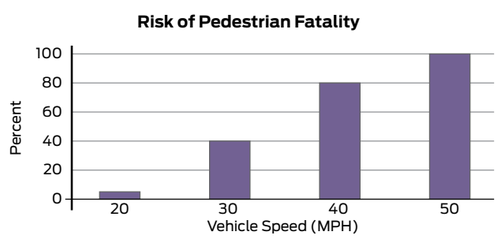


Figure 01: Pedestrian Conditions

RECOMMENDED PEDESTRIAN FACILITY IMPROVEMENTS

Under existing conditions, the five-lane roadway configuration of Telegraph Avenue results in multiple-threat conditions for pedestrians at every unsignalized intersection. The multiple-threat condition occurs on multi-lane roadways where one vehicle may yield to a pedestrian, but a vehicle in an adjacent lane fails to yield, often because their sight line to the pedestrian is blocked by the stopped vehicle (see Figure 01). Addressing the multiple-threat condition is a priority on the Telegraph Avenue corridor. A variety of treatments have been evaluated and final recommendations range from implementing a road diet where feasible, to improving crosswalk location, signalization, signs, and striping.

PEDESTRIAN FACILITY IMPROVEMENT ELEMENTS

While standard crosswalk striping is typically sufficient at signal controlled pedestrian crossing locations, additional design enhancements may be required to improve safety at unsignalized crosswalk locations where motorist yielding is required. See Table 8 for images and descriptions of these treatments, as well as their recommended applicability in the Telegraph Avenue corridor, and see Appendix A and Figures 08, 09 and 10 for more detailed illustrations of recommended physical improvements.

ROADWAY IMPROVEMENTS

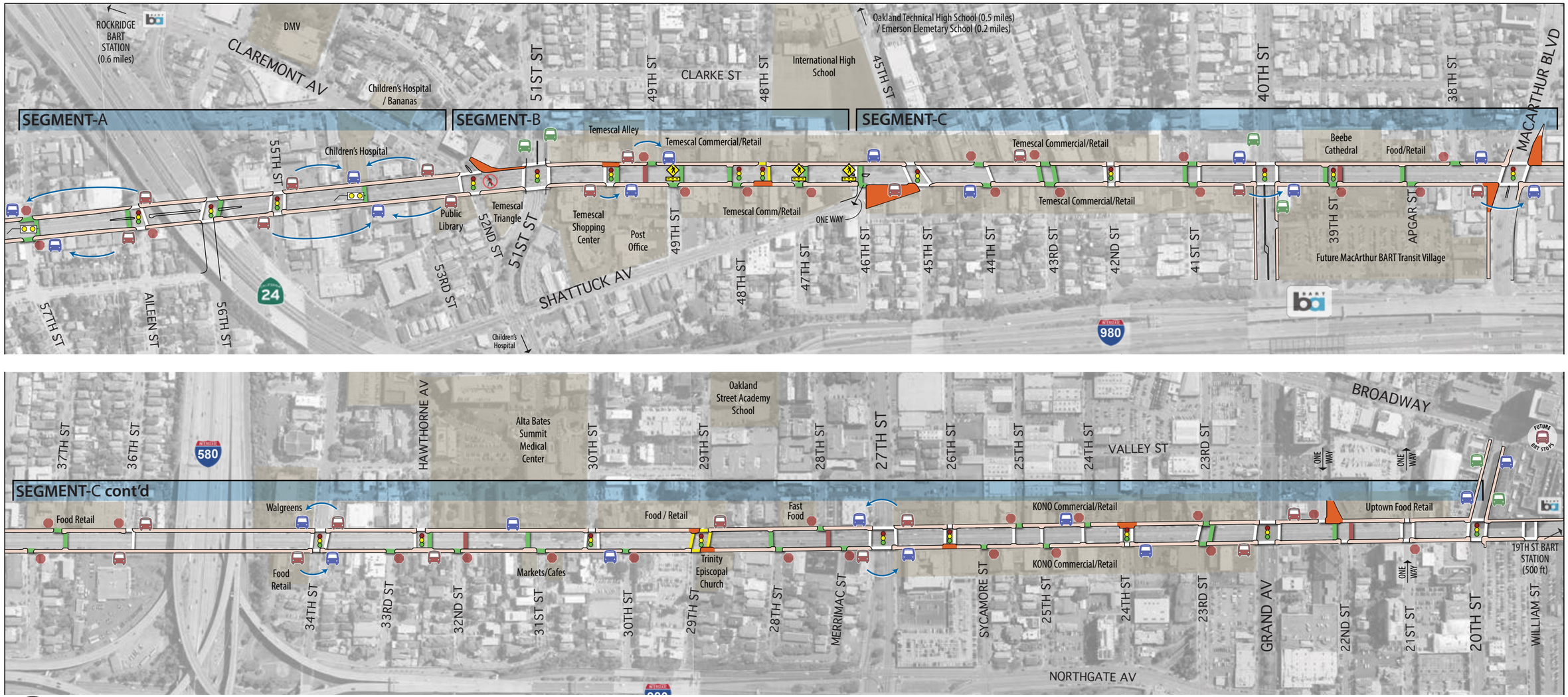
- **High-Visibility Striping and Signs:** consist of a ladder-style crosswalk and pedestrian crossing warning signs, which improve visibility of the crossing itself to motorists. These may be accompanied with advanced yield markings, particularly on multi-lane roadways
- **Curb Extensions:** extend the curb and sidewalks further into the roadway, shortening the length of the crosswalk. These act as a traffic calming device by narrowing the effective width of the roadway. Because they extend into the roadway, often past parallel-parked vehicles, they improve visibility for pedestrians and shorten the distance pedestrians have to cross. Corner bulb-outs can be constructed with reduced curb radii, which further slow the speed of turning vehicles and can accommodate directional curb ramps.
- **Median Refuges:** are placed in the center of the roadway separating opposing lanes of traffic with cutouts or ramps for accessibility along the pedestrian path. Median refuge islands are recommended where right-of-way allows and conditions warrant. Refuges allow pedestrians to cross in two stages during which they can focus their attention on one direction of approaching traffic at a time.

SIGNALIZATION IMPROVEMENTS

- **Rectangular Rapid Flashing Beacons (RRFBs):** are an enhancement of the flashing beacon that replaces the traditional slow flashing incandescent lamps with rapid flashing LED lamps. The RRFB may be push-button activated or activated with passive detection.
- **Pedestrian Hybrid Beacon (PHB):** is a pedestrian-activated warning device located on the roadside or on mast arms over midblock pedestrian crossings. The beacon head consists of two red lenses above a single yellow lens. The beacon head is "dark" until activated by the pedestrian desires to cross the street, at which point the device flashes the yellow lens to warn drivers of the following stop display of a steady red indication to drivers and a "WALK" indication to pedestrians. This is followed by a flashing red phase during which drivers must stop before proceeding. These are also known as "HAWK" signals.

Table 8: Summary of Pedestrian Crossing Options

LOCATION	PREFERRED OPTIONS
All	▪ High-visibility crosswalk markings; AND ▪ Curb extensions (permanent and interim format)
Segment A (52nd - 57th Street)	▪ Pedestrian Hybrid Beacon (PHB)
Segment B (46th - 52nd Street)	▪ Rectangular Rapid Flashing Beacon (RRFB) with median refuge island OR ▪ PHB (where refuge island is infeasible)
Segment C (20th - 46th Street)	▪ Median refuge island OR ▪ RRFB (where refuge island is infeasible)V
	High Visibility Striping and Signs *Image source: http://www.pedbikesafe.org/PEDSAFE/*
	Curb Extensions
	Median Refuges *Image source: Mike King*
	Rectangular Rapid Flashing Beacon (RRFB) *Image source: http://carmanah.com/traffic/solar-flashing-beacons*
	Pedestrian Hybrid Beacon (PHB) *Image source: Mike Cynecki, http://www.fhwa.dot.gov/publications/publicroads/11mayjun/03.cfm*



September 2014

Pedestrian and Transit Facility Recommendations

Source: CD+A, 2014, Fehr & Peers, 2014, City of Oakland, 2013, Telegraph Avenue Pedestrian Streetscape Improvements Project, 2005

- Proposed Consolidated Line 1 (On Telegraph Avenue)
- Removed Bus Stops (On Telegraph Avenue)
- Bus Stop (On cross street)
- Stop Sign
- Traffic Signal
- Existing Standard Crosswalk
- Existing Ladder Crosswalk
- Pedestrian Crossing not allowed
- Sidewalks
- Pedestrian Hybrid Beacon
- Proposed New Crosswalk
- Proposed Crosswalk Removal
- Pedestrian generating / attracting uses
- Rectangular Rapid Flashing Beacon
- SEGMENT-A Corridor Segment
- Pedestrian Open Space / Plaza

Figure 02: Pedestrian and Transit Facility Recommendations

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CORRIDOR CROSSWALK PLACEMENT

The Recommended Project includes the addition, relocation and removal of crosswalks, as indicated in Figure 02. The crosswalk locations proposed consider adjacent land uses, potential roadway reconfiguration, and transit option recommendations. The project corridor from 57th to 20th Street features 35 existing marked crosswalks (counting three- and four-way intersections as one crosswalk and offset intersections with two marked crosswalks as two) over approximately 2.4 miles, for an average spacing of over 400-feet between crosswalks. This interval is slightly larger than that of a typical city block in an urbanized area, and indeed the corridor is predominantly intersected by cross streets at every 250 to 350-feet. A notable exception is the segment under the I-580 overpass where crosswalks are separated by a gap of over 700-feet. Numerous other locations throughout the corridor require pedestrians to travel up to 500-feet to reach a destination directly across the street, using available marked crosswalks.

The recommended crosswalk locations shown in Figure 02 results in a total of 41 marked crosswalks throughout the project corridor. This improves the average spacing between crosswalks to approximately 300-feet, within the interval of street intersections indicated above. There are no gaps between crosswalks of more than 400-feet, with the exception of the I-580 overpass, which remains unchanged.

SEGMENT A

Segment A extends between 57th Street and 52nd Street. No unsignalized crosswalks exist in this segment. One new unsignalized crosswalk is proposed roughly equidistant from existing signalized crosswalks, near the proposed location of relocated bus stops. Given the multiple threat condition, high vehicle volumes, and lack of median, a PHB (Pedestrian Hybrid Beacon) is recommended at this location. In addition, a PHB is commended at the 57th Street crosswalk.

SEGMENT B

Segment B extends between 52nd Street and 46th Street. Through this segment, several uncontrolled crosswalks exist, primarily at offset intersections. Since this segment would remain a multi-lane roadway as proposed under the project, installation of an RRFB (Rectangular Rapid Flashing Beacon) is recommended at the uncontrolled crosswalks to manage high volumes of pedestrians and address the potential for multiple threat collisions. RRFBs are recommended at 46th Street and 47th Street, while a PHB is recommended for 49th Street as a median refuge is not present at this location.

SEGMENT C

Segment C extends between 46th Street and 20th Street. A road diet on Telegraph Avenue from five lanes to three lanes is proposed through this segment of the corridor. The lane reduction on Telegraph eliminates the potential for multiple threat collisions, and indicates that yielding rates are likely to be higher along the corridor through a visual and physical narrowing of the roadway. As a result, lower level treatments, including median refuges, curb extensions, and high-visibility signing and striping are proposed at these locations. These uncontrolled crossings should be monitored in the future for motorist compliance. Should motorist yielding rates be lower than expected, RRFBs could be considered at these locations.

RECOMMENDED TRANSIT FACILITY IMPROVEMENTS

Using the equations described in the Transit Capacity and Quality of Service Manual, 3rd Edition (TCQSM), the effects of the proposed project on transit speeds in the corridor were evaluated and compared to baseline conditions. The baseline scenario assumes that lines 1 and 1R will be combined into a single hybrid line. From the baseline scenario, proposed components of the project were added to the bus speed models. These include a lane reduction from 20th Street to 46th Street, installing transit signal priority (TSP) at all traffic signals, moving bus stops from near-side to far-side at signals, and installing transit islands and bus bulbs. See Appendix A and Figures 11 and 12 for more detail about the proposed improvements.

BASELINE CONDITIONS

AC Transit plans to combine Line 1 and Line 1R into one line within the time frame of implementing the Telegraph Complete Street project. The line would serve fewer bus stops than the existing Line 1 but more bus stops than the existing Line 1R. This analysis assumes that the new line would operate at a frequency of approximately 10 buses per hour, which is the combined frequency of lines 1 and 1R[8].

STOP CONSOLIDATION

AC Transit identified the optimal bus stop spacing of the new line at approximately 4 bus stops per mile. Baseline conditions for the purposes of this study include bus stops with a high existing daily ridership relative to other bus stops in the corridor, while also considering adjacent land uses. Figure 03 presents a map of proposed stop locations for the combined line based on passenger activity of each bus stop. See Appendix B of the Roadway Design Options Report[9] for detailed ridership data.

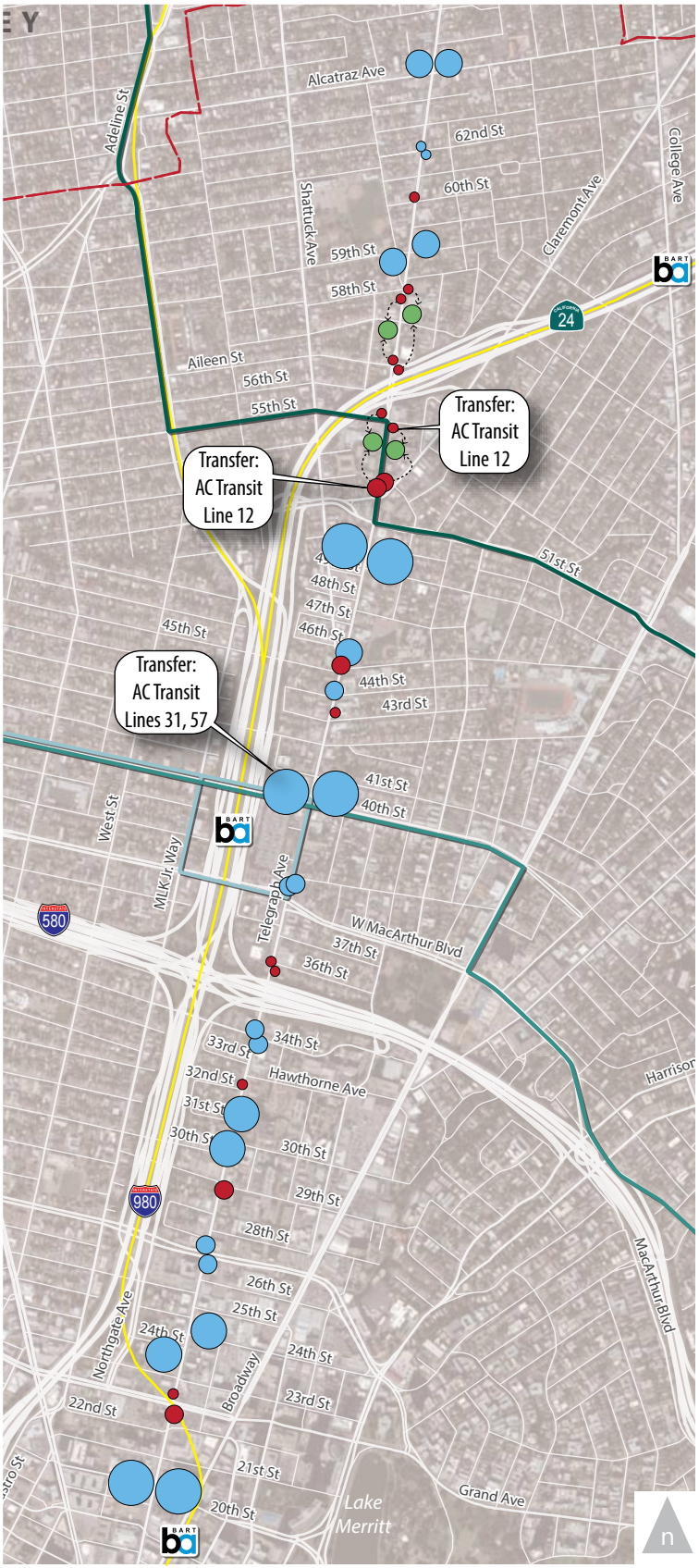
Baseline conditions assume the following bus stops would be eliminated as part of consolidation:

- Grand Avenue – both directions
- 29th Street – both directions
- 32nd Street – southbound
- 36th Street – both directions
- 43rd Street – northbound
- 45th Street – southbound
- 55th Street and Claremont/52nd – both directions, relocate and combine
- 60th Street – southbound
- 62nd Street – both directions

The bus stops at 55th Street and Claremont Avenue/52nd Street would be consolidated into mid-block bus stops in both directions. Since dwell time depends on the number of riders at each stop, an estimate of riders for the consolidated stops was determined, see the Roadway Design Options Report.

8 Actual frequency will be determined during implementation of the consolidated route.

9 The full Roadway Design Options Report can be found on the City's Telegraph Avenue project website at http://www2.oaklandnet.com/n/OAK046665



KEY

- Existing Stop to Remain
- Stop Removed
- New Stop

*Average Daily Ridership for Line 1 and Line 1R **

- 0 - 33
- 34 - 92
- 93 - 236
- 237 - 381
- 382 - 700

- AC Transit Line 12
- AC Transit Line 57
- AC Transit Line 31

Notes: Size of circle shows magnitude of daily bus stop ridership

* Daily Ridership (Ons + Offs)

Source: AC Transit, 2013.

Figure 03: Proposed Line 1 and 1R Bus Stop Consolidation

RECOMMENDED PROJECT

As described above, the Recommended Project includes the following elements that will affect transit travel times based on the TCQSM methodology:

- Removal of one through lane in both directions of Telegraph Avenue between 20th Street and 46th Street resulting in an increase of vehicles in the curb lane
- Implementation of active TSP at all signals in the study area
- Relocation of bus stops from near-side to far-side at traffic signals preventing bus operators from missing a green phase due to passenger boarding and alighting, removing conflicts between right-turning vehicles and buses, reducing sight-distance issues at intersection approaches, and encouraging pedestrians to cross the street behind the bus

These modifications were applied to the model to quantify their potential to change bus speeds on the corridor. To account for transit signal priority, the ratio of green time to cycle length at a signal was increased by 10 percent. The models also assume that all near-side bus stops at signals would move to far-side with the exception of northbound 50th Street. The project proposes to move this bus stop to near-side of 49th Street. For the scenario with a road diet from 20th Street to 46th Street, the models assume that transit islands or bus bulbs/curb extensions would be applied at all bus stops north of 46th Street, allowing buses to stop in the travel lane.

The results of the analysis suggest that the proposed bus enhancement treatments would maintain existing bus speeds on the corridor even with impact of the road diet on corridor bus speeds in the AM and PM peak hours.

Table 9: Operating Speeds with Recommended Project

NORTHBOUND	CORRIDOR		20TH TO 30TH		30TH TO 40TH		40TH TO 50TH		50TH TO ALCATRAZ	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Baseline	11.1	11.4	11.3	11.5	11.8	11.2	10.6	11.4	10.7	11.4
Recommended Project	11.1	11.4	11.3	11.5	11.8	11.2	10.6	11.4	10.7	11.4

SOUTHBOUND	CORRIDOR		ALCATRAZ TO 50TH		50TH TO 40TH		40TH TO 30TH		30TH TO 20TH	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Baseline	12.0	11.0	11.7	10.9	12.5	11.0	12.8	11.2	11.4	11.1
Recommended Project	12.2	11.0	12.1	10.9	12.5	11.0	12.8	11.2	11.4	11.1

ADDITIONAL TRANSIT FACILITY IMPROVEMENTS

In addition to the quantifiable elements of the proposed project identified above, the Recommended Project will implement buffered bike lanes and transit islands with cycle tracks behind (see Figure 11). These design features are not accounted for in the TCQSM methodology. Under existing conditions, buses and bikes share the same space along the corridor requiring buses to either merge into the inside lane to pass bikes or to travel behind the bike at a reduced speed, and creating conflict points with buses entering and exiting bus stops. Bike lanes will remove these bus-bike conflicts and allow buses to safely pass bikes in a separate lane between and at bus stops. Currently, busses must also use the inside lane to pass cars that are making parallel parking maneuvers. With the Recommended Project, parallel parking maneuvers will likely take place in a portion of the buffered bike lane, reducing conflicts between buses and parking cars.

The addition of bus islands will provide additional benefit over traditional bus bulbs. The bus islands will allow bikes to travel around the back of the bus stop, eliminating the existing bike-bus conflict that occurs as a bus enters and exits the stop. This allows the bus island to be aligned with the travel lane with buses pulling directly in to the stop instead of through the bike lane. The placement of bus islands within the road diet segment greatly reduces the distance required for a bus to pull into a bus stop when compared to the existing condition on Telegraph Avenue.

RECOMMENDED BICYCLE FACILITY IMPROVEMENTS

BICYCLE FACILITY DESIGN OPTIONS

The Telegraph Avenue Complete Streets Plan considered four categories of bicycle accommodation along the street: cycle tracks, buffered bike lanes, bike lanes, and shared lane markings or "sharrows" (see Figures 04 - 07 for examples of these elements). The National Association of City Transportation Officials (NACTO) has published the NACTO Urban Bikeway Design Guide[10] for design and implementation of bicycle infrastructure, which provides the following definitions of these elements:

CYCLE TRACKS

See Figure 04. "A cycle track is an exclusive bike facility that combines the user experience of a separated path with the on-street infrastructure of a conventional bike lane. A cycle track is physically separated from motor traffic and distinct from the sidewalk. Cycle tracks have different forms but all share common elements—they provide space that is intended to be exclusively or primarily used for bicycles, and are separated from motor vehicle travel lanes, parking lanes, and sidewalks. In situations where on-street parking is allowed cycle tracks are located to the curb-side of the parking (in contrast to bike lanes)."

BUFFERED BIKE LANES

See Figure 05. "Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane."

BIKE LANES

See Figure 06. "A Bike Lane is defined as a portion of the roadway that has been designated by striping, signage, and pavement markings for the preferential or exclusive use of bicyclists. Bike lanes enable bicyclists to ride at their preferred speed without interference from prevailing traffic conditions and facilitate predictable behavior and movements between bicyclists and motorists… A bike lane is distinguished from a cycle track in that it has no physical barrier (bollards, medians, raised curbs, etc.) that restricts the encroachment of motorized traffic." Currently, there are bike lanes on both sides of Telegraph Avenue between 57th Street and Alcatraz Avenue.

SHARED LANE MARKINGS OR "SHARROWS"

See Figure 07. "Shared Lane Markings (SLMs), or 'sharrows,' are road markings used to indicate a shared lane environment for bicycles and automobiles. Among other benefits shared lane markings reinforce the legitimacy of bicycle traffic on the street and recommend proper bicyclist positioning. The shared lane marking is not a facility type, it is a pavement marking with a variety of uses to support a complete bikeway network."

"Desirable shared lane marking applications … strengthen connections in a bikeway network … [and] fill a gap in an otherwise continuous bike path or bike lane, generally for a short distance."

10 Quoted text on this page comes from the NACTO Urban Bikeway Design Guide www.nacto.org/cities-for-cycling/design-guide/. A deeper look at these sections can be found on the subsequent pages.

Raised Cycle Track - Concept Illustration

Raised cycle track: Vancouver, BC
Flickr user: Bejan

Raised cycle track: Cambridge, MA
www.westsideaction.wordpress.com

Figure 04: Cycle Tracks

Source for all images on this page:
NACTO Urban Bikeway Design Guide - http://nacto.org/cities-for-cycling/design-guide/cycle-tracks/raised-cycle-tracks/

Buffered Bike Lanes - Concept Illustration

Buffered bike lanes: New York, NY

Buffered bike lanes: Portland, OR

Figure 05: Buffered Bike Lanes

Source for all images on this page:
NACTO Urban Bikeway Design Guide - http://nacto.org/cities-for-cycling/design-guide/bike-lanes/buffered-bike-lanes/

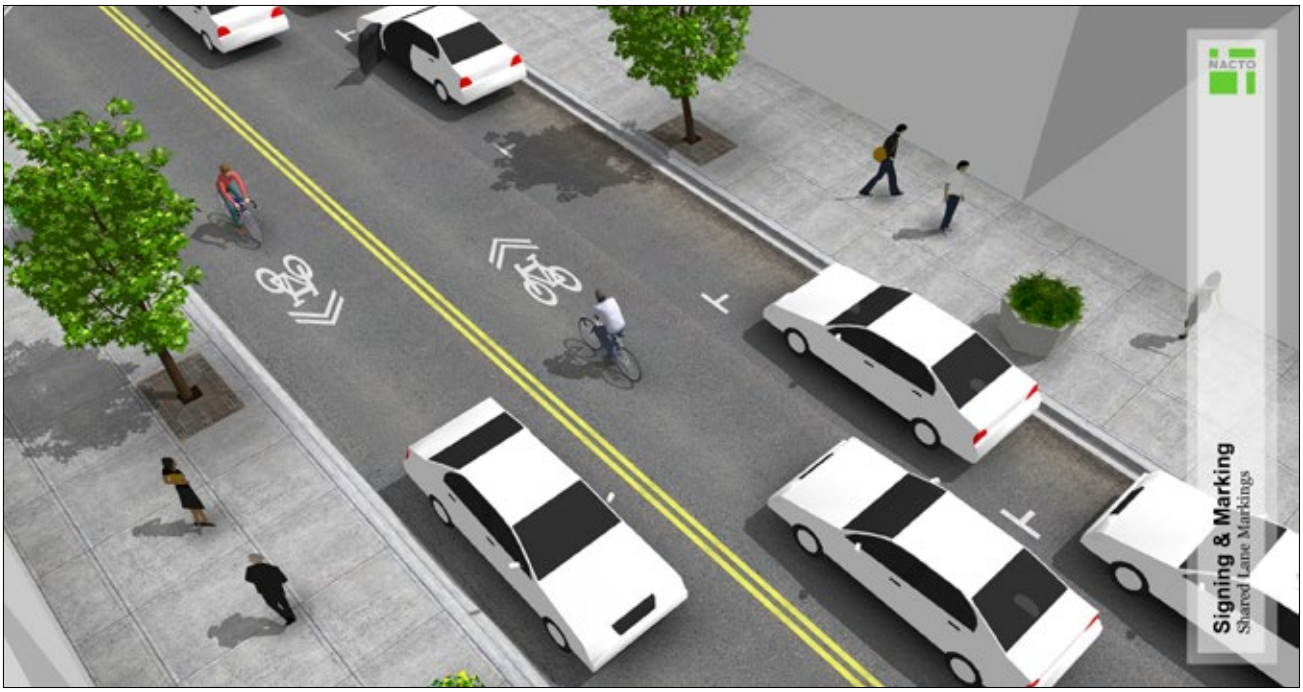
Bike Lanes - Concept Illustration

Bike lanes: Chicago, IL
CDOT

Bike lanes: San Francisco, CA
www.pedbikeimages.org - Dan Burden

Figure 06: Bike Lanes

Source for all images on this page:
NACTO Urban Bikeway Design Guide - http://nacto.org/cities-for-cycling/design-guide/bike-lanes/conventional-bike-lanes/



Shared Lane Markings ("Sharrows") - Concept Illustration

Shared lane markings ("sharrows"): Brookline, MA

Shared lane markings ("sharrows"): Long Beach, CA

Figure 07: Shared Lane Markings

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NACTO Urban Bikeway Design Guide - http://nacto.org/cities-for-cycling/design-guide/bikeway-signing-marking/shared-lane-markings/

EVALUATION OF BICYCLE FACILITY DESIGN OPTIONS

Buffered bike lanes provide people on bikes greater protection than standard bike lanes or sharrows. As they exist in the Recommended Plan (see Appendix A), buffered bike lanes are 6-feet wide and include a 3-foot buffer from moving vehicles and a 2-foot buffer from the parking lane (which is 8-feet wide). The bike facility is buffered from buses at transit stops through the use of transit islands, and from motorists making right turns at locations with high demand through the use of right turn pockets. While buffered bike lanes must be crossed by vehicles accessing on-street parking and can be misused by motorists double-parking (which is illegal), the combined 11-foot width of the buffered bike facility provides enough space to allow bicyclists to navigate around these and other obstructions while staying within the buffer zone. When this is not possible because of larger obstructions, buffered bike lanes provide the option for bicyclists to "take the lane" as they are not separated from the adjacent travel lanes by a physical buffer.

COMPARISON WITH CYCLE TRACKS

Cycle tracks are located between the parking lane and the sidewalk. As such, bicyclists are restricted to use the width of the cycle track alone, which makes avoiding obstructions in the lane more difficult, including slower bicyclists. Furthermore, pedestrians entering and exiting parked vehicles and transit islands must cross the path of cyclists. In busy commercial areas, and during peak commute hours, the restriction of cyclists to a confined, albeit protected cycle track facility, could prove more inconvenient for many bicyclists.

While cycle tracks do provide a more protected facility at mid-block locations where driveways are not present, and there are a variety of special design solutions for cycle tracks crossing intersections and driveways, the frequency of both along Telegraph Avenue (one driveway or intersection nearly every 150 feet, on average) presents a number of issues, including the potential loss of about one parking space per driveway crossing and 1 additional loss per intersection, compared with the Recommended Plan.

FACILITY CONSISTENCY AND CYCLIST SAFETY

The contrast between the protection provided by a cycle track at mid-block locations, and while crossing frequent driveways and intersections, is starker than that for buffered bike lanes. A cyclist in a buffered bike lane is constantly in view of, and can themselves easily view, adjacent moving vehicles. As such, bicyclists are never obscured from turning motorists' view by parked vehicles, so they are more likely to be aware of vehicle movements in advance of driveways and intersections, and less likely to be struck by those motorists. While properly designed cycle track facilities do provide adequate sight lines and space to accommodate such turning movements safely, they consume more roadway space, namely parking spaces, than do buffered bike lanes.

ROADWAY PERFORMANCE

In its current format, the outside travel lane on Telegraph Avenue does not perform very well. It serves as a de facto bicycle lane, it hosts vehicle turning and parking movements, it serves as a bus lane and bus stop, and motorists expect to use it as a functioning through lane. By implementing a road diet from 20th to 46th Street, the Recommended Project eliminates through motorists from the outside lane, provides separated, bus-only lanes at stops, and provides dedicated bicycle facilities outside of the path of moving vehicles and buses. Additionally, separated right turn pockets are provided at intersections with high right turn demand. As a constructive part of a balanced complete streets approach to Telegraph Avenue, a buffered bike lane provides the space needed to accommodate parallel parking maneuvers outside of the remaining through lane, which is important to maintaining desirable vehicle and bus through movement in that single through lane.

With a cycle track the bicycle facility does not provide the flexibility for parking maneuvering, double parking, faster bicycles passing slower bicycles, etc. This would likely result in slower travel times for all the sorts of personal, commercial and transit vehicles that travel along Telegraph Avenue. A significant decrease in travel time could deteriorate Telegraph Avenue's important role as a connector between downtown, North Oakland, and to neighborhoods further north. There are relatively few streets that serve this connector function in Oakland's northern street network.

RECOMMENDED PROJECT BICYCLE FACILITY DESIGNS

As illustrated in Appendix A and described in Table 7, the Recommended Project accommodates bicycle facilities along the Telegraph Avenue corridor as follows:

SEGMENT A

The Recommended Project includes a combination of standard and buffered bike lanes connecting the existing bike lanes on Telegraph Avenue at 57th Street through to 52nd Street. Transit islands with cycle tracks behind are recommended at the consolidated mid-block bus stop location between 55th and 52nd Streets, bike boxes are provided at 55th Street to facilitate connections from that designated cross town bike route, and sharrows are provided through intersections. See Appendix A, Figure A-2 and A-3 for an example of Telegraph Avenue with the center turn lane removed, and standard bike lanes added.

SEGMENT B

Between 52nd Street and 46th Street, sharrows are provided in the outside travel lane. Parallel bike route connections are present along 46th Street, Shattuck Avenue and 55th Street to the west, and via Webster Street/Shafter Avenue/Cavour Street/Vicente Way/55th Street to the east. See Appendix A, Figure A-4 for an example of Telegraph Avenue with existing lanes maintained, and sharrows added.

SEGMENT C

Buffered bicycle lanes are recommended between 20th Street and 46th Street. Additional features include transit islands with cycle tracks behind, separated right turn pockets and bike through lanes with flexible bollard-separation at intersections with high right turn demand, sharrows and dashed bike lane markings through intersections, and two-stage left turn queue boxes and bike boxes to facilitate connections with other routes in the City of Oakland bike network, including Grand Avenue, 27th Street, MacArthur Boulevard, 40th Street, and Shattuck Avenue via a new bicycle crossing of Telegraph Avenue at 46th Street. See Appendix A, Figure A-11 for an example of Telegraph Avenue with one travel lane in each direction removed, and buffered bike lanes added.

RECOMMENDED MOTOR VEHICLE FACILITY IMPROVEMENTS

VEHICLE TRAVEL

Peak hour traffic operations at signalized intersection under the Recommended Project were evaluated using the Synchro software and the 2010 Highway Capacity Manual (HCM) methodology. For the proposed project, estimated traffic volumes from the MacArthur Transit Village were added to the existing traffic volumes analyzed under existing conditions. These volumes were then carried through the corridor and balanced between intersections for consistency. The MacArthur Transit Village represents a 4.4 percent increase in peak hour traffic at the Telegraph Avenue/MacArthur Boulevard intersection. Appendix B provides the Existing Plus MacArthur Transit Village peak hour turning movement volumes.

The Synchro network used to analyze existing conditions was updated to reflect the proposed road diet between 20th Street and 46th Street. This includes the reduction of one through lane in each direction, the addition of right-turn pockets where proposed, and optimization of signal timings based on the new lane configuration. Lane reconfiguration is not proposed for signalized intersections north of 46th Street; therefore, there is no change to existing signalized intersection operations. The results of the operational analysis are shown in Appendix B, Figure B-4. All signalized intersections continue to operate at Level of Service C or better with the proposed project.

PARKING

CORRIDOR-WIDE PARKING IMPACTS

The Recommended Project improvements will result in a slight overall reduction in on-street parking corridor-wide: under 4% overall loss of on-street parking on Telegraph, and less than 1% loss of Telegraph "corridor" parking, which includes adjacent cross street parking. These figures assume the presence of two public but off-street surface parking lots: one recommended under SR-24 and one planned in upper Temescal at the older Frazee Paints property. See Table 11 for additional details.

Parking changes related to bringing bus stops up to current standards and improving pedestrian safety and visibility at intersections and mid-block crossing are responsible for a majority of on-street parking losses. The proposed transit islands require approximately 100 feet of curb space, including the bus platform itself and transition space for the bike lane. For comparison purposes, this is the minimum that would be required for an adequately sized curbside lane to allow the bus to pull out of the roadway and align itself with the curb. In many circumstances, more space would be required, consuming more parking.

At intersections where bulb-outs are recommended to reduce pedestrian crossing distance, parking is preserved up to the bulb-out itself. This is equivalent to the standard red curb length required at intersection approaches, thus there is no net loss in parking at most locations. The exception is where an existing, inadequately size red zone is replaced with a properly sized bulb-out.

Table 11: Recommended Project Parking Impacts

		SEGMENT				TOTAL
		20TH - 34TH	34TH - 44TH	44TH - 51ST	51ST - 57TH	
EXISTING ON-STREET PARKING	Existing Telegraph	188	153	76	107	**524**
	Existing Cross Street	759	404	176	288	**1,627**
	Total Existing	947	557	252	395	**2,151**
CHANGES TO ON-STREET PARKING	Loss - Corner bulb	-8	0	0	0	**-8**
	Loss - Mid-block bulb	-4	-2	-2	0	**-8**
	Loss - Other	-16	-17	-8	-47	**-88**
	Gain - On-street	0	7	8	9	**24**
	Total change on-street	-28	-12	-2	-38	**-80**
NEW LOTS	Gain - New off-street lot	0	0	26	39	**65**
	Total change with lot	-28	-12	24	+1	**-15**
TOTAL CHANGE	**Percent of Telegraph**	**-14.9%**	**-7.8%**	**-2.6%**	**-35.5%**	**-2.9%**
	Percent of Corridor	**3.0%**	**-2.2%**	**9.5%**	**0.3%**	**-0.7%**

PARKING IMPACTS IN SEGMENT A

The greatest loss of parking in a single block occurs under SR-24, where all on-street parking is removed, except for 5 spaces. This parking removal is required to provide space to connect bike lanes on Telegraph from Aileen Street to 55th Street. The existing curb-to-curb dimension precludes preservation of parking on even one side of Telegraph Avenue with standard bike lanes in this location; as such, buffered bike lanes are provided to maximize protection of bicyclists from moving vehicles entering and exiting the highway. Additional parking loss is incurred between 55th Street and 52nd Street, to preserve right turn lanes at those intersections and transition to the mid-block transit islands. To counteract these parking losses in Segment A, a 39-space surface parking lot is recommended on vacant land below SR-24. This parking lot would actually benefit local auto-depended businesses north of SR-24, which currently rely on parking below the highway, by concentrating additional parking in close proximity to their doors. To ensure parking is available for people patronizing local businesses, meters and/or parking time limits are recommended. Without this parking lot, the change in parking between 57th and 51st Street is a net loss of 38 on-street spaces, or 36 percent loss. With the parking lot, there is a net gain of 1 space, or 0.3 percent increase.

PARKING IMPACTS IN SEGMENT B

An additional paid, but public parking lot is planned for the existing private lot behind the Frazee Paint building on Telegraph and 49th Street, in the center of the popular upper Temescal commercial district. Without this parking lot, the Recommended Project's impact on on-street parking between 44th and 51st Street a loss of 2 parking spaces, or a 2.6 percent decrease. Counting the new parking lot at Frazee Paint, there is actually a net gain of 24 parking spaces, or 9.5 percent increase in parking capacity.

PARKING IMPACTS IN SEGMENT C

Between 44th Street and 34th Street, the Recommended Project's impact on parking is a loss of 12 spaces, for a 7.8 percent decrease in Telegraph Avenue on-street parking, or a 2.2 percent decrease in corridor on-street parking. Between 34th Street and 20th Street, the Recommended Project's impact on parking is a loss of 28 spaces, for a 14.9 percent decrease in Telegraph Avenue on-street parking, or a 3.0 percent decrease in corridor on-street parking.

TYPICAL DETAILS OF THE RECOMMENDED PROJECT

This section illustrates and further describes the key elements of the Recommended Project; the full length of the Recommended Project and the location of these elements are illustrated in Appendix A: Recommended Project Plan Sheets.

CORNER BULB-OUTS

A bulb-out provides better visibility between pedestrians and motorists, shortens the pedestrian crossing distance, and has the potential to reduce vehicle speeds around corners by reducing the effective turning radius, which further improves safety. Corner bulb-outs typically occupy space close to intersections, where parking is already prohibited. As such, bulb-outs do not typically displace existing on-street parking. Figure 08 illustrates the two typical corner bulb-out recommendations for the project:

PERMANENT BULB-OUT

A permanent bulb-out expands the existing sidewalk and curb and gutter, and with it, expands the pedestrian realm. Permanent bulb-outs also can provide the space required to provide multiple, directional curb ramps that are aligned with their respective crosswalks. Permanent bulb-outs can necessitate storm drain relocations or other improvements to manage the flow of storm water from the surface of the street, because curbs are the flow line for runoff. Use of landscape planters and tree wells for green storm water infrastructure, use of trench drains, and other details can resolve storm drain issues. Bulb-outs can increase landscape areas and usable sidewalk space for pedestrians or adjacent business, as well as having the potential to be extended along the curb at bus stops, see discussion of Transit Bulb-outs below. Planters and other features can be accommodated within permanent bulb-outs to provide an identity for business districts and neighborhoods, and improve the aesthetic appearance of the pedestrian realm.

INTERIM BULB-OUT

Certain physical conditions and/or funding constraints may prevent construction of permanent corner bulb-outs, including roadways with a large crown, or where stormwater drainage inlets cannot be moved. Where such physical conditions, or when budgetary limits exist, interim "paint and planter" bulb-outs can be implemented to achieve many of the same benefits at a fraction of the cost. Interim bulb-outs utilize existing curb ramp(s) and do not involve the physical construction of additional sidewalk or curb and gutter. Rather, painted zones that mirror the shape of a permanent bulb-out define interim bulb-outs. Bollards or planters placed within the painted area create a physical barrier between pedestrians and moving traffic. While interim bulb-outs do not expand the sidewalk area, they do achieve the transportation goals of improving visibility between pedestrians and drivers or bicyclists that are approaching the crossing and slow drivers that are making right turns by reducing the effective curb radius. In addition, they provide opportunities for merchant associations or neighborhood groups to customize some aspects of the improvement through special paint colors or patterns, and selection of planter elements and plant palettes. As such, interim bulb-outs can help build a neighborhood or shopping district's identity and sense of place. Use of decorative treatments and/or planters in interim bulb-outs will typically require a maintenance agreement with a local partner.

T-INTERSECTION "MID-BLOCK" BULB-OUTS

At T-intersections, a bulb-out that is on the far side of the intersection, away from the street that is intersecting with Telegraph, a mid-block bulb-out can be provided to help create safer crossing conditions (see Figure 09). A mid-block bulb-out provides better visibility between pedestrians and motorists and shortens the pedestrian crossing distance. Depending on the size of the mid-block bulb-out, additional features such as stormwater planters, seating, and street trees can be included to further enhance the quality of the pedestrian realm. Depending on the location, on-street parking may be affected by the placement of mid-block bulb-outs, particularly if a crosswalk was not previously in place.

EXTENDED BULB-OUT

A version of the mid-block crossing occurs at offset or "T" intersections, which are common on Telegraph Avenue (see Figure 09). The City of Oakland does not typically allow parking on the far side of offset intersections. Converting these areas to extended bulb-outs provides better visibility between pedestrians and motorists and shortens the pedestrian crossing distance, as with mid-block and corner bulb-outs. Because they are significantly longer than other mid-block bulb-outs, additional features such as bicycle corrals, stormwater planters, seating, and street trees can be more easily included to further enhance the quality of the pedestrian realm.

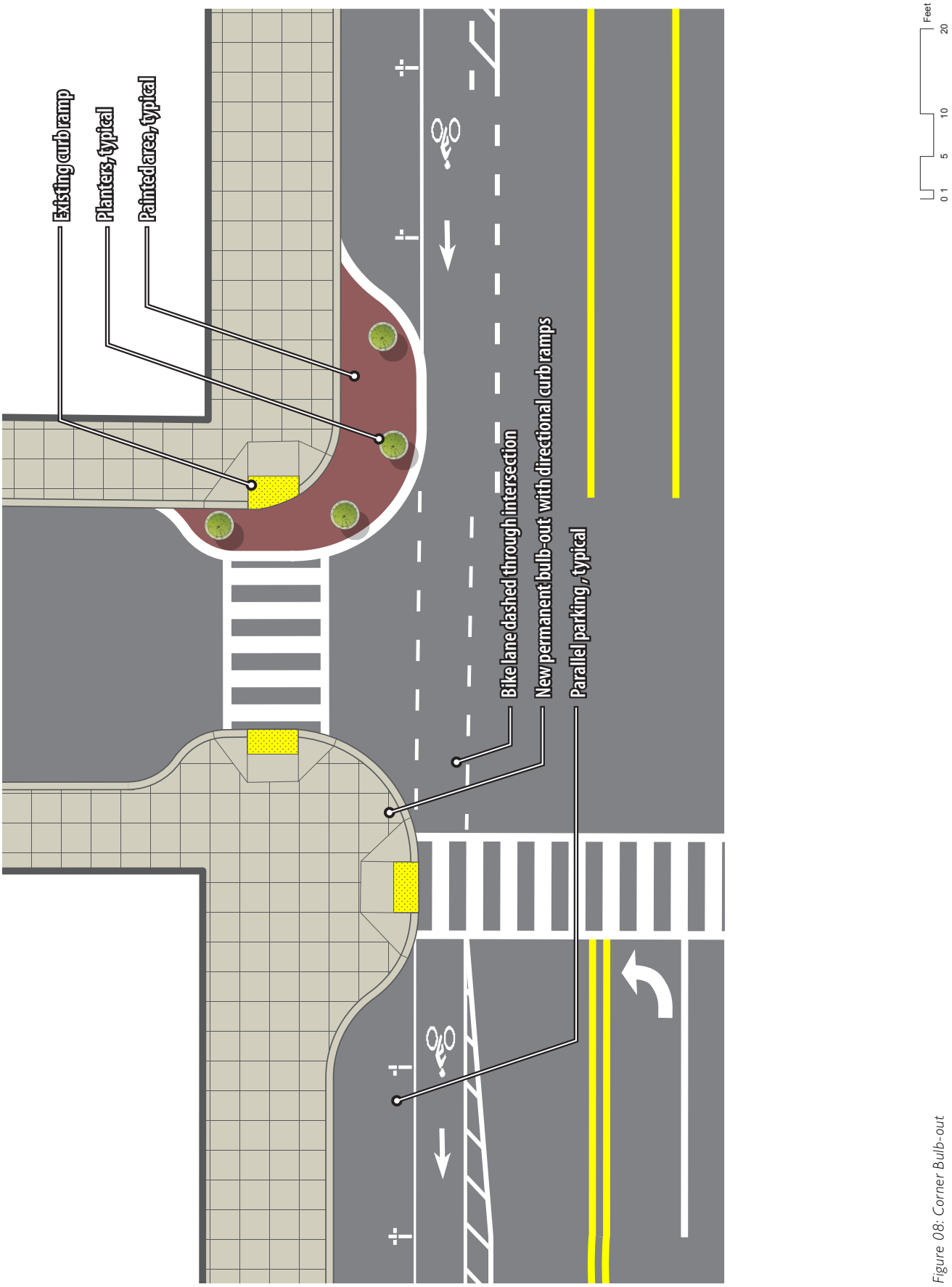

Figure 08: Corner Bulb-out

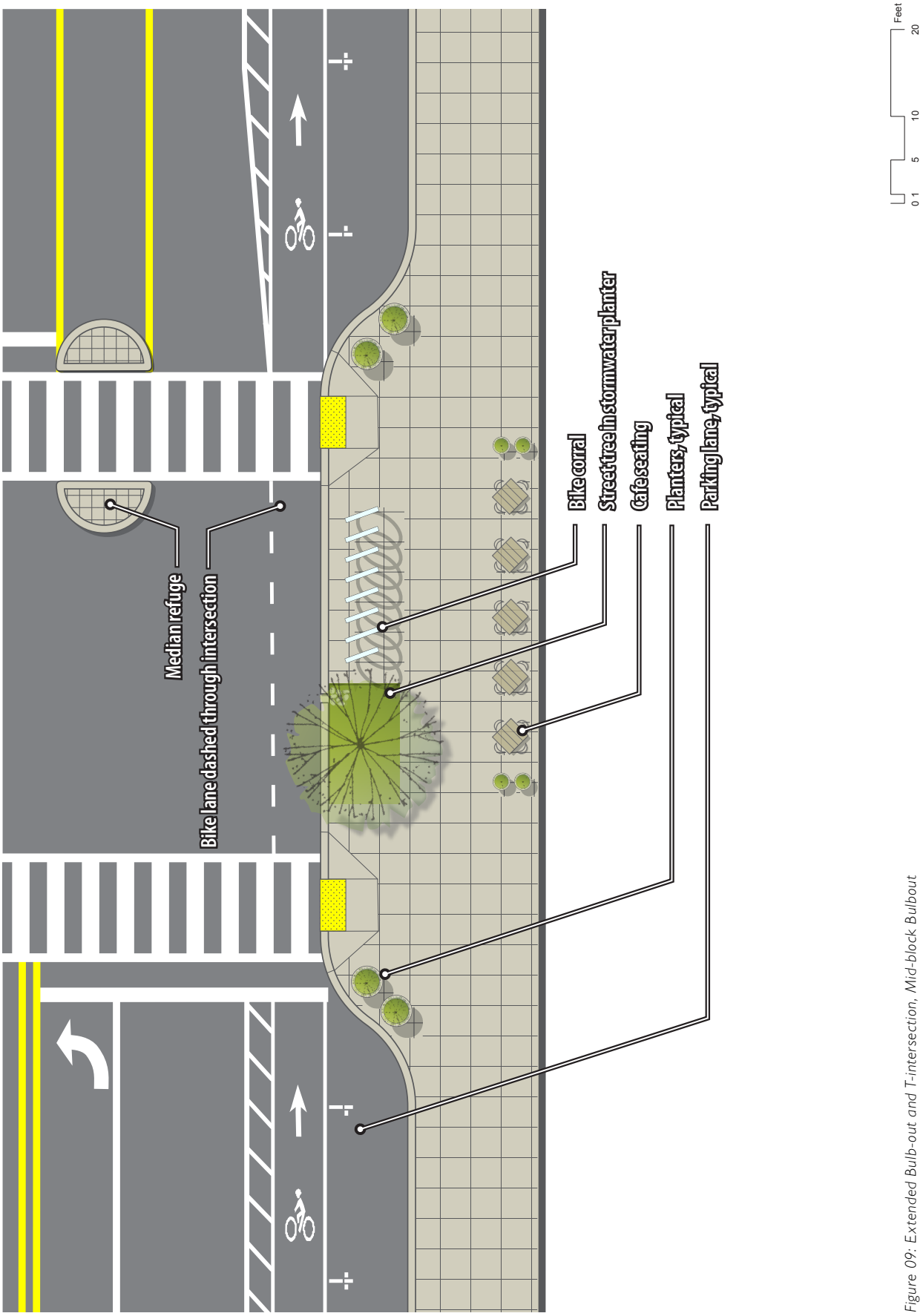

Figure 09: Extended Bulb-out and T-intersection, Mid-block Bulbout

MEDIAN REFUGE NOSE

At mid-block, T-intersection or one-way street intersections, left turns pockets are often unnecessary in at least one direction. As a result, a median refuge can be placed in the center turn lane adjacent to new or existing crosswalks, providing additional safety benefits to crossing pedestrians by allowing them to focus on crossing one direction of traffic at a time, with a refuge between. As with corner bulb-outs, interim "paint and planter" median refuges can be constructed where space or budgets initially preclude permanent construction (see Figure 10). Where median refuges are used at offset or "T" intersections, as is very common on Telegraph Avenue, they can also potentially reduce vehicle speeds by reducing the effective turning radius for vehicles making left turns onto Telegraph Avenue.

Median refuges provide additional benefits, as well. On corridors with active commercial and retail uses such as Telegraph Avenue, median refuges can provide protection for delivery vehicle drivers who choose to park in the center turn lane. By positioning the loading area of their truck towards the median refuge, drivers are able to load and unload deliveries in an area protected from moving vehicles, and have access to the crosswalk to more safely reach destinations on either side of the street; delivery vehicle parking in the center turn lane is a behavior that exists along Telegraph today in both KONO and Temescal districts.

TRANSIT ISLAND

Transit islands place the bus stop adjacent to the travel lane on a roughly 9-foot by 70-foot "platform" or island similar to a bulb-out, but separated from the sidewalk (see Figure 11). This separation provides space along the existing curb to allow bikes to continue in a dedicated lane behind the bus stop, eliminating the bus-bike conflicts that are common today at stop locations. The bike lane behind the stop is colored green to differentiate the bikeway from the sidewalk and transit island, while a railing, benches, shelter and planters can be used on the island and adjacent sidewalk to facilitate safe and convenient pedestrian access to transit islands. The stops are typically provided with two ADA-accessible curb ramps. One of the access points is typically aligned with a crosswalk and protected with a median nose, which effectively creates a bulb-out that significantly shortens the roadway crossing distance for pedestrians. A second access point is provided at the far end of the transit island. Yield markings in the path of bicyclists and standard crosswalk striping, as well as posted "Bikes Yield to Pedestrians" signs, indicate to bicyclists that pedestrians have right of way.

Transit islands also reduce the time required to serve a bus stop by preventing operators from needing to pull out of and back into the travel lane. As configured in the Recommended Project, all transit islands include a separate, full-length bus only concrete pad at the stop, as well as a merging area following each stop to reduce the delay of bus entry and exit. All transit islands provide a minimum clear boarding and alighting area of 60-feet, and allow bus operators to more easily align the full length of the bus parallel to the stop so that all doors are adjacent to the platform rather than just the front door. In addition, transit islands provide more room for amenities at bus stops, because they are removed from the sidewalk. Shelters, planters, benches or leaning bars, and a protective railing adjacent to the bike lane are among the amenities that could be provided. Separating the bus facility from the sidewalk in turn frees up space on the sidewalk for landscaping, including stormwater planters and café seating as shown in the illustration.

See Appendix A for the recommended location of transit islands. They are included as part of the improvements in Segment A and Segment C, and account for 16 of the 20 transit stops in the project corridor.

TRANSIT BULB-OUT

Transit bulb-outs are effectively longer versions of regular sidewalk bulb-outs that accommodate a full 60-foot clear zone along the curb for boarding and alighting at bus stops. Similar to transit islands, they reduce the time required to serve a bus stop and provide more room for amenities, while freeing up space on the sidewalk. As with typical bulb-outs, transit bulb-outs reduce pedestrian crossing distance where they are aligned with crosswalks. Unlike transit islands, buses stop in an outside travel lane, which is also shared with bicycles and vehicles. The Recommended Plan includes two transit bulb-outs in Segment B. See Figure 12 for an example.

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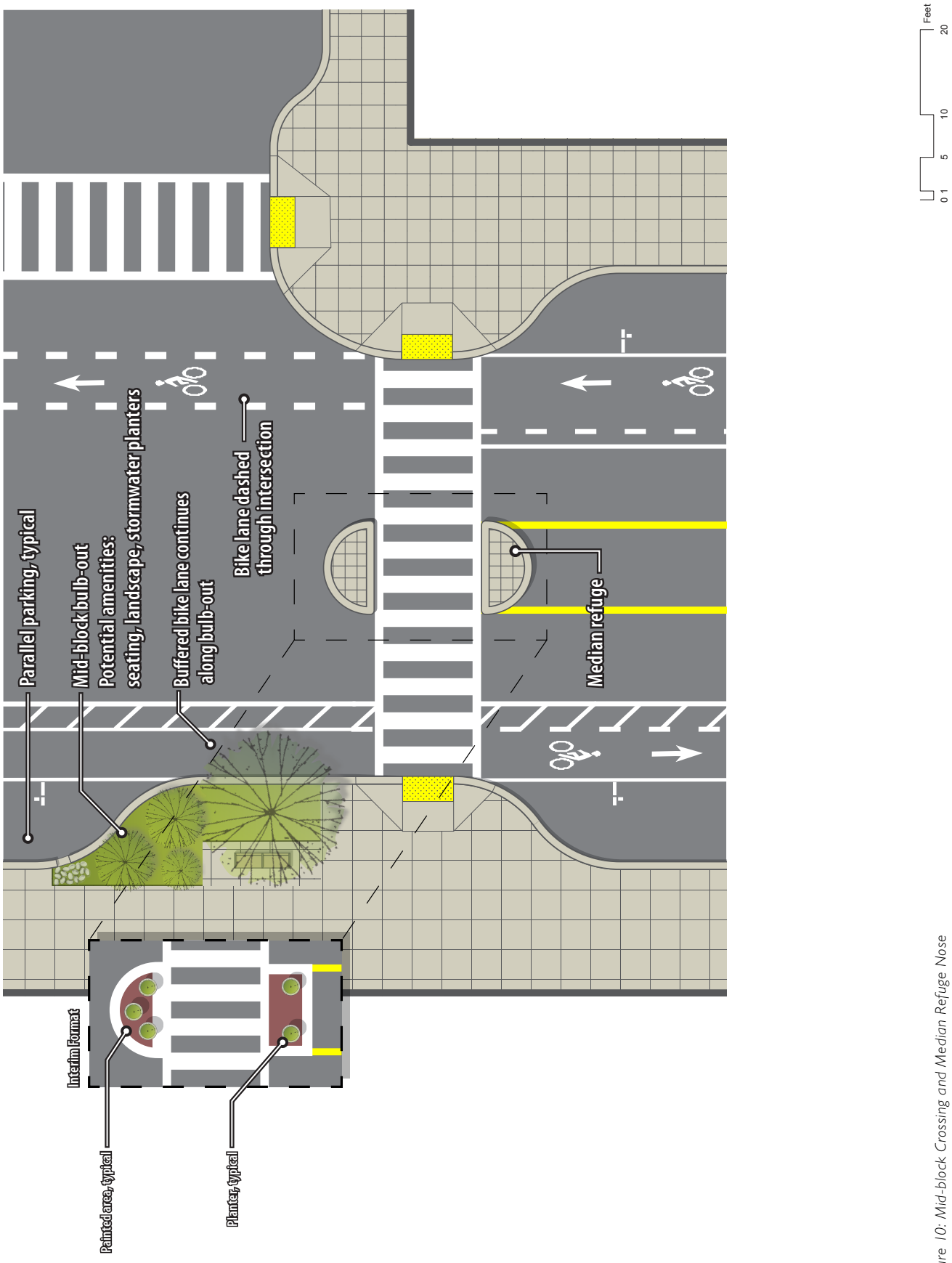

Figure 10: Mid-block Crossing and Median Refuge Nose

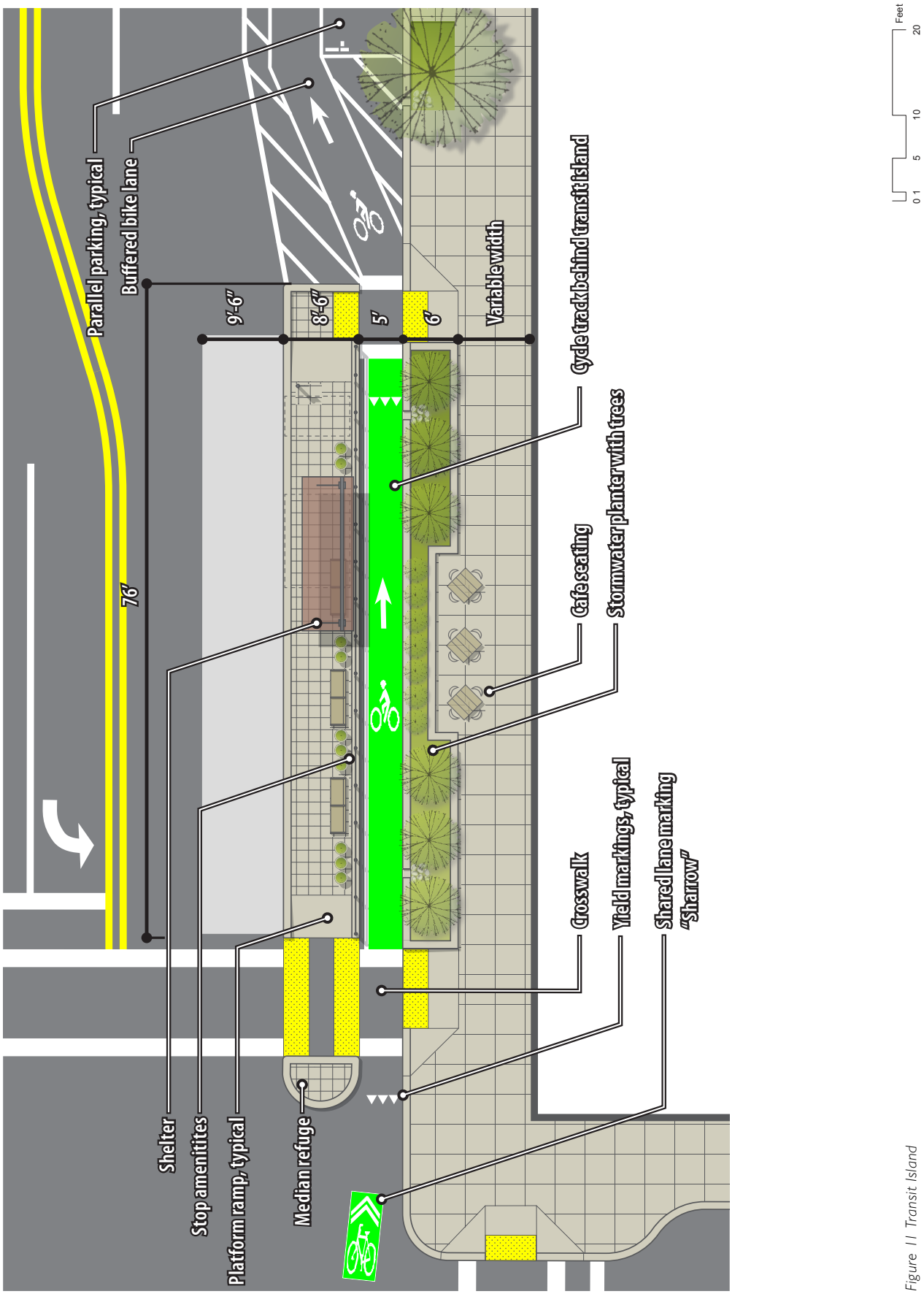

Figure 11 Transit Island

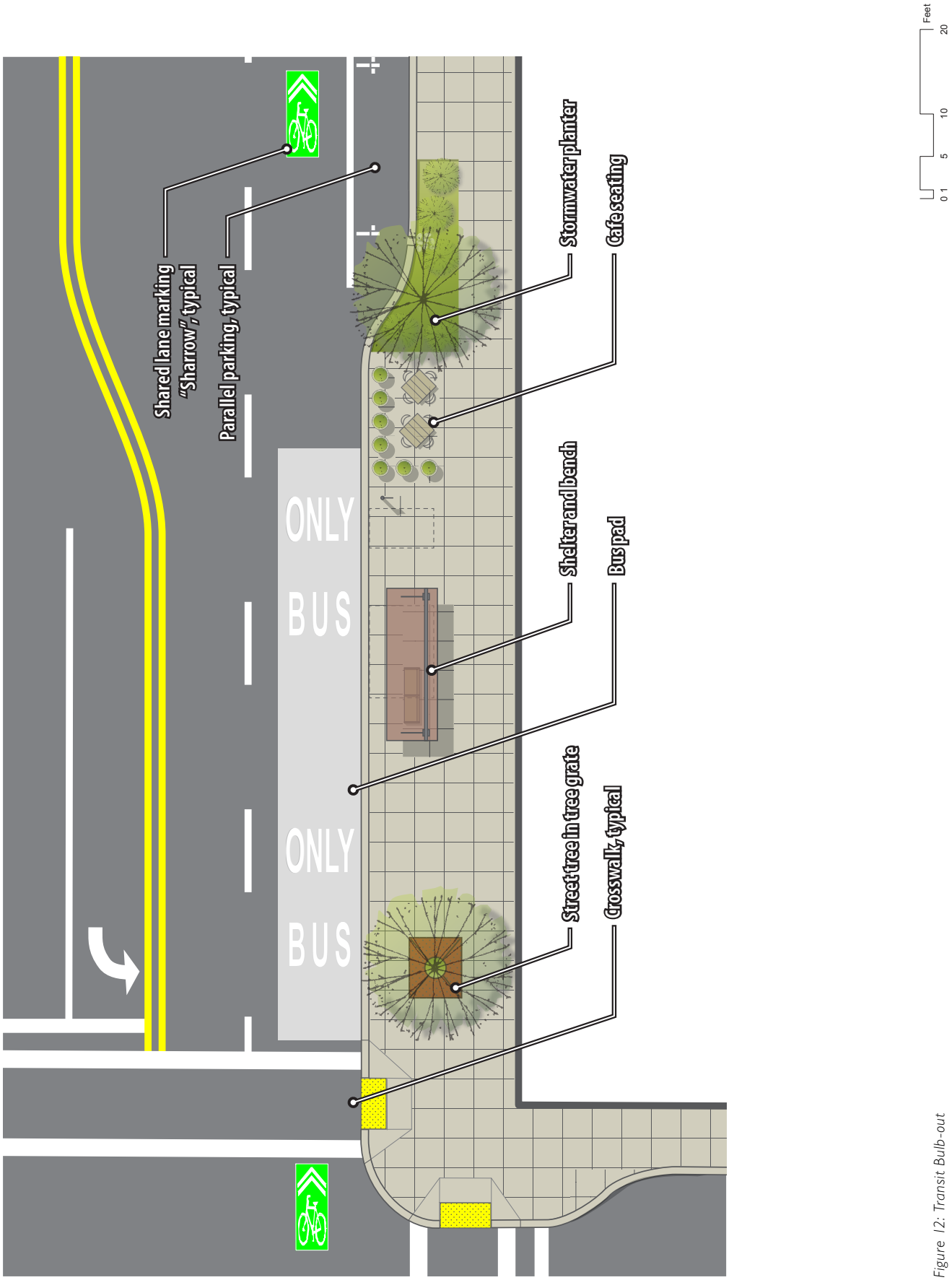

Figure 12: Transit Bulb-out

PAVEMENT-TO-PARKS

At several locations along Telegraph Avenue, intersections with cross streets produce excessively large areas of roadway, or result in complicated intersections or slip lanes that create safety hazards for all roadway users, especially pedestrians. The Recommended Project includes concepts for the redesign of these locations to improve their safety and repurpose roadway space for public open space and placemaking improvements.

KASPER'S KORNER

The most developed concept in the Recommended Project is located where Shattuck Avenue intersects Telegraph Avenue at 45th Street. The existing intersection is awkward with several difficult and atypical turning and merging movements, and has been the site of numerous vehicle collisions[11]. Vehicles traveling south on Shattuck often fail to obey their yield signal when merging into Telegraph Avenue, in part because there is a receiving lane on Telegraph. The 2005 Telegraph Avenue Pedestrian Streetscape Improvement Project identified Shattuck Avenue between 45th and 46th Streets as a potential street segment for closure. In the Pedestrian Streetscape Improvement Project's proposed concept, the adjacent triangular parcel is expanded into the street right-of-way and shown with new development.

The project has developed a conceptual rendering of this location reimagined as an expanded public plaza with seating, stormwater planters with boardwalks to provide access across both sides of the plaza, reuse of the existing Kasper's building for a café or similar use, and additional space for food trucks and other public gatherings or programmed uses that also permits emergency vehicle access through the site (see Figure 13, and Appendix A, Figure A-5). The design provides improvements to the intersections at Telegraph Avenue and 46th Street, creating a two-way configuration on 46th Street to provide access to Telegraph Avenue from Shattuck Avenue and 46th Street. Pedestrian access to the plaza is improved with a new crossing and sidewalk edge on the east side of the Kasper's building along Telegraph. The intersection of 45th and Telegraph is also improved, with bulb-outs to shorten crossing distances, and better-aligned high visibility crosswalks. If this segment of Shattuck Avenue were to be closed and the public right of way repurposed, a design and approvals process involving adjacent property owners and area stakeholders would be necessary.

OTHER PAVEMENT-TO-PARKS OPPORTUNITY SITES

See Figure 02 and Appendix A for the locations of the following "Pavement-to-Parks" improvement concepts.

Temescal Gateway

South of the intersection of Telegraph Avenue and 45th Street, the Recommended Project includes a large median island that could be used as a gateway to upper Temescal. As illustrated in Figure 13, the gateway could feature landscape improvements, in addition to signs, public art, or other elements as determined in conjunction with the neighborhood and surrounding businesses and property owners. Note that realizing this opportunity would require eliminating the left-turn from northbound Telegraph Avenue to 45th Street, which is a legal though seldom made turn today.

22nd Street

Westbound 22nd Street is significantly wider than other cross streets where it intersects Telegraph Avenue. The Recommended Project includes a concept to shorten this crossing and repurpose unnecessary street right-of-way as a public open space. By extending the sidewalks along Telegraph Avenue and 22nd Street, a plaza area could be created and used for pedestrian seating, public art, or additional planters and/or stormwater features, as determined in conjunction with the neighborhood and adjacent businesses and property owners.

Claremont Avenue and MacArthur Boulevard Slip Lanes

The slip lanes that allow vehicles to make turns onto northbound Claremont Avenue and east and westbound MacArthur Boulevard create modal conflicts and issues of pedestrian and cyclist comfort, especially for those traveling along Telegraph Avenue. Closing these slip lanes, as proposed by the Recommended Project, would create more standardized right turns for vehicles, increase safety, and provide public plaza areas where pedestrian seating, public art, or additional planters and/or stormwater features could be installed, as determined in conjunction with the neighborhood and adjacent businesses and property owners.

11 See the Existing Conditions Report

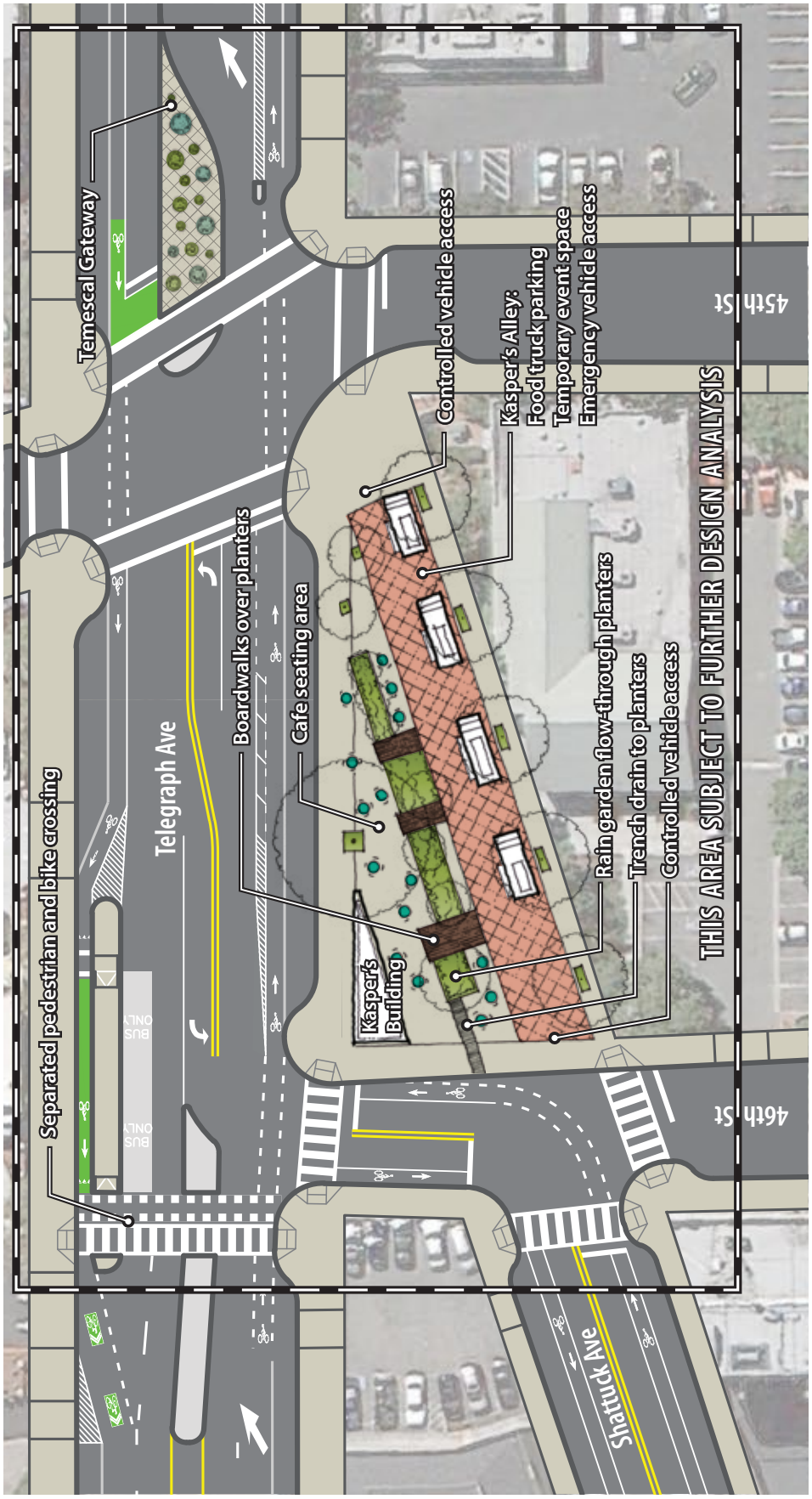

Figure 13: "Kaspers Korner" Design Concept Update – Based on 2005 Telegraph Avenue Pedestrian Streetscape Improvement Project
NOTE: Additional information about the surrounding roadway design elements shown above is available in Appendix A, Figure A-5

OTHER ELEMENTS OF THE RECOMMENDED PROJECT

TRANSIT SIGNAL PRIORITY

The Recommended Project includes active transit signal priority (TSP) at all signals in the study area. Active TSP modifies traffic signal timing as a bus approaches an intersection. The bus would trigger either an extension of the green phase or an early call of the green phase at a TSP-enabled intersection. After serving the bus, the signal will return to normal operations within a few cycles. The benefits of TSP include reduction in signal delay and improvement of schedule reliability.

TRAFFIC SIGNAL ENHANCEMENTS FOR PEDESTRIANS

The Recommended Project includes pedestrian enhancements at signalized intersections to make the pedestrian experience consistent throughout the corridor. Under existing conditions, some signals do not have pedestrian heads and many do not have countdown pedestrian heads. The project will add countdown pedestrian heads to all signalized intersections. The project will also upgrade all pedestrian push buttons to meet Americans with Disabilities Act guidelines, including audible feedback.

Pedestrian phase recall will also be implemented at several locations. This provides automatic recall of the "walk" phase at a traffic signal without the need for a pedestrian to push a button. While this is currently the case at many several pedestrian crossings along Telegraph Avenue, there is opportunity to add additional locations to further enhance the pedestrian experience. The reduced pedestrian crossing distances help facilitate this by requiring less time for the pedestrian phase. Pedestrian recall is recommended at the following intersections on Telegraph Avenue:

- 20th Street
- Grand Avenue
- 27th Street
- W. MacArthur Boulevard
- 40th Street
- 45th Street

WEBSTER STREET/SHAFTER AVENUE TRAFFIC CALMING

To the east of Telegraph Avenue, a parallel vehicle and "bicycle boulevard" route exists along Webster Street and Shafter Avenue, between 28th Street and 51st Street (with a connection via Cavour Street and Vicente Way to 55th Street/Telegraph Avenue). In conjunction with any road diet project on Telegraph Avenue north of MacArthur Boulevard, the Webster/Shafter bike route should also be enhanced to reduce the likelihood of cut-through automobile traffic on these residential streets. This traffic calming will also facilitate improved bicyclist experience by potentially reducing the number of stop signs along the route. In particular, the proposed improvements include replacing stop signs with traffic circles and adding speed humps to meet speed/volume thresholds appropriate for a bicycle boulevard.

POTENTIAL FUTURE ELEMENTS

TRANSIT QUEUE JUMP LANES

Queue jump lanes are intended to reduce delay associated with traffic signals. The bus would enter a right-turn lane upstream of the traffic signal and would continue through the intersection into a far-side stop before pulling back into general traffic. To be effective, the queue jump lane must extend as long as the typical peak period vehicle queue (and thus remove parking in most cases). It would also require special signal phasing to resolve conflicts between bicycles, right-turning vehicles, and buses. At this time, the project is not proposing queue jump lanes given these conflicts and the estimated low signalized intersection delay. However, if future traffic conditions change such that a queue jump lane would be beneficial, the project does not preclude future implementation.

PROTECTED CYCLE TRACKS

The Recommended Project includes buffered bike lanes throughout Segment C and a modified buffered bike lane where possible in Segment A (see Table 7 and Appendix A). The combined dimension of the parking lane, buffers, and bicycle lane in the current configuration could also accommodate a cycle track, buffer, and in most locations also allow a parking lane, as an alternative bicycle facility (see Figure 14). The transit islands that are included in the Recommended Project would also work well with cycle tracks

The City's analysis of trade-offs that led to the Recommended Project's incorporation of buffered bike lanes instead of cycle tracks is described in the following Multimodal Performance Analysis section of this Plan. However, at a future date it may be desirable based on observation and stakeholder and community input to consider replacement of the buffered bike lane facility with a cycle track, as well as its implementation at other locations throughout the Telegraph Avenue corridor.

BICYCLE LANES IN SEGMENT B

The Recommended Project maintains existing parking, through lanes, and center turn lane in Segment B (see Table 7 and Appendix A). As such, a separate bicycle facility cannot be accommodated as part of the Recommended Project between 46th Street and 52nd Street. However, at a future date it may be desirable, based on observation and stakeholder and community input, to consider the implementation of dedicated bike lanes or other separated bike facilities through Segment B, in conjunction with on-street parking removal as described in the Roadway Design Options Report (see Figure 15), and/or in conjunction with changes to the City of Oakland's current traffic policies, which currently require the preservation of the existing travel lanes and center turn lane.

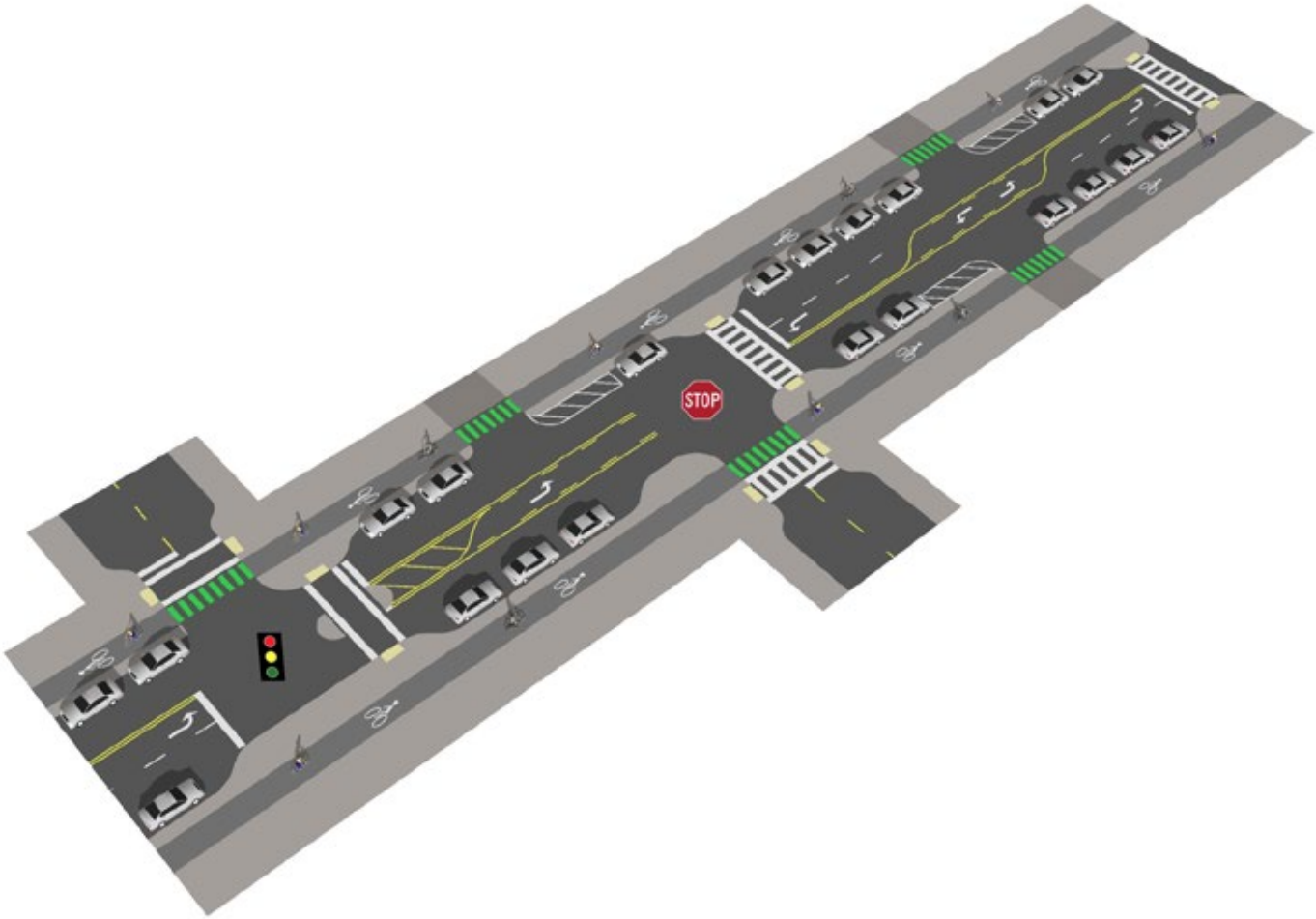

Figure 14: View showing possible future bicycle conditions with cycle track

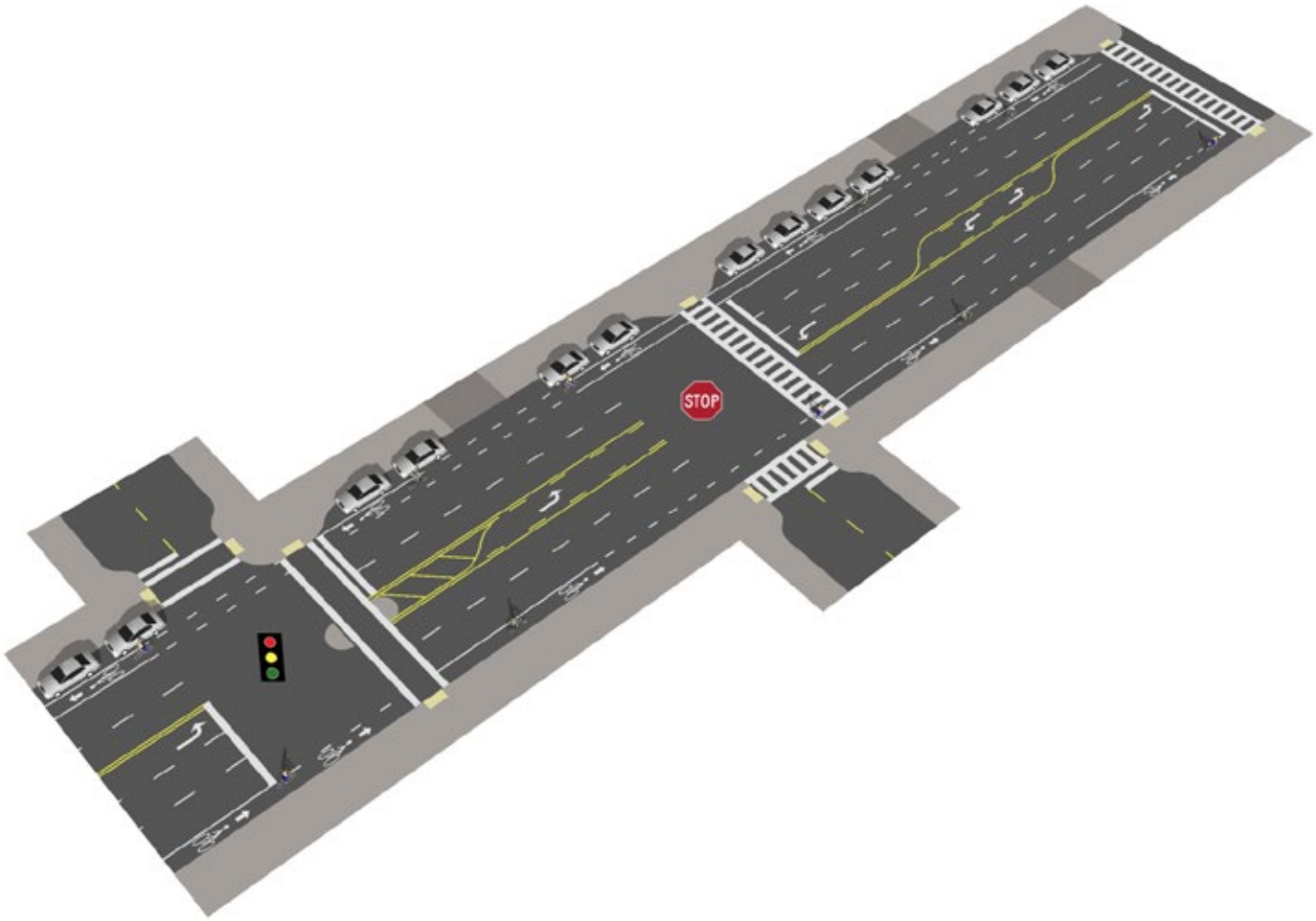

Figure 15: View showing possible future bicycle conditions in with bike lanes and parking on one side only

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PHASING PLAN AND COST ESTIMATES

The Recommended Project covers 2.4 miles of Telegraph Avenue, from 20th Street to 57th Street. As such, implementation of the project will be phased and coordinated with opportunities to leverage planned and budgeted roadway improvements. This Plan anticipates that phasing will be divided into two parts: 20th Street to 38th Street, and 38th Street to 57th Street. Cost estimates are similarly divided. While these are described as phases, given likely funding constraints each phase will likely be implemented through a series of construction projects overtime.

INTERIM IMPROVEMENTS

As part of the project's phasing, certain improvements could be implemented in an interim format, using temporary and/or movable materials, such as paint and planters. As described in the Typical Details of Recommended Project section of this Plan, these may include the construction of corner bulb-outs and median refuges with paint on the roadway surface and movable planters to provide separation from pedestrian zones and vehicle zones. Use of interim treatments would require a maintenance agreement with a local organization to ensure appropriate maintenance (e.g., sweeping, watering of plants), as City maintenance budgets could not cover these costs.

Decisions about the extent of interim improvements would be influenced by available design and construction budget and maintenance agreements. Which specific locations would get permanent improvements should be based on further assessment of the usefulness of specific improvements in terms of safety and the number of users that would benefit. Should measuring specific traffic, pedestrian, bicycle, and/or transit rider activity not be feasible at the time of detail design, best estimates of activity based on an understanding of activity generators (i.e.; commercial, restaurant, civic, medical, or other uses) and a review of accident records should be done to establish which permanent improvements should be made first.

PHASE I: 20TH STREET TO 38TH STREET

The initial phase for the project is planned to be 20th Street to 38th Street. This portion of the Recommended Project will benefit from already planned and budgeted roadway resurfacing between 16th Street and 27th Street. Table 12 provides a summary of estimated costs for the Recommended Project. The actual implementation cost will vary based on a number of factors, including but not limited to final designs, extent of required roadway resurfacing, whether permanent or interim format elements are specified, utilities relocation, and fluctuations in labor and materials costs. Costs could be reduced by increasing the extent of interim paint and planters improvements which should be determined in the next round of project design and development. Given the need for interim improvements, a continued effort will need to be undertaken to identify further funding for subsequent construction projects to lead to full implementation of this segment of the project from 20th Street to 38th Street, and possibly projects that include both phasing segments.

Table 12: Cost Estimate for Phase I – 20th Street to 38th Street

ELEMENT	NUMBER	ESTIMATED SUBTOTAL
Bulb-out (Permanent) (Including 10 stormwater planters)	33	$1,008,000
Bulb-out Mid-block (Permanent) (Including 3 stormwater planters)	5	$86,000
Bulb-out Mid-block T (Permanent) (Including 3 stormwater planters)	3	$100,000
Median Refuge Nose (Permanent)	20	$25,000
Bulb-out (Paint and Planter)	30	$111,000
Transit Island (Permanent)	10	$731,000
Lighting Relocation	21	$103,000
Pedestrian Open Space – 22nd Street	NA	$88,000
Roadway Resurfacing	NA	$1,445,000
Roadway Striping	NA	$225,000
Signals – New and Upgraded	NA	$339,000
Landscape Maintenance	NA	$75,000
Contingencies, Contractor, Design, etc.	NA	$4,336,000
TOTAL COST ESTIMATE – 20th Street to 38th Street		**$8,649,000**

PHASE II: 38TH STREET TO 57TH STREET

The subsequent phase of implementation is planned to be 38th Street to 57th Street. Table 13 provides a summary of estimated costs for the Recommended Project. The actual implementation cost will vary based on a number of factors, including but not limited to final designs, extent of required roadway resurfacing, whether permanent or interim format elements are specified, utilities relocation, and fluctuations in labor and materials costs. Costs could be reduced by increasing the extent of interim paint and planters improvements which should be determined in the next phase of project development.

Later improvements can be made to further enhance the initial set of improvements, such as upgrades to paint and planters elements or replacement with full permanent improvements.

Table 13: Cost Estimate for Phase 1 – 38th Street to 57th Street

ELEMENT	NUMBER	ESTIMATED SUBTOTAL
Bulb-out (Permanent) (Including 10 stormwater planters)	33	$1,036,000
Bulb-out Mid-block (Permanent) (Including 2 stormwater planters)	3	$57,000
Bulb-out Mid-block T (Permanent) (Including 4 stormwater planters)	3	$100,000
Median Refuge Nose (Permanent)	16	$20,000
Medians (Permanent)	6	$543,000
Bulb-out (Paint and Planter)	20	$74,000
Transit Island / Bus Bulb (Permanent)	8	$585,000
Lighting Relocation	21	$103,000
Pedestrian Open Space – Claremont Ave	NA	$46,000
Pedestrian Open Space – Kasper's Korner (Including large scale stormwater planter)	NA	$250,000
HWY-24 Replacement Parking Lot (Including pervious drainage zones)	NA	$325,000
Roadway Resurfacing	NA	$2,372,000
Roadway Striping	NA	$225,000
Signals – New and Upgraded	NA	$1,804,000
Contingencies, Contractor, Design, etc.	NA	$7,305,000
TOTAL COST ESTIMATE – 38th Street to 57th Street		**$14,845,000**

NO
LEFT
TURN