

Adams Street & Kains Avenue Traffic Calming & Bikeway Study



November 2017

Prepared for:

City of Albany, California

Prepared by:



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1. Introduction

In 2012, the City of Albany, California adopted the Albany Active Transportation Plan (ATP), which included an update to the Bicycle Master Plan and the development of the first Pedestrian Master Plan. The plan recommended 27 bike and pedestrian projects aimed at making Albany become a more environmentally friendly and sustainable community.

Two of the proposed bicycle projects (Projects 6 and 10 in the ATP) involved the implementation of bicycle boulevards on Kains Avenue and Adams Street. Kains and Adams are one-way streets; Kains is southbound from Brighton to Marin, and Adams is northbound from Buchanan to Clay. To designate them as bicycle boulevards, bi-directional traffic circulation would have to be allowed within every block, with potential one-way exit and access through partial barriers and regulatory signage at intersections. Upon adoption of the ATP, residents of the subject streets expressed concern that this configuration would be confusing to people who do not live on these streets and that it would create safety problems. Due to these concerns, the City Council requested further analysis and evaluation of additional design options suitable for bicycle facilities on one-way streets.

In a regional context, the Bicycle Plans for the Counties of Alameda and Contra Costa include the implementation of a bicycle route that connects central Richmond to the Oakland Waterfront. This route is known as Alameda County Bicycle Route 5. The route crosses several cities and each jurisdiction has implemented its segment of this route, respectively. In Albany, there is a gap in this regional bike connection and Adams would be the preferred alignment to close this existing gap. If plans are adopted and depending on the type of improvements and their cost, the City may include the Kains and Adams bicycle facility projects in the next Capital Improvement Plan (CIP) update.

Parisi Transportation Consulting (Parisi) assisted the City with assessing potential configurations for Kains and Adams. The project scope of work included community outreach with a kickoff meeting and site audit, research on potential treatments to address the observed circulation conditions, and development of potential conceptual designs.

The next section of this report, Chapter 2, summarizes the conditions recorded during two community meetings held in June 2017. Chapter 3 presents potential treatments to address issues with vehicular traffic. Chapter 4 presents potential roadway configurations that could accommodate two-way bicycle traffic. Chapter 5 presents draft corridor conceptual designs for Kains Avenue and Adams Street.

2. Existing Conditions – Issues and Opportunities

This chapter summarizes Parisi Transportation Consulting's review of potential opportunities and issues to provide traffic calming and bicycle facilities along Kains Avenue and Adams Street. As an initial task, community member observations were collected during a June 15, 2017 public meeting and community walk audits held on June 24, 2017. Based on the information collected, the analysis identifies the pedestrian, bicycle and vehicular circulation patterns, conflict "hot-spots", and physical limitations that could either constrain or be addressed by potential bikeways.

Parisi's initial findings on potential design elements was presented to the community at another public meeting held on October 4, 2017. Residents' reception to the design elements were recorded and used to formulate the recommended corridor designs.

A. COMMUNITY MEETING, JUNE 15, 2017

City and Parisi staff hosted a community meeting on June 15, 2017 at the City of Albany Council Chambers to collect community members' feedback on existing issues along Kains Avenue and Adams Street. The kick-off meeting was attended by approximately 30 Albany residents, most who live along either Kains Avenue or Adams Street. Parisi began the meeting with a presentation about existing conditions along the corridors. Attendees were given the opportunity to provide their spoken feedback during the meeting or via written comment on a large-scale printout of the corridors' aerial photo. The direct meeting notes are provided in Appendix A.

The community's comments generally fell into one of five themes:

1. Traffic issues along the Kains and Adams corridors,
2. Traffic issues at intersections,
3. Issues related to on-street parking,
4. Questions on the need for a potential bicycle facility, and
5. Questions on the design of a bicycle facility.

High-speed traffic and cut-through traffic diverting from San Pablo Avenue were frequently mentioned as key traffic issues along the Kains and Adams corridors. Attendees mentioned that the traffic speeds along these one-way streets seemed to be greater than on parallel two-way streets of the same widths, and that cut-through traffic occurs frequently during the morning and afternoon commute peak periods. Other issues mentioned included wrong-way traffic on the one-way streets, including bicycle traffic; localized congestion near the 900 block of Kains Avenue at the YMCA; and large vehicles regularly blocking the street. Potential solutions

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suggested by community members included lower speed limits, traffic enforcement, and speed bumps.

Several commenters mentioned the difficulty in crossing intersections because the side street approaches are generally not subject to STOP sign control. Their concerns included the high speed of approaching vehicles, especially those coming from San Pablo Avenue, and vehicles parked on the side streets that obstruct drivers' sight lines of oncoming vehicles.

Residents of the Kains and Adams corridors mentioned that cars parked on the street tend to obstruct their view as a driver when navigating out of their driveway onto the street; this included obstructing their view of bicyclists on the street. Others stated that parked cars occasionally encroached into their driveway. Some commenters hypothesized that the high demand in curbside parking was due to employees of businesses located along San Pablo Avenue, and suggested a residential parking permit program to reduce non-resident parking along the street.

Among the comments not related to existing traffic issues, there was a mix of support and rejection for bicycle facilities along Kains and Adams. Several commenters mentioned their discomfort with bicycling along San Pablo Avenue and their desire for lower speed and lower vehicle-trafficked facilities. Others meeting attendees expressed their concern on whether a bikeway would negatively impact their street and questioned what the anticipated bicycle use would be on the potential bikeways. A couple of commenters asked whether the bikeways could be moved to Stannage Avenue and Madison Street, which are parallel and both currently two-way streets. Some commenters mentioned that they observed bicyclists riding against traffic, not stopping at stop signs, and riding on the sidewalk.

Although the meeting was framed to discuss existing issues, community members posed several questions about the roadways' ability to accommodate a dedicated bike lane, given their limited width (approximately 30 feet between the curbs). There were several questions about how converting Kains and Adams to two-way street could effect on-street parking, whether the two-way configuration could slow traffic, and how the intersections could be reconfigured. Commenters' suggestions for the bikeway design included physical separation, green lane markings, and traffic calming features.

B. COMMUNITY WALK AUDIT, JUNE 24, 2017

City and Parisi staff walked with community members along Kains Avenue and Adams Street on the morning of June 24, 2017 to inspect and identify potential issues and opportunities related to traffic and a potential bikeway. The walk audit attendees split into two groups, one focusing primarily on Kains Avenue and another group focusing on Adams Street. Each group was hosted by one City staff member and one Parisi staff member. The audits lasted about three hours. The direct notes are provided in Appendix B. Photos taken during the walk audit are provided in Appendix C.

1. TRAFFIC CALMING

Current prevailing traffic speed was a consistent concern for walk audit attendees. Both Kains and Adams were described as busy and high-density residential streets, and attendees expressed their concern about fast-moving traffic making them feel uncomfortable for themselves and their families. Some attendees asked how speeds compared to the two-way streets adjacent to Kains and Adams and mentioned their interest in speeds bumps or other traffic calming devices to slow traffic. Some attendees said that converting the streets to two-way traffic or installing bicycle facilities could be beneficial for speed reduction and traffic calming.

Walk audit attendees made note of intersections where they felt protected and less protected from oncoming traffic. Audit attendees noted that traffic turning from San Pablo Avenue and then passing through Adams and Kains seem to travel at higher-than-desirable speeds. Conversely, side street traffic approaching San Pablo Avenue intersections with traffic signals were observed accelerating toward the intersection to catch the traffic signal green light phase.

The intersection of Adams and Solano was lauded for having curb and sidewalk bulb-outs to help pedestrian crossings. The bulb-outs also served to restrict parking near the corners, which improved drivers' ability to see oncoming traffic from Solano Avenue. However, attendees noted that the signage indicating the Adams Street is one way was not clear for drivers approaching from Solano Avenue. For instance, the ONE-WAY signs were mounted much higher than drivers' line of sight and the street lacked directional arrow pavement markings. At other intersections, a typical complaint was vehicles parked at the corners impeding drivers' view of approaching pedestrians, and vice versa. While most intersections had marked crosswalks, they were missing at some locations, including the Adams Street / Buchanan Street intersection.

Potential improvements suggested by the group included moving side-street stop signs from Stannage to Kains, and from Madison to Adams, to slow traffic moving to and from San Pablo Avenue. Pavement marking arrows were noted as useful in enforcing one-way traffic on Kains and Adams. Red curb markings were frequently suggested to prohibit parking encroachment into the intersection.

2. PARKING

Residents noted high parking demand on both Kains Avenue and Adams Street that they attributed to dense residential development, as well as non-residential or local employee parking. Where parking "T" striping was present, residents generally noted that they were helpful in delineating proper parking position. Attendees noted that red curb areas seemed to be irregularly enforced by City parking officers.

One attendee asked how curbside parking would be arranged if two-way parking were allowed on Kains and Adams, but if the street had partial blockages preventing traffic from entering from one direction.

3. BIKEWAY DESIGN

Comments related to bikeway design along Kains and Adams generally centered around three topics:

- the residents' expectations for bicycle traffic,
- their ability to see oncoming bicycle traffic, and
- potential design details.

One resident mentioned that she nearly collided with a bicyclist traveling in the opposite direction of traffic when pulling out of her driveway. Several other residents described their difficulty seeing oncoming traffic traveling in the legal direction, and mentioned their concern about a potential change to two-way traffic.

A couple of residents took it upon themselves to mark out a "contraflow" bicycle facility on each street, using temporary tape. The markings consisted of existing parking (7 to 7.5 feet on each side of the street), a 5 to 5.5-foot bicycle lane in the opposite direction of the existing one-way traffic on Kains and Adams, and the remaining 10.5 to 11 feet for vehicular traffic.

Nearly all residents mentioned the need for education and public outreach prior to any potential change to the traffic patterns on Kains and Adams, since the streets have existed in their current configuration for several decades.

C. COMMUNITY MEETING, OCTOBER 4, 2017

Parisi and City staff presented their findings on the observed conditions along Kains and Adams on October 4, 2017. A "toolkit" of potential improvements and conceptual cross-sections was also presented to gauge residents' reception (Chapters 3 and 4).

Residents were generally supportive of providing traffic calming measures on their streets. Meeting attendees did, however, express their concerns about parking loss resulting from any potential improvements. Several residents were concerned about recommended changes to

the stop control at intersections and some mentioned their opposition to two-way traffic on Kains and Adams due to the narrow roadway. Many residents offered that traffic calming would help improve safety for all users, including bicyclists, with or without designated bicycle facilities included.

D. EXISTING TRAFFIC SPEEDS

During the June 15, 2017 public meeting, several residents asked about whether there are differences in traffic speed between Kains and Adams’s one-way segments and speeds on parallel, two-way streets. In response, the City’s speed survey data for Kains Avenue, Madison Street and Stannage Street collected between 2009 and 2017 was reviewed. There was no recent speed survey data for Adams Street (Table 1).

Table 1 Adams, Kains, Madison and Stannage Speed Survey Data

Street / Block	Avg Speed (mph)	85th %ile Speed (mph)	Max Speed (mph)	Average Daily Traffic	Dates Sampled
Adams Street – 700 block	21.7	27.3	43.4	650	T 09/26/17 – Th 09/28/17
Kains Avenue					
400	19.2	23.0	34.2	1200	T 9/9/14 - Th 9/11/14
500	20.5	25.5	41.7	500	F 10/10/14 - Th 10/16/14
600	20.7	25.7	42.1	600	W 04/19/17 - Th 04/27/17
1000	20.8	26.8	50	1000	Th 05/4/17 - Th 05/11/17
Madison Street					
600	19.9	25.0	41	500	T 08/25/09 - Su 08/30/09
700	21.8	27.1	40.8	500	T 09/26/17 - Th 09/28/17
Stannage Avenue					
800	20.2	26	41	900	Th 07/09/15 - Th 07/16/15

Source: City of Albany, CA, 2009-2017

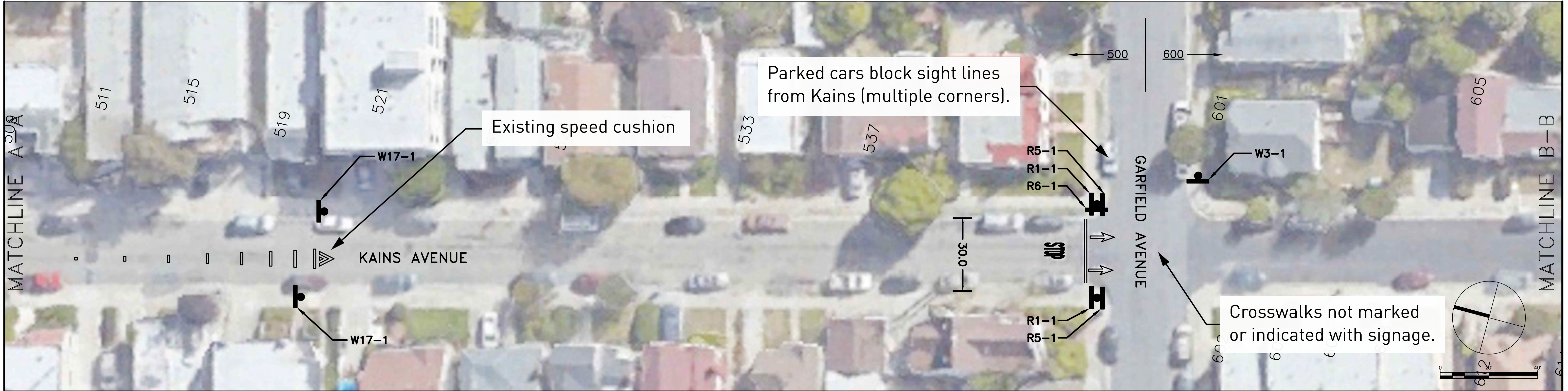
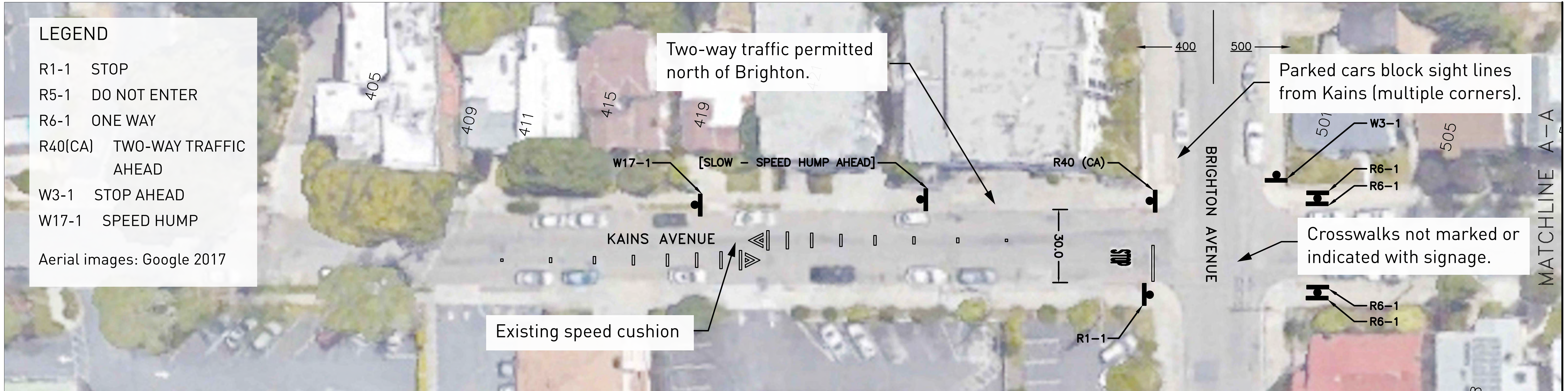
The average vehicular traffic speed on Adams Street, Kains Avenue, Madison Street, and Stannage Avenue were all within 2 MPH of 20 MPH, and the 85th percentile speed within 2 MPH of 25 MPH. The 85th percentile speed is used to set the posted speed limit, with an allowance of 5 MPH higher or lower. Madison Street had the highest observed average speed (21.8 MPH). Adams Street had the highest observed 85th percentile speed (27.3 mph). Among the various segments of Kains Avenue measured, the two-way 1000 block had the highest 85th percentile speed (26.8 MPH). There was no consistent difference between the two-way and one-way segments, and no consistent difference between Kains Avenue, Adams Street and the other streets.

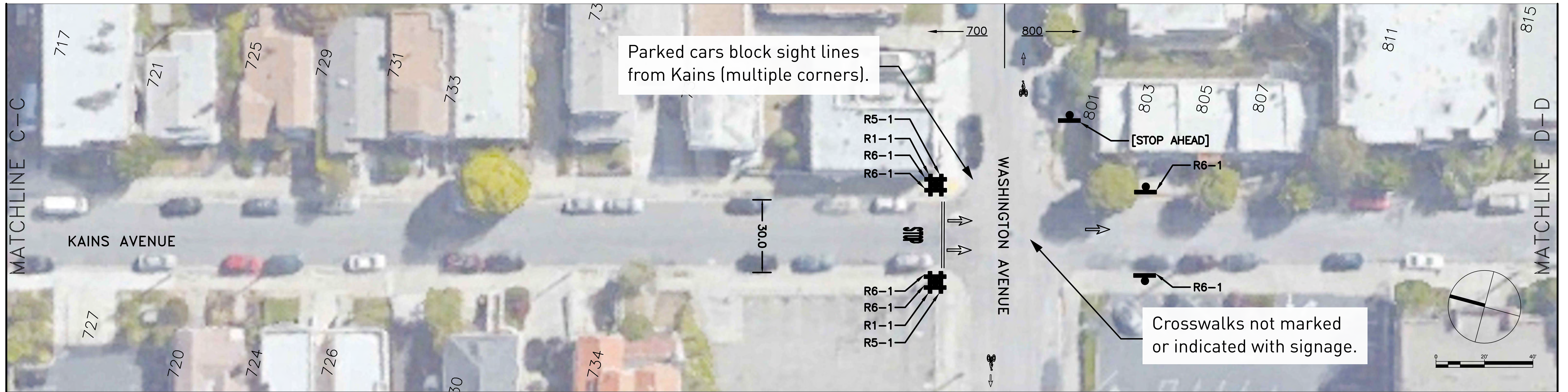
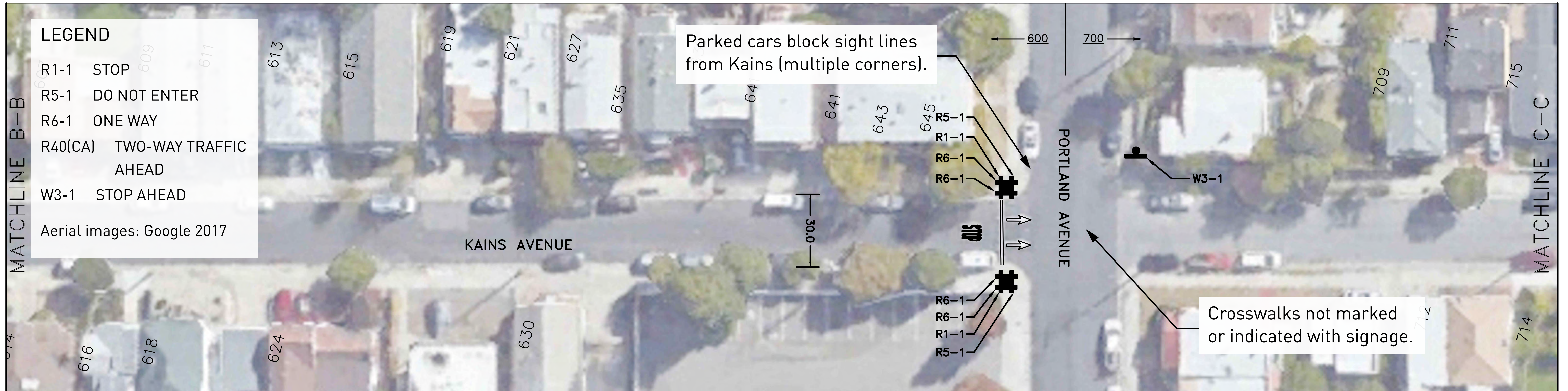
Kains Avenue and Adams Street both had the highest maximum observed speeds between the four sampled streets. The 700 block of Adams Street had a maximum speed of 43 mph. Three out

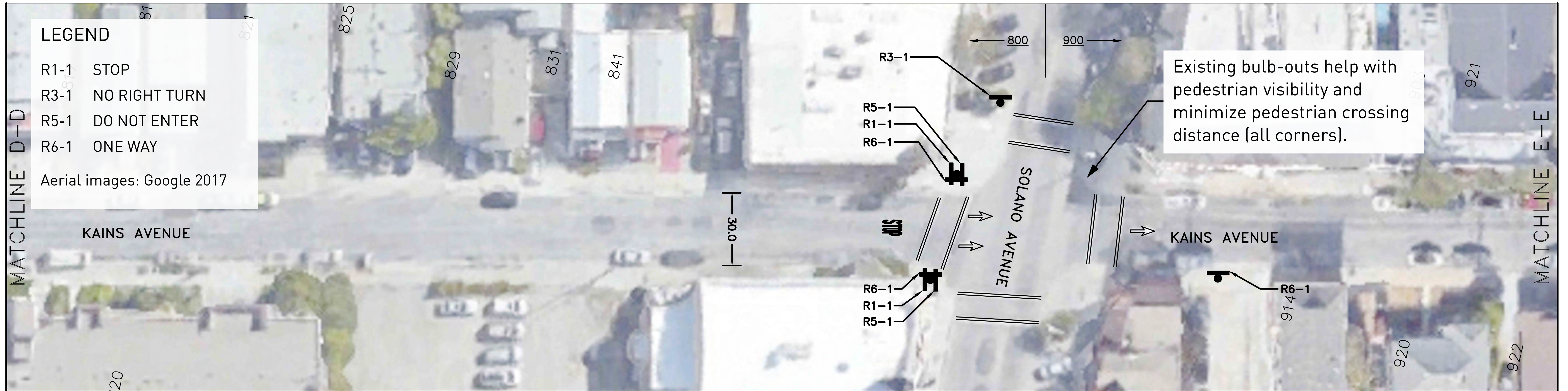
of the four sampled blocks of Kains Avenue had maximum speeds higher than 40 mph, with the 1000 block at 50 mph.

E. EXISTING CONDITIONS SUMMARY MAPS

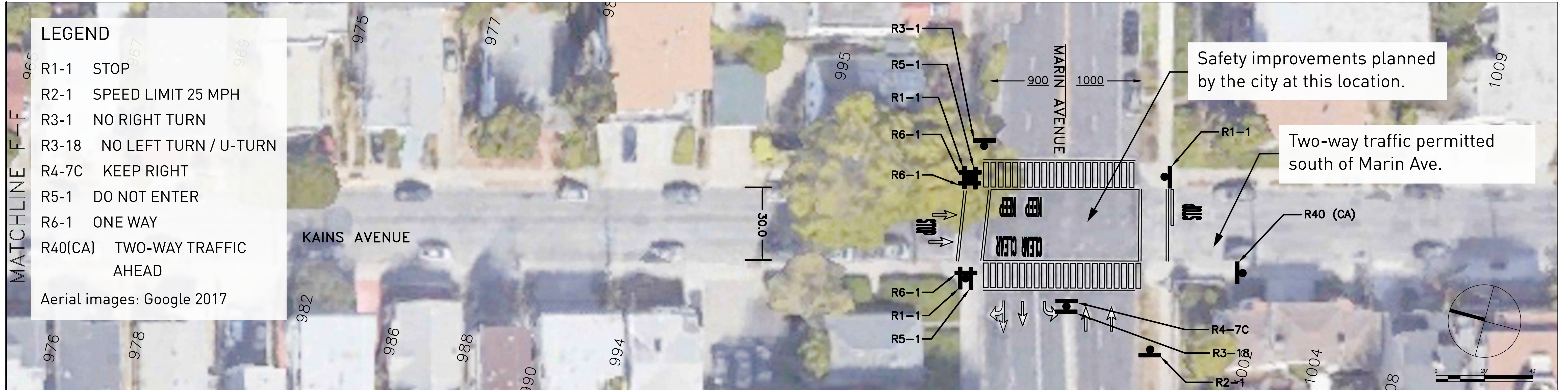
Figure 1 presents existing conditions maps that illustrate each street's existing signage and pavement markings. The maps also identify challenging locations mentioned by community members during the community meeting and walk audit.



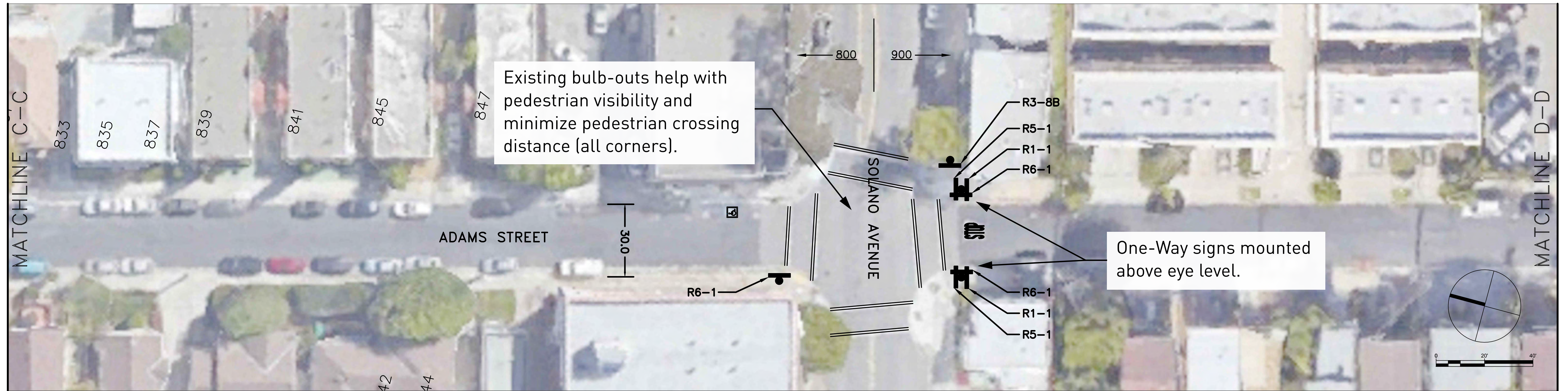
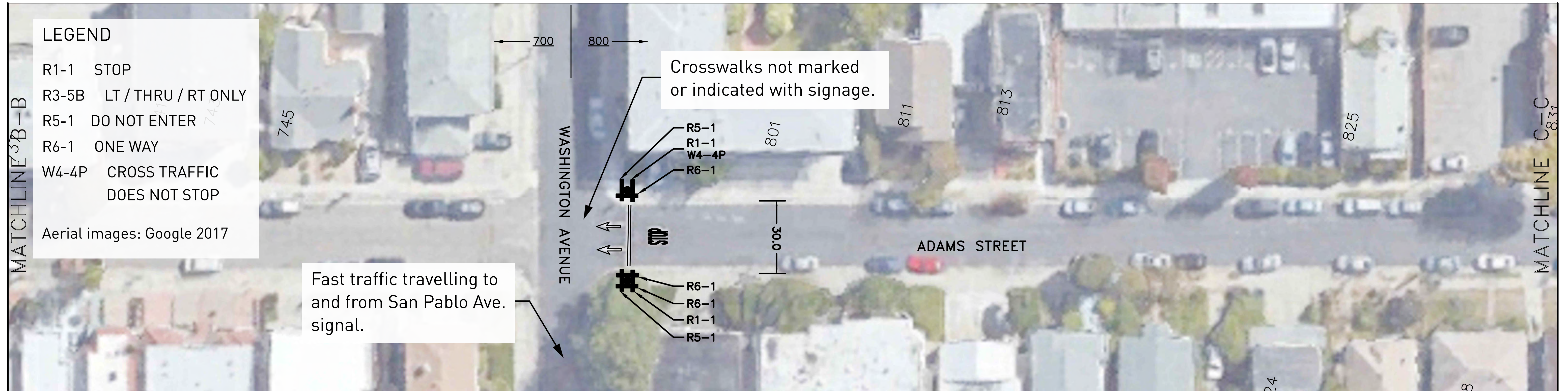




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Kains Avenue Existing Conditions Assessment (Sheet 3)









3. Traffic Calming Toolkit

Although this study was initially conceptualized as a bikeway feasibility study, based on community input it became clear that neighbors would like to see reduced traffic volumes and/or lower travel speeds on their streets before or at the same time any bikeway facilities were provided. Therefore, the following section presents traffic calming measures that could be considered as countermeasures to the issues observed on Kains Avenue and Adams Street. Some of the measures could be implemented with bikeway improvements or independently. Measures are grouped between those applied at intersections and at midblock locations.

A. INTERSECTION IMPROVEMENTS

1. CORNER RED CURB / DAYLIGHTING

Recommended application – For streets with on-street parking, designate no parking zones with red curb paint within minimum 20 feet of the near-side intersection approach and within a minimum of 10 feet of the far-side intersection approach.

Purpose – Increase sight distance at intersections for all modes of traffic. Increase awareness and safe crossing by pedestrians, bicyclists, and motorists. Increase reaction times and decrease stopping distances for all modes of traffic.

Existing installations – Buchanan at Adams (westbound), Washington at Adams (eastbound)

Potential treatment location – At streets intersecting Kains and Adams with on-street parking permitted at the corners.

Potential impacts – Parking loss with new designated No Parking zones, between two and four spaces per block.

References: FHWA (2014) [Bikesafe 2014 Bicycle Safety Guide and Countermeasure Selection System](http://pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=19). http://pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=19



Figure 2 Corner Red Curb

NE corner of Buchanan Street / Adams Street, Albany, CA. Image: Google, 2017.

2. CURB RADIUS REDUCTION / PAINTED BULB-OUTS

Recommended application – For streets with on-street parking, designate bulb-out zones (maximum six feet from the face of curb) with on-street edge line markings, raised delineators, and colored pavement within the bulb-out area.

Purpose – Reduce pedestrian and bicyclist crossing distance while increasing their visibility to oncoming vehicles. Narrow the roadway to reduce vehicle speeds. Create a tighter curb radius to slow vehicular right turns.

Existing installations –

Raised concrete bulb-out: Solano Avenue at Kains Avenue and Adam Street.

Painted bulb-out: Eighth Street / Virginia Street (Berkeley)

Potential treatment location - At streets intersecting Kains and Adams with on-street parking permitted at the corners, and where drivers have been known to take fast and wide right turns.

Potential impacts – Parking loss with new designated No Parking zones, between two and four spaces per block.

References: FHWA (2014) [Bikesafe 2014 Bicycle Safety Guide and Countermeasure Selection System](http://pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=16). http://pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=16



Figure 3 Painted Bulb-Outs Example

Fulton Street, Berkeley, CA.

3. STOP SIGN MODIFICATIONS

Recommended application – Move STOP sign control from Kains Avenue and Adams Street to the intersecting street when the adjacent intersection with San Pablo Avenue is not signalized.

Purpose – Control traffic traveling to and from San Pablo Avenue with STOP control. Indicate to drivers that they are entering a residential neighborhood. Improve crossing safety for pedestrians, bicyclists and drivers on Kains and Adams.

Existing installations – Kains Avenue / Jones Street (Berkeley).

Additional notes – Improvement can be implemented with corner red curb / daylighting and curb radius reduction / painted bulb-outs.

Potential treatment location – Kains Avenue at Garfield Avenue, Portland Avenue, and Washington Avenue; Adams Street at Castro Street.

References: Caltrans (2014) [California Manual on Uniform Traffic Control Devices](#). Section 2B.06.



Figure 4 Alternate STOP Sign Control Example
Jones St. at Kains Ave., Berkeley, CA.
Image: Google, 2017.

4. MINI-CIRCLES

Recommended application – Install a raised circular island with wayfinding signs and optional landscaping.

Purpose – Control traffic traveling to and from San Pablo Avenue with YIELD control. Indicate to drivers that they are entering a residential neighborhood. Improve crossing safety for pedestrians, bicyclists and drivers on Kains and Adams.

Existing installations – Page Street / Cornell Avenue (Berkeley), Chestnut Street / Hearst Avenue (Berkeley). Proposed along Brighton Avenue in Albany.



Figure 5 Mini-Circle Example
Fulton Street, Berkeley, CA.

Potential treatment location – Kains Avenue / Brighton Avenue, Adams Street at Washington Avenue.

References: FHWA (2014) [Bikesafe 2014 Bicycle Safety Guide and Countermeasure Selection System](http://pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=25). http://pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=25

5. PARTIAL TRAFFIC CLOSURES

Recommended application – Install a raised barrier and sign prohibiting entry by motor vehicles and allowing entry by bicyclists.

Purpose – Reduce instances of wrong-way vehicle traffic on one-way streets, or limit vehicle traffic access on two-way streets. Calm traffic at the intersection.

Existing installations – Russell Street / Wheeler Street (Berkeley)

Potential treatment location – Most Kains Avenue and Adams Street intersections.

References: National Association of City Transportation Officials (NACTO) [Urban Bikeway Design Guide](https://nacto.org/publication/urban-bikeway-design-guide/). Volume Management.

<https://nacto.org/publication/urban-bikeway-design-guide/bicycle-boulevards/volume-management/>



Figure 6 Partial Closure Example
Russell Street, Berkeley, CA.

6. TRAFFIC DIVERSIONS

Recommended application – Install a raised barrier that requires motor vehicles to turn rather than proceeding straight through an intersection.

Purpose – Reduce cut-through traffic on local streets.

Existing installations – Martin Luther King Jr. Way / Channing Way (Berkeley); Ninth Street / Delaware Street (Berkeley)

Additional notes - Residents on the treated street tend to be most negatively affected by traffic diversion.

Potential treatment location – Not currently recommended, but may be considered for further cut-through traffic reduction.

References: FHWA (2014) [Bikesafe 2014 Bicycle Safety Guide and Countermeasure Selection System](http://pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=29). http://pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=29



Figure 7 Traffic Diverter Example
Berkeley, CA. Image: Google, 2017.

7. ALTERNATING ONE-WAY STREETS (VARIANT OF TRAFFIC DIVERSIONS)

Recommended application – Install a raised barrier that restricts vehicle access between blocks. Alternate the direction of one-way traffic. May be implemented with contra-flow bike lanes.

Purpose – Reduce cut-through traffic on local streets.

Additional notes - Residents on the treated street tend to be most negatively affected by traffic diversion.

Potential treatment location – Not currently recommended, but may be considered for further cut-through traffic reduction.



Figure 8 Partial Closure Example

Image: Nacto.org

References: FHWA (2014) [Bikesafe 2014 Bicycle Safety Guide and Countermeasure Selection System](http://pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=29). http://pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=29

B. CORRIDOR / MID-BLOCK IMPROVEMENTS

1. MARKED PARKING SPACES (PARKING TS)

Recommended application – Delineate parking spaces to reduce instances of driveway blocking and crowding.

See Figure 10 for the parking detail currently used on Adams Street.

See Figure 11 for a proposed parking detail. The proposed design would encourage drivers to center their vehicle in the marked space and provide greater visibility to drivers pulling out of adjacent spaces.

Purpose – Increase sight distance for drivers pulling into and out of residential driveways. Improve safety for pedestrians, bicyclists and other drivers.

Existing installations – 900 block of Adams Street

Potential treatment location – Segments of Kains Avenue and Adams Street where parking demand is high and driveway crowding / block is an issue.

Potential impacts – Striping designated parking spaces will likely reduce the overall number of parking spaces on the street by approximately two to four spaces per block.

The City may allow on-street parking by residents in front of their residential driveways. Parking enforcement will be needed to ensure driver compliance with parking Ts.

The City should adopt a policy to allow left-side parking if a contraflow bikeway concept or two-way traffic concept is pursued.

References - Caltrans (2014) California Manual on Uniform Traffic Control Devices. Section 3B.19.



Figure 9 Painted Parking Ts Example

900 block of Adams Street, Albany, CA
Image: Google 2017

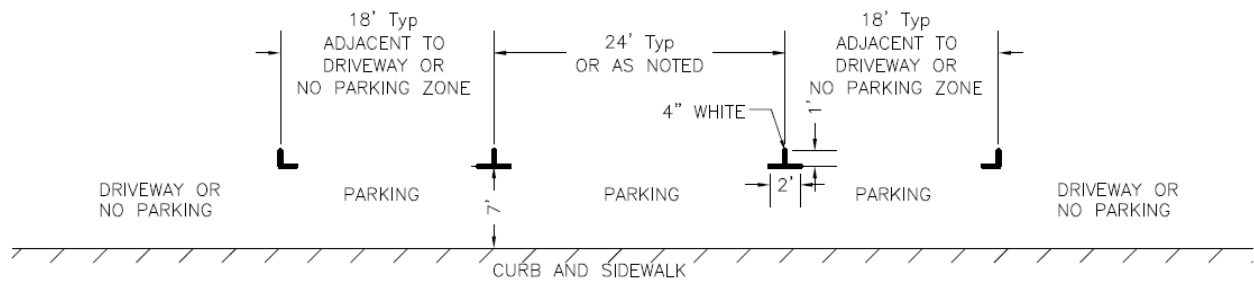


Figure 10 Existing Parallel Parking Detail

The existing parking detail shown in Figure 10 provides 18 feet when the parking space is adjacent to a driveway or no parking zone. The parking maneuver is easier to perform because there is at least one side that does not have an obstacle, e.g., another parked car. Spaces located between two adjacent parking spaces are provided 24 feet to perform the more difficult parallel parking maneuver.

Marking parking spaces per the detail shown in Figure 10 would reduce the number of potential parking spaces by approximately two to three spaces per side, per block, when compared to an unmarked condition where drivers park with little to no gaps between vehicles.

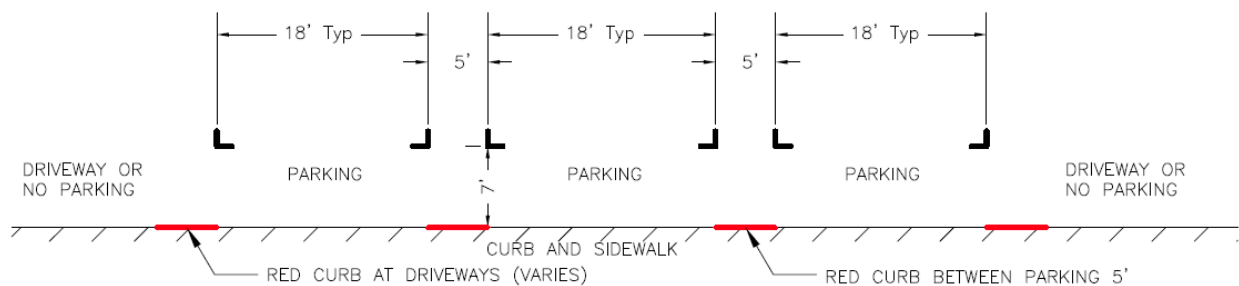


Figure 11 Proposed Parallel Parking Detail

The proposed parallel parking detail shown in Figure 11 provides 18 feet for spaces located adjacent to driveways or No Parking zones. However, it requires an additional five feet between parking spaces. The additional space is designed to provide a setback between cars so that drivers maneuvering out of the curbside space are afforded more room and better visibility of the street.

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Marking parking spaces per the detail shown in Figure 11 would further reduce the number of potential parking spaces compared to the arrangement shown in Figure 10 by approximately two to three more spaces per side, per block.

The proposed parallel parking detail is an optional element for three of the concepts presented in Chapter 5: Concept 1A (Traffic Calming), Concept 1B (Traffic Calming with Lane Lines) and Concept 3 (Traffic Calming with Two-Way Traffic). The proposed parallel parking detail is a recommended element for Concept 2 (Traffic Calming with Contra-Flow Bike Lane) due to bicyclists riding near cars parked opposite the bicyclists' direction of travel.

2. SPEED HUMPS / SPEED CUSHIONS

Recommended application – Install raised speed hump or speed cushion that allows vehicular traffic to pass over at 15 to 20 mph. Speed humps should not be confused with speed bumps found in parking lots, which have a much lower design speed.

Purpose – Decrease vehicular speeds along the corridor, especially instances of excessive speed.

Existing installations – 400 and 1200 blocks of Kains Avenue (Albany, Berkeley).

Additional notes – Traffic noise due to the speed hump or speed cushion will be most noticeable for residents adjacent to the installation. Speed humps are a device of last resort and other traffic calming solutions should be considered first.

Potential treatment location – Midblock locations along Kains Avenue and Adams Street.

References: FHWA (2014) [Bikesafe 2014 Bicycle Safety Guide and Countermeasure Selection System](http://pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=29). http://pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=29



Figure 12 Speed Hump Example

1200 block of Kains Avenue, Berkeley, CA.

Image: Google 2017

3. TWO-WAY YIELD STREET

Recommended application – Permit two-way travel on Kains Avenue and Adams Street. Modify signage and pavement markings to indicate two-way traffic.

Purpose – Decrease vehicular speeds along the corridor by requiring two-way vehicle traffic to yield when passing in opposite directions. Calm traffic to improve pedestrian and bicycle safety.

Existing installations – Stannage Avenue and Madison Street (Albany).

Potential treatment location – All segments of Kains Avenue and Adams Street if implementing a shared street bikeway.

References: National Association of City Transportation Officials (NACTO) [Urban Bikeway Design Guide](https://nacto.org/publication/urban-street-design-guide/streets/yield-street/). Yield Street. <https://nacto.org/publication/urban-street-design-guide/streets/yield-street/>

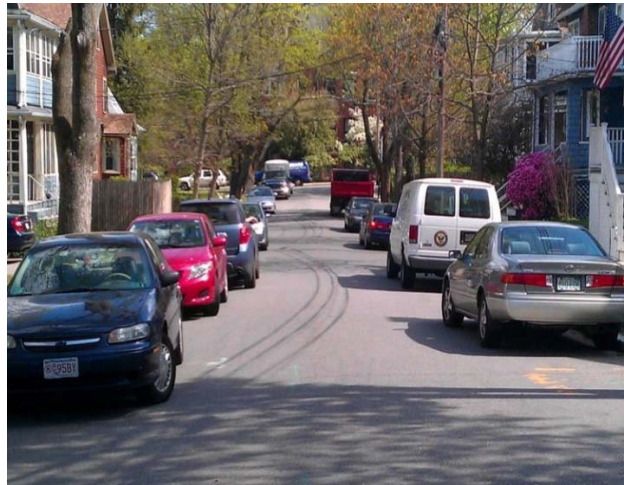


Figure 13 Two-Way Yield Street
Image: NACTO.org

4. LANE NARROWING

Recommended application – Paint lane markings to provide a 10-foot wide vehicle lane. Redistribute the additional space to bike lanes or parking lanes.

Purpose – Decrease vehicular speeds along the corridor by narrowing the vehicle right of way. Calm traffic to improve pedestrian and bicycle safety.

Existing installations – Marin Avenue (Albany).

Potential treatment location – All segments of Kains Avenue and Adams Street if implementing a contra-flow bikeway. See Section 4.A.2..

References: FHWA (2014) [Bikesafe 2014 Bicycle Safety Guide and Countermeasure Selection System](http://pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=10). http://pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=10.



Figure 14 Lane Narrowing with Bike Lanes

Image: FHWA.dot.gov

4. Potential Bikeway Cross-Sections

As noted in the introduction of this report, the initial objective of this study was to study potential improvements that would allow for bidirectional bicycle traffic on Kains Avenue and Adams Street. To allow two-way bicycle traffic on each street, there are two primary options:

1. Bike boulevard option, where bicycles share the road with vehicular traffic. Two-way bicycle traffic may occur without a dedicated bike lane only if two-way vehicular traffic is also allowed.
2. Bike lane option, where bicycles are provided a dedicated bike lane measuring at least five feet wide in at least one direction. If maintaining one-way traffic, bicycle traffic in the opposing direction may be allowed with a “contra-flow” bike lane.

The width of the streets and the demands for that width are their major constraints when considering potential bikeways. Both Kains Avenue and Adams Street are 30 feet wide between curbs. There is currently on-street parking on both sides (seven feet each side), which leaves 16 feet width for vehicular travel. One-way vehicle lanes are typically between nine and 12 feet wide. Bike lanes adjacent to parked vehicles must be at minimum five feet wide.

Figure 15 presents a map of all streets that have the same 30-foot curb-to-curb width as Adams Street and Kains Avenue, for comparative purposes.

The following section presents potential cross-sections that could accomplish the goal of allowing two-way bicycle traffic on the street. The cross-section refers to roadway widths allocated between vehicular travel lanes, bikeways and on-street parking. Each cross-section can be implemented with the traffic calming measures presented in the previous chapter or independently.

There are several other cross-sectional options that greater degrees of separation between bicycles and motor vehicles. Each would require a substantial amount of parking removal and are not considered feasible options, but are presented for informational purposes.

Adams Street & Kains Avenue Traffic Calming & Bikeway Study



Figure 15 City of Albany, California Streets with 30-foot Curb to Curb Width

Image: Google 2017; Parisi Transportation Consulting 2017

A. POTENTIAL CONCEPTS

The following concepts are considered feasible options for providing bidirectional bicycle access given the existing constraints of the Kains and Adams corridors.

1. TWO-WAY SHARED STREET / BIKE BOULEVARD

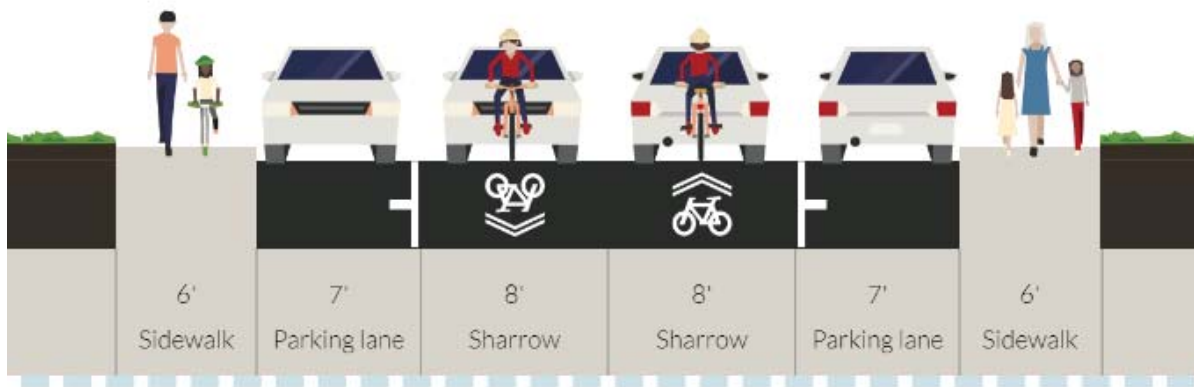


Figure 16 Two-way shared street

Streetmix.com

Potential application

Install shared lane pavement markings (“sharrows”) in both directions. Install signs at intersections and along the route to identify the route as a bike boulevard.

Advantages

- Largely maintains existing parking supply.
- Traffic congestion may calm traffic in areas where speeding is observed.
- Design is identical to parallel corridors with same cross-sectional width.
- Presence of two-way traffic will create the expectation to look both ways when pulling out of driveways (compared to contraflow bike lane)
- Yield streets allow bicyclists and motorists to ride / drive down the center of the street and pull over when encountering an opposing vehicle, rather than constraining to one side of the street.
- Eliminates issues of wrong-way traffic.

Adams Street & Kains Avenue Traffic Calming & Bikeway Study

- Can be combined with traffic calming measures at intersection and midblock

Disadvantages

- Narrow vehicular lane width combined with dense parking demand will create need for oncoming traffic to yield to each other.
- May exacerbate traffic congestion in areas of high demand (e.g., YMCA).
- May create impassible situations with oncoming large vehicles.
- With access restrictions at intersections, drivers will likely park on the left side of the street, rather than making a U-turn to park on the right. The driver of a vehicle parked on the left side of the street will have reduced visibility of oncoming traffic being positioned farther away from the traffic lane.

Anticipated bicycle use / bicycle position

- A bicyclist riding in the center of the street when there are no oncoming vehicles would be 14 to 15 feet from the nearest face of curb, and 7-8 feet from a parked car.
- Allows side-by-side riding.

Curbside parking consideration

- California Vehicle Code Section (CVC) 22502 mandates that motor vehicles park with their right-hand wheels next to the right-hand curb, i.e., parking on the left side of a street against oncoming traffic is not allowed.
- With a transition to two-way traffic, the City may establish a special parking regulation allowing left-side parking on a two-way street (CVC 22503.5). If allowed, the driver of a vehicle parked on the left side of two-way street will be positioned on the left side, and will have reduced visibility of oncoming bicyclists and vehicles compared to parking on the right side of the street.

References: National Association of City Transportation Officials (NACTO) [Urban Bikeway Design Guide](https://nacto.org/publication/urban-bikeway-design-guide/bicycle-boulevards/). Bicycle boulevards. <https://nacto.org/publication/urban-bikeway-design-guide/bicycle-boulevards/>

2. CONTRA-FLOW BIKE LANE STREET

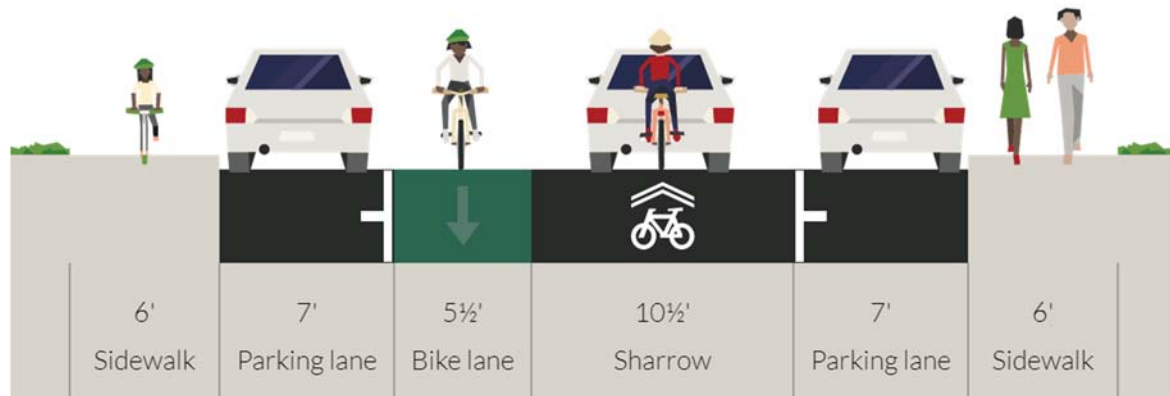


Figure 17 Contra-flow Bike Lane Street

Streetmix.com

Potential application

Install a dashed yellow line to separate the contra-flow bike lane from the oncoming shared lane. Install bike lane symbol and arrow markings to define the bike lane direction. Install shared lane pavement markings (“sharrows”) in the shared lane. Install signs at intersections and along the route to inform drivers of two-way traffic.

Advantages

- Allows street to maintain existing one-way vehicular circulation pattern.
- Narrowed vehicular lane may calm traffic
- Can be combined with traffic calming measures at intersection and midblock

Disadvantages

- Bicyclists are placed in a position where drivers on the street and pulling out of driveways do not expect to see them.
- Special consideration should be given before implementing contra-flow bike lanes adjacent to parking. Cars entering and exiting the parking lane will be maneuvering head-on with oncoming bicyclists.
- The driver of a vehicle parked adjacent to a contra-flow lane will be positioned on the left side, and will have reduced visibility of oncoming bicyclists when compared to

parking adjacent to a with-flow bike lane. Figure 18 illustrates a potential conflict where “the driver of car (b), exiting the parking spot, is on the curb side and may not see car (a) or the bicyclist. Car (a) prevents the bicyclist from merging out of the bike lane to avoid car (b).”¹

- On-street parking would need to be reduced to enable adequate sight lines for the driver when pulling into oncoming bicycle traffic.
- Contra-flow bike lanes are not recommended where there are many intersecting driveways.

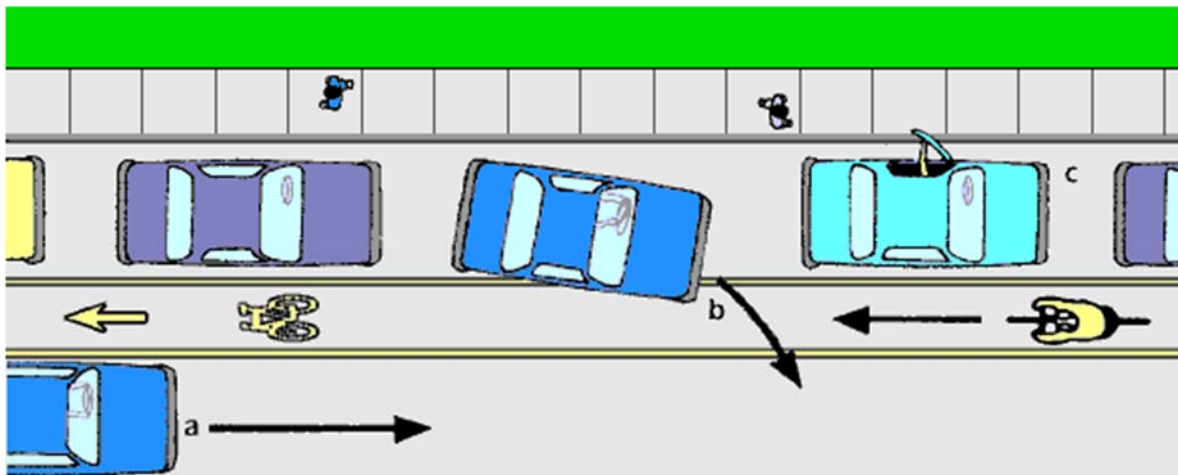


Figure 18 Issues with a Contraflow Bike Lane Adjacent to Parking

Source: <http://www.bikexprt.com/bikepol/facil/lanes/contraflow.htm> (John S. Allen)

Anticipated bicyclist use / bicycle position

- A bicyclist riding at the left edge of the contra-flow lane would be 11 to 12 feet from the nearest face of curb and 4-5 feet from a parked car.
- Facility width does not allow side-by-side riding

References: National Association of City Transportation Officials (NACTO) [Urban Bikeway Design Guide](https://nacto.org/publication/urban-bikeway-design-guide/bike-lanes/contra-flow-bike-lanes/). Contra-flow bike lanes. <https://nacto.org/publication/urban-bikeway-design-guide/bike-lanes/contra-flow-bike-lanes/>

FHWA (2014) [Bikesafe 2014 Bicycle Safety Guide and Countermeasure Selection System](http://pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=15). http://pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=15

¹ Allen, John S. (2002) *When does contraflow bicycle travel make sense?* <http://www.bikexprt.com/bikepol/facil/lanes/contraflow.htm>

B. CONCEPTS NOT RECOMMENDED FOR FURTHER CONSIDERATION

The following section presents cross-sections that would allow for bidirectional bicycle traffic, but would require extensive removal or on-street parking, and are therefore not considered feasible.

1. TWO-WAY VEHICLE AND TWO-WAY BIKE LANE.

Advantages

Dedicated right of way for all modes, accomplishes project objective for two-way bicycle traffic.

Disadvantages

Removing on-street parking may increase vehicular speeds.

Fatal flaw

Significant removal of on-street parking



Figure 19 Two-way Street and Two-way Bike Lanes

Image: Streetmix.com

2. TWO-WAY VEHICLE AND TWO-WAY SEPARATED BIKEWAY (CYCLE-TRACK).

Advantages

Dedicated right of way for all modes, accomplishes project objective for two-way bicycle traffic. Provides additional protection to bicyclists with a horizontal buffer.

Disadvantages

Two streams of two-way traffic passing in front of residential driveways. Removing on-street parking may increase vehicular speeds.

Fatal flaw

Significant removal of on-street parking



Figure 20 Two-way Street and Two-way Separated Bikeway

Image: Streetmix.com

3. ONE-WAY VEHICLE AND TWO-WAY SEPARATED BIKEWAY (CYCLE-TRACK).

Advantages

Dedicated right of way for all modes, accomplishes project objective for two-way bicycle traffic. Provides additional protection to bicyclists with a horizontal buffer. Maintains existing vehicular circulation. Narrowed lanes could calm traffic.

Disadvantages

Two streams of two-way traffic passing in front of residential driveways.

Fatal flaw

Significant removal of on-street parking



Figure 21 One-way Street and Two-way Separated Bikeway

Image: Streetmix.com

5. Potential Corridor Designs

The following section presents potential corridor designs for Kains Avenue and Adams Street. The conceptual drawings present one prototypical block with recommended design elements that could be replicated for other blocks on both Kains and Adams corridors.

Concept 1A presents design elements that would calm traffic along Kains and Adams, and address the safety and operational issues observed along the corridor. The design would not provide for two-way bicycle traffic on Kains and Adams.

Concept 1B builds on the Concept 1A traffic calming elements and adds lane striping to narrow the vehicular lanes and further calm vehicle traffic speeds. Similar to Concept 1A, Concept 1B would not provide for two-way bicycle traffic on Kains and Adams.

Concept 2 includes the same traffic calming elements as Concepts 1A and 1B, but adds a contra-flow bike lane, i.e., a bike lane running opposite one-way vehicular and bicycle traffic. Concept 2 has some similarity to Concept 1B in that the contra-flow bike lane would narrow the vehicular traffic lane and further calm vehicle traffic speeds.

Concept 3 includes the same traffic calming elements as Concepts 1A, 1B and 2, and allows two-way bicycle and vehicular traffic on Kains and Adams. Bollards or other physical devices would restrict vehicle travel to the existing predominant direction of traffic (Kains southbound and Adams northbound), but would allow for two-way traffic if vehicles turn around within the block. Concept 3 would allow two-way bicycle travel on Kains and Adams.

Each concept is presented in the figures on the following pages with a discussion of the various design elements and their relative advantages and disadvantages.

A. CONCEPT 1A TRAFFIC CALMING (RETAIN ONE-WAY TRAFFIC)

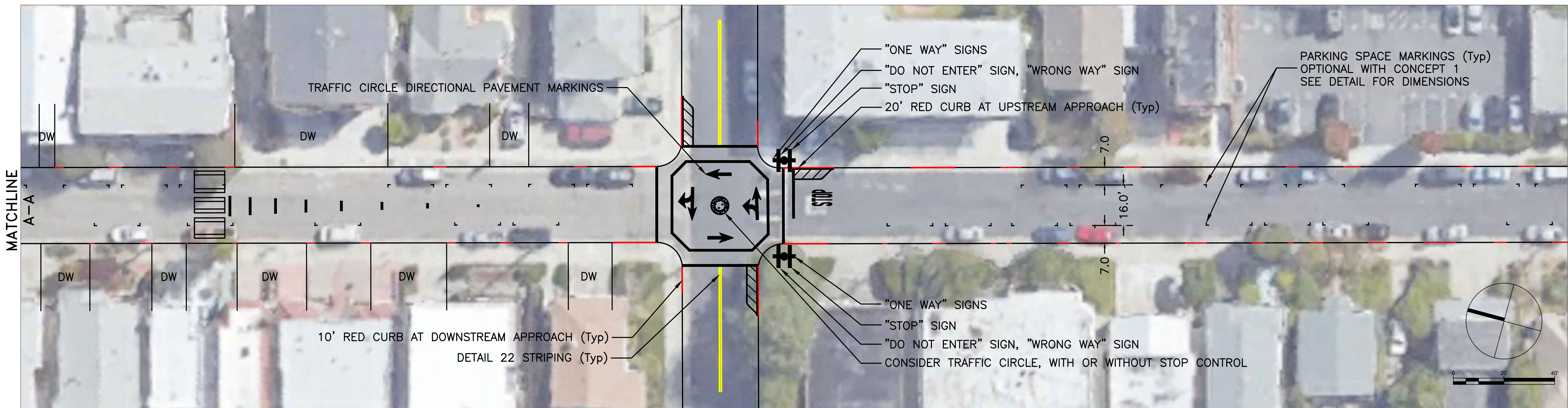
Concept 1A's primary objective is address vehicular traffic issues mentioned by neighborhood residents during the public meetings and walk audit. The design elements would focus on reducing vehicle speeds and improving intersection safety as described below. Concept 1A would maintain existing one-way vehicle traffic and would not provide for two-way bicycle travel on Kains and Adams.

- Intersection control at locations not adjacent to a signal on San Pablo Avenue (Adams Street at Castro Street)
 - Crosswalk markings to improve drivers' awareness of pedestrians.
 - Corner red curbs and painted bulb-outs to improve intersection sight lines
 - Addition of STOP control to the side street intersection (if warranted)
- Intersection control at locations adjacent to a signal on San Pablo Avenue (Adams Street at Washington Avenue)
 - Crosswalk markings (no parking impact).
 - Corner red curbs and painted bulb-outs. **Parking loss: between two and four parking spaces per block.**
 - Mini traffic circle to calm traffic with or without full STOP control (no parking impact)
- Corridor improvements
 - Parking Ts to reduce driveway encroachment. Marked parking is an optional treatment on both left and right side of the street. **Parking loss: between two and three parking spaces per side, per block (optional).**
 - Speed table / speed lump to reduce maximum vehicular speeds (no parking impact).

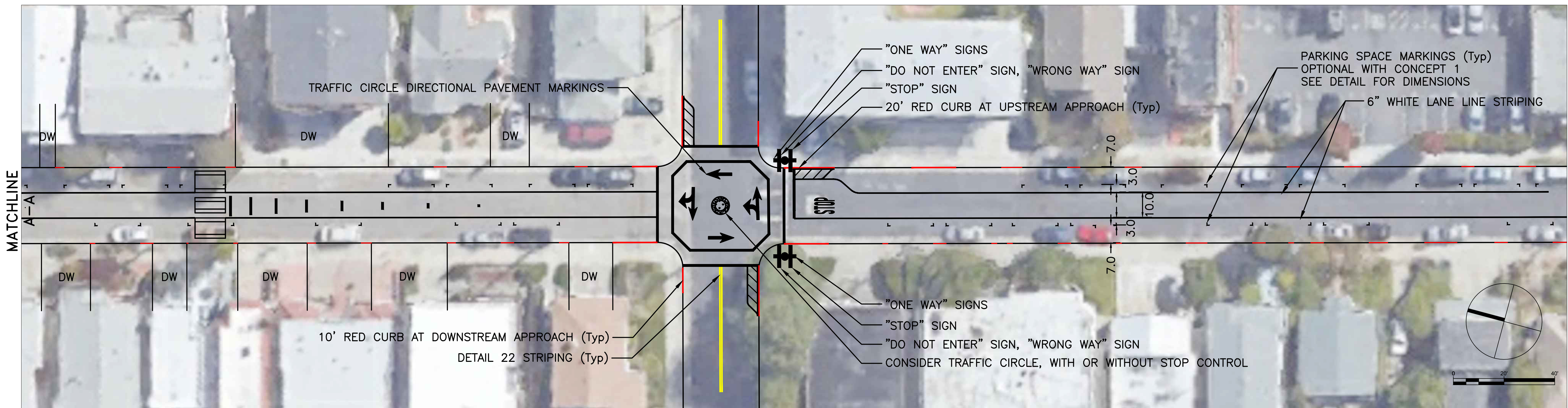
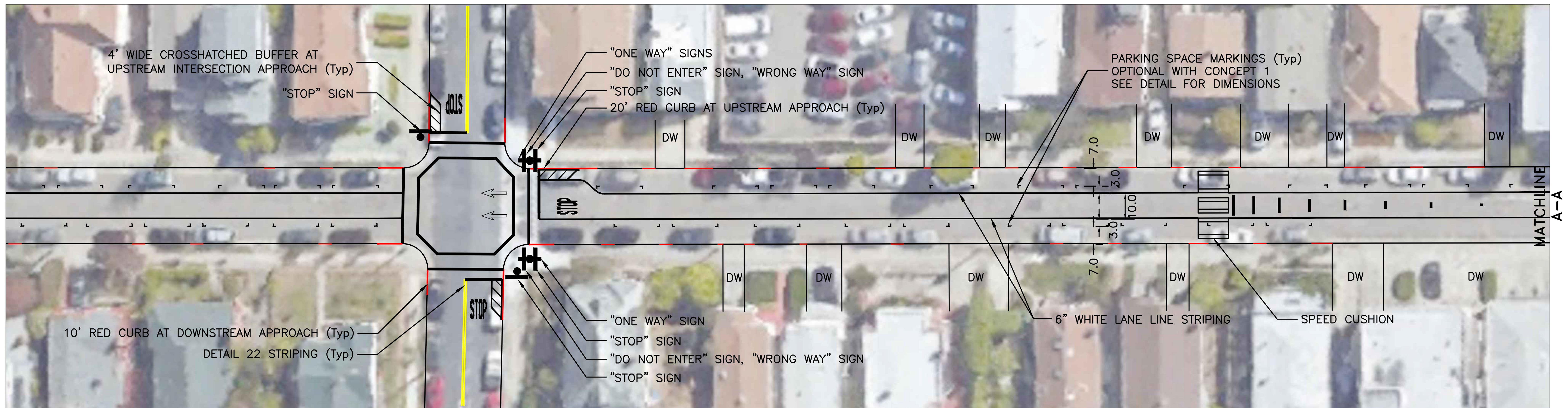
B. CONCEPT 1B TRAFFIC CALMING WITH LANE LINES (RETAIN ONE-WAY TRAFFIC)

Concept 1B builds on the traffic calming design features of Concept 1A and adds lane markings to reduce the vehicle lane from 16 feet to 10 feet. The narrower lane encourages drivers to pay greater attention to staying within the marked lane, and to travel at a slower speed. Concept 1B would maintain existing one-way vehicle traffic would not provide for two-way bicycle travel on Kains and Adams.

The parking loss associated with Concept 1B would be the same as Concept 1A.



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Kains Avenue & Adams Street Traffic Calming and Bikeway Study
Prototypical Design Concept 1A: Traffic Calming (Retain One-Way Traffic)



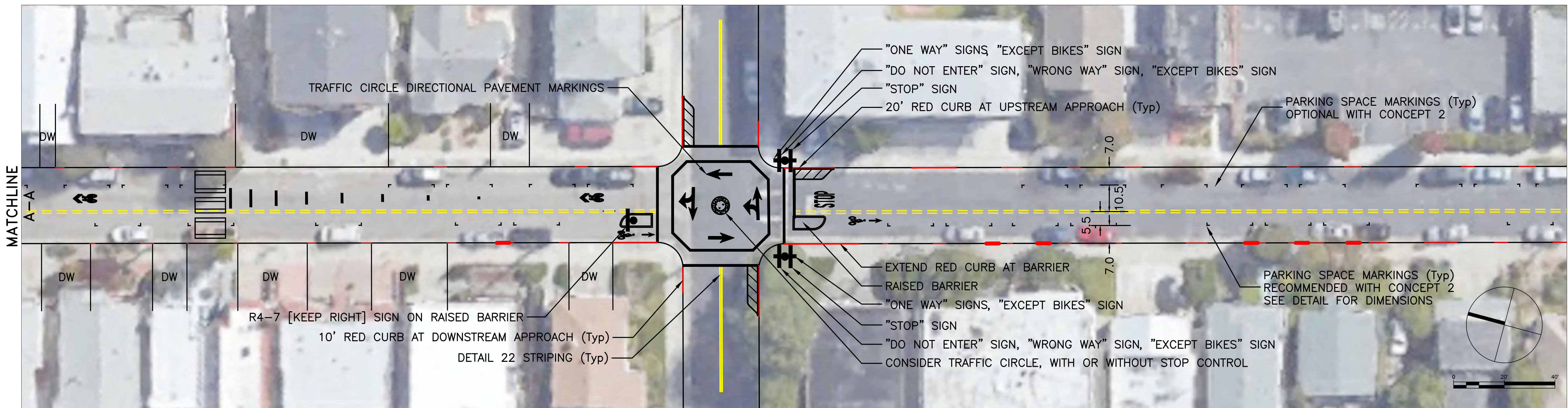
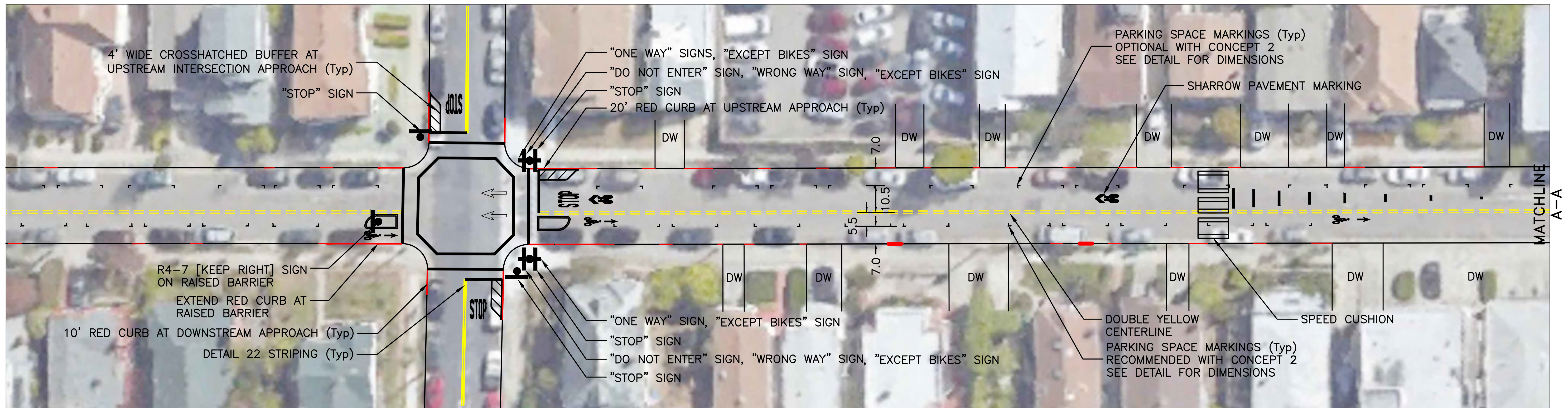
CITY OF ALBANY
Kains Avenue & Adams Street Traffic Calming and Bikeway Study
Prototypical Design Concept 1B: Traffic Calming with Lane Lines (Retain One-Way Traffic)

C. CONCEPT 2 TRAFFIC CALMING (RETAIN ONE-WAY TRAFFIC) WITH CONTRA-FLOW BIKE LANE

Concept 2 builds on the same traffic calming design features of Concepts 1A and 1B. It is also like Concept 1B in that lane striping would be used to narrow the vehicle lane. However, rather than painting lane lines on both sides of the street, the narrowed lane width is reallocated to a contra-flow bike lane on one side of the street. For instance, Adams Street, which is predominantly northbound, would install a southbound bike lane and allow northbound bicycle traffic in the shared vehicle lane. Other design elements include

- Median barriers at intersections to separate vehicle traffic from opposing direction bicycle traffic. **Parking loss: Between two and six parking spaces due to longer red curbs and painted bulb-outs.**
- Shared lane markings, or “sharrows”, within the vehicle lane to guide bicyclists riding in the same direction of traffic (no parking impact).
- Parking Ts to reduce driveway encroachment. Marked parking is optional treatment on the right side of the street, where cars would be parked in the same direction of traffic. **Marked parking is a recommended treatment on the left side of the street, where cars would be parked opposite the direction of oncoming bicycle traffic. Parking loss: between two and three additional parking spaces per side, per block.**

Extensive neighborhood education will be needed to address potential conflicts that will arise from the contraflow lane design, particularly drivers’ awareness of bicyclists on the street, and the need to watch for bicyclists when pulling out of driveways and from left-side curb-side parking spaces.



CITY OF ALBANY

Kains Avenue & Adams Street Traffic Calming and Bikeway Study

Prototypical Design Concept 2: Traffic Calming (Retain One-Way Traffic) with Contra-Flow Bike Lane



D. CONCEPT 3 TRAFFIC CALMING WITH TWO-WAY TRAFFIC (BIKE BOULEVARD)

Concept 3 provides the same traffic calming design features of Concept 1A, but would allow for two-way bicycle and vehicle traffic on Kains and Adams.

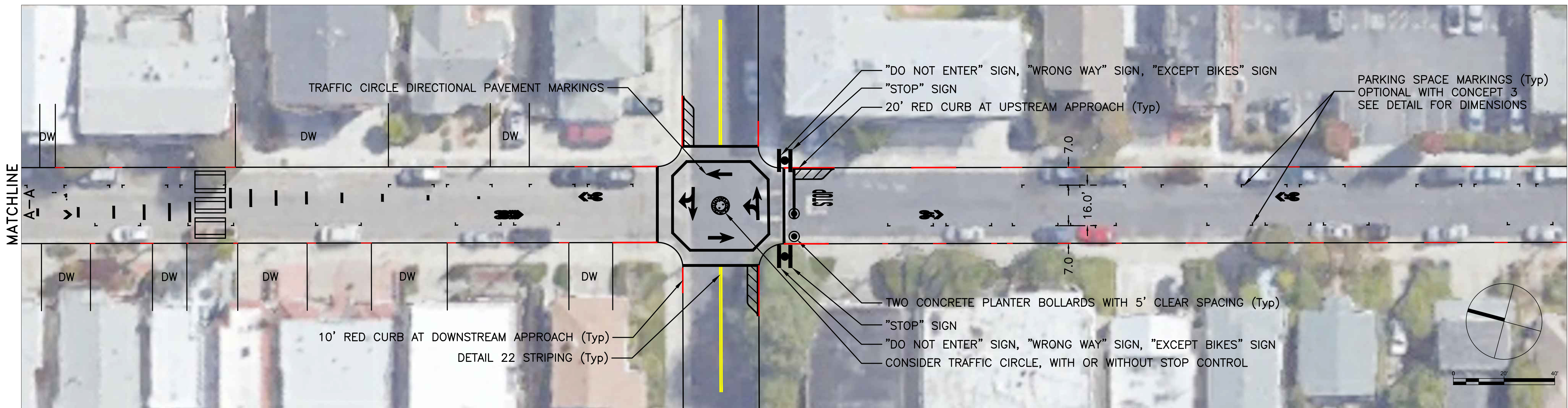
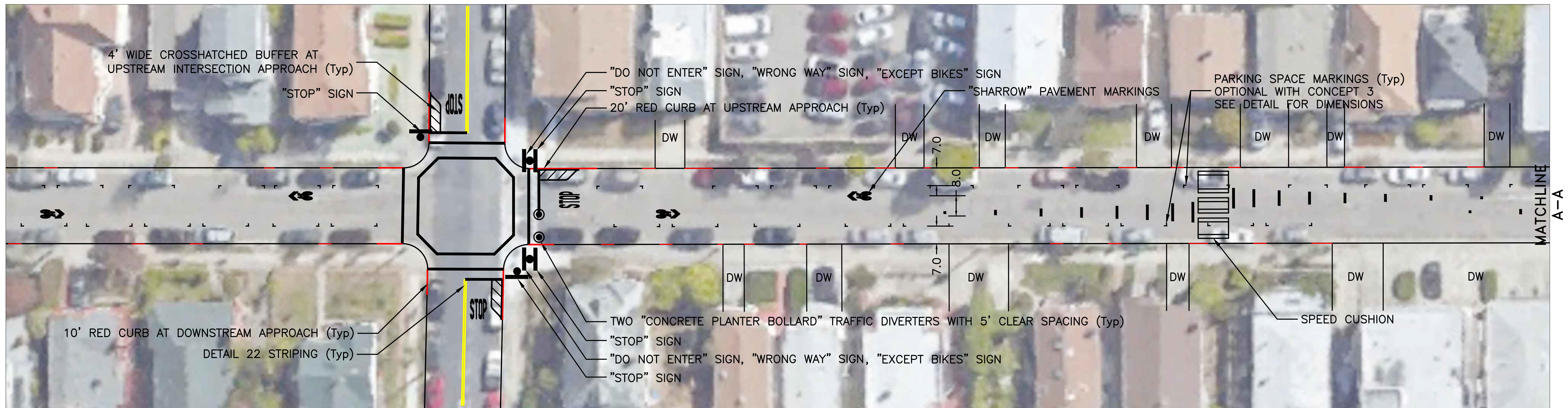
Bollards or other physical devices will be used to restrict vehicle entry on Kains Avenue only from the north end of the block, and on Adams Street only from the south end of the block. The predominant direction of vehicle traffic would continue to be northbound on Adams Street and southbound on Kains Avenue, consistent with existing conditions. The access restriction afforded by the bollards would prevent northbound vehicle traffic from using Kains Avenue, and southbound traffic from using Adams Avenue as cut-through routes. Two-way vehicle traffic would occur only if vehicles turn around within the block, either when pulling out of driveways or making a U-turn.

The bollards would be designed to allow bicycle entry onto Kains and Adams from either end of the block, with no access restriction.

On-street vehicle parking will largely follow the predominant direction of traffic, meaning that safety issues related left side curbside parking identified for Concept 2 would also occur with Concept 3. Concept 3 would lack the traffic calming afforded by lane narrowing in Concept 1B and 2.

Corner red curbs and painted bulb-outs parking loss: between two and four parking spaces per block.

Marked parking is an optional treatment on both left and right side of the street. **Parking loss: between two and three parking spaces lost per side, per block (optional).**



CITY OF ALBANY
Kains Avenue & Adams Street Traffic Calming and Bikeway Study
Prototypical Design Concept 3: Traffic Calming with Two-Way Traffic (Bike Boulevard)

6. Traffic & Safety Commission Recommendation

City staff and Parisi Transportation Consulting presented the findings of this report on October 26, 2017 to the City of Albany Traffic and Safety Commission. Dozens of community members attended the meeting and provided their comment on the traffic calming measures and conceptual options.

The Commission moved to recommend the two-way shared street / bike boulevard concept for Kains Avenue and Adams Street. The design elements carried forward by the Commission include:

- Two-way vehicle and bicycle traffic permitted on both Kains and Adams.
- Entry onto Kains Avenue restricted to only the southbound direction; entry onto Adams Street restricted to only the northbound direction.
- Barriers placed at the north end of each block of Adams Street, i.e., the south leg of each intersection. Barriers placed at the south end of each block of Kains Avenue, i.e., the north leg of each intersection. Barriers would prevent traffic from entering from the side streets onto Adams Street in the southbound direction, and onto Kains Avenue in the northbound direction.
- Consideration of lane edge lines to delineate the parking areas.
- Consideration of speed cushions as traffic calming.
- No changes to stop controlled intersections along the Kains and Adams corridors.
- Amend on-street parking regulations to allow parking in either direction on those corridors

The City Council will hear the Traffic and Safety Commission's recommendation on December 4, 2017.

7. Appendix

Appendix A – Community Meeting Notes, June 15, 2017

Appendix B – Community Walk Audit Meeting Notes, June 24, 2017

Appendix C - Community Walk Audit Photos, June 24, 2017

APPENDIX A1, PUBLIC WORKSHOP NOTES, THURSDAY, JUNE 15, 2017

The following are direct comments received during the June 15, 2017 community meeting.

1. Concern about speed and cut-through traffic; comment that one-way streets have higher speeds than two-way streets.
2. Question about whether a bikeway can calm traffic
3. Question about whether a bikeway can include physical separation. Comment that separated bikeways (physical separation) are safer for bikers.
4. Question about bicycle demand, e.g., bicycle counts on San Pablo, Kains and Adams
5. Concern about residents backing out of driveways and issues with adequate sight lines. Cars are parked closely to driveways impede sight lines. Comment that when backing out it's hard b/c lack of visibility for cyclists (cannot be seen).
6. Question about whether the roadways are too narrow for a contra-flow lane bikeway.
7. Suggestion to keep bikeways one-way
8. Comment that bicyclists are not following the rules of the road. Comment that bicyclists don't stop, ride on the sidewalk (kids), or go the wrong way on Kains + Adams. Observation that some residents take short-cuts going against traffic
9. Suggestion to move bikeways one more block away from San Pablo (Stannage and Madison) or to keep on San Pablo Avenue.
10. Concern about left turns from San Pablo Avenue
11. Question about the number of bike-involved crashes at Kains / Dartmouth, comment that Dartmouth has poor sight lines due to parked cars
12. Commenter did not like bike lanes next to parked cars
13. Comment about difficult crossing at Castro and Washington
14. Suggestion for speed bumps but concern that they're noisy
15. Comment that there is wasted space without parking Ts and lack of parking enforcement against driveway blocking
16. Suggestion that the bikeway needs to be well-marked
17. Comment that there are wrong-way drivers, particularly deliveries, non-residents, garbage collection and residential shortcuts

18. Comment that 15 mph speed limits are not effective. Comment by resident of Albany Hill that drivers do not observe the 15 mph speed limit. Request to put stop signs on hill.
19. Comment that parked cars block intersection sight-lines at Portland / Evelyn
20. Comment that 900 block of Kains is very congested due to the YMCA, with wrong-way bicycle traffic and morning cut-through traffic
21. Suggestion to alternate one-way directions on Kains / Adams
22. Observation about morning cut-through traffic on Kains
23. Comment about not wanting to remove stop signs on Kains / Adams
24. Comment about lack of traffic enforcement on Kains / Adams
25. Observation that two-way traffic can increase traffic "friction" and therefore slow traffic
26. Comment that paratransit access can be difficult for streets without sidewalk access
27. Suggestion to improve vehicular safety
28. Suggestion of mid-block bulb-outs
29. Suggestion to look at previous plans for traffic calming on Brighton, which has difficult crossings due to oncoming traffic
30. Question about off-site school drop-off along Kains
31. Suggestion to look at speed bumps on Kains like in Berkeley. Request to compare speed hump effects on speeds vs no humps.
32. Question about project cost and funding.
33. Question about implementing a residential parking permit due to San Pablo corridor employees
34. Question about how many people will use the bikeway; request to provide stats on how many cyclists on San Pablo Ave.
35. Comment that residents want bikeways that don't negatively impact streets.
36. Question about whether it legal to provide a two-way bikeway on one-way streets.
37. Comment in favor of traffic diverters.
38. Question about how a bike lane would look like on a 30' wide roadway.
39. Comment that drivers have to allow 3' to pass a bike.

40. Comment that bicyclists next to packed cars are dangerous. Visibility lines are not the best at Adam/Castro.
41. Observation that parking is tight near 700 Kains and that drivers park badly. Comment that parking T's are needed, but need to be enforced.
42. Observation that the 900 block of Kains experiences congestion with the YMCA.
43. Comment that the Active Transportation Plan suggested to eliminate stop signs, and that residents oppose this approach.
44. Comment that making it less easy to drive could increase safety for bikes and pedestrians.
45. Request for Install mid block crosswalks or bulb out.
46. Question about implementation of mini circles proposed for Brighton Ave. and the traffic mitigation plan. Comment that when school is in session, it is difficult to cross Brighton.
47. Question about whether the 500 block of Kains would be a drop off zone for middle school.

APPENDIX B1, SITE WALK NOTES, SATURDAY, JUNE 24, 2017

The following are direct comments received during the June 24, 2017 walk audit along Adams Street and Kains Avenue.

ADAMS CORRIDOR GROUP

1. Notes collected from group of approximately seven community members
2. No Xwalk at Buchanan
3. Fast turns onto Adams from Buchanan
4. Complains for fast police traffic near police station
5. Suggestion for partial blockages
6. Desire for congestion to slow traffic
7. Question about how parking will be arranged with two-way traffic
8. Concern about sight lines and trees
9. Parking Ts deployed between Buchanan and Solano are generally helpful
10. Some red curbs deployed at driveways, but not regularly enforced
11. Garbage pickup can cause backups
12. Corridor subject to parking congestion, concern about non-resident parking
13. Suggestion that two-way traffic will require training and education
14. Intersection at Solano is tough for through movements. There is traffic traveling from the highway, requires slow movement into the intersection
 - a. Signage at times is inadequate to indicate one-way traffic – signs placed too high, no pavement arrows
 - b. Existing bulb-outs good for ped safety
15. Intersection at Washington observation of many crashes.
 - a. Valley gutter acts as an inverted speed bump
 - b. Subject to bypass from Solano, has fast downhill traffic
 - c. Needs traffic calming on Washington
16. Intersection at Castro – hard to see oncoming vehicles with existing sight lines

- a. Observation of near-hit with wrong-way bicyclist when pulling out of driveway
 - b. Street is a community route to school across San Pablo
17. General comment – overhead lighting is important for bicycle visibility
 18. Intersection at Clay – no stop in the westbound direction. Concer about WBL onto Adams.

KAINS CORRIDOR GROUP

1. El Cerrito Plaza has 128 units.
2. Residents believe Kains is the busiest residential street in Albany and has the highest residential density along it.
3. Kains in Berkeley has speed humps; please review Kains in Berkeley.
4. Perhaps we could measure speeds on Kains and Adams, as one-way streets, and compare to same width two-way streets.
5. Consider cross-street stop signs and/or staggered stop signs with other roadways.
6. Move all-way stop signs from Stannage to Kains instead?
7. Provide consistent red curb at corners.
8. Access to Villa d'Albany is via Kains.
9. In the morning southbound San Pablo is stacked up, so cars use Kains at a cut-through.
10. In the 600 blocks of Kains and Adams the neighbors requested no street sweeping signs; self-impose parking restrictions.
11. Some participants felt that the double wrong way pavement arrows are effective.
12. Participated believe that no matter what happens with the infrastructure, education will be needed.

APPENDIX C, SITE WALK PHOTOS, SATURDAY, JUNE 24, 2017



