

APPENDIX C - MOBILITY CONCEPTS

Introduction

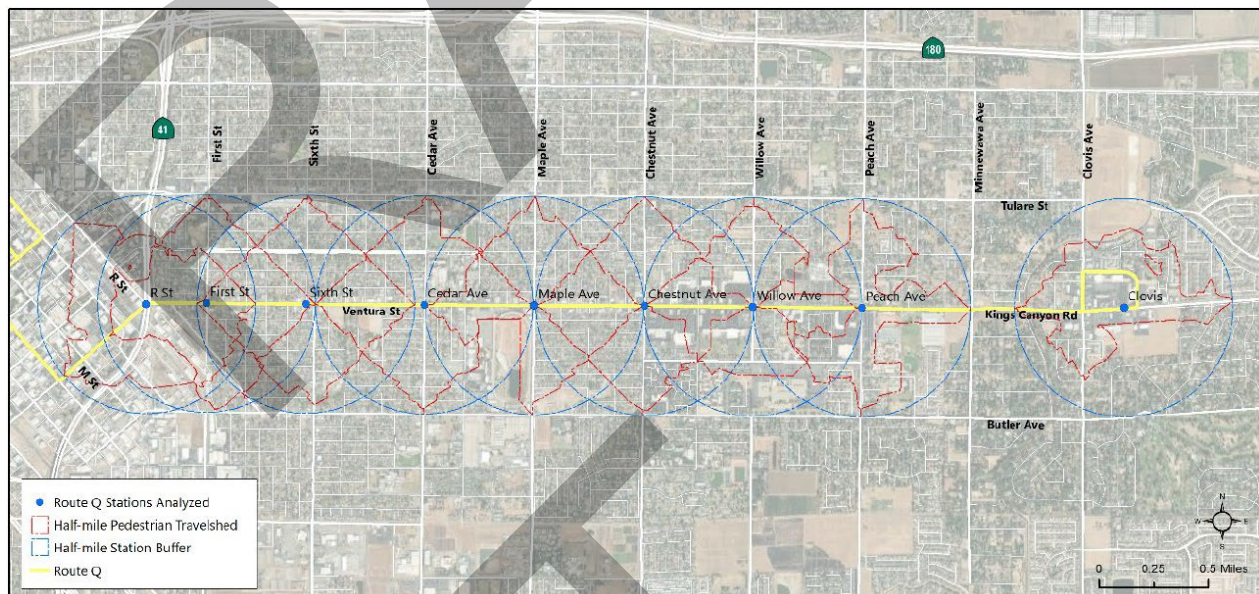
This memo summarizes the findings of the Assessment of Pedestrian Conditions for Chestnut Avenue and Cedar Avenue and presents concept designs and costs for the potential improvements.

Background

As identified in earlier analysis of the Transit Benefit Assessment (Attachment A, 11-2-2021), pedestrian improvements were one of the “5Ps” (People, Pedestrian/Bicycle, Physical Form, Places, Performance) assessed for potential transit use and accessibility of the bus rapid transit (BRT) station areas.

The initial assessment examined the entire corridor from R Street to Clovis Avenue. As indicated in the red outlines on the mapping in Figure 1, Half-Mile Travelsheds, the potential for improved connectivity of pedestrian/bicycle access within $\frac{1}{2}$ mile for each station area was analyzed. With improved “perfect connectivity” in a grid system the red outlines would be a perfect square if there were no impediments to walking $\frac{1}{2}$ mile in north, south, east or west from each station intersection.

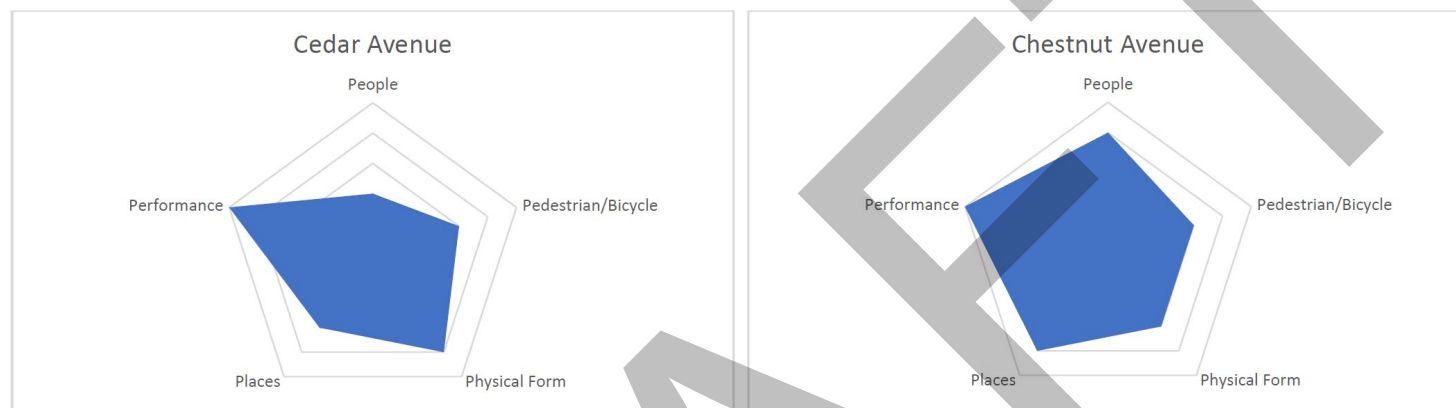
Figure 1, Half-Mile Travelsheds



Source: CR Associates

The Transit Benefit Assessment analyzed all 5P conditions around each station and found R Street, Cedar Avenue and Chestnut Avenue stations to have the most promising overall indicators for supporting transit. The pedestrian/bicycle conditions of the Cedar Avenue and Chestnut Avenue stations were determined to be among the areas that could be improved to increase transit use, as shown in Figure 2, below. Increased pedestrian activity can increase an areas' potential to promote transit-oriented development.

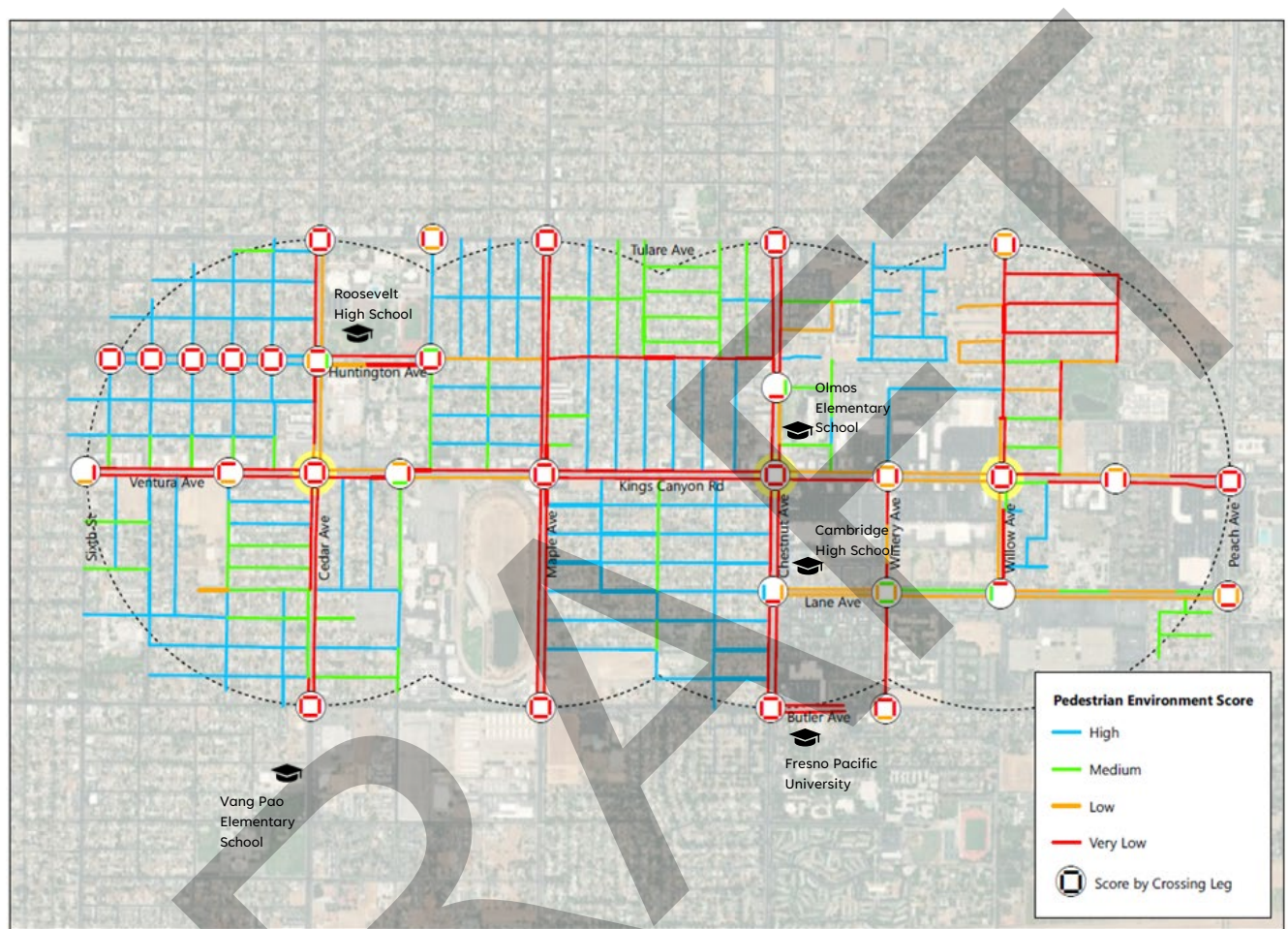
Figure 2, Transit Benefit Assessment, Cedar and Chestnut Avenues



Source: CR Associates

In September 2022, CRA analyzed station pedestrian and bike conditions more closely in the areas around Cedar Avenue, Maple Avenue, Chestnut Avenue and Willow Avenue stations, to determine more specifically the types of improvements that could be implemented to improve pedestrian/bicycle conditions around the BRT stations in this area of the corridor. The results of this analysis, shown in Figure 3, found that the Pedestrian Environment Score (PES) in several station areas as “very low”, indicating that pedestrian improvements along much of the length of both Cedar Avenue and Chestnut Avenue, could increase the pedestrian usage, and thus, increase accessibility and utilization of transit. (*The PES, developed by CR Associates, is a performance measure which uses posted speed limits and number of travel lanes and presence and type of facility (horizontal separation) to assess the comfort of the roadway environment.*). The methodology of this analysis is shown in Attachment B.

Figure 3, Pedestrian Environment Score



Kings Canyon Corridor TOD

*Pedestrian Environment Score Surrounding Prioritized Stations
(Cedar Ave, Chestnut Ave, Willow Ave)*



Source: CR Associates

Additionally, the City of Fresno determined in the 2017 Active Transportation Plan that the Bicycle Level of Traffic Stress (LTS) on Cedar Avenue and Chestnut to have the highest level of stress, or least amount of comfort on these streets, as shown in Figure 4, Bicycle Level of Traffic Stress. Metrics for bicycling LTS were developed at the Mineta Transportation Institute (MTI) and published in the report “Low-Stress Bicycling and Network Connectivity.” The LTS assessment was confirmed by CRA’s analysis during this TOD analysis.

Figure 4, Bicycle Level of Traffic Stress



CRA, under the direction of CityThinkers and the City of Fresno, advanced concept drawings for Cedar Avenue between Butler Avenue and Tulare Avenue, and a portion of Chestnut Avenue, north of Kings Canyon. These roadways were chosen based on the 5P analysis, low pedestrian environment score, high level of traffic stress for bicycle users, the connectivity to BRT stations, and the connectivity to schools.

Conceptual Improvements

The concept drawings and costs produced for both Cedar Avenue and Chestnut Avenue are initial concepts for further analysis and discussions with stakeholders.

Attachments:

- Attachment A: Transit Benefit Assessment 11-2-2021
- Attachment B: Kings Canyon Corridor Pedestrian Project Identification/Benefit Analysis Task Order Memo 9-26-2022
- Attachment C: Concept Cross Sections and Plans for Cedar Avenue between Butler Avenue and Tulare Street
- Attachment D: Concept Cross Sections and Plans for Chestnut Avenue, North of Kings Canyon Road
- Attachment E: Estimated Rough Order of Magnitude Costs for Cross Sections and Plans

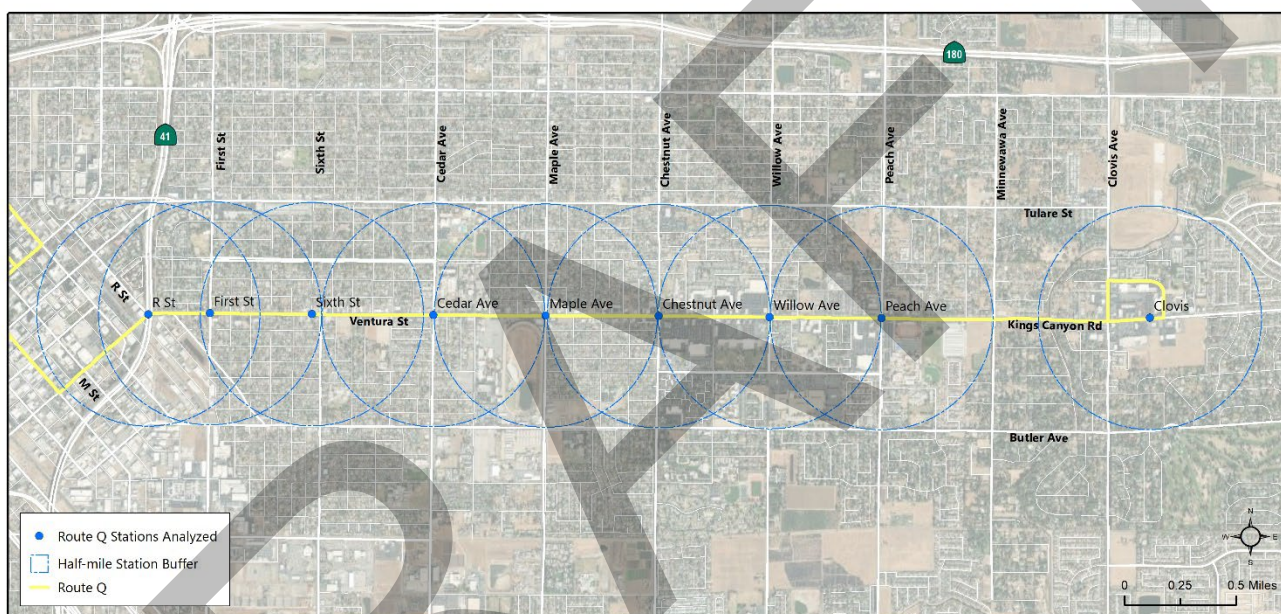
Attachment A: Transit Benefit Assessment 11-2-2021

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1.0 Transit Orientation Indicators

People, places, pedestrian/bicycle connectivity, (transit) performance, and physical form are proven metrics to indicate the transit-supportiveness of an area. To analyze the transit orientation of the BRT stations in the study area, measures were developed to approximate each of these factors in the areas surrounding the eight existing FAX Route Q stations east of State Route 41 along a roughly 4.5 mile stretch of Ventura Avenue and Kings Canyon Road. The stations and their half-mile radius are shown in **Figure 1**. The indicators and the methods to calculate them are described in the following section.

Figure 1: Project Study Area



1.1 People

This indicator is represented by population and employment within a half-mile of each FAX Route Q station within the study area. Higher densities of residents and workers signifies there is a larger pool of users for transit. Higher densities are also correlated with higher rates of transit ridership and less per capita automobile usage.

This data to analyze this metric was gathered from Fresno Council of Governments population and employment data for a base year (2020). To attribute the population and employment to the half-mile areas of each FAX Route Q station in the study area, the data's geographies (Transportation Analysis Zones (TAZs) – roughly the size of Census Block Groups) were intersected with the half-mile buffers of each station. Any TAZ which partially overlapped any half-mile buffer were 'apportioned' by the percentage of the TAZ area overlapping with the buffer. The combined population and employment from 2020 were classified into five categories according to Jenks natural breaks classification method (natural breaks), with the most points awarded to category with highest population and employment. The results are shown in **Table 1**.

Table 1: Population and Employment within Half-mile of FAX Route Q Stations

Station	2020 Population	2020 Employment	Combined Population & Employment	Category Break
R St	3,391	7,117	10,508	4
First St	5,335	1,102	6,437	1
Sixth St	6,111	855	6,966	2
Cedar Ave	4,975	1,961	6,936	2
Maple Ave	6,665	1,797	8,462	3
Chestnut Ave	9,326	2,569	11,895	4
Willow Ave	7,120	6,858	13,978	5
Peach Ave	4,247	5,461	9,708	3
Clovis Ave	5,000	2,292	7,292	2

Source: Fresno COG and CR Associates (2021)

1.2 Places

This indicator captures the variety of destinations and land uses near each Route Q station within the study area. A variety of destinations accessible makes it easier for people to complete trips without driving, improving the viability of travel without a car. Transit stops with destinations and attractions nearby can also attract ridership for a variety of trips.

To calculate this measure, business types including: grocery and drug stores, dining and drinking establishments, retail, personal care and other types of services were counted and summarized within a half-mile network travel distance of Route Q station in the study area based on business data from DataAxle. This analysis also included a count of key civic land uses such as parks, schools, hospitals, libraries within a half-mile of each station from City of Fresno land use data. The City of Fresno also supplied a dataset of the locations of businesses and services along Ventura/Kings Canyon for a portion of the corridor. That data was examined in comparison to the data obtained from DataAxle and it was determined the latter adequately represented the City-provided data while also providing more complete geographic coverage of the study area.

The ‘Opportunity Score’ is an index score based on a total count and variety of the destinations and land uses that were accessible to each station. Each business destination category (those categories which exclude the civic land uses such as parks, schools, hospitals, libraries) were given a multiplier based on dividing the number 100 from the highest count of that destination category from any station. Civic land uses were credited with the full 100 points for that category if they were accessible within a half mile from each station. The index scores were classified into five categories according to natural breaks, with the most points awarded to the category with highest population and employment. The results are shown in **Table 2**.

Table 2: Opportunity Score within Half-mile of FAX Route Q Stations

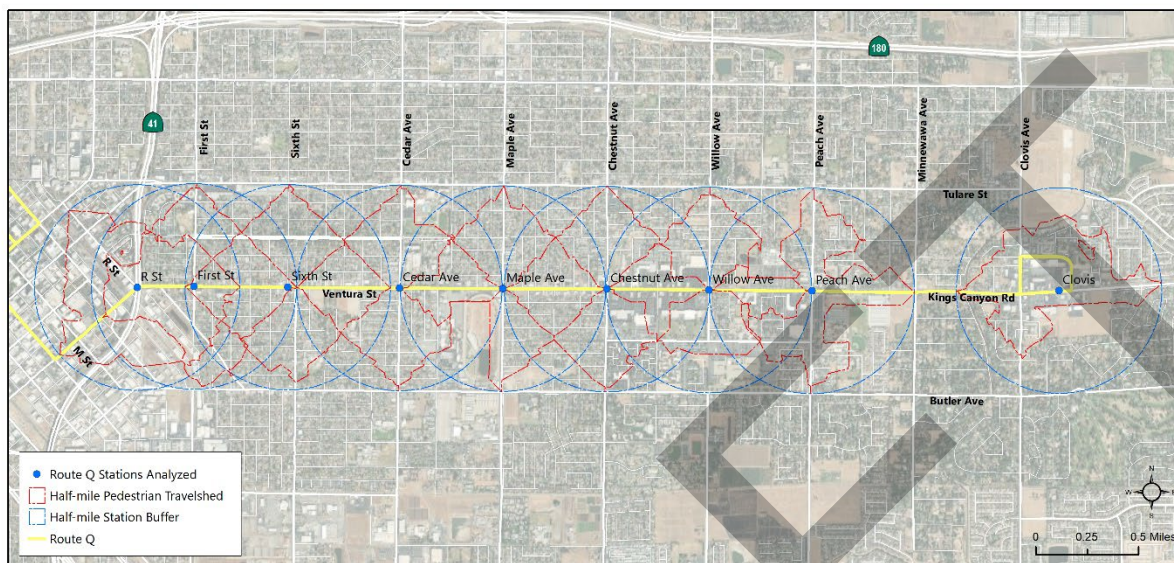
Station	Elementary Schools	High Schools	Parks	Hospitals	Libraries	Grocery and Drug Stores	Dining and Drinking Establishments	Retail	Personal Care Services	Other Services	Opportunity Score (sum of multiplier x counts)	Category Break
Multiplier	100	100	100	100	100	6.25	3.23	3.85	9.10	4.00		
R St	0	0	0	0	0	7	11	14	1	25	243	1
First St	0	0	1	0	0	4	8	11	2	15	271	1
Sixth St	1	0	0	0	0	4	9	18	4	13	311	2
Cedar Ave	0	1	0	1	0	3	18	11	4	11	399	3
Maple Ave	0	0	0	1	0	7	12	9	2	6	260	1
Chestnut Ave	1	0	1	0	0	16	20	23	5	6	522	4
Willow Ave	1	0	1	0	0	12	22	26	11	5	566	5
Peach Ave	1	1	1	0	0	6	14	9	6	2	481	4
Clovis Ave	0	0	1	0	1	13	31	14	7	1	503	4

Source: DataAxle and CR Associates (2021)

1.3 Pedestrian and Bicycle Connectivity

This indicator captures the quality of the pedestrian and bicycling environment of areas surrounding each Route Q station within the study area. While the previous 'Places' indicator is based on the quantity and variety destinations and land uses in the vicinity of each station, it assumes a perfect environment. The Places measure does not factor the sensitivity to roadway environment experienced by pedestrians and bicyclists, and poor conditions often deter trip-making. To calculate the Pedestrian and Bicycle Connectivity measure, half-mile street travelsheds were created for each station using street networks with distance adjusted for the comfort of the pedestrian and bicycling environment as shown in **Figure 2**.

Figure 2: Half mile Network Travelsheds



To approximate the comfort of the pedestrian and bicycling environment, all the roads within a half-mile of Route Q stations in the study area were assessed using Bicycle Level of Traffic Stress (LTS) and Pedestrian Environmental Score (PES), a performance measure which uses posted speed limits and number of travel lanes and presence and type of facility (horizontal separation) to assess the comfort of the roadway environment. These measures were applied after referencing the criteria in aerial and street view imagery. Each roadway centerline received one of three scores representing ‘adequate’ conditions, ‘inadequate’ conditions, and ‘highly inadequate’ conditions. For roadways with four or more travel lanes, each side of the street received a score. The three categories were applied as travel time multipliers to the street network prior to creating a network travelshed: two times the distance cost were applied to inadequate segments and three times the distance cost were applied to highly inadequate segments. The lengths of segments with adequate conditions were not multiplied.

A regular half-mile travelshed (without adjusting for environmental conditions) would have approximated connectivity based on the density and geometry of the street network, however that alone would not reflect the quality of the environment for pedestrians and bicyclists. The environment-adjusted travelsheds however would capture both the connectivity and environmental quality dimensions of pedestrian conditions. Areas with better connected street networks are advantaged by this measure, though are not immune from being penalized. The acreage sizes of the environment-adjusted half-mile travelshed were classified into five categories according to natural breaks, with the most points awarded to the category with largest environment-adjusted travelshed. The results are shown in **Table 3.**

Table 3: Travelshed Acreage within Half-mile of FAX Route Q Stations (Unadjusted and Adjusted for Pedestrian and Bicycling Environment)

Station	Unadjusted Half-mile Travelshed Acreage	Environment-Adjusted Travelshed Acreage	Category Break
R St	303.6	248.8	5
First St	300.3	185.4	4
Sixth St	306.3	215.2	4
Cedar Ave	300.0	113.1	3
Maple Ave	253.6	98.4	3
Chestnut Ave	301.9	95.9	3
Willow Ave	266.0	72.4	2
Peach Ave	237.2	47.5	1
Clovis Ave	188.6	73.1	2

Source: CR Associates (2021)

1.4 Performance

This indicator is represented by weekday average daily transit ridership from 2019 within a half-mile of each FAX Route Q station within the study area. Places with high existing daily ridership are indicative of having good transit orientation. Areas with the highest transit ridership will typically have more frequent transit service and better regional accessibility to destinations by way of the transit system.

To calculate this measure average weekday daily boardings and alightings were provided by FAX for every bus stop within a half-mile of each FAX Route Q station in the study area for 2019. The boardings and alightings for each Route Q station, and the ridership of the nearest bus stops to each Route Q station within a half-mile nearest were summarized together for each Route Q station. The combined boardings and alightings were classified into five categories according to natural breaks, with the most points awarded to the category with the highest average boardings and alightings. The results are shown in **Table 4**.

Table 4: Average Weekday Boardings & Alightings within Half-mile of FAX Route Q Stations

Station	2019 Boardings/Alightings	Category Break
R St	124	1
First St	901	3
Sixth St	273	1
Cedar Ave	1,941	5
Maple Ave	612	2
Chestnut Ave	1,581	5
Willow Ave	756	2
Peach Ave	1,165	4
Clovis Ave	1,097	4

Source: FAX (2021)

1.5 Physical Form

This indicator is represented by average block size within a half-mile of each FAX Route Q station in the study area. Smaller average block sizes are correlated with better walkability and more compact urban form, both of those characteristics are more compatible with transit potential.

Block features were generated in GIS by dissolving contiguous parcels data (retrieved from Fresno County) into single part polygons. Parcels data works ideally for creating block features because it excludes the coverage of road and freeway right-of-way. Inspection of the outputs after the dissolving process was needed to make adjustments where necessary, such as removing parkway medians generated as output and merging together blocks separated by alleys. The average block sizes were classified into five categories according to natural breaks, with the most points awarded to the category with the smallest average block size. The results are shown in **Table 5**.

Table 5: Average Block Sizes within Half-mile of FAX Route Q Stations

Station	Average Block Size (acres)	Category Break
R St	3.9	5
First St	3.9	5
Sixth St	3.5	5
Cedar Ave	6.0	4
Maple Ave	7.2	4
Chestnut Ave	8.8	3
Willow Ave	17.8	2
Peach Ave	21.3	1
Clovis Ave	14.9	2

Source: CR Associates (2021)

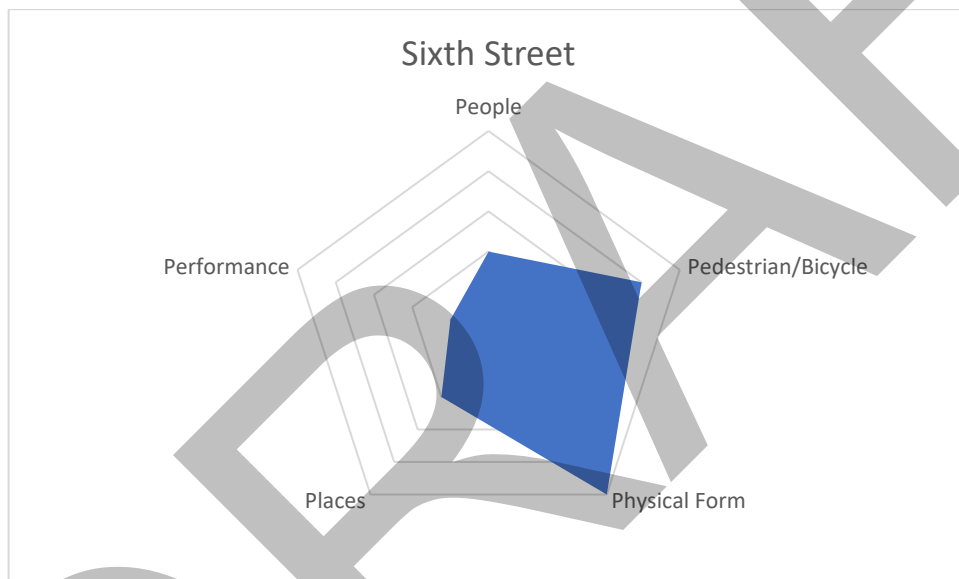
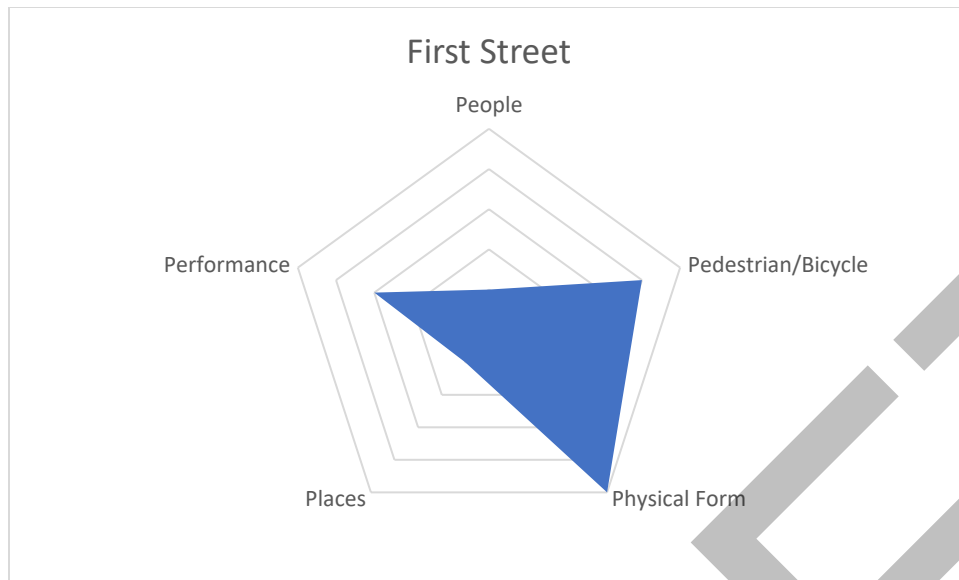
1.6 Summary of All Indicators

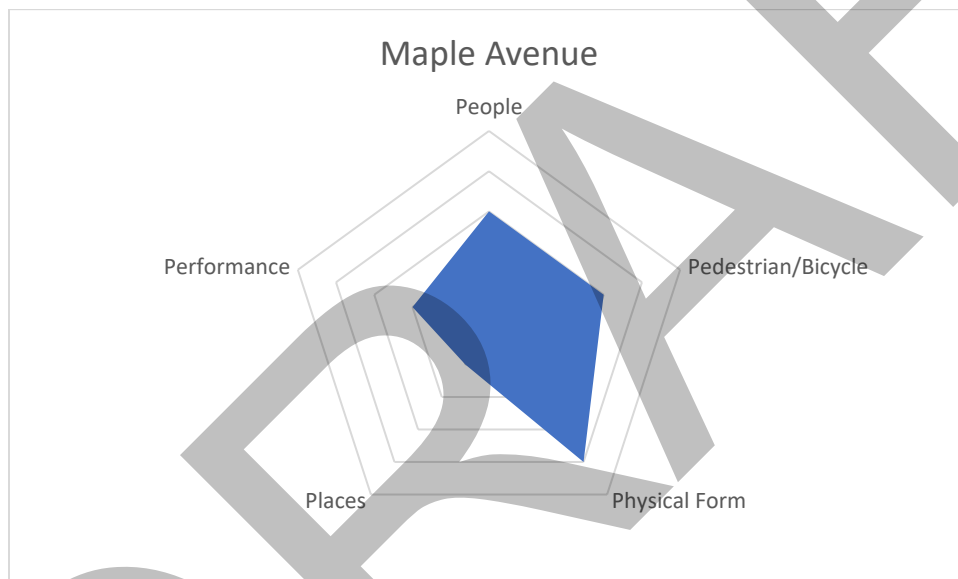
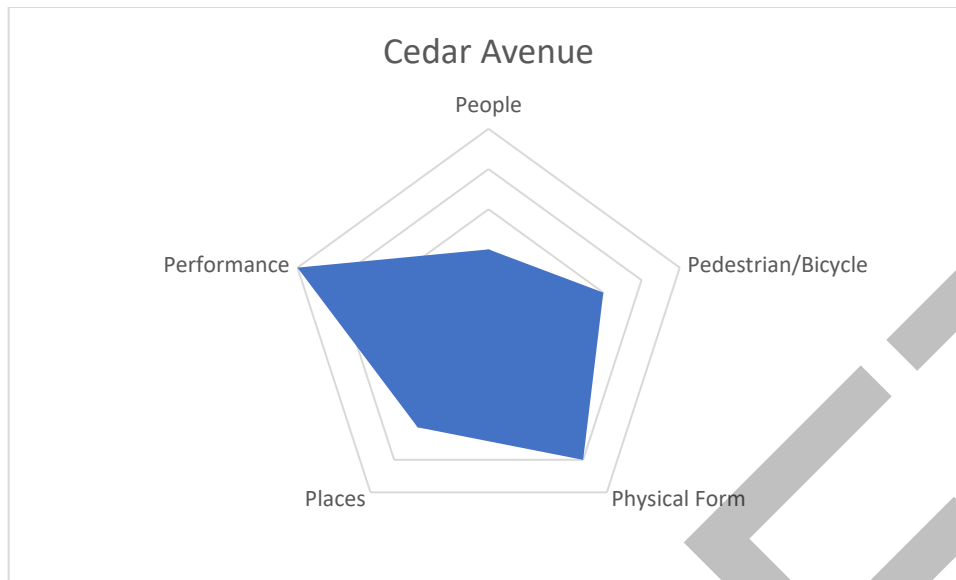
Table 6 summarizes the points awarded to the Route Q stations within the study area for the five criteria: people, places, pedestrian/bicycle connectivity, (transit) performance, and physical form. Based on those indicators, the most transit supportive station in the study area is Chestnut Avenue, which received 19 of a possible 25 points. Each station's transit orientation score is also shown as radar charts.

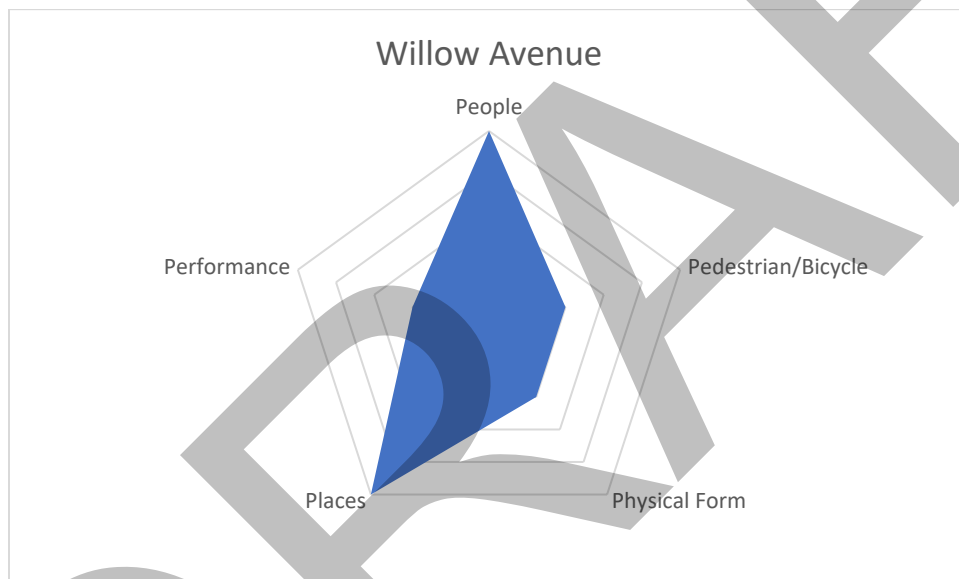
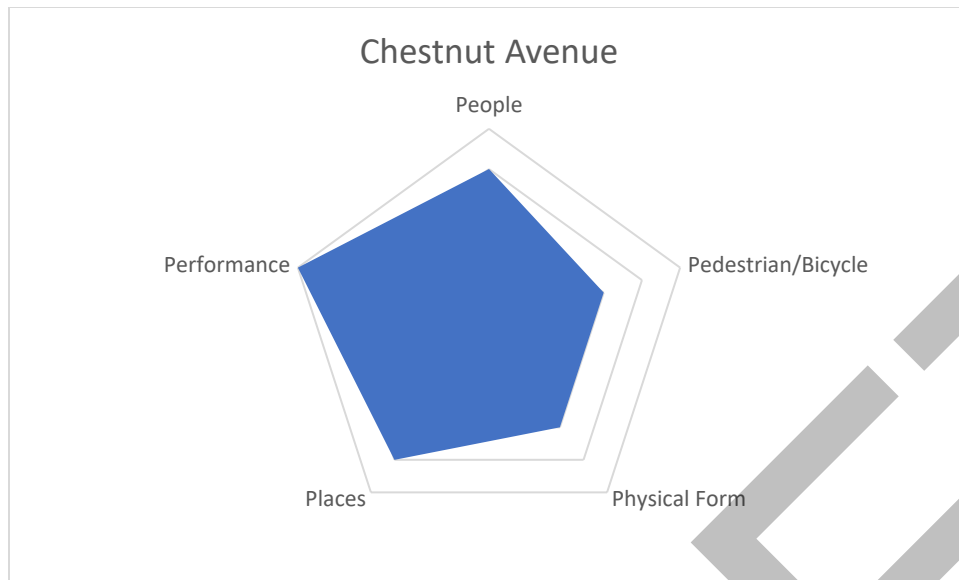
Table 6: Summary of All Indicators

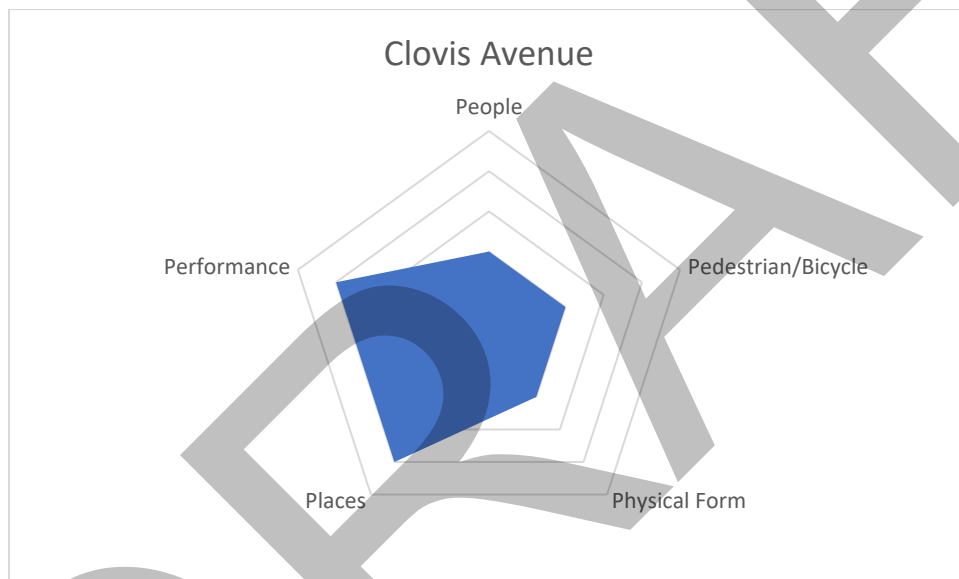
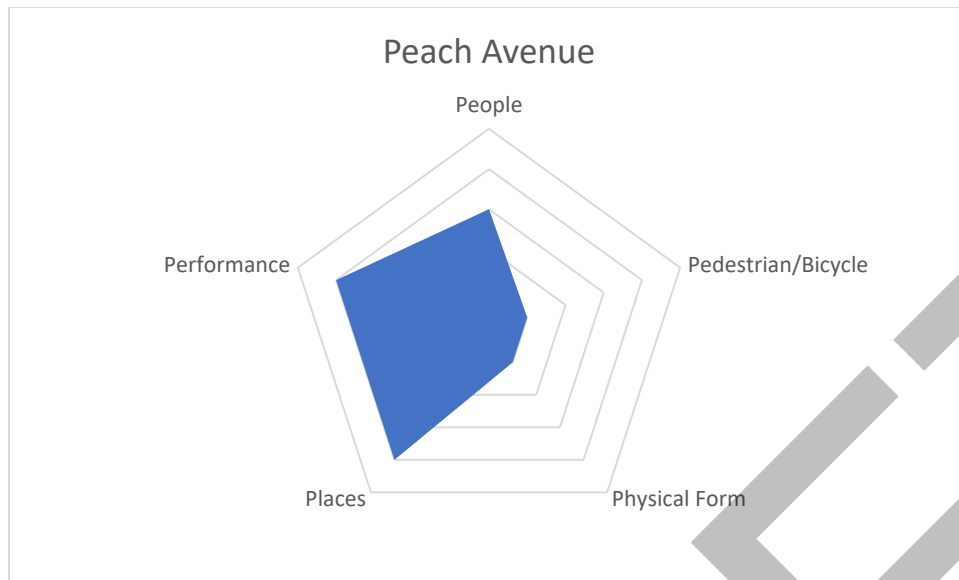
Station	People	Places	Ped/Bike Connectivity	Performance	Physical Form	Total
R St	4	1	5	1	5	16
First St	1	1	4	3	5	14
Sixth St	2	2	4	1	5	14
Cedar Ave	2	3	3	5	4	17
Maple Ave	3	1	3	2	4	13
Chestnut Ave	4	4	3	5	3	19
Willow Ave	5	5	2	2	2	16
Peach Ave	3	4	1	4	1	13
Clovis Ave	2	4	2	4	2	14

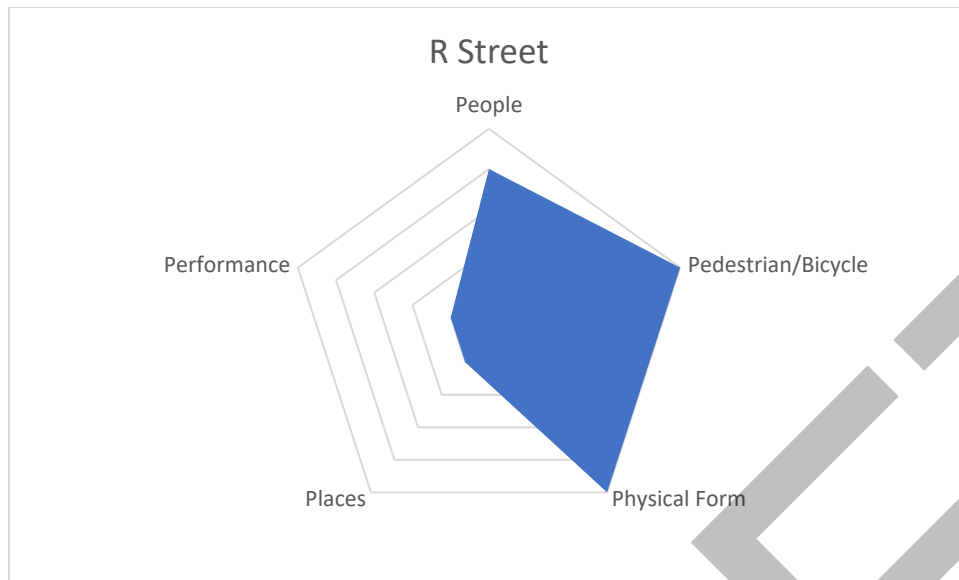
Source: CR Associates (2021)











Attachment B: Kings Canyon Corridor Pedestrian Project
Identification/Benefit Analysis Task Order Memo 9-26-2022

DRAFT



TO: Diego Velasco, City Thinkers

FROM: Tony Mendoza and Sasha Jovanović, CR Associates

DATE: 9/26/22

RE: Kings Canyon Corridor Pedestrian Project Identification/Benefit Analysis Task Order

Overview

CRA will assess the pedestrian environment on all streets within a half-mile surrounding three Kings Canyon corridor stations: Cedar Avenue, Chestnut Avenue, and Willow Avenue, using a more refined version of its performance measure called Pedestrian Environment Score (PES) that was used during the existing conditions phase of this study. PES classifies/scores pedestrian walkways and street crossing legs into one of four categories: High (4 points), Medium (3 points), Low (2 points) and Very Low (1 point), through inventory of a robust selection of segment and street crossing variables. The PES measure, its methodology described in the next section, will be used to identify recommended improvements along mid-block segments and at crossing locations in the vicinity of the three stations. An analysis measuring the capture of population, employment, and select types of destinations within a half-mile of the stations will be completed using distance-based and environment-adjusted (existing conditions and existing conditions with improvements) pedestrian travelsheds to determine which projects deliver the most benefit in how they increase accessibility to population, employment and select destinations. Variables attributable to each project from this analysis will be summarized and provided in a project sheet along with planning level conceptual graphics, either depicting the cross-section or plan view of the project. The products from this task will provide information to support potential grant applications.

Pedestrian Environment Score (PES) Methodology

The initial step of PES is to assign a base score (Table 1), which is influenced by a combination of posted speed limit and roadway cross-section. Streets with higher posted speeds and/or a wider roadway cross-section receive a lower base score, while low speed roadways fewer than three lanes start out with a higher base score.

Table 1: Segment Base Score

		Roadway Cross-Section			
		2-Lanes	4-Lanes with Raised Median or 2-Lanes w/Center Left Turn Lane	3-Lanes or 4-Lanes Undivided	5-Lanes or More
Posted Speed Limit	25 mph	3	2	1	1
	30 mph	2	2	1	1
	35 mph	1	1	1	1
	40 mph or Greater	0	0	0	0

Following the base score, sidewalk and regular street lighting are inventoried. These two infrastructure features are considered essential, so their presence is not rewarded in the environment score. However, if either feature is not present along a segment one point is subtracted from the base score (resulting in an adjusted base score). For example, a 2-Lane roadway at 25 mph has a base score of 3 (Medium). If it is lacking sidewalk, its score is then reduced to 2 (Low). If it is lacking both sidewalk and regular street lighting, its score is reduced to 1 (Very Low).

Following the inventory of essential infrastructure, each segment is inventoried for the additional amenities or attributes influential to the pedestrian environment. These amenities and attributes, if present, are each worth one point, which are added to the adjusted base score to generate the segment's final PES score. These features include:

- Sidewalk width of 8' or greater
- Horizontal separation from the outside travel lane of 14' greater
- Traffic calming infrastructure in the roadway (horizontal deflection, speed bumps, etc.)
- Landscaping with or along the right-of-way provides a tree canopy
- Pedestrian scale lighting

If no sidewalk is present, it is excluded from receiving points for any of these amenities or attributes, even if they are present along the roadway. If no regular street lighting is present, then it is deduced that pedestrian scale lighting is also not present and is thus excluded from receiving points from that attribute. Segments with high base scores, generated by the combination of lower posted speed limits and narrower cross-sections, have a lower bar to clear to attain a High PES final score. For instance, a 2-Lane/25-mph block segment which has an adjusted base score of 3 (medium), only needs one of the listed amenities or attributes listed to attain a High PES score. A segment with a lower adjusted base score (based on higher speeds and a wider roadway cross-section), may need to have as many four of the listed amenities to attain the same high score. A road diet, installation of a raised median or reduction of posted speed limit is another avenue to improve the PES score, as such a modification may increase the segment's base score. To speed up the process of completing the PES analysis for a large study area, once any segment reaches a High PES score, other categories may not be inventoried because its score has already been determined.

The PES score for crossing locations are determined with a similar methodology, however with intersection-specific inputs. They are similarly assigned a base score (Table 2), which is comprised of a combination of the type of traffic control along the receiving leg and the number of travel lanes (including turn lanes). Crossing locations that are wider begin the analysis with a lower base score, requiring more amenities or features to achieve a High or Medium PES score.

Table 2: Crossing Location Base Score

		Number of Lanes (including Turning Lanes) to Cross			
		2 Lanes	3 Lanes	4 to 5 Lanes	6 Lanes or More
Traffic Control on Receiving Leg	Protected Phase	3	3	2	1
	Stop Control All-Ways	3	2	1	1
	Permissive Signal Phase	3	2	1	1
	Roundabout/Yield	3	2	1	1
	Free/Side Street	3	2	1	1

Following the crossing location base score, curb ramps and daylighting- which is ensuring there are no vertical elements within a few feet of the street corners (most commonly parking) which can impact the visibility of pedestrians to approaching motorists - are inventoried for each intersection. These two features are considered essential, so their presence is not rewarded in the environment score. However, if either feature is not present along a segment one point is subtracted from the base score (resulting in an adjusted base score).

Following the inventory of these essential features at the intersection, each crossing location is inventoried for the additional physical or operational features which would improve the pedestrian environment at the crossing locations. These amenities and attributes, if present, are each worth one point, which are added to the adjusted base score to generate the segment's final PES score. They include treatments, such as:

- Lead Pedestrian Interval or No Turn on Red
- Curb Extensions or median refuges
- High visibility crosswalks (continental stripes or similar) with advanced stop bars at traffic-controlled locations or Rectangular Rapid-Flashing Beacon (RRFB)/HAWK signal at non-traffic-controlled locations
- Pedestrian signal enhancements (e.g., countdown timers, audible signals, automated signals)
- Raised crosswalks
- Pedestrian scramble phase

If any of these features are not present, they may be considered as potential projects, if appropriate for their location context.

Accessibility Improvement Measure (AIM) to Measure Project Benefit

To examine the benefits of each project improvement locations, CRA will complete an analysis measuring accessibility to surrounding area from each station. For each station area, capture of population, employment and destinations will be summarized under three scenarios: ideal conditions (unadjusted for pedestrian environment), existing conditions (adjusted for pedestrian environment using PES), and existing plus project conditions scenarios (adjusted for pedestrian environment

using PES for existing and conditions and where project changes improve the PES score). Any project recommendations resulting in network changes (e.g., new streets/paseos through redevelopment or new paths) would also be factored into the existing plus project conditions scenario. The pedestrian environment of the new connections would be assessed based on its planned features using the PES methodology (it is likely that new connections will be designed to have a High PES score).

The first scenario (ideal conditions) will measure the latent potential of each station area by summarizing the capture of population, employment and destinations within a half-mile walking distance. This scenario represents the maximum potential accessibility of each station within a half-mile of each station area given the current street network, if that street network had an ideal pedestrian environment. This scenario does not factor the role hostile conditions may play in deterring pedestrian trips. The second scenario, existing conditions, does factor in that role by approximating accessibility to the surrounding area if pedestrian trips were deterred by hostile conditions.

To assess the impact the pedestrian environment may have on pedestrian trip making, the existing conditions PES scores are incorporated into adjusted network travelshed measurements originating from each of the three station locations where lower PES scores receive a weighted factor travel time penalty – emulating the increased perceived travel times of worse street environments. Very Low PES will have a proposed factor of 3 applied to a segment's travel distance (the length of segment is multiplied by 3), Low PES a factor of 2, and Medium PES a factor of 1.25. These factors will result in a travelshed area smaller than the unadjusted half-mile distance. The capture of population, employment, and destinations will be summarized within this adjusted area. While Medium PES is technically adequate, a slight travel time penalty is suggested for this analysis to generate some incentive for the improvement of locations to High PES rather than Medium PES. CRA may adjust weights for each category as needed to ensure an appropriate sensitivity for the purposes of analysis.

To comparatively assess the most beneficial projects/project locations within the three station half-mile areas, each project location's improved PES score (based on the change in score generated by the amenities or features recommended) will be coded into the network, and the travelshed analysis ran for each specific project with existing conditions PES scores otherwise maintained for the surrounding area. The improvement in access will be measured from each project's scenario – measuring the capture of population, employment and destinations with the project to the capture population, employment, and destinations under existing conditions. This will be run for each unique project, allowing the improved capture measurements (benefits) to be compared for each project.

Planning Level Conceptual Graphics, Costs and Benefits

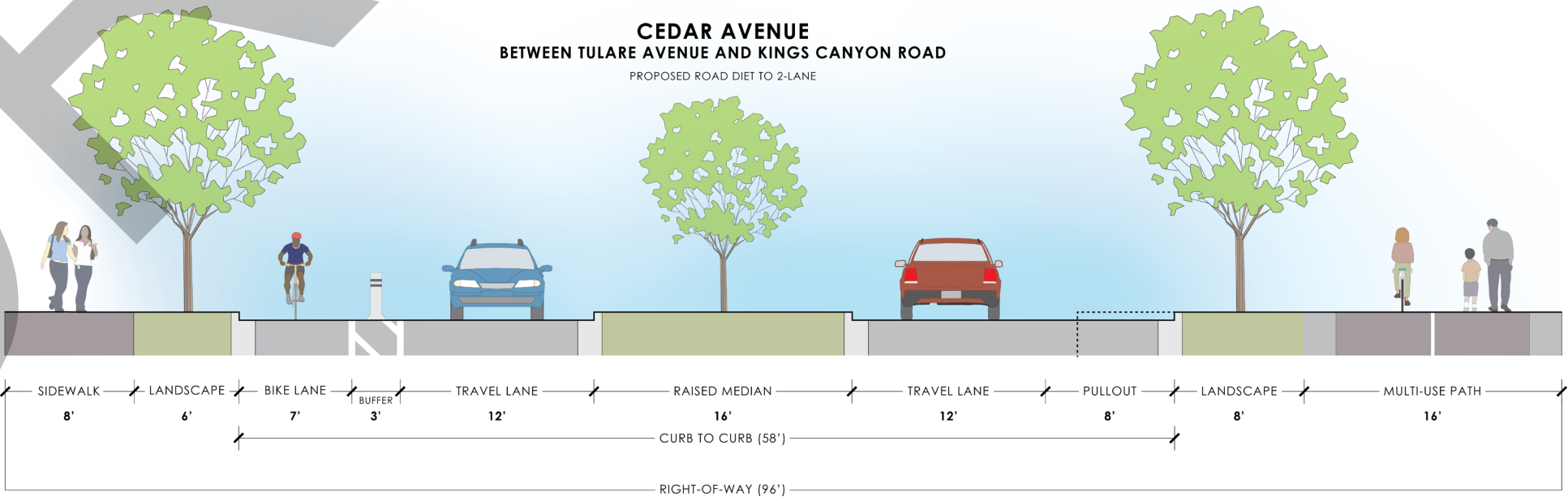
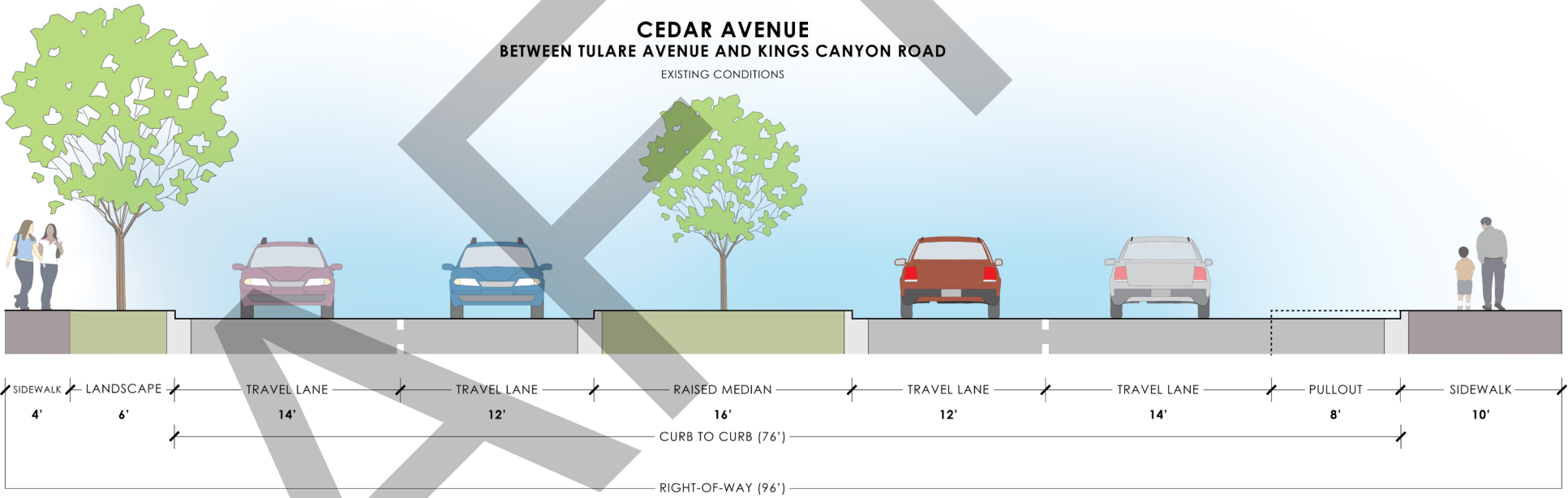
To aid with the implementation or grant pursuit process, a select number of projects identified from this analysis will be illustrated with planning level conceptual graphics, either depicting the improvement in a cross-section or plan view exhibit. These projects will have associated high-level costs and potential benefits as identified from the AIM analysis.

Attachment C: Concept Cross Sections and Plans for Cedar
Avenue between Butler Avenue and Tulare Street

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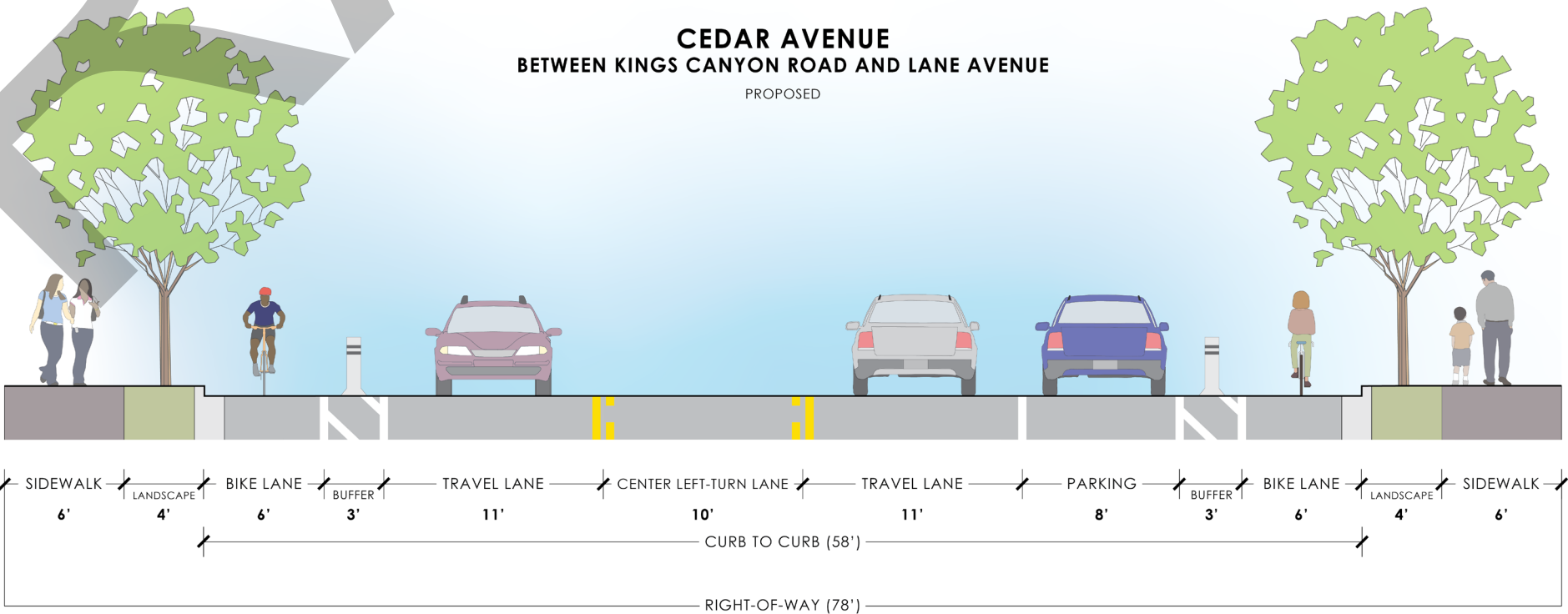
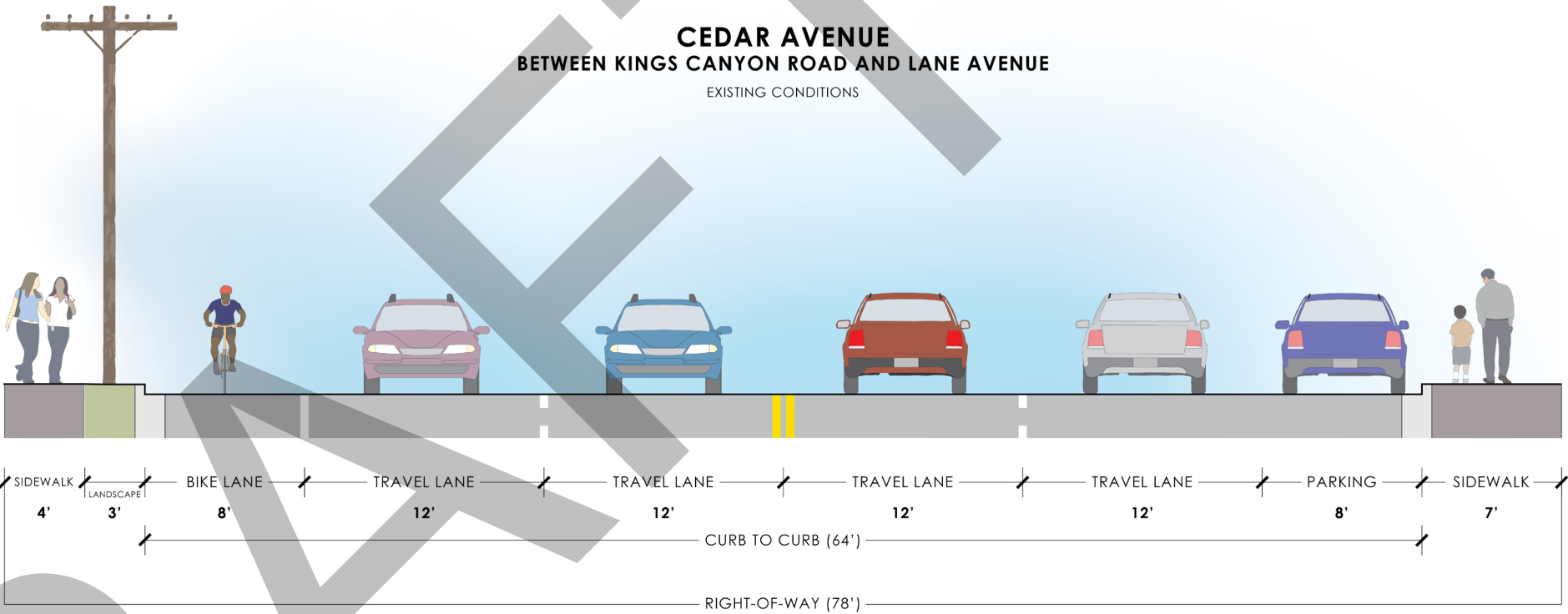
Cedar Avenue - Tulare Avenue to Kings Canyon Road

Option 1: Road Diet to 2-Lane



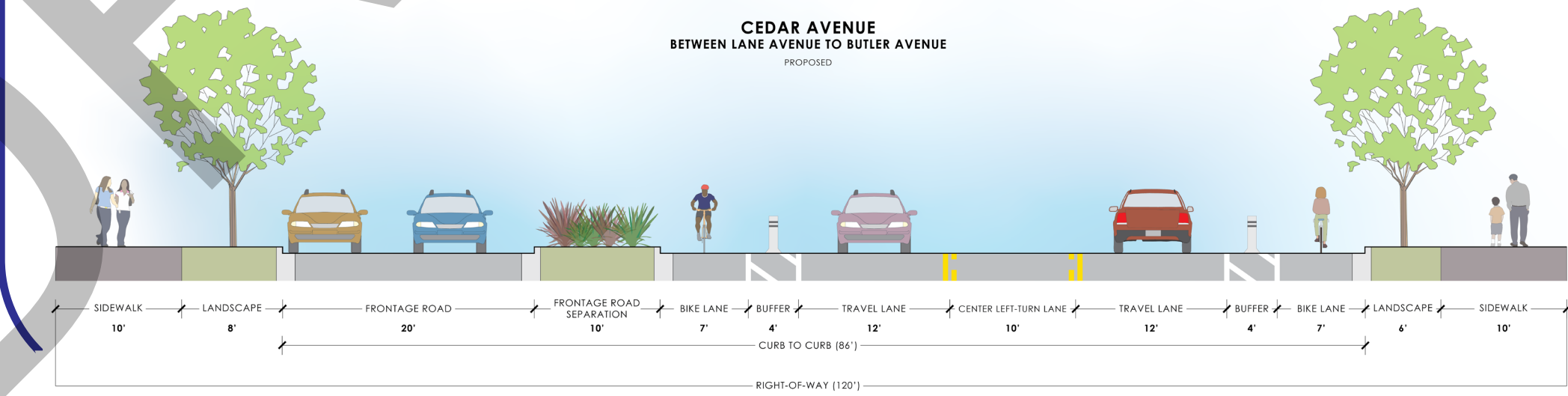
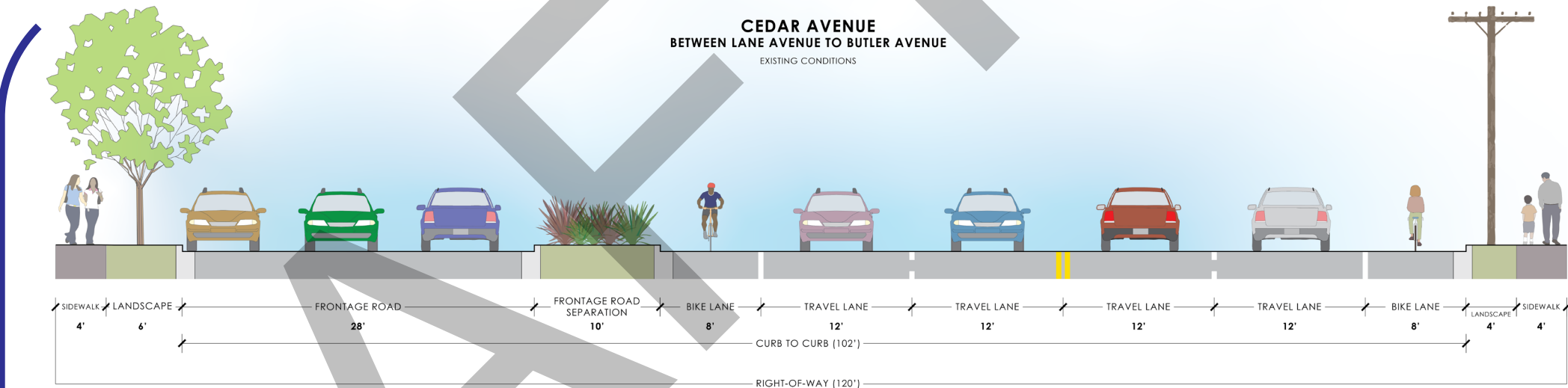
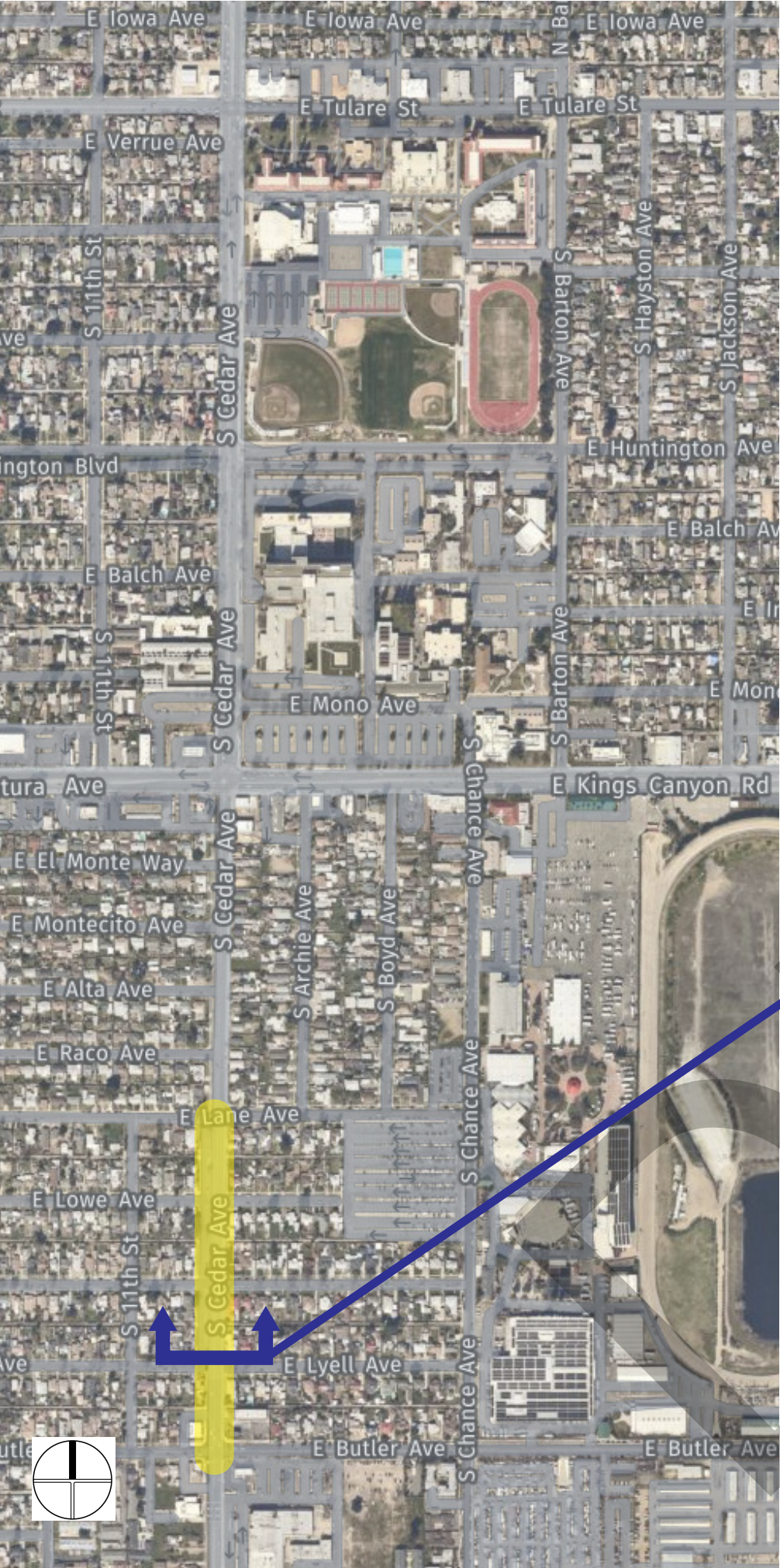
Cedar Avenue - Kings Canyon Road to Lane Avenue

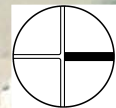
Proposed Option



Cedar Avenue - Lane Avenue to Butler Avenue

Proposed Option





HUNTINGTON
BLVD

KERCKHOFF AVE

PLATT AVE

VERRUE AVE

TULARE AVE

CEDAR AVE



VENTURA AVE

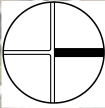
KINGS CANYON RD

BALCH AVE

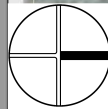
CEDAR AVE

CHANCE AVE

HUNTINGTON BLVD



BUTLER AVE



LYELL AVE

CEDAR AVE

LIBERTY AVE

LOWE AVE

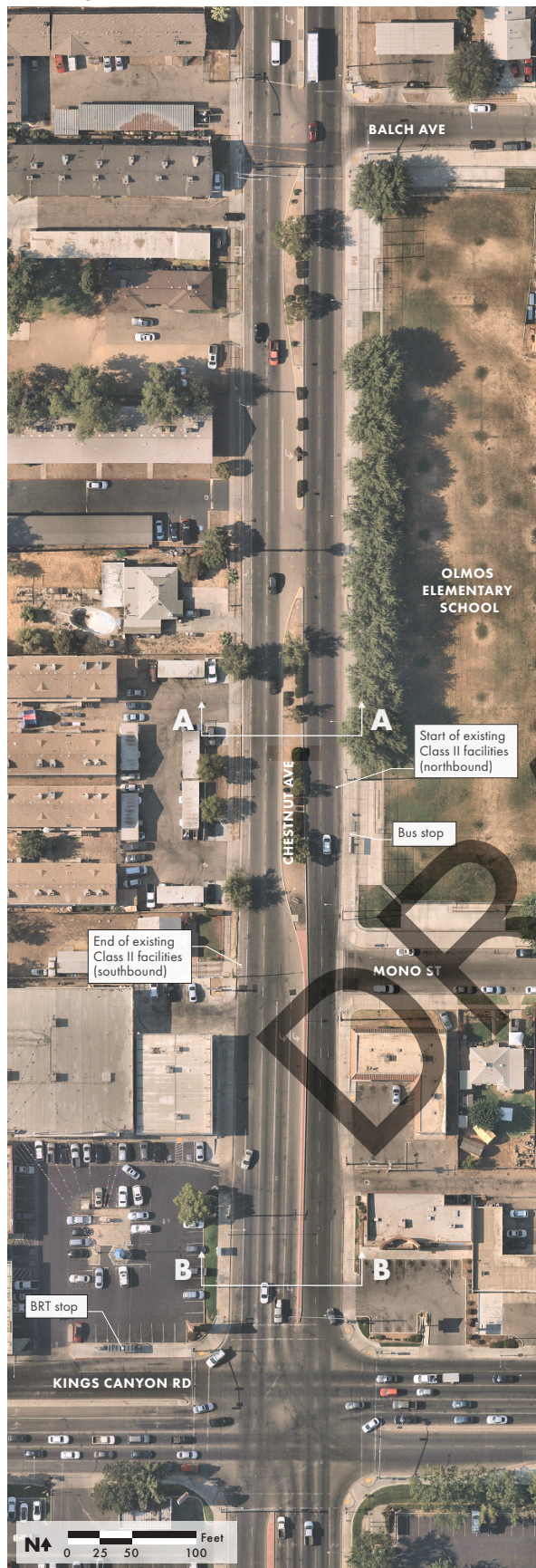
LANE AVE

EL RACO AVE

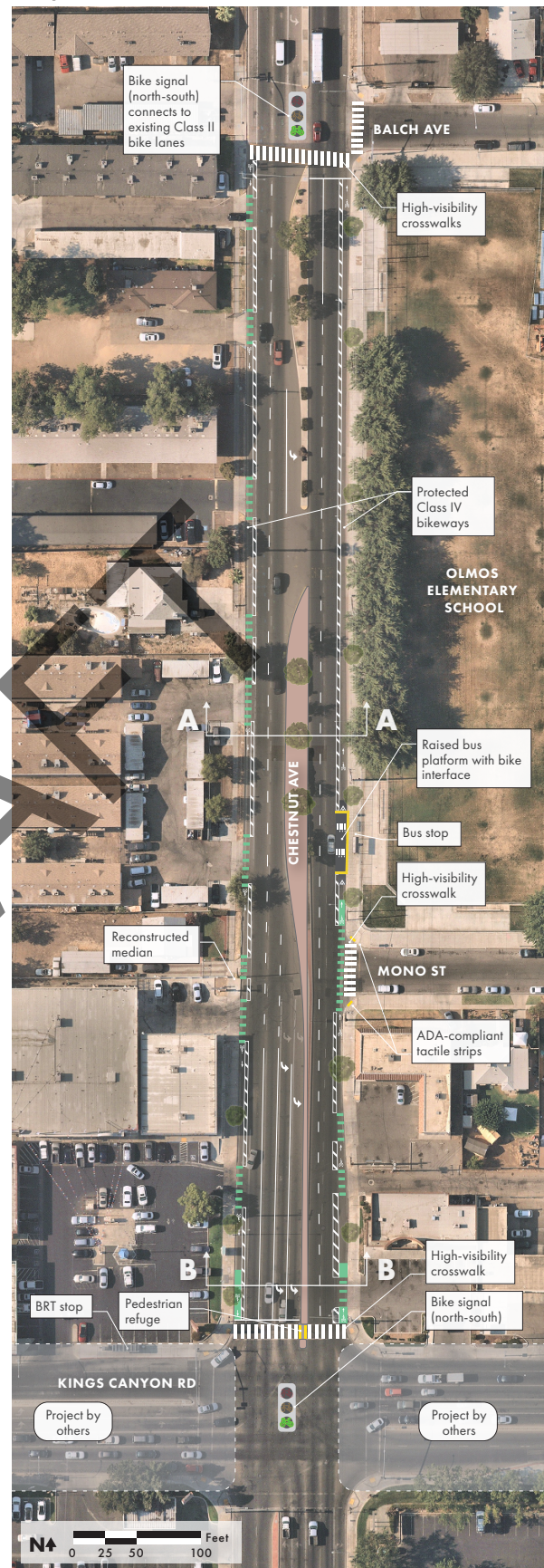
Attachment D: Concept Cross Sections and Plans for Chestnut
Avenue, North of Kings Canyon Road

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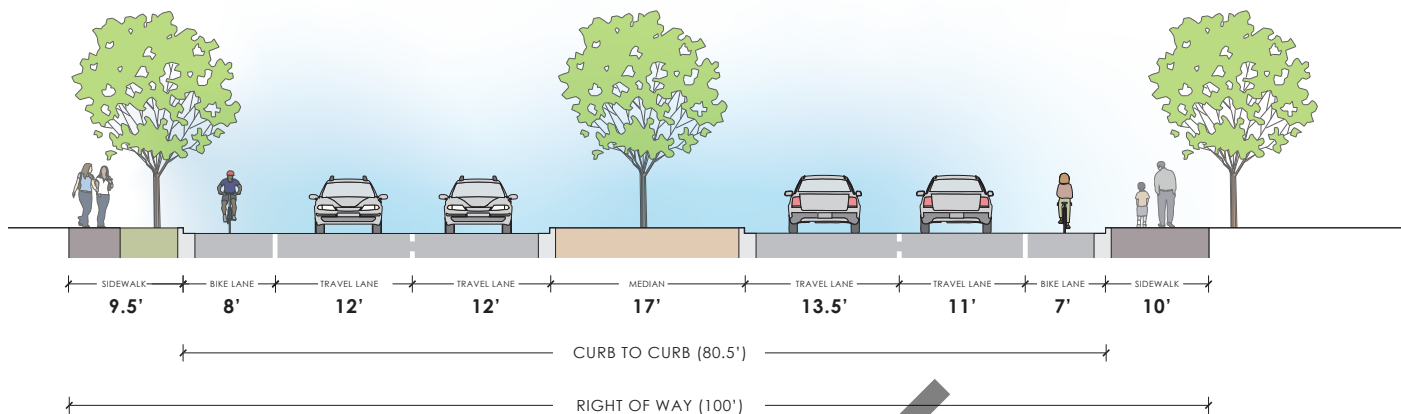
Existing Conditions



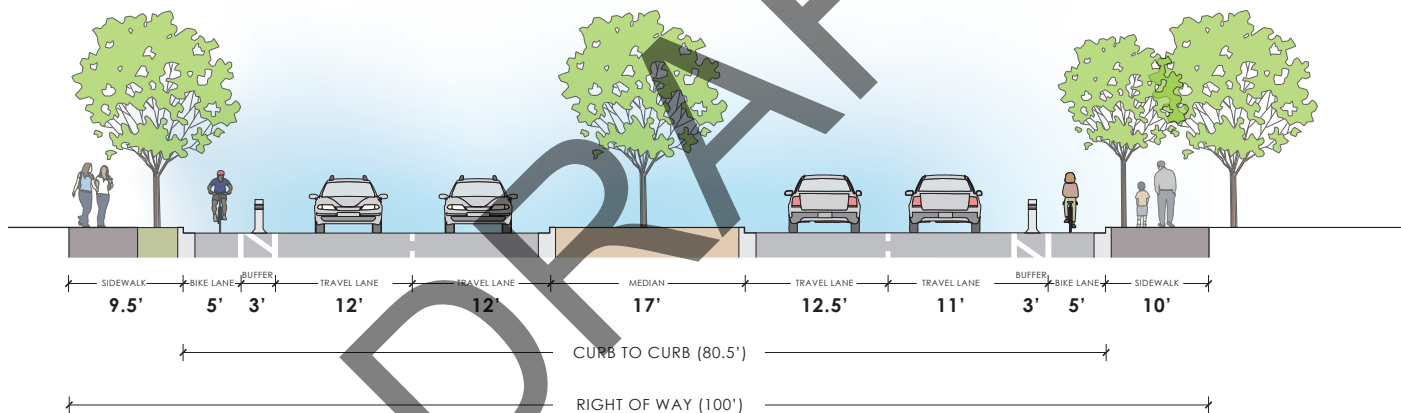
Proposed Conditions



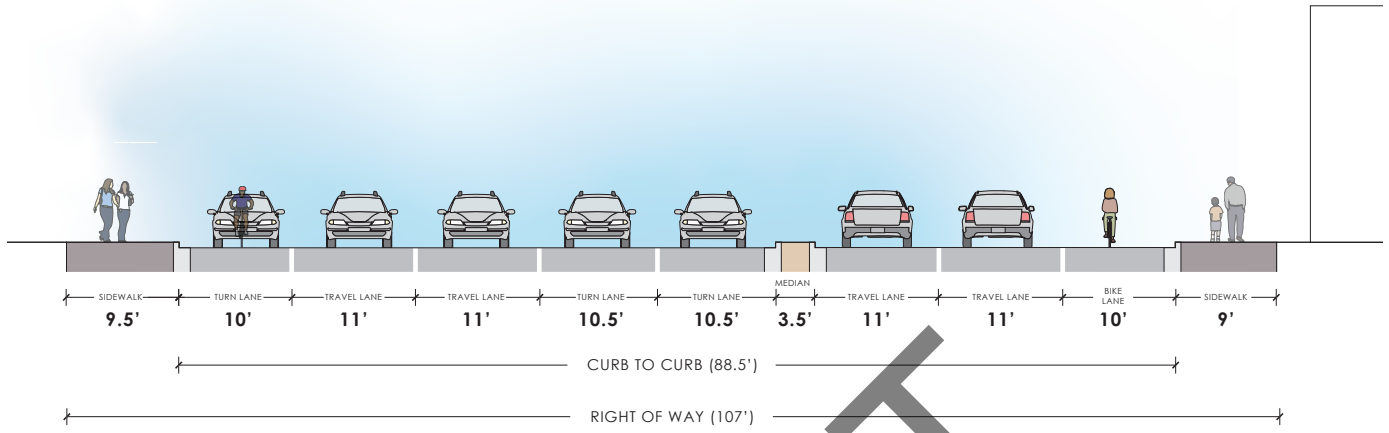
**A-A
CHESTNUT AVE
NORTH OF KINGS CANYON ROAD, LOOKING NORTH
EXISTING CONDITIONS**



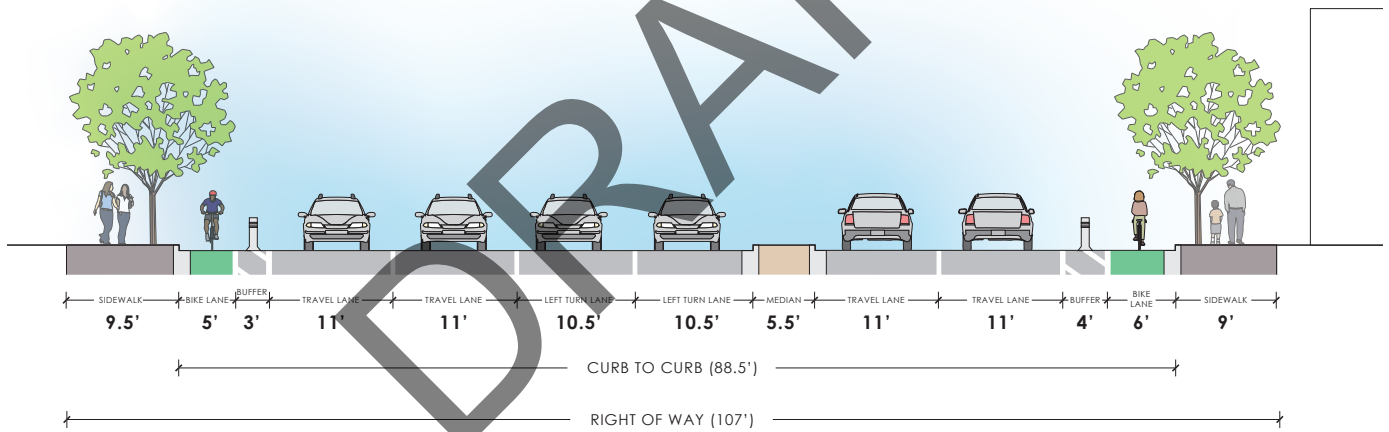
**A-A
CHESTNUT AVE
NORTH OF KINGS CANYON ROAD, LOOKING NORTH
PROPOSED CONDITIONS**



B-B
CHESTNUT AVE
 NORTH OF KINGS CANYON ROAD, LOOKING NORTH
EXISTING CONDITIONS



B-B
CHESTNUT AVE
 NORTH OF KINGS CANYON ROAD, LOOKING NORTH
PROPOSED CONDITIONS



Attachment E: Estimated Rough Order of Magnitude Costs
for Cross Sections and Plans

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Opinion of Probable Construction Cost



General					
Item No.	Description	Unit	Quantity	Unit Price	Total
G1	Mobilization / Demobilization	LS	1	\$ 490,900.00	\$ 490,900.00
G2	Maintain Construction Schedule	LS	1	\$ 196,400.00	\$ 196,400.00
G3	SWPPP	LS	1	\$ 294,600.00	\$ 294,600.00
G4	Construction Staking	LS	1	\$ 785,400.00	\$ 785,400.00
G5	Traffic Control	LS	1	\$ 196,400.00	\$ 196,400.00
Sub-Total					\$ 1,963,700.00

Earthwork & Grading					
Item No.	Description	Unit	Quantity	Unit Price	Total
1	Unclassified Excavation	LS	1	\$ 15,000.00	\$ 15,000.00
Sub-Total					\$ 15,000.00

Demolition					
Item No.	Description	Unit	Quantity	Unit Price	Total
2	Adjust Utility Cover to Finish Grade	EA	17	\$ 1,500.00	\$ 25,500.00
3	Remove Sidewalk	SF	56100	\$ 5.00	\$ 280,500.00
4	Remove Trees	EA	95	\$ 3,000.00	\$ 285,000.00
5	Remove Concrete Curb & Gutter	SF	9520	\$ 15.00	\$ 142,800.00
6	Remove Existing Asphalt Pavement	SF	142740	\$ 4.50	\$ 642,350.00
7	Re-establishment of Monuments	EA	10	\$ 2,250.00	\$ 22,500.00
8	Relocate Overhead Utility Pole	EA	35	\$ 15,000.00	\$ 525,000.00
9	Relocate Fire Hydrant	EA	5	\$ 10,000.00	\$ 50,000.00
10	Remove Cross Gutter	SF	1200	\$ 12.50	\$ 15,000.00
Sub-Total					\$ 1,990,000.00

Infrastructure					
Item No.	Description	Unit	Quantity	Unit Price	Total
11	Sawcut	LF	10470	\$ 3.00	\$ 31,450.00
12	Construct 6" Asphalt Concrete	TON	3450	\$ 265.00	\$ 914,150.00
13	Construct 6" Base Material	CY	3925	\$ 70.00	\$ 274,800.00
14	Slurry Seal	SF	149200	\$ 1.00	\$ 149,200.00
15	Transition to Existing Curb and Gutter	LF	460	\$ 60.00	\$ 27,600.00
16	Construct 6" Curb & Gutter	LF	9520	\$ 60.00	\$ 571,200.00
17	Construct Cross Gutter	SF	1200	\$ 25.00	\$ 30,000.00
18	Construct Concrete Sidewalk	SF	95070	\$ 13.50	\$ 1,283,450.00
19	Construct 4" PCC Bike Ramp over 6" PMB	EA	6	\$ 5,500.00	\$ 33,000.00
20	Construct Concrete Driveway	SF	8090	\$ 16.50	\$ 133,500.00
21	Construct Curb Ramps (All Types) per Plan	EA	46	\$ 7,000.00	\$ 322,000.00
22	Construct Truncated Domes	SF	1500	\$ 20.00	\$ 30,000.00
23	Construct Elevated Bus Platform	EA	9	\$ 11,000.00	\$ 99,000.00
24	Construct 4" Thick Integral Colored Concrete	SF	6300	\$ 40.00	\$ 252,000.00
25	Landscape and Irrigation Installation	LS	1	\$ 872,000.00	\$ 872,000.00
26	Install Post Delineator	EA	476	\$ 100.00	\$ 47,600.00
27	Furnish and Install Wayfinding Sign	EA	5	\$ 750.00	\$ 3,750.00
Sub-Total					\$ 5,074,700.00

Storm Drain Improvements					
Item No.	Description	Unit	Quantity	Unit Price	Total
28	New Storm Drain Lateral	LF	350	\$ 450.00	\$ 157,500.00
29	Install Catch Basin	EA	10	\$ 25,000.00	\$ 250,000.00
30	Remove Existing Catch Basin	EA	10	\$ 12,500.00	\$ 125,000.00
Sub-Total					\$ 532,500.00

Bus Stop Amenities					
Item No.	Description	Unit	Quantity	Unit Price	Total
31	Furnish and Install Trash Receptacle	EA	10	\$ 1,500.00	\$ 15,000.00
32	Furnish and Install Bench	EA	10	\$ 1,750.00	\$ 17,500.00
33	Furnish and Install Bus Shelter	EA	10	\$ 20,000.00	\$ 200,000.00
34	Furnish and Install Bike Rack	EA	10	\$ 1,200.00	\$ 12,000.00
Sub-Total					\$ 244,500.00

Traffic Signal Modifications					
Item No.	Description	Unit	Quantity	Unit Price	Total
35	Traffic Signal Modifications - Butler Ave	LS	1	\$ 320,000.00	\$ 320,000.00
36	Traffic Signal Modifications - Kings Canyon Rd	LS	1	\$ 500,000.00	\$ 500,000.00
37	Traffic Signal Modifications - Huntington Ave	LS	1	\$ 475,000.00	\$ 475,000.00
38	Traffic Signal Modifications - Tulare Ave	LS	1	\$ 380,000.00	\$ 380,000.00

Sub-Total					\$	1,675,000.00
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Striping and Signage						
Item No.	Description	Unit	Quantity	Unit Price	Total	
39	Signing and Striping	LS	1	\$ 285,000.00	\$	285,000.00
Sub-Total					\$	285,000.00

Construction Items

Sub Total of Construction Items					\$	11,780,400.00
Construction Item Contingencies (% of Construction Items) (20%)					\$	2,356,080.00
Total (Construction Items & Contingencies) Cost:					\$	14,136,480.00

Preliminary Engineering (PE)

Environmental Studies and Permits (PA&ED) (5%)*					\$	706,824.00
Plans, Specifications and Estimates (PS&E) (18%)					\$	2,544,566.40
Total (PE)					\$	3,251,390.40

Construction Engineering (CE)

Construction Engineering (10%)					\$	1,413,648.00
Total Construction Costs					\$	15,550,128.00

Total Project Cost					\$	18,801,518.40
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4-Year Build-out Adjustment

4-Year Build-out Adjustment					\$	3,343,000.00
Total Project Cost for 4-Year Build-out					\$	22,144,518.40

(Form Rev: 8/4/2020)

Opinion of Probable Construction Cost



General					
Item No.	Description	Unit	Quantity	Unit Price	Total
G1	Mobilization / Demobilization	LS	1	\$ 249,600.00	\$ 249,600.00
G2	Maintain Construction Schedule	LS	1	\$ 99,900.00	\$ 99,900.00
G3	SWPPP	LS	1	\$ 149,800.00	\$ 149,800.00
G4	Construction Staking	LS	1	\$ 399,400.00	\$ 399,400.00
G5	Traffic Control	LS	1	\$ 99,900.00	\$ 99,900.00
Sub-Total					\$ 998,600.00

Earthwork & Grading					
Item No.	Description	Unit	Quantity	Unit Price	Total
1	Unclassified Excavation	LS	1	\$ 50,000.00	\$ 50,000.00
Sub-Total					\$ 50,000.00

Demolition					
Item No.	Description	Unit	Quantity	Unit Price	Total
2	Remove Sidewalk	SF	3900	\$ 5.00	\$ 19,500.00
3	Remove Median Landscaping	SF	800	\$ 3.50	\$ 2,800.00
4	Remove Median Curb	SF	3785	\$ 12.00	\$ 45,450.00
5	Remove Concrete Curb & Gutter	SF	975	\$ 15.00	\$ 14,650.00
6	Remove Existing Asphalt Pavement	SF	33880	\$ 4.50	\$ 152,500.00
7	Re-establishment of Monuments	EA	5	\$ 2,250.00	\$ 11,250.00
Sub-Total					\$ 250,000.00

Infrastructure					
Item No.	Description	Unit	Quantity	Unit Price	Total
8	Sawcut	LF	1080	\$ 3.00	\$ 3,250.00
9	Construct 6" Asphalt Concrete	TON	1228	\$ 265.00	\$ 325,400.00
10	Construct 6" Base Material	CY	2593	\$ 70.00	\$ 181,550.00
11	Slurry Seal	SF	319600	\$ 1.00	\$ 319,600.00
12	Transition to Existing Curb and Gutter	LF	230	\$ 60.00	\$ 13,800.00
13	Construct 6" Curb	LF	3785	\$ 32.00	\$ 121,150.00
14	Construct 6" Curb & Gutter	LF	980	\$ 60.00	\$ 58,800.00
15	Construct Concrete Sidewalk	SF	3896	\$ 13.50	\$ 52,650.00
16	Construct 4" PCC Bike Ramp over 6" PMB	EA	2	\$ 5,500.00	\$ 11,000.00
17	Construct Curb Ramps (All Types) per Plan	EA	23	\$ 7,000.00	\$ 161,000.00
18	Construct Truncated Domes	SF	250	\$ 20.00	\$ 5,000.00
19	Construct Elevated Bus Platform	EA	9	\$ 11,000.00	\$ 99,000.00
20	Construct 4" Thick Integral Colored Concrete	SF	6300	\$ 40.00	\$ 252,000.00
21	Construct Median Hardscape	SF	6810	\$ 50.00	\$ 340,500.00
22	Median Landscape and Irrigation Installation	LS	1	\$ 500,000.00	\$ 500,000.00
23	Install Post Delineator	EA	635	\$ 100.00	\$ 63,500.00
24	Furnish and Install Wayfinding Sign	EA	5	\$ 750.00	\$ 3,750.00
Sub-Total					\$ 2,511,950.00

Bus Stop Amenities					
Item No.	Description	Unit	Quantity	Unit Price	Total
25	Furnish and Install Trash Receptacle	EA	9	\$ 1,500.00	\$ 13,500.00
26	Furnish and Install Bench	EA	9	\$ 1,750.00	\$ 15,750.00
27	Furnish and Install Bus Shelter	EA	9	\$ 20,000.00	\$ 180,000.00
28	Furnish and Install Bike Rack	EA	9	\$ 1,200.00	\$ 10,800.00
Sub-Total					\$ 220,050.00

Traffic Signal Modifications					
Item No.	Description	Unit	Quantity	Unit Price	Total
29	Traffic Signal Modifications - Butler Ave	LS	1	\$ 320,000.00	\$ 320,000.00
30	Traffic Signal Modifications - Kings Canyon Rd	LS	1	\$ 500,000.00	\$ 500,000.00
31	Traffic Signal Modifications - Huntington Ave	LS	1	\$ 475,000.00	\$ 475,000.00
32	Traffic Signal Modifications - Tulare Ave	LS	1	\$ 380,000.00	\$ 380,000.00
Sub-Total					\$ 1,675,000.00

Striping and Signage					
Item No.	Description	Unit	Quantity	Unit Price	Total
33	Signing and Striping	LS	1	\$ 285,000.00	\$ 285,000.00
Sub-Total					\$ 285,000.00

Construction Items

Sub Total of Construction Items	\$	5,990,600.00
Construction Item Contingencies (% of Construction Items) (20%)	\$	1,198,120.00
Total (Construction Items & Contingencies) Cost:	\$	7,188,720.00

Preliminary Engineering (PE)

Environmental Studies and Permits (PA&ED) (5%)*	\$	359,436.00
Plans, Specifications and Estimates (PS&E) (18%)	\$	1,293,969.60
Total (PE)	\$	1,653,405.60

Construction Engineering (CE)

Construction Engineering (10%)	\$	718,872.00
Total Construction Costs	\$	7,907,592.00

Total Project Cost	\$	9,560,997.60
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4-Year Build-out Adjustment

4-Year Build-out Adjustment	\$	1,700,000.00
Total Project Cost for 4-Year Build-out	\$	11,260,997.60

(Form Rev: 8/4/2020)

Attachment F: Cedar Avenue Multi-use Path Renderings

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Cedar Avenue Multi-use Path Renderings

