

# E

## *Sustainable Street Priority Project Concept Designs*

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## Rollins Road Burlingame



### Concept Description

The Burlingame General Plan identifies Rollins Road as an area that will be targeted for growth and reinvention as a more diverse mixed-use neighborhood with access to transit. As part of this change the city is proposing a road diet and the addition of a class IV bike lane with separated parking to support pedestrian and bicycle activity. This concept proposed to integrate green stormwater infrastructure with the planned transportation improvements.

Linear bioretention planters are proposed as the barrier between the bike lane and driving lane on the south side of Rollins Road. Linear bioretention planters are proposed on the north side of Rollins Road at strategic locations within the parking lane to protect pedestrian crossings and driveways. These bioretention planters will capture stormwater runoff from the roadway and sidewalk. A total of 4,400 square feet of bioretention planter and 6,000 square feet of permeable pavement is proposed, managing stormwater from approximately 3.5 acres of roadway. This project is expected to capture 6.3 acre-feet of runoff per year and retain approximately 69% of runoff.

### Site Characteristics

In Priority Development Area  
Yes

Watershed  
El Portal Creek, Mills Creek, & Easton Creek

### Green Infrastructure Performance


Drainage Management Area  
3.5 ac

Annual Runoff Captured  
6.3 ac-ft

Bioretention Area / Storage Volume  
4,400 sf / 0.15 ac-sf

Permeable Pavement Area / Storage Volume  
6,000 sf / 0.08 ac-ft

### Active Transportation Performance

Change in Bicycle Level of Traffic Stress (LTS)   
LTS 4 to LTS 3

Increase in % Likely Bicyclist Usage  
6%

#### Key Transportation Benefits

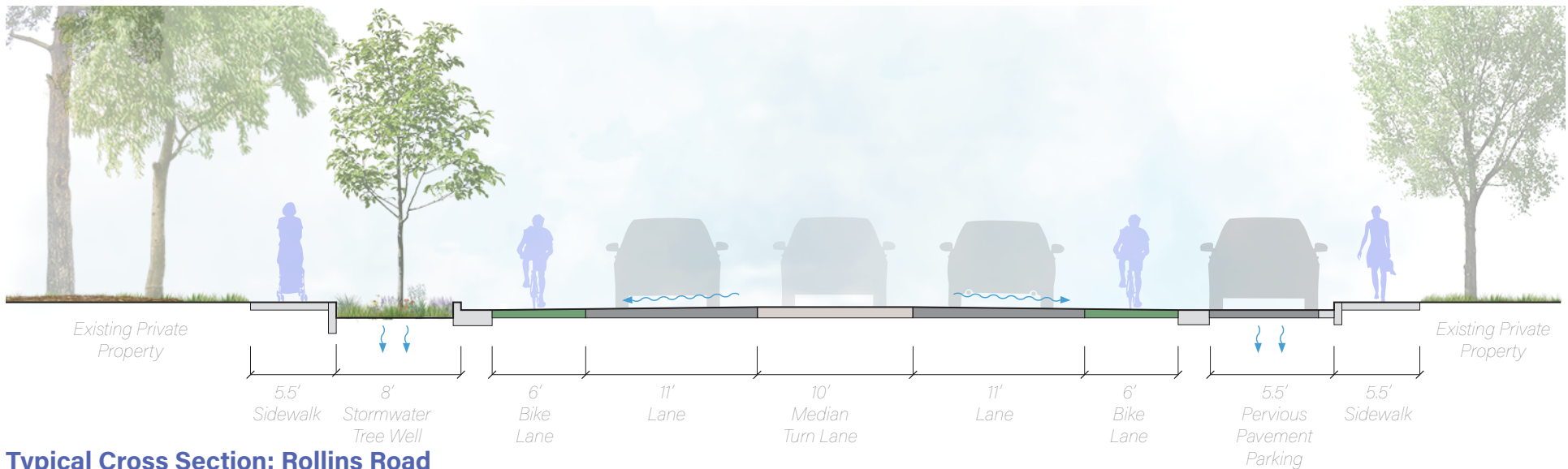
- » Reduced pedestrian crossing distance
- » Protected bike space
- » Traffic calming



**KEY SITE IMPROVEMENTS**

- |  |  |  |
|--|--|--|
| <b>A</b> Proposed stormwater tree well | <b>C</b> Proposed bike lane                | <b>E</b> Proposed permeable parking lane     |
| <b>B</b> Proposed planter buffer       | <b>D</b> Proposed crosswalk curb extension | <b>F</b> Proposed colored pavement turn lane |

**Typical Concept Site Plan Detail: Rollins Road, Burlingame**



**Typical Cross Section: Rollins Road**



# Rollins Road Burlingame

## Concept Perspectives



Existing condition, Rollins Rd looking east toward Ingold Rd



Proposed condition

## Site Elements



Stormwater Tree Well



Planters between parking stalls



Permeable Pavement Median Turn Lane



Bike lane, San Francisco CA

## Project Benefits



**Prioritize Non-Motorized Users**  
*Convert car lanes for biking & walking*  
*Promote more active transportation*



**Groundwater Recharge**  
*Recharge of the Westside Groundwater Basin*



**Walkability & Safety**  
*Curb extensions for safer street crossing*  
*Connection to commercial areas*



**Increased Trees**  
*Shade for walking comfort*  
*Heat and carbon emission reduction*



**Reestablishes Natural Hydrology**  
*Bioretention planters capture and infiltrate stormwater*



**Bikeability & Safety**  
*Increased bike lanes*  
*Increased bike-share roads*



**Bike Network**  
*Part of larger network for connectivity*  
*Promote biking with more connectivity*



**Neighborhood Beautification**  
*Increased vegetation*  
*Provide engaging streets to walk on*

## Planning-Level Cost Estimate

DESCRIPTION	UNIT COST	UNIT COST	QUANTITY	SUBTOTAL
Utilities Protection/Relocation	\$200,000	LS	1	\$200,000
Sawcutting Pavement	\$12	LF	3,880	\$46,560
Concrete Demo, Excavation & Offhaul	\$11	SF	11,140	\$122,500
Planter Excavation & Offhaul	\$70	CY	790	\$55,300
Planter Curb & Gutter & 36" Sidewalls	\$220	LF	1,930	\$424,600
Curb & Gutter	\$60	LF	240	\$14,400
Bioretention Curb Inlet	\$1,500	EA	26	\$39,000
Flush Curb Ribbon	\$60	LF	1,280	\$76,800
Bio-soil Media	\$250	CY	260	\$65,000
Underdrains	\$6	SF	10,670	\$64,000
Drain Rock Subbase	\$160	CY	400	\$64,000
Bioretention Plantings & Mulch	\$25	SF	4,670	\$116,800
Storm Drain Connections	\$7,500	EA	13	\$97,500
Bikelane Striping	\$12	SF	8,500	\$102,000
Pavement and Sidewalk Repair	\$15	SF	8,750	\$131,300
Irrigation System	\$16,470	EA	11	\$181,200
Traffic Sign Relocation	\$900	EA	4	\$3,600
Trees	\$1,500	EA	30	\$45,000
Landscaping Soil	\$125	CY	40	\$5,000
Landscaping Plantings & Mulch	\$20	SF	470	\$9,400
Permeable Pavement	\$25	SF	6,000	\$150,000
Pavement Painting	\$5	SF	10,000	\$50,000
<b>CONSTRUCTION SUBTOTAL</b>				<b>\$2,014,000</b>
Traffic Control				\$100,700
Mobilization (10% construction)				\$201,000
Contingency (30% construction)				\$604,000
Design Fees (15% total)				\$438,000
<b>TOTAL PROJECT COST (DESIGN + CONSTRUCTION)</b>				<b>\$3,358,000</b>

This is a planning-level cost estimate (\$2020) for design and construction. Soft costs for City administration and project management and post-construction operations and maintenance are not included. Other factors that may affect the cost of future construction include escalation and market conditions.

# Rollins Road Burlingame

## Additional Considerations

This project concept is presented for discussion only. This project concept is planning-level and subject to revision as additional information becomes available. Factors to be considered during design of this project include but are not limited to the following:

- » Infiltration Potential. The hydrologic soil group along Rollins Road is classified as type C indicating potentially slow draining soils. Bioretention planters can utilize an elevated underdrain to maximize infiltration potential while providing filtration of any runoff that does not infiltrate. A geotechnical investigation will be conducted during design development, including site-specific borings and infiltration tests, to ensure facilities are designed appropriately. Proposed green infrastructure improvements may be lined with impermeable geotextile and fitted with underdrain pipes to connect treated flows to existing storm drain line if infiltration is deemed infeasible.
- » Utility Conflict. Initial utility assessments were conducted for sanitary sewer, storm sewer, and water mains. Green infrastructure facilities are proposed in configurations that minimize disruption of sewer and water lines, though water mains may conflict with proposed stormwater tree wells. Other utilities such as power and gas were not available for consideration during the development of this concept and should be assessed during design development. The linear bioretention facility on the south side of Rollins Rd is proposed to protect the bike lane and avoid the water main.
- » Facility Sizing. To minimize the impact to existing parking, bioretention planters are sized relatively small compared to the drainage area. Permeable pavement is proposed in concert with the planters to provide adequate runoff management.
- » Buffered Bike Lane. A two-foot buffer between the bike lane and parking lane is included in this concept to provide safety for bicyclists based on site observations. This buffer will increase the lane to 8' of bikeable space and provide sufficient buffer between opening car doors and bikers to reduce swerving into fast-moving vehicular traffic.
- » Irrigation. Green infrastructure planters should be irrigated to ensure establishment and maintenance of healthy plants during periods with no rain. The planning-level cost estimate includes an irrigation system for the bioretention planters.

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## El Camino Real Colma



### Concept Description

El Camino Real (State Highway 82) through the Town of Colma is being redesigned with pedestrian and bicycle improvements. The design includes new landscaping, the addition of a protected bike lane in both directions, new signaling, and a lane reduction from C Street to Mission Street. This concept proposed to integrate green stormwater infrastructure in the planned transportation improvements.

The proposed vegetated median separating the bike lanes from vehicular traffic is 5 to 6 feet wide. At T-intersections and at intersection approaches the proposed median widens to 10 to 13 feet. Portions of the vegetated median on the northeast side of El Camino Real can be installed as bioretention facilities that collect and manage stormwater runoff from the roadway, bike lanes, and sidewalks. The remaining portions of the median

can be landscaped with trees and graded to direct flow towards the bioretention areas. The proposed median on the southwest side of El Camino Real is located above a water main making bioretention facilities infeasible.

The bioretention facilities are shown for the block extending north of Collins Road representing a typical block within the corridor. The same design can be applied to the full extent of improvement from C Street through Mission Street. The proposed bioretention facilities shown on the typical block represent 3,300 square feet of facilities. This project will manage stormwater from 1.9 acres of roadway and provide capture of 3.5 acre-feet of runoff per year. The project is expected to retain approximately 68.6% of runoff.

### Site Characteristics

In Priority Development Area  
Yes

Pavement Condition Index  
Not Available

Watershed  
Colma Creek


### Green Infrastructure Performance

Drainage Management Area  
1.9 ac

Annual Runoff Captured  
3.5 ac-ft

Bioretention Area / Storage Volume  
3,300 sf / 0.10 ac-sf

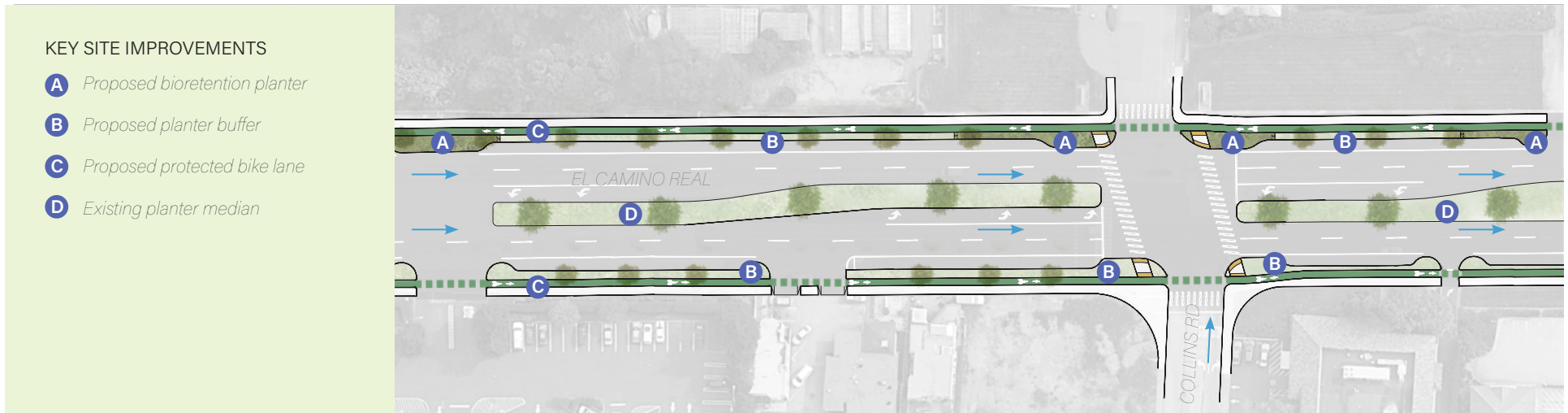
### Active Transportation Performance

Change in Bicycle Level of Traffic Stress (LTS)   
LTS 4 to LTS 1

Increase in % Likely Bicyclist Usage  
99%

#### Key Transportation Benefits

- » Reduced pedestrian crossing distance
- » Protected bike space
- » Road diet



**Typical Concept Site Plan Detail: El Camino Real, Colma**



**Typical Cross Section Detail: El Camino Real**



# El Camino Real Colma

## Concept Perspectives



Existing condition, El Camino Real



Proposed condition

## Site Elements



Class IV bike lane with planter buffer, Oak St, San Francisco CA



Bioretention planter buffer, Portland



Landscaped raised planter median, Farragut TN



Class IV bike lane and parking lane, Sacramento

## Project Benefits



**Prioritize Non-Motorized Users**  
Convert car lanes for biking & walking  
Promote more active transportation



**Bike Network**  
Part of larger network for connectivity  
Promote biking with more connectivity



**Walkability & Safety**  
Curb extensions for safer street crossing  
Connection to commercial areas



**Increased Trees**  
Shade for walking comfort  
Heat and carbon emission reduction



**Neighborhood Beautification**  
Increased vegetation  
Provide engaging streets to walk on



**Reestablishes Natural Hydrology**  
Bioretention planters capture and infiltrate stormwater



**Bikeability & Safety**  
Increased protected bike lanes  
Increased bike-share roads



**Groundwater Recharge**  
Recharge of the Westside Groundwater Basin

## Planning-Level Cost Estimate

DESCRIPTION	UNIT COST	UNIT COST	QUANTITY	SUBTOTAL
Utilities Protection/Relocation	\$100,000	LS	1	\$100,000
Sawcutting Pavement	\$12	LF	4,100	\$49,200
Concrete Demo, Excavation & Offhaul	\$11	SF	10,900	\$119,900
Planter Excavation & Offhaul	\$70	CY	5,750	\$402,500
Planter Curb & 36" Sidewalls	\$160	LF	500	\$80,000
Planter Curb & Gutter & 36" Sidewalls	\$180	LF	560	\$100,800
Curb and Gutter	\$40	LF	4,780	\$191,200
Bio-soil Media	\$250	CY	170	\$42,500
Bioretention Plantings & Mulch	\$25	SF	3,100	\$77,500
Trees	\$1,500	EA	35	\$52,500
Landscaping Soil	\$125	CY	410	\$51,250
Landscaping Plantings & Mulch	\$20	SF	5,430	\$108,600
Underdrains	\$6	SF	1,600	\$9,600
Drain Rock Subbase	\$160	CY	110	\$17,600
Storm Drain Connections	\$7,500	EA	6	\$45,000
Curb Ramps	\$6,000	EA	4	\$24,000
Crosswalk Striping	\$6,000	EA	2	\$12,000
Bike Lane Striping	\$12	SF	9,850	\$118,200
Irrigation System	\$22,300	EA	3	\$66,900
Asphalt and Subbase for Turn Lanes	\$15	SF	1,600	\$24,000
Traffic Sign Relocation	\$900	EA	13	\$11,700
<b>CONSTRUCTION SUBTOTAL</b>				<b>\$1,705,000</b>
Traffic Control				\$170,500
Mobilization (10% construction)				\$171,000
Contingency (30% construction)				\$512,000
Design Fees (15% total)				\$384,000
<b>TOTAL PROJECT COST (DESIGN + CONSTRUCTION)</b>				<b>\$2,943,000</b>

This is a planning-level cost estimate (\$2020) for design and construction. Soft costs for City administration and project management and post-construction operations and maintenance are not included. Other factors that may affect the cost of future construction include escalation and market conditions.

# El Camino Real Colma

## Additional Considerations

This project concept is presented for discussion only. This project concept is planning-level and subject to revision as additional information becomes available. Factors to be considered during design of this project include but are not limited to the following:

- » Infiltration Potential. Soils around El Camino Real in Colma are classified as hydrologic soil group (HSG) B which indicates potentially good soils for infiltrating. A geotechnical investigation will be conducted during design development, including site-specific borings and infiltration tests, to ensure facilities are designed appropriately. Proposed green infrastructure improvements may be lined with impermeable geotextile and fitted with underdrain pipes to connect treated flows to existing storm drain line if infiltration is deemed infeasible.
- » Utility Conflict. An initial utility assessment was conducted for sanitary sewer, storm sewer, water, electrical, and telecom. Bioretention facilities are proposed in configurations that minimize disruption of water and sewer lines.
- » Regional Stormwater Management. The existing water main precludes locating a bioretention planter within the median on the southwest side of El Camino Real. There is potential to route runoff from this side of the street towards the open space on the northeast side of El Camino near the intersection with Mission Street. Within the available space a regional stormwater facility could provide storage and infiltration of runoff from the large portion of El Camino Real.
- » Irrigation. Green infrastructure planters should be irrigated to ensure establishment and maintenance of healthy plants during periods with no rain. The planning-level cost estimate includes an irrigation system for the bioretention planters.



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## Bayshore & Woodrow Wilson Elementary Daly City



### Concept Description

In March 2019 walk audits were conducted at Bayshore Elementary School and Woodrow Wilson Elementary School in Daly City which identified several critical intersections where curb extensions could be installed to establish a safer route to these schools. Nine intersections were evaluated for safety improvements and stormwater management opportunities. Curb extensions coupled with bioretention planters are proposed at 5 intersections near Bayshore Elementary and 6 intersections near

Woodrow Wilson Elementary. These curb extensions will extend the sidewalk at crosswalks which will reduce crossing distances, preclude vehicles from parking too close to crossings, slow vehicles, and increase pedestrian visibility. These curb extensions will also provide space for bioretention planters that will capture stormwater runoff from approximately 2.2 acres of roadway and sidewalk area.

### Site Characteristics

In Priority Development Area  
Yes

Watershed  
*Broadmoor & Bayshore*

### Green Infrastructure Performance

Drainage Management Area  
*2.2 ac*

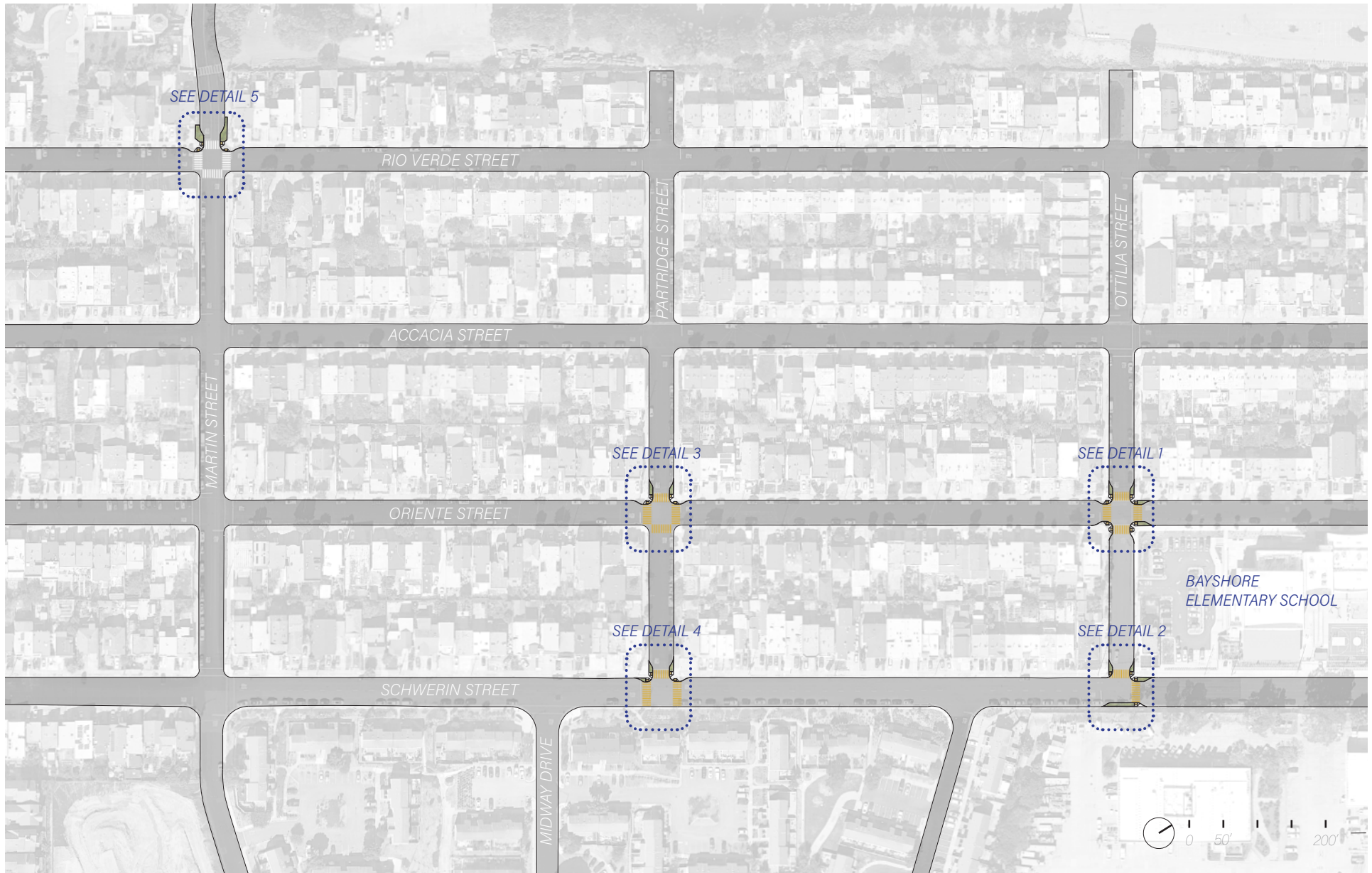
Annual Runoff Captured  
*4.0 ac-ft*

Bioretention Area / Storage Volume  
*3,700 sf / 0.10 ac-ft*

### Active Transportation Performance

#### Key Transportation Benefits

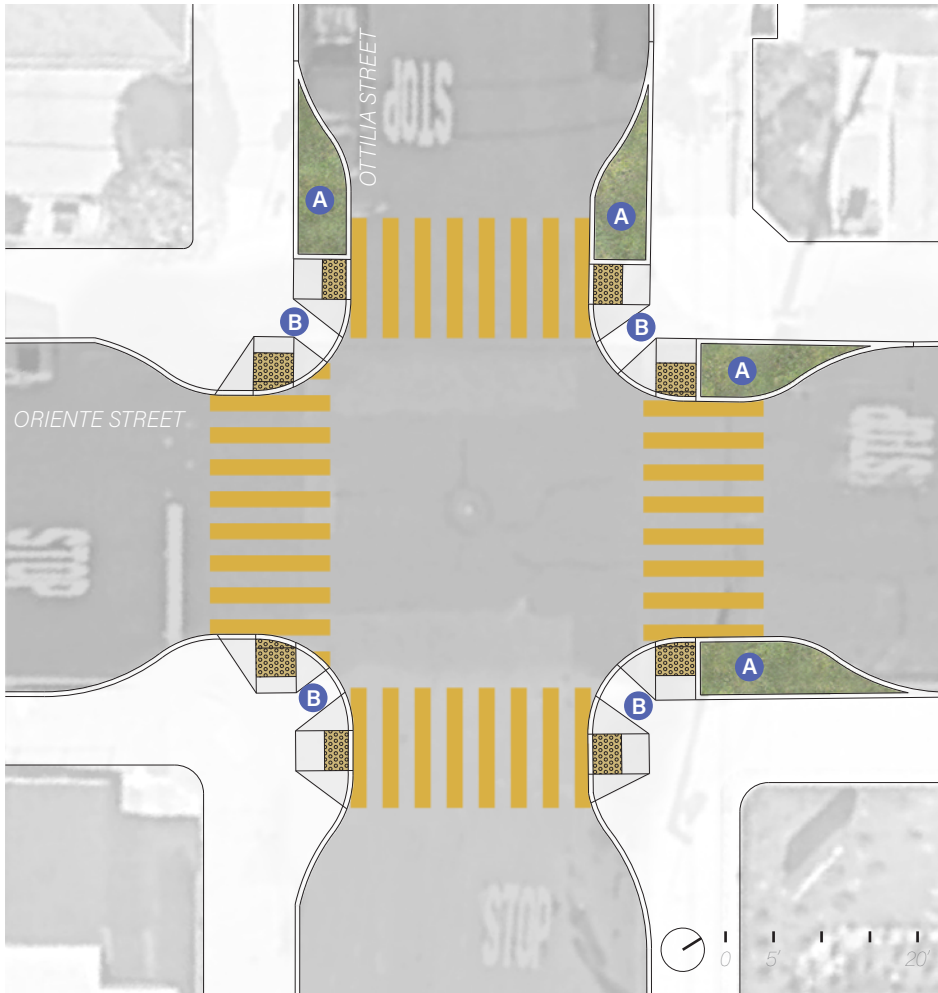
- » *Reduced pedestrian crossing distance*
- » *Traffic calming*



**Site Plan Context: Bayshore Elementary School, Daly City**

# Bayshore & Woodrow Wilson Elementary Daly City

## Concept Detail 1: Otilia Street and Oriente Street

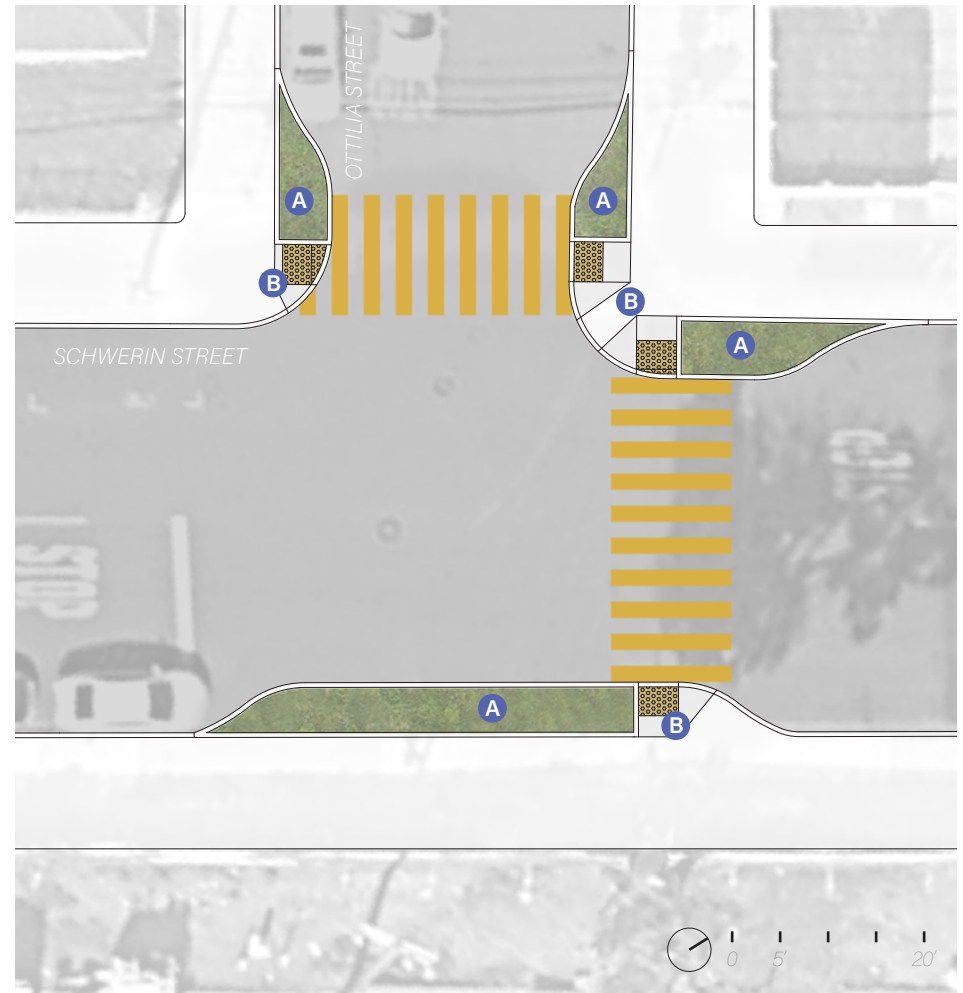


### KEY SITE IMPROVEMENTS

- A** Proposed stormwater curb extension
- B** New curb ramp extensions

Note: Sewer main runs along the western half of Oriente Street and may run below proposed stormwater curb extension planters

## Concept Detail 2: Otilia Street and Schwerin Street



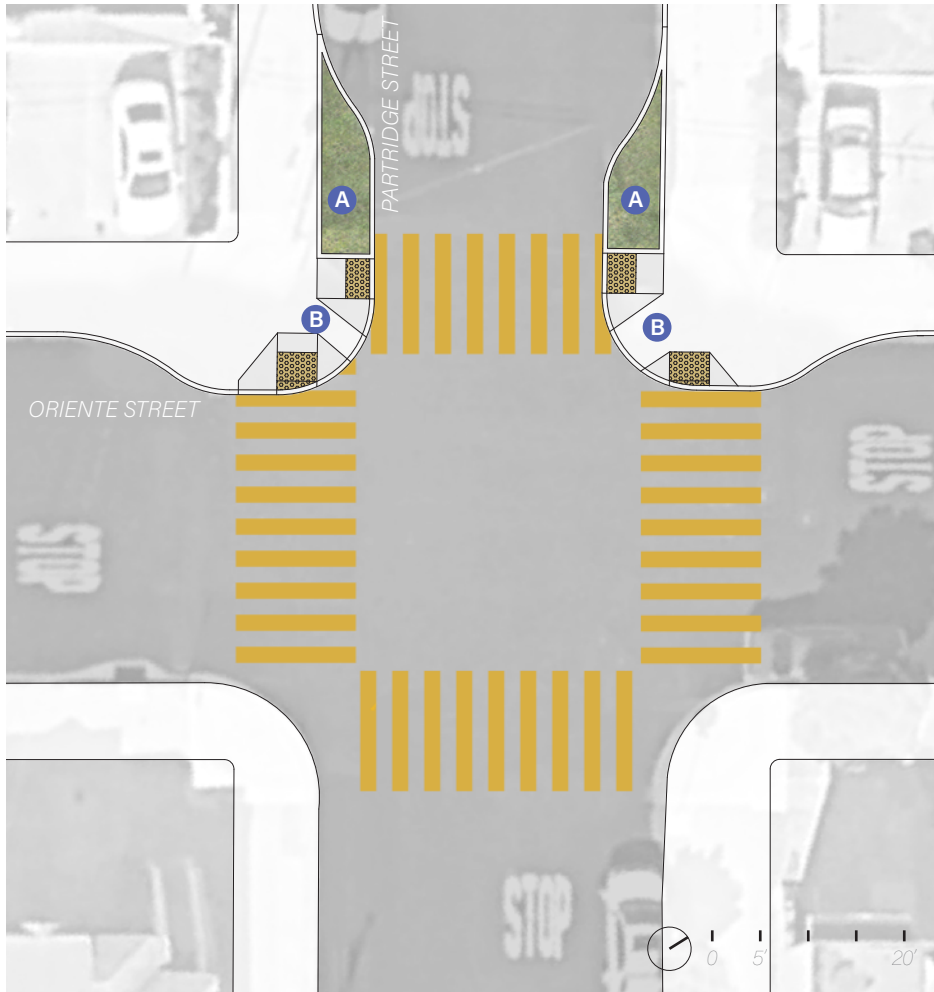
### KEY SITE IMPROVEMENTS

- A** Proposed stormwater curb extension
- B** New curb ramp extensions

Note: Sewer main runs along the western half of Schwerin Street and may run below proposed stormwater curb extension planters



### Concept Detail 3: Partridge Street and Oriente Street

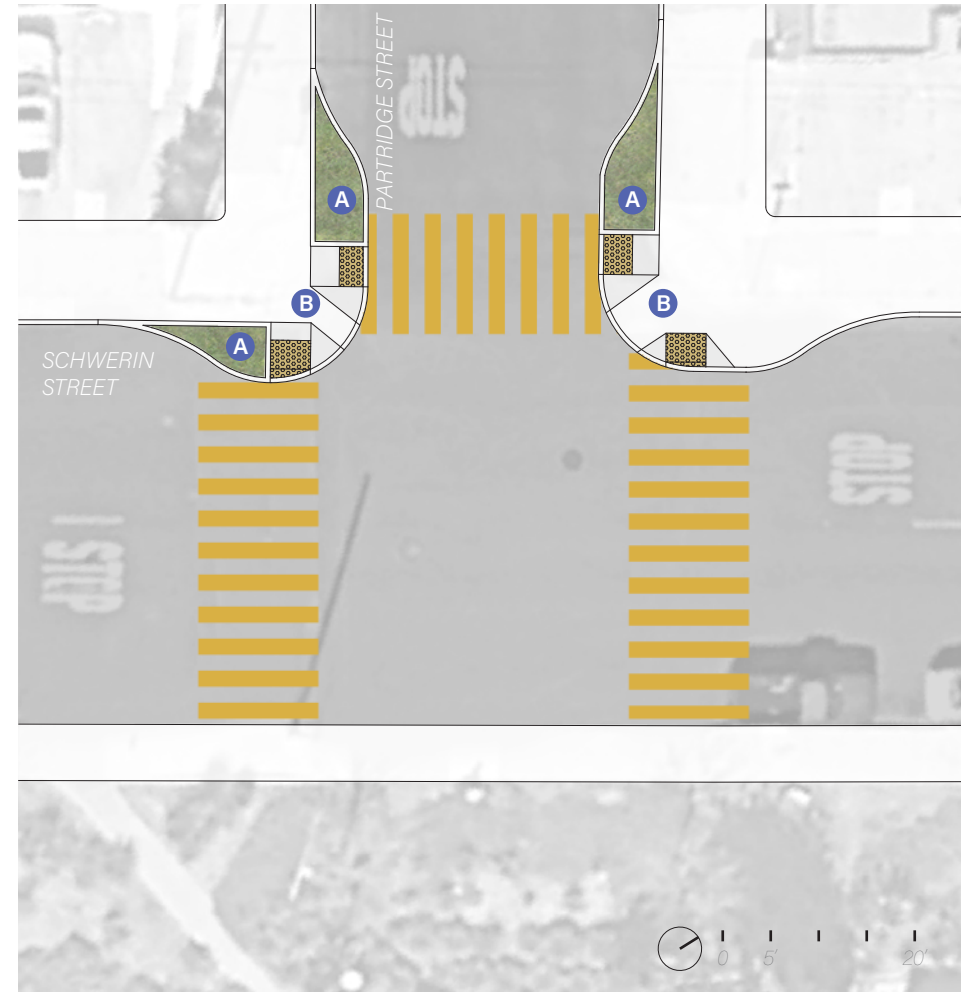


#### KEY SITE IMPROVEMENTS

- A** Proposed stormwater curb extension
- B** New curb ramp extensions

*Note: Sewer main runs along the western half of Oriente Street and may run below proposed stormwater curb extension planters*

### Concept Detail 4: Partridge Street and Schwerin Street



#### KEY SITE IMPROVEMENTS

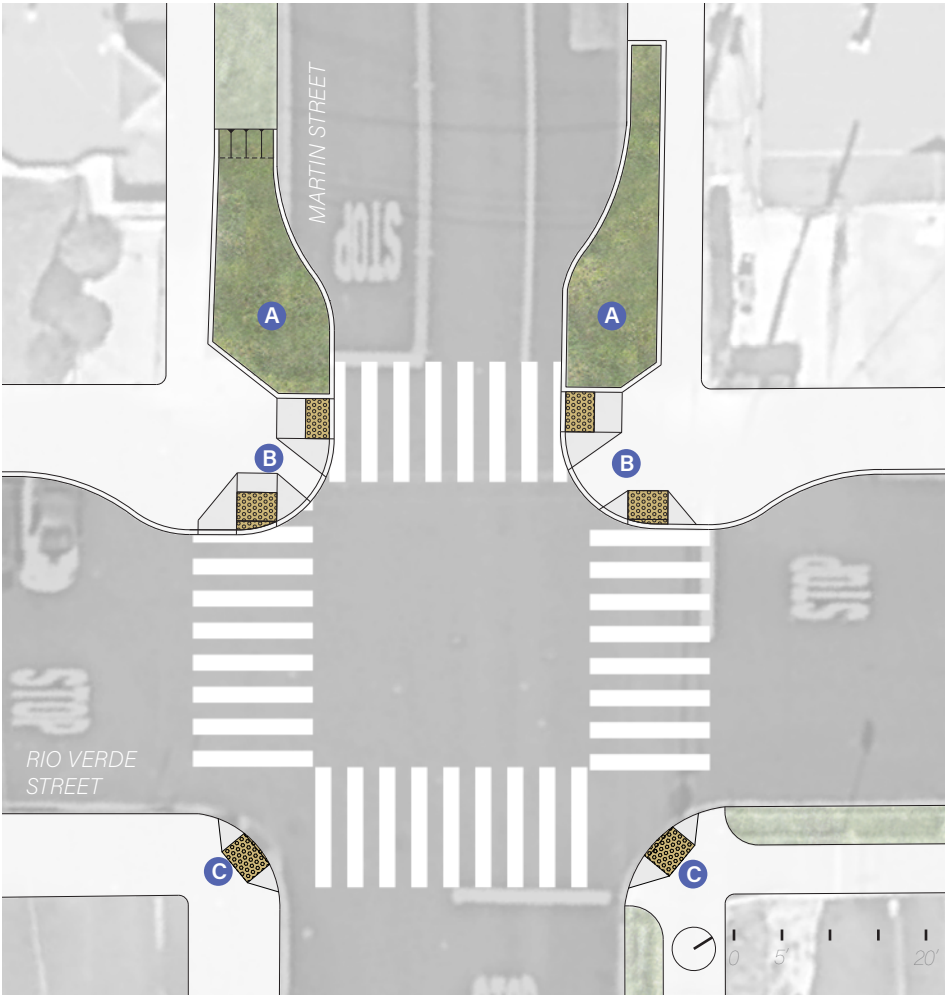
- A** Proposed stormwater curb extension
- B** New curb ramp extensions

*Note: Sewer main runs along the western half of Schwerin Street and may run below proposed stormwater curb extension planters*

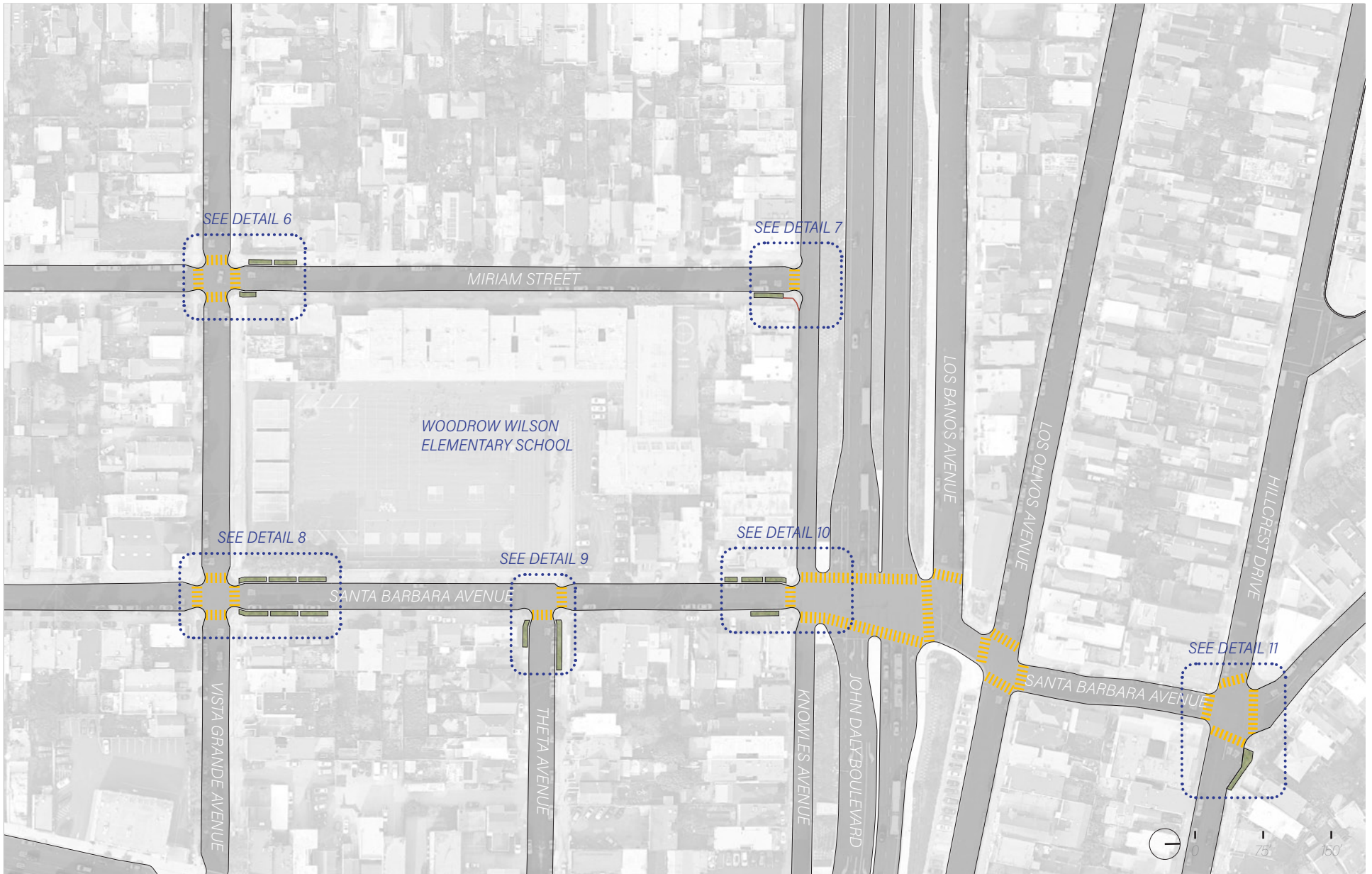


# Bayshore & Woodrow Wilson Elementary Daly City

## Concept Detail 5: Martin Street and Rio Verde Street



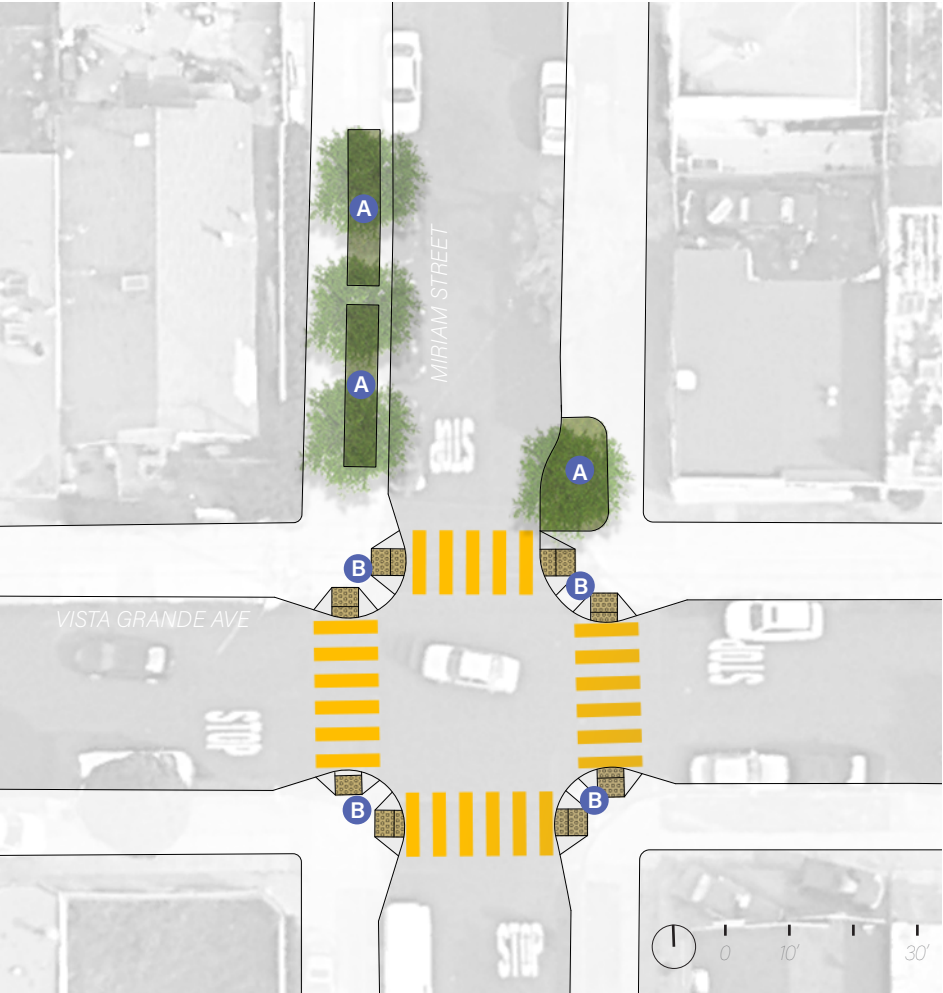
- KEY SITE IMPROVEMENTS
- A** Proposed stormwater curb extension
  - B** New curb ramp extensions
  - C** New curb ramp



**Site Plan Context: Woodrow Wilson Elementary School, Daly City**

# Bayshore & Woodrow Wilson Elementary Daly City

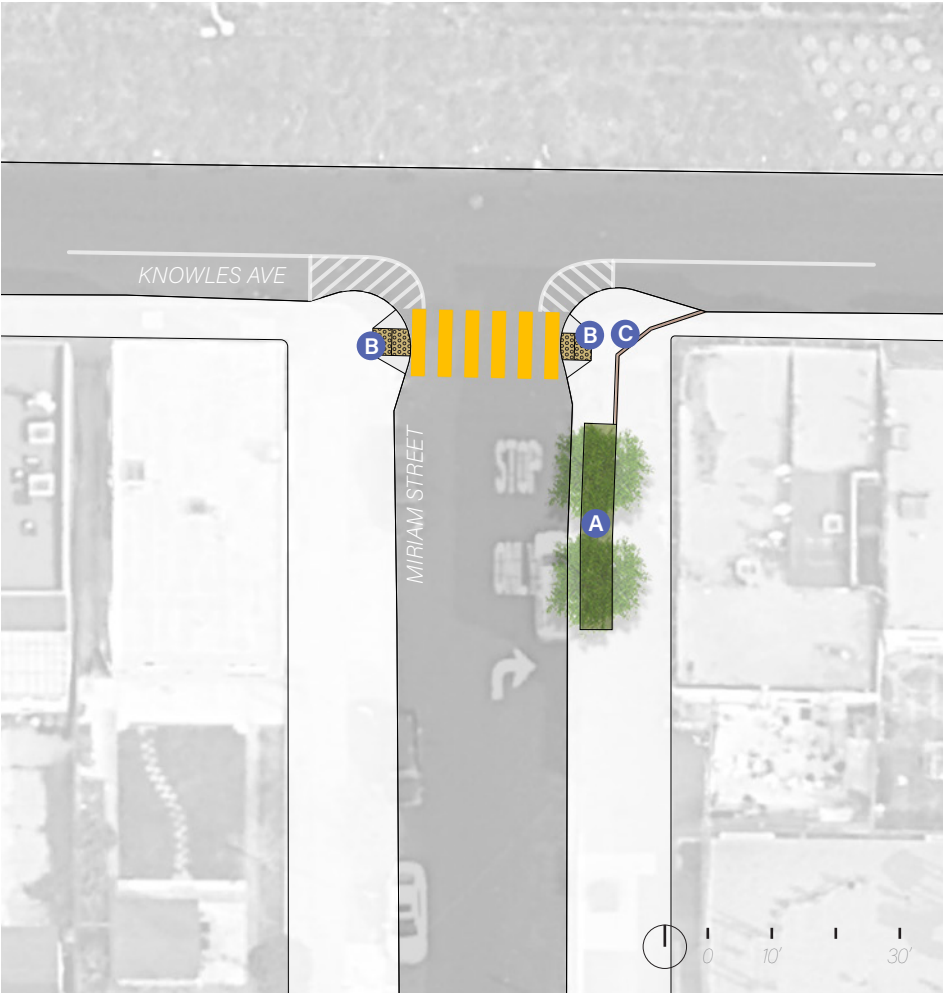
Concept Detail 6: Miriam Street and Vista Grande Ave



- KEY SITE IMPROVEMENTS
- A Proposed bioretention planter
  - B New curb ramp extensions

Note: Stormwater curb extension on east side of Miriam St is limited to the existing red curb and does not encroach on the existing driveway apron.

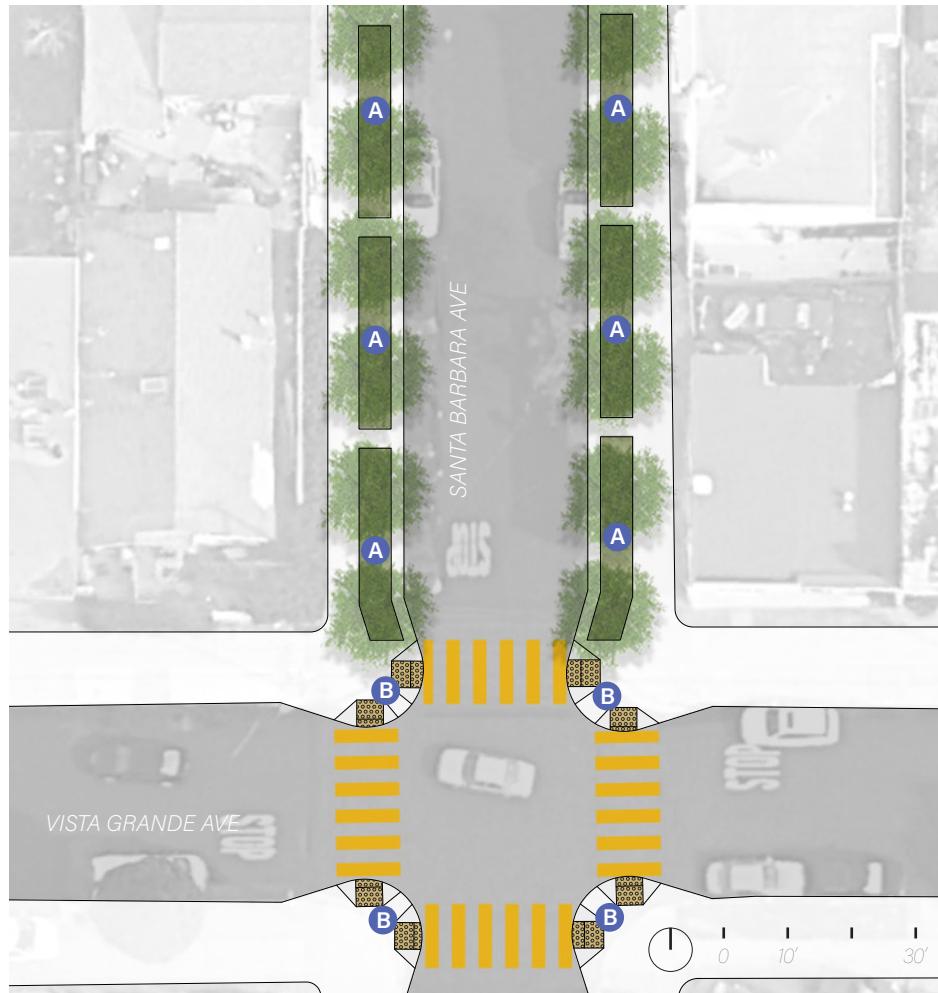
Concept Detail 7: Miriam Street and Knowles Ave



- KEY SITE IMPROVEMENTS
- A Proposed bioretention planter
  - B New curb ramp extensions
  - C Runnel



### Concept Detail 8: Santa Barbara Ave and Vista Grande Ave



#### KEY SITE IMPROVEMENTS

- A** Proposed bioretention planter
- B** New curb ramp extensions

### Concept Detail 9: Santa Barbara Ave and Theta Ave

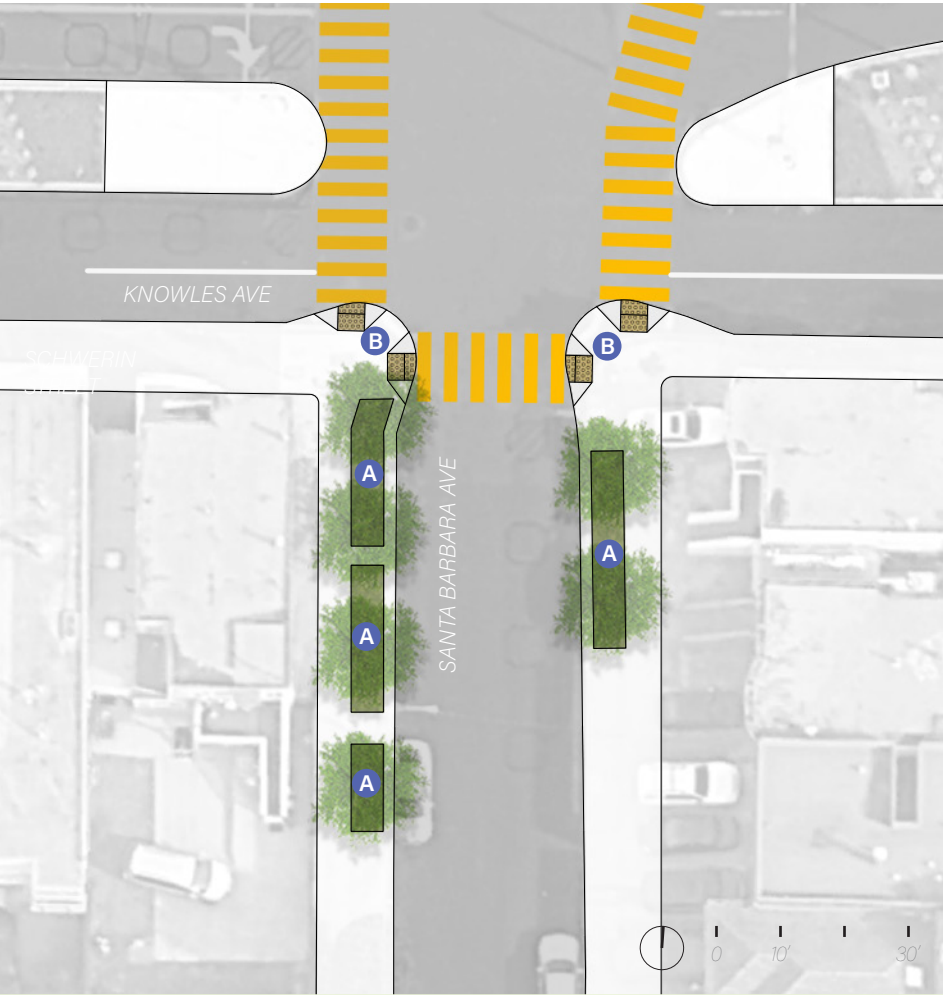


#### KEY SITE IMPROVEMENTS

- A** Proposed bioretention planter

# Bayshore & Woodrow Wilson Elementary Daly City

Concept Detail 10: Santa Barbara Ave and Knowles Ave



- KEY SITE IMPROVEMENTS
- A Proposed bioretention planter
  - B New curb ramp extensions

Concept Detail 11: Santa Barbara Ave and Hillcrest Drive



- KEY SITE IMPROVEMENTS
- A Proposed stormwater curb extension
  - B New curb ramp extensions
  - C New curb ramps
- Note: Stormwater planter does not encroach on the existing driveway apron.

## Project Benefits



**Prioritize Non-Motorized Users**  
*Promote active transportation*



**Walkability & Safety**  
*Curb extensions for safer street crossing*



**Visual Safety**  
*Curb extensions slow vehicles*



**Increased Trees**  
*Shade for walking comfort*  
*Heat and carbon emission reduction*



**Neighborhood Beautification**  
*Increased vegetation*  
*Provide engaging streets to walk on*



**Groundwater Recharge**  
*Recharge of Westside and Visitacion Valley*  
*Groundwater Basins*



**Re-establishes Natural Hydrology**  
*Bioretention planters capture and infiltrate*  
*stormwater*

## Planning-Level Cost Estimate

DESCRIPTION	UNIT COST	UNIT COST	QUANTITY	SUBTOTAL
Utilities Protection/Relocation	\$220,000	LS	1	\$220,000
Sawcutting Pavement	\$40	LF	4,000	\$160,000
Concrete Demo, Excavation & Offhaul	\$11	SF	21,000	\$231,000
Planter Excavation & Offhaul	\$70	CY	350	\$24,500
Planter Curb & 36" Sidewalls	\$200	LF	1,600	\$320,000
Bio-soil Media	\$275	CY	210	\$57,800
Underdrains	\$6	SF	21,000	\$126,000
Drain Rock Subbase	\$160	CY	140	\$22,400
Plantings & Mulch	\$25	SF	3,800	\$95,000
Catch Basin Relocation	\$8,000	EA	5	\$40,000
Storm Drain Connections	\$7,500	EA	18	\$135,000
Curb and Gutter	\$70	LF	2,800	\$196,000
Bioretention Curb Inlet	\$1,500	EA	20	\$30,000
Bioretention Curb Outlet	\$1,000	EA	20	\$20,000
Curb Ramps	\$2,750	EA	56	\$154,000
Crosswalk Striping	\$2,000	EA	28	\$56,000
Pavement and Sidewalk Repair	\$11.50	SF	17,500	\$201,300
Irrigation System	\$7,000	EA	11	\$77,000
Traffic Sign Replacement	\$2,000	EA	11	\$22,000
<b>CONSTRUCTION SUBTOTAL</b>				<b>\$2,188,000</b>
Traffic Control (5% Construction)				\$109,400
Mobilization (10% construction)				\$219,000
Contingency (30% construction)				\$656,000
Design Fees (15% total)				\$476,000
<b>TOTAL PROJECT COST (DESIGN + CONSTRUCTION)</b>				<b>\$3,648,000</b>

This is a planning-level cost estimate (\$2020) for design and construction. Soft costs for City administration and project management and post-construction operations and maintenance are not included. Other factors that may affect the cost of future construction include escalation and market conditions.

# Bayshore & Woodrow Wilson Elementary Daly City

## Additional Considerations

This project concept is presented for discussion only. This project concept is planning-level and subject to revision as additional information becomes available. Factors to be considered during design of this project include but are not limited to the following:

- » Infiltration Potential. Soils around Woodrow Wilson are classified as hydrologic soil group (HSG) B which indicates potentially good soils for infiltrating. Near Bayshore Elementary School the HSG is unknown, however, regional geologic maps indicate the site has Quaternary Hillslope Deposit which may indicate unconsolidated soil that is conducive to infiltration. A geotechnical investigation will be conducted during design development, including site-specific borings and infiltration tests, to ensure facilities are designed appropriately. Proposed green infrastructure improvements may be lined with impermeable geotextile and fitted with underdrain pipes to connect treated flows to existing storm drain line if infiltration is deemed infeasible.
- » Utility Conflict. Initial utility assessments were conducted for sanitary sewer, storm sewer, and water. Bioretention facilities are proposed in configurations that minimize disruption of water and sewer lines. Other utilities such as power and telecom were not available for consideration during the development of this concept.
- » Irrigation. Green infrastructure planters should be irrigated to ensure establishment and maintenance of healthy plants during periods with no rain. The planning-level cost estimate includes an irrigation system for the bioretention planters.

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## Fordham Street East Palo Alto



### Concept Description

The intersection of Fordham Street and Purdue Avenue is a major school crosswalk to Costano Elementary School. It serves as the pedestrian crossing entryway to the elementary school, as well as the sole entrance to the school's parking lot and drop-off loading zone. The intersection is also included as part of East Palo Alto's planned bike improvement plans, where a proposed Class III shared bike route will run along Fordham Street, and a Class I off-street bike path will run from Costano Elementary to Purdue Avenue.

Curb extensions are proposed at the main diagonal crosswalk across Fordham Street as part of the Safe Routes to School initiative, and will extend approximately 6 feet into the roadway. This will provide traffic calming for a busy intersection with multiple modes of transportation,

reduce the pedestrian crossing distance, and increase visibility of pedestrians to oncoming traffic.

Bioretention stormwater planters are also proposed to be integrated into the curb extensions to provide management of roadway runoff, since the intersection experiences flood and drainage issues after rain events due to an inadequate storm drain system in the area. The southwestern corner will manage runoff from Fordham Street while the northeastern corner will manage runoff from Purdue Avenue via curb runnel. A total of 220 square feet of bioretention planter is proposed, capturing stormwater from approximately 0.12 acres of roadway and school parking area which will provide management of 0.22 acre-feet of runoff per year.

### Site Characteristics

In Priority Development Area  
Yes

Pavement Condition Index  
*Good/Fair, At Risk, Excellent/Very Good (3 road intersection)*

Watershed  
*Ravenswood Slough*

### Green Infrastructure Performance

Drainage Management Area  
*0.12 ac*

Annual Runoff Captured  
*0.22 ac-ft*

Bioretention Area / Storage Volume  
*220 sf / xx ac-ft*

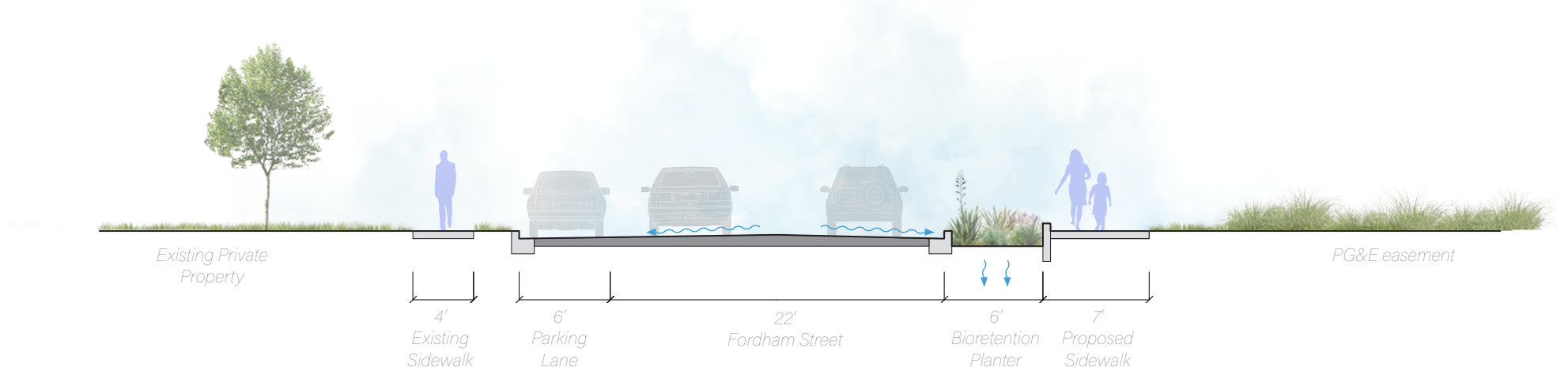
### Active Transportation Performance

#### Key Transportation Benefits

- » *Reduced pedestrian crossing distance*
- » *Traffic calming*



**Concept Site Plan Detail: Fordham Street, East Palo Alto**



**Typical Cross Section: Fordham Street**



# Fordham Street East Palo Alto

## Concept Perspectives



Existing condition, intersection at Fordham Street & Purdue Avenue



Proposed condition

## Site Elements



Safe routes to school stormwater curb extension, Burlingame CA



Safe routes to school stormwater curb extension, San Mateo CA



Planter buffer curb extension, Long Beach CA



Planter buffer bump-out

## Project Benefits



**Prioritize Non-Motorized Users**  
*Promote more active transportation*



**Neighborhood Beautification**  
*Increased vegetation*  
*Provide engaging streets to walk on*



**Increased Trees**  
*Shade for walking comfort*  
*Heat and carbon emission reduction*

**Groundwater Recharge**  
*Recharge of the San Mateo Plain*  
*Groundwater Basin*



**Walkability & Safety**  
*Curb extensions for safer street crossing*  
*Connection to commercial areas*

**Reestablishes Natural Hydrology**  
*Bioretention planters capture and infiltrate stormwater*

## Planning-Level Cost Estimate

DESCRIPTION	UNIT COST	UNIT COST	QUANTITY	SUBTOTAL
Utilities Protection/Relocation	\$15,000	LS	1	\$15,000
Sawcutting Pavement	\$12	LF	105	\$1,260
Concrete Demo, Excavation & Offhaul	\$11	SF	210	\$2,300
Planter Excavation & Offhaul	\$70	CY	210	\$14,700
Planter Curb & 36" Sidewalls	\$160	LF	55	\$8,800
Planter Curb & Gutter & 36" Sidewalls	\$180	LF	50	\$9,000
Bio-soil Media	\$250	CY	20	\$5,000
Underdrains	\$6	SF	210	\$1,300
Drain Rock Subbase	\$160	CY	10	\$1,600
Bioretention Plantings & Mulch	\$25	SF	210	\$5,300
Curb & Gutter	\$40	LF	20	\$800
Storm Drain Connections	\$7,500	EA	2	\$15,000
Bioretention Curb Inlet	\$1,500	EA	2	\$3,000
Curb Ramps	\$6,000	SF	2	\$12,000
Sidewalk Repair	\$15	SF	200	\$3,000
Irrigation System	\$11,380	EA	2	\$22,800
<b>CONSTRUCTION SUBTOTAL</b>				<b>\$121,000</b>
Traffic Control				\$6,050
Mobilization (10% construction)				\$12,000
Contingency (30% construction)				\$36,000
Design Fees (15% total)				\$26,000
<b>TOTAL PROJECT COST (DESIGN + CONSTRUCTION)</b>				<b>\$201,000</b>

This is a planning-level cost estimate (\$2020) for design and construction. Soft costs for City administration and project management and post-construction operations and maintenance are not included. Other factors that may affect the cost of future construction include escalation and market conditions.

# Fordham Street East Palo Alto

## Additional Considerations

This project concept is presented for discussion only. This project concept is planning-level and subject to revision as additional information becomes available. Factors to be considered during design of this project include but are not limited to the following:

- » Infiltration Potential. The hydrologic soil group is unknown along Fordham Ave, and preliminary investigations show that groundwater levels are approximately 6 feet below ground surface. A geotechnical investigation will be conducted during design development, including site-specific borings and infiltration tests, to ensure facilities are designed appropriately. Proposed green infrastructure improvements may be lined with impermeable geotextile and fitted with underdrain pipes to connect treated flows to existing storm drain line if infiltration is deemed infeasible.
- » Utility Conflict. Initial utility assessments were conducted for sanitary sewer, storm sewer, and water utilities. Bioretention facilities are proposed in configurations that minimize disruption of sewer and water lines. Other utilities such as power and telecom were not available for consideration during the development of this concept and should be assessed during design development.
- » Bus route. Due to existing bus stop on Purdue Avenue prior to the intersection with Fordham Street and the narrow roadway along Purdue, curb extensions were not considered for the crosswalk along Purdue Avenue.

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## Main Street Half Moon Bay



### Concept Description

Main Street in Half Moon Bay between Highway 1 and Stone Pine Road is being redesigned to include a separated bikeway. This bikeway will cross Highway 92 and Lewis Foster Drive which provides access to Half Moon Bay High School. This concept proposes to integrate green stormwater infrastructure in the planned bikeway improvements to provide stormwater management and improved safety for bikers while providing streetscape amenities.

Main Street has a 60-foot right-of-way and 46-foot roadway with space for a four-foot wide bike lanes within the shoulder on both sides of the street. Curb extensions and bioretention planters are proposed in areas around the proposed bike lane to provide streetscape improvements and manage stormwater runoff.

A redesign of the approach of Lewis Foster Dr to Main St is proposed that removes the dedicated right-hand turn lane from Lewis Foster Dr. This will create a safer intersection with a better view of oncoming bicycle traffic on Main Street and a shorter pedestrian crossing. In addition, this redesign will provide space for a bioretention planter that can manage runoff from Main Street and Lewis Foster Dr.

Curb extensions and planters are proposed on the south side of Main St, at the intersection of Main St and Highway 92, and along Stone Pine Road to provide a total of 7,900 square feet of bioretention planter capturing stormwater from approximately 2.4 acres of roadway and providing capture of 4.4 acre-feet or runoff per year. This project is expected to retain 68.6% of runoff.

### Site Characteristics

In Priority Development Area  
*No*

Watershed  
*Pilarcitos Creek*

### Green Infrastructure Performance


Drainage Management Area  
*2.4 acres*

Annual Runoff Captured  
*4.4 ac-ft*

Bioretention Area / Storage Volume  
*7,900 sf / 0.27 ac-sf*

Permeable Pavement Area / Storage Volume  
*3,500 sf / 0.05 ac-ft*

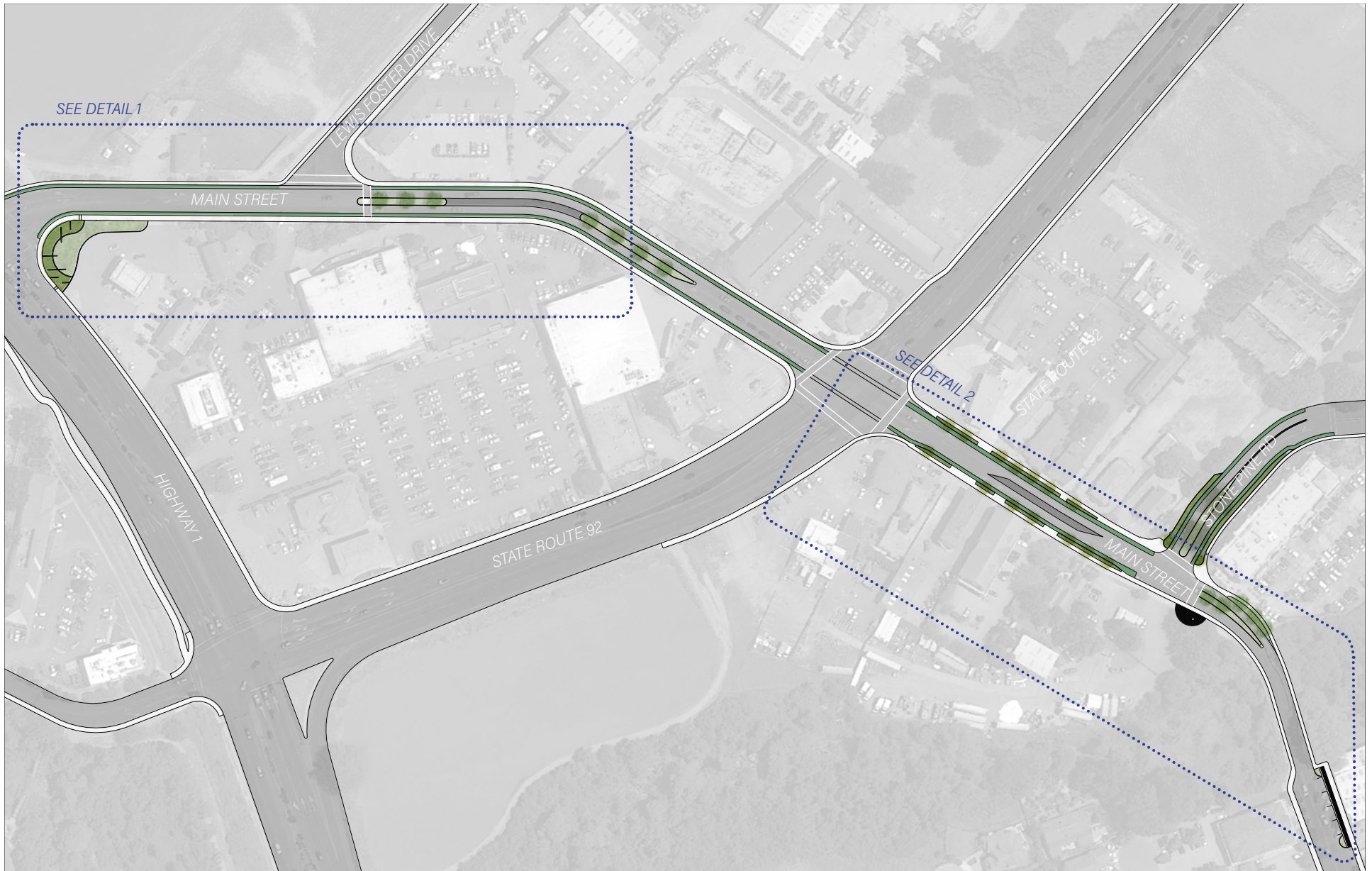
### Active Transportation Performance

Change in Bicycle Level of Traffic Stress (LTS)   
*LTS 4 to LTS 3*

Increase in % Likely Bicyclist Usage  
*11%*

#### Key Transportation Benefits

- » *Added bike space*
- » *Traffic calming*

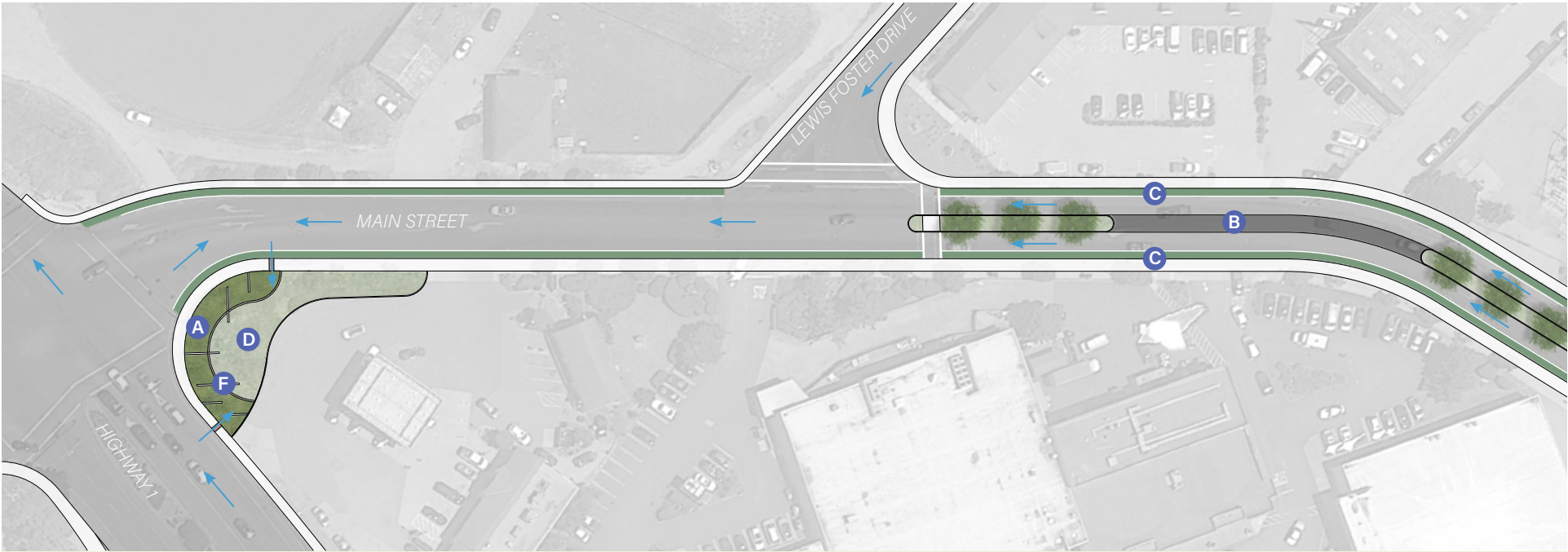


Site Plan Context: Main Street, Half Moon Bay





# Main Street Half Moon Bay

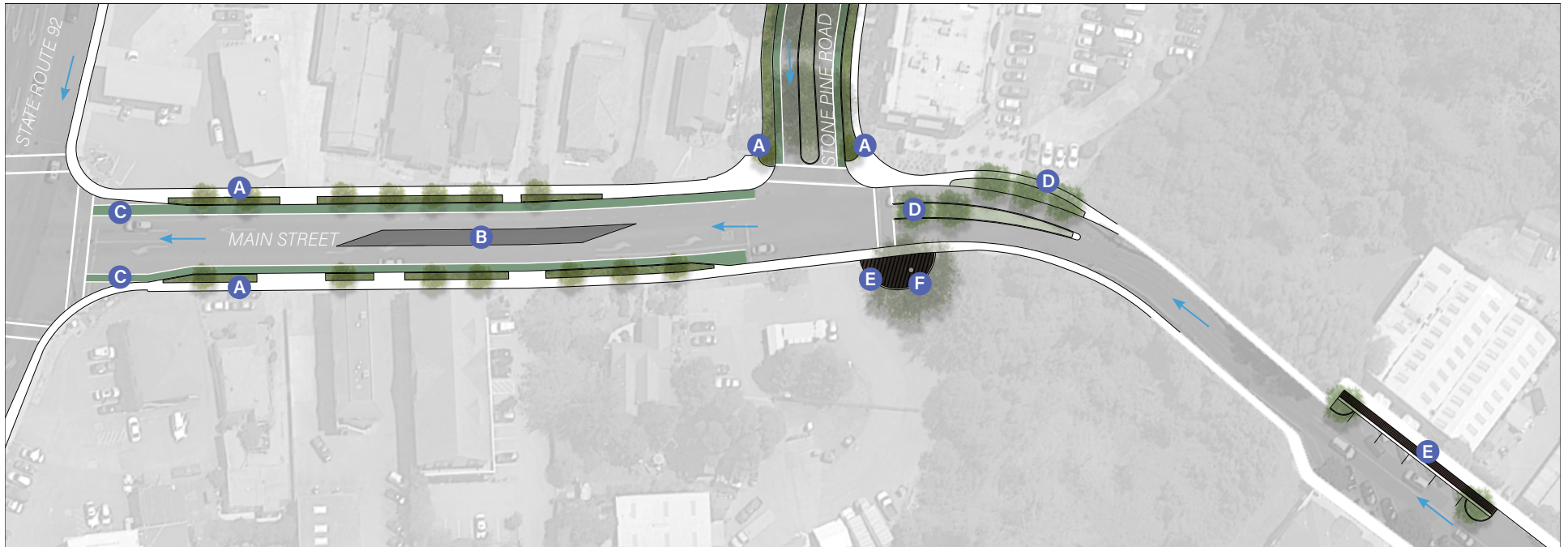


## KEY SITE IMPROVEMENTS

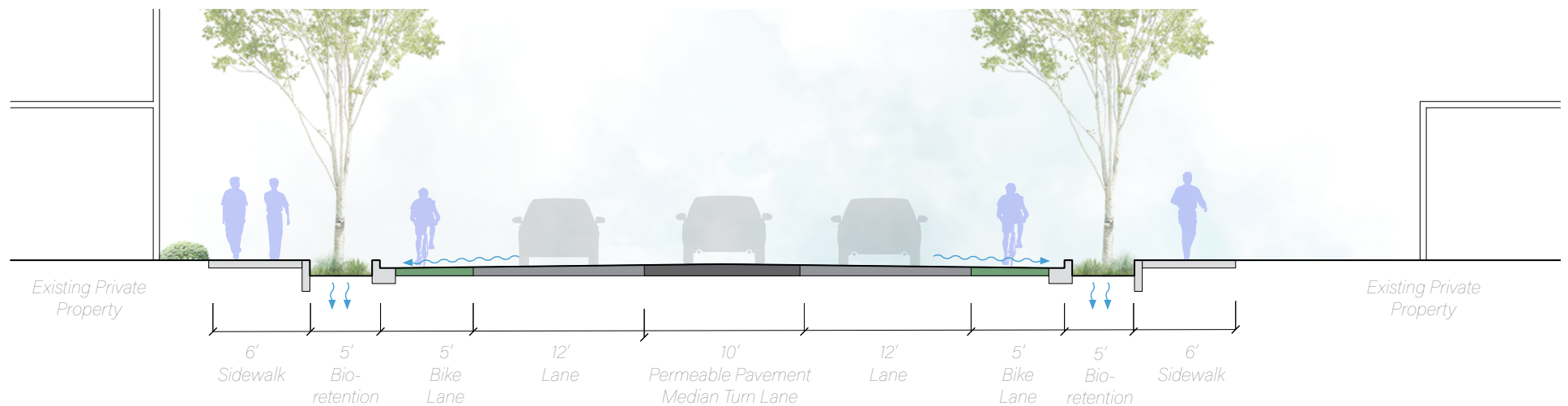
- A** *Proposed bioretention planter*
- B** *Proposed permeable pavement*
- C** *Proposed bike lane*
- D** *Proposed planter buffer*
- E** *Proposed wooden plaza*
- F** *"Welcome to Half Moon Bay" sign*

Concept Detail 1: Main Street (north)





**Concept Detail 2: Main Street (south)**



**Typical Cross Section: Main Street**



# Main Street Half Moon Bay

## Concept Perspectives



Existing condition, Main St looking towards Stone Pine Rd



Proposed condition

## Site Elements



Class IV bike lane with striped buffer, Folsom St, San Francisco



Bioretention planter, Washington



Bioretention planter extension with trees



Pervious pavement median turn lane



## Project Benefits



**Prioritize Non-Motorized Users**  
*Convert car lanes for biking & walking*  
*Promote more active transportation*



**Bikeability & Safety**  
*Increased protected bike lanes*  
*Increased bike-share roads*



**Walkability & Safety**  
*Curb extensions for safer street crossing*  
*Connection to commercial areas*



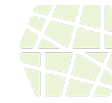
**Increased Trees**  
*Shade for walking comfort*  
*Heat and carbon emission reduction*



**Neighborhood Beautification**  
*Increased vegetation*  
*Provide engaging streets to walk on*



**Groundwater Recharge**  
*Recharge of Half Moon Bay Terrace*  
*Groundwater Basin*



**Bike Network**  
*Part of larger network for connectivity*  
*Promote biking with more connectivity*



**Reestablishes Natural Hydrology**  
*Bioretention planters capture and infiltrate*  
*stormwater*

## Planning-Level Cost Estimate

DESCRIPTION	UNIT COST	UNIT COST	QUANTITY	SUBTOTAL
Utilities Protection/Relocation	\$100,000	LS	1	\$100,000
Sawcutting Pavement	\$12	LF	3,520	\$42,240
Concrete Demo, Excavation & Offhaul	\$11	SF	12,420	\$136,600
Planter Excavation & Offhaul	\$70	CY	1,360	\$95,200
Planter Curb & 36" Sidewalls	\$160	LF	1,360	\$217,600
Planter Curb & Gutter & 36" Sidewalls	\$180	LF	910	\$163,800
Concrete Curb	\$40	LF	1,172	\$46,900
Bio-soil Media	\$250	CY	450	\$112,500
Underdrains	\$6	SF	12,120	\$72,700
Drain Rock Subbase	\$160	CY	450	\$72,000
Bioretention Plantings & Mulch	\$25	SF	7,960	\$199,000
Wood Boardwalk	\$50	SF	1,436	\$71,800
Storm Drain Connections	\$7,500	EA	6	\$45,000
Flush Curb Ribbon	\$60	EA	820	\$49,200
Bikelane Striping	\$12	SF	14,350	\$172,200
Sidewalk Repair	\$15	SF	6,500	\$97,500
Irrigation System	\$31,800	EA	5	\$159,000
Traffic Sign Relocation	\$900	EA	6	\$5,400
Trees	\$1,500	EA	28	\$42,000
Landscaping Soil	\$125	CY	450	\$56,250
Landscaping Plantings & Mulch	\$20	SF	9,920	\$198,400
Permeable Pavement	\$25	SF	3,510	\$87,750
<b>CONSTRUCTION SUBTOTAL</b>				<b>\$2,243,000</b>
Traffic Control				\$112,150
Mobilization (10% construction)				\$224,000
Contingency (30% construction)				\$673,000
Design Fees (15% total)				\$488,000
<b>TOTAL PROJECT COST (DESIGN + CONSTRUCTION)</b>				<b>\$3,740,000</b>

This is a planning-level cost estimate (\$2020) for design and construction. Soft costs for City administration and project management and post-construction operations and maintenance are not included. Other factors that may affect the cost of future construction include escalation and market conditions.

# Main Street Half Moon Bay

## Additional Considerations

This project concept is presented for discussion only. This project concept is planning-level and subject to revision as additional information becomes available. Factors to be considered during design of this project include but are not limited to the following:

- » Infiltration Potential. Soils around Main Street are classified as hydrologic soil group (HSG) A which indicates potentially good soils for infiltrating. A geotechnical investigation will be conducted during design development, including site-specific borings and infiltration tests, to ensure facilities are designed appropriately. Proposed green infrastructure improvements may be lined with impermeable geotextile and fitted with underdrain pipes to connect treated flows to existing storm drain line if infiltration is deemed infeasible.
- » Utility Conflict. Initial utility assessments were conducted for sanitary sewer, storm sewer, water, and telecom. Bioretention facilities are proposed in configurations that minimize disruption of sewer lines. Other utilities such as power utilities were not available for consideration during the development of this concept and should be assessed during design development.
- » Access. Proposed bioretention planters along Main Street between Stone Pine Rd and SR-92 may impact driveway access to some parcels. Outreach should be conducted during the design process to ensure access is adequately maintained.
- » Irrigation. Green infrastructure planters should be irrigated to ensure establishment and maintenance of healthy plants during periods with no rain. The planning-level cost estimate includes an irrigation system for the bioretention planters.

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## Santa Cruz Avenue Menlo Park



### Concept Description

Menlo Park has described in their Downtown Specific Plan a desire to renovate Santa Cruz Avenue to create more usable public space, an interest in closing parts of the street for temporary events such as Farmers Markets, and a goal of protecting and enhancing pedestrian amenities. This sustainable street concept proposes a reconfiguration of the street between University Drive and Crane Street to increase pedestrian use spaces and integrate stormwater management within green infrastructure.

On the west side of Santa Cruz Ave, the parking lane is proposed to be realigned from angled parking to parallel parking to increase the available pedestrian space. The parking lane is proposed as permeable pavement with street trees dividing every two spaces. The permeable pavement will infiltration runoff from the street and direct excess flows to the adjacent bioretention planters.

The bioretention planters will integrate vegetation into the pedestrian parklet areas. A permeable boardwalk is proposed that will allow sidewalk runoff to drain to bioretention areas located below the boardwalk. The boardwalk bioretention and bioretention planters will be connected to provide infiltration of runoff from the street, sidewalk, and parking areas. On the east side of Santa Cruz Ave, a similar system of bioretention planters and boardwalks is proposed to provide management of roadway and sidewalk runoff while providing increased pedestrian space.

A total of 2,450 square feet of permeable pavement is proposed and a total of 7,800 square feet of bioretention planter/boardwalks are proposed. These are estimated to manage stormwater runoff from approximately 1.9 acres of roadway, sidewalk, and adjacent roofs, providing capture of 3.6 acre-feet of runoff per year.

### Site Characteristics

In Priority Development Area

Yes

Pavement Condition Index

At Risk

Watershed

Ravenswood Slough

### Green Infrastructure Performance

Drainage Management Area

1.9 ac

Annual Runoff Captured

3.6 ac-ft

Bioretention Area / Storage Volume

7,800 sf / 0.2 ac-ft

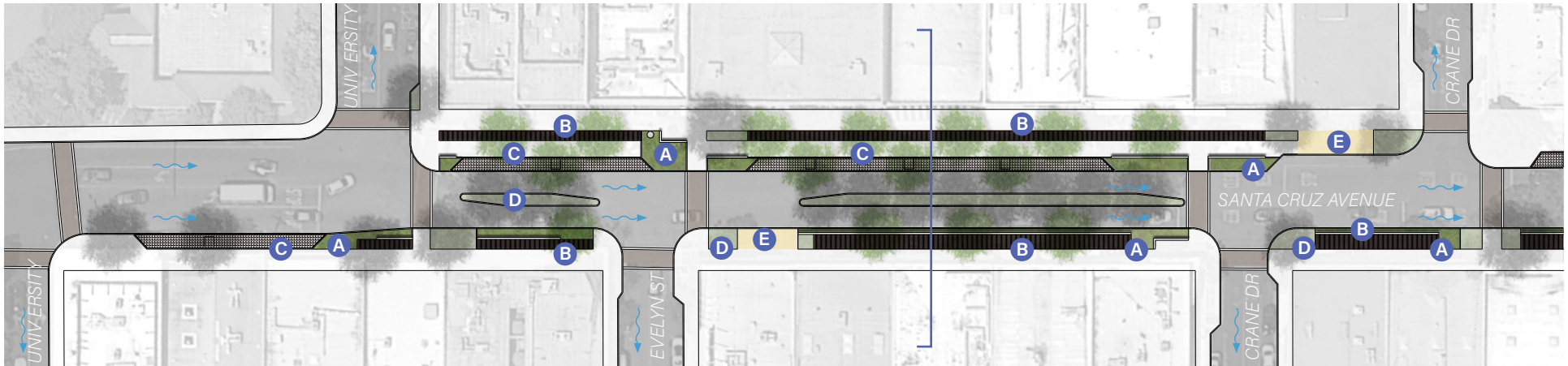
Permeable Pavement Area / Storage Volume

2,450 sf / 0.03 ac-ft

### Active Transportation Performance

Key Transportation Benefits

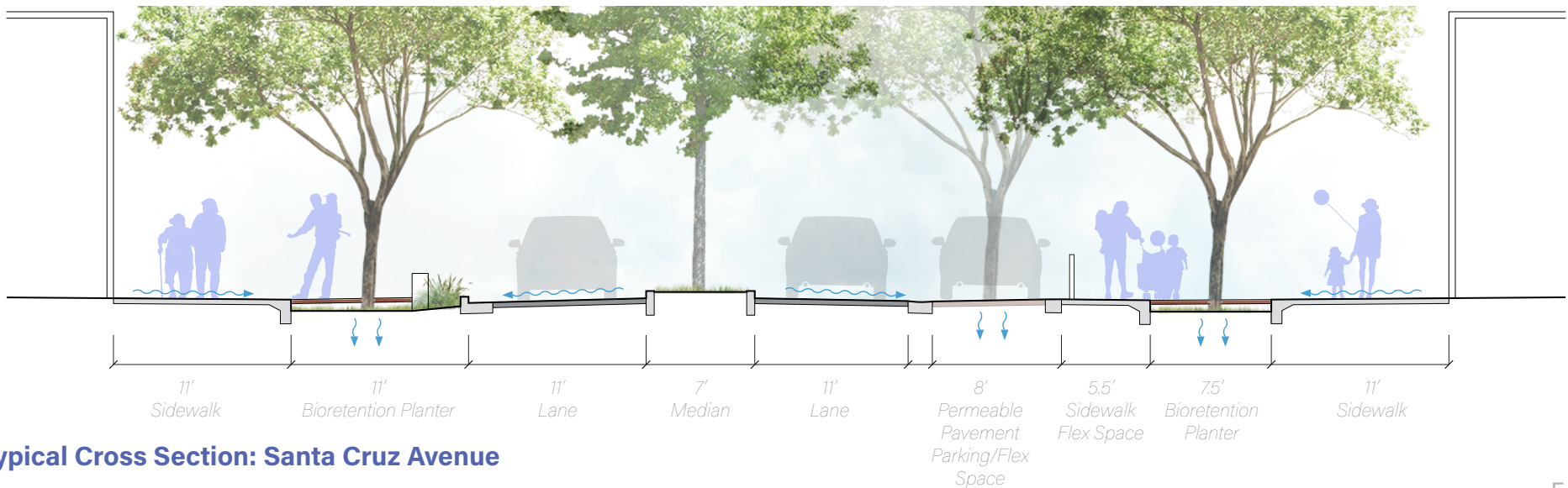
- » Reduced pedestrian crossing distance
- » Traffic calming



**KEY SITE IMPROVEMENTS**

- A** Proposed bioretention planter
- C** Proposed permeable pavement
- E** Proposed bus stop loading zone
- B** Proposed boardwalk over bioretention planter
- D** Proposed planter buffer

**Concept Site Plan Detail: Santa Cruz Avenue, Menlo Park**



**Typical Cross Section: Santa Cruz Avenue**



# Santa Cruz Avenue Menlo Park

## Concept Perspectives



Existing condition, Santa Cruz Ave from University Dr



Proposed condition

## Site Elements



Boardwalk over bioretention basin



Tree dividers between parking stalls



Downtown street plaza space



Flex-use parking lane converting to outdoor seating

## Project Benefits



**Prioritize Non-Motorized Users**  
*Promote more active transportation*



**Increased Trees**  
*Shade for walking comfort*  
*Heat and carbon emission reduction*



**Walkability & Safety**  
*Curb extensions for safer street crossing*  
*Connection to commercial areas*



**Groundwater Recharge**  
*Recharge of the San Mateo Plain*  
*Groundwater Basin*



**Neighborhood Beautification**  
*Increased vegetation*  
*Provide engaging streets to walk on*



**Reestablishes Natural Hydrology**  
*Bioretention planters capture and infiltrate*  
*stormwater*

## Planning-Level Cost Estimate

DESCRIPTION	UNIT COST	UNIT COST	QUANTITY	SUBTOTAL
Utilities Protection/Relocation	\$150,000	LS	1	\$150,000
Sawcutting Pavement	\$12	LF	3,360	\$40,320
Concrete Demo, Excavation & Offhaul	\$11	SF	11,500	\$126,500
Planter Excavation & Offhaul	\$70	CY	920	\$64,400
Planter Curb & 36" Sidewalls	\$160	LF	1,910	\$305,600
Planter Curb & Gutter & 36" Sidewalls	\$180	LF	690	\$124,200
Curb & Gutter	\$70	LF	810	\$56,700
Bio-soil Media	\$250	CY	430	\$107,500
Underdrains	\$6	SF	11,010	\$66,100
Drain Rock Subbase	\$160	CY	410	\$65,600
Bioretention Plantings & Mulch	\$25	SF	1,660	\$41,500
Storm Drain Connections	\$7,500	EA	7	\$52,500
Bioretention Curb Inlet	\$1,500	EA	9	\$13,500
Flush Curb Ribbon	\$165	EA	440	\$72,600
Permeable Pavement	\$25	SF	3,340	\$83,500
Boardwalk	\$50	SF	6,000	\$300,000
Curb Ramps	\$6,000	SF	9	\$54,000
New Sidewalk	\$15	SF	2,730	\$41,000
Irrigation System	\$16,100	EA	5	\$80,500
Traffic Sign Relocation	\$900	EA	4	\$3,600
Landscaping Soil	\$125	CY	40	\$5,000
Landscaping Plantings & Mulch	\$20	SF	490	\$9,800
Trees	\$1,500	EA	15	\$22,500
<b>CONSTRUCTION SUBTOTAL</b>				<b>\$1,864,000</b>
Traffic Control				\$93,200
Mobilization (10% construction)				\$186,000
Contingency (30% construction)				\$559,000
Design Fees (15% total)				\$405,000
<b>TOTAL PROJECT COST (DESIGN + CONSTRUCTION)</b>				<b>\$3,107,000</b>

This is a planning-level cost estimate (\$2020) for design and construction. Soft costs for City administration and project management and post-construction operations and maintenance are not included. Other factors that may affect the cost of future construction include escalation and market conditions.



# Santa Cruz Avenue Menlo Park

## Additional Considerations

This project concept is presented for discussion only. This project concept is planning-level and subject to revision as additional information becomes available. Factors to be considered during design of this project include but are not limited to the following:

- » Infiltration Potential. The hydrologic soil group is unknown along Santa Cruz Ave. A geotechnical investigation will be conducted during design development, including site-specific borings and infiltration tests, to ensure facilities are designed appropriately. This design incorporates bioretention below boardwalk areas within the sidewalk resulting in a large amount of facility area relative to the roadway drainage area. Therefore, bioretention facilities will likely be able to manage roadway runoff without the need for underdrains even if slow draining soils are present on site.
- » Utility Conflict. Initial utility assessments were conducted for sanitary sewer, storm sewer, and water mains. Bioretention facilities are proposed in configurations that minimize disruption of sewer and water lines. Other utilities such as power and gas were not available for consideration during the development of this concept and should be assessed during design development.
- » Roof Drains. During a site visit, drains were observed in the street curbs along Santa Cruz Ave. It is assumed these are roof drains from the adjacent buildings which discharge through the face of the curb into the roadway gutter. The flow from these roof drains is accounted for in the design of the bioretention planters for this project. Approximately 40,000 square feet of roof area was assumed to drain to the proposed bioretention planters.
- » Street Trees. Trees are proposed within the parking lane. These will be protected with curbs or fencing. They are proposed to divide every two parking spots. The trees will provide shade and assist in stormwater management within the roadway.
- » Irrigation. Green infrastructure planters should be irrigated to ensure establishment and maintenance of healthy plants during periods with no rain. The planning-level cost estimate includes an irrigation system for the bioretention planters.
- » Maintenance. Bioretention planters located under pedestrian boardwalks will require minimal maintenance as they will not be planted and smaller exposed bioretention planters will serve as the inlet and outlet of these systems. The inlet planters will capture the majority of the sediment load and prevent the downstream planters below the boardwalk from needing frequent maintenance.
- » Passenger & Commercial Loading Zone. There is potential to designate flexible curb use within the proposed permeable pavement shoulder on either side of Santa Cruz Ave for passenger loading and commercial loading with complementary time restrictions for each activity.

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## Laurel Avenue Millbrae



### Concept Description

Laurel Avenue is characterized by long blocks and has been identified as an opportunity to add a crosswalk and provide traffic calming around Green Hills Elementary School. Streetscape improvements including curb extensions, longitudinal bioretention planters, and trees are proposed along Laurel Ave to improve pedestrian safety and provide stormwater runoff management.

Laurel Ave has a 40-foot roadway with moderately low demand street parking. Curb extensions are proposed at the intersections of Ludeman Lane, Cypress Court, and Green Hills Drive. These curb extensions extend into the roadway approximately 9 feet. These will reduce the pedestrian crossing distance, increase the visibility of pedestrians and oncoming traffic, allow the addition of crosswalks at Cypress Court, and provide traffic calming.

Bioretention stormwater planters are proposed to be integrated into the curb extensions to provide management of roadway runoff. A longer bioretention planter is proposed on the west side of Laurel Ave near Green Hills Drive where space is available. A smaller bioretention planter is proposed within the Green Hills Elementary School parking lot to capture and manage stormwater runoff before it drains to Laurel Ave where there are more constraints.

A total of 4,200 square feet of bioretention planter is proposed, with approximately half located within the right-of-way and half located within Green Hills Elementary parking lot. This project will manage runoff from approximately 0.9 acres of roadway and 0.6 acres of school area and capture 2.7 acre-feet of runoff per year and retain 69%.

### Site Characteristics

In Priority Development Area  
*No*

Watershed  
*Highline Creek*

### Green Infrastructure Performance

Drainage Management Area  
*1.5 ac*

Annual Runoff Captured  
*2.7 ac-ft*

Bioretention Area / Storage Volume  
*4,200 sf / 0.14 ac-ft*

### Active Transportation Performance

#### Key Transportation Benefits

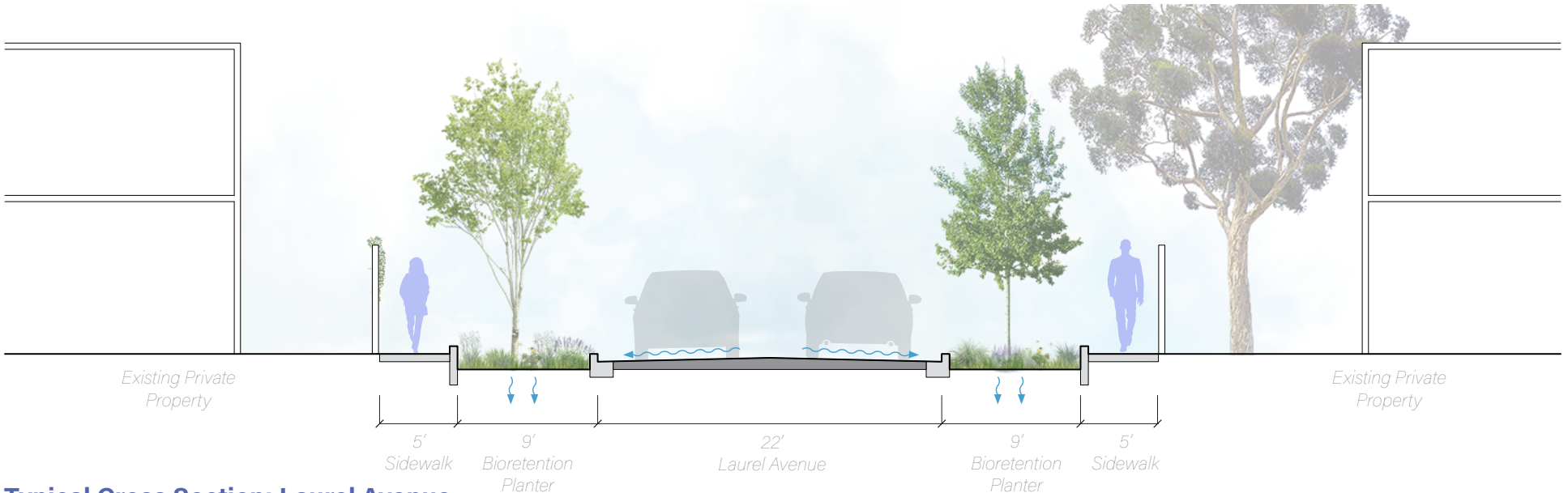
- » *Reduced pedestrian crossing distance*
- » *Traffic calming*



**KEY SITE IMPROVEMENTS**

- A** Proposed stormwater curb extension
- B** Proposed bioretention planter
- C** Proposed planter curb extension
- D** Proposed planter beds

**Concept Site Plan Detail: Laurel Avenue, Millbrae**



**Typical Cross Section: Laurel Avenue**



# Laurel Avenue Millbrae

## Concept Perspectives



Existing condition, intersection Cypress Ct and Laurel Ave



Proposed condition

## Site Elements



Safe routes to school stormwater curb extension, Burlingame CA



Bioretention planter extension



Planter buffer curb extension, Long Beach CA



Planter buffer bump-out



## Project Benefits



**Prioritize Non-Motorized Users**  
*Promote more active transportation*



**Increased Trees**  
*Shade for walking comfort*  
*Heat and carbon emission reduction*



**Walkability & Safety**  
*Curb extensions for safer street crossing*  
*Connection to commercial areas*



**Groundwater Recharge**  
*Recharge of the Westside Groundwater Basin*



**Neighborhood Beautification**  
*Increased vegetation*  
*Provide engaging streets to walk on*



**Reestablishes Natural Hydrology**  
*Bioretention planters capture and infiltrate stormwater*

## Planning-Level Cost Estimate

DESCRIPTION	UNIT COST	UNIT COST	QUANTITY	SUBTOTAL
Utilities Protection/Relocation	\$70,000	LS	1	\$70,000
Sawcutting Pavement	\$12	LF	1,920	\$23,040
Concrete Demo, Excavation & Offhaul	\$11	SF	8,040	\$88,400
Planter Excavation & Offhaul	\$70	CY	590	\$41,300
Planter Curb & 36" Sidewalls	\$190	LF	970	\$184,300
Curb and Gutter	\$40	LF	1,000	\$40,000
Bio-soil Media	\$250	CY	250	\$62,500
Underdrains	\$6	SF	4,110	\$24,700
Drain Rock Subbase	\$160	CY	150	\$24,000
Bioretention Plantings & Mulch	\$25	SF	4,400	\$110,000
Catch Basin Relocation	\$8,000	EA	1	\$8,000
Storm Drain Connections	\$7,500	EA	5	\$37,500
Bioretention Curb Cuts	\$1,500	EA	8	\$12,000
Curb Ramps	\$6,000	EA	7	\$42,000
Crosswalk Striping	\$2,000	EA	4	\$8,000
Sidewalk repair	\$15	SF	1,470	\$22,100
Irrigation System	\$23,900	EA	6	\$143,400
New Sidewalk	\$15	SF	850	\$12,800
Landscaping Soil	\$125	CY	300	\$37,500
Landscaping Plantings & Mulch	\$11.50	SF	3,700	\$42,600
Trees	\$1,500	EA	18	\$27,000
<b>CONSTRUCTION SUBTOTAL</b>				<b>\$1,061,000</b>
Traffic Control				\$53,050
Mobilization (10% construction)				\$106,000
Contingency (30% construction)				\$318,000
Design Fees (15% total)				\$231,000
<b>TOTAL PROJECT COST (DESIGN + CONSTRUCTION)</b>				<b>\$1,769,000</b>

This is a planning-level cost estimate (\$2020) for design and construction. Soft costs for City administration and project management and post-construction operations and maintenance are not included. Other factors that may affect the cost of future construction include escalation and market conditions.

# Laurel Avenue Millbrae

## Additional Considerations

This project concept is presented for discussion only. This project concept is planning-level and subject to revision as additional information becomes available. Factors to be considered during design of this project include but are not limited to the following:

- » Infiltration Potential. The hydrologic soil group is unknown along Laurel Ave. A geotechnical investigation will be conducted during design development, including site-specific borings and infiltration tests, to ensure facilities are designed appropriately. Proposed green infrastructure improvements may be lined with impermeable geotextile and fitted with underdrain pipes to connect treated flows to existing storm drain line if infiltration is deemed infeasible.
- » Utility Conflict. Initial utility assessments were conducted for sanitary sewer, storm sewer, and water utilities. Bioretention facilities are proposed in configurations that minimize disruption of sewer and water lines, e.g., the curb extension on the south corner of Laurel Ave and Ludeman Lane is proposed without a bioretention planter due to the proximity of the water main and fire hydrant. Other utilities such as power and telecom were not available for consideration during the development of this concept and should be assessed during design development.
- » Contributing Area. The bioretention planter at the southwest corner of Laurel Avenue and Green Hills Drive has been oversized to account for run-on from the adjacent Millbrae School District maintenance building and from Green Hills Elementary sports fields which drain via bubblers to Laurel Ave. The existing right turn pocket from Laurel Avenue to Green Hills Drive has been removed to accommodate the proposed footprint and improve pedestrian crossing safety, based on recommendations from city traffic studies.
- » Green Hills Elementary Parking Lot. Existing run-on from the school parking lot drains to the northwest corner of Laurel Avenue and Ludeman Lane. Bioretention planters are proposed within the parking lot to manage run-on flows due utility conflicts along Laurel Avenue, and the parking lot has been reconfigured to maintain the existing 28 parking spots while decreasing the amount of existing imperviousness. Proposed parking lot improvements are subject to agreements between the school and city Parks Department that maintains the parking lot facilities.

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## San Carlos Avenue San Carlos



### Concept Description

The third phase of pedestrian safety improvements on San Carlos Avenue will span between Wellington Drive and Beverly Drive. Phases 1 and 2 installed sidewalk and curb and gutter and included bike lane striping on the north side of San Carlos Ave from Sycamore Ave to Wellington Dr. This third phase will extend the sidewalk, curb and gutter, and bike lane improvements. Bioretention planters and planter buffer landscaping can be incorporated in these improvements to provide stormwater runoff management of the roadway.

This portion of San Carlos Ave has a 60-foot right-of-way and has an existing Class II bike lane in both directions. The sidewalk on the north side of the street will abut the right-of-way boundary while the south side of the street has a 12-foot vegetated median between the sidewalk and the edge of the right-of-way.

Bioretention planters are proposed on the south side of San Carlos Ave where space is available and small bubble up structures are proposed to direct runoff from both sides of the street to these facilities. Locating the planters outside of the roadway will avoid major utility conflicts while maximizing the potential for infiltration. At Beverly Drive there is space on the north side of the street for a proposed bioretention planter that

This project will capture and manage runoff from approximately 1.3 acres of roadway, sidewalk, and adjacent parcel area, providing capture of 2.5 acre-feet of runoff per year. This project is expected to retain 69% of runoff.

### Site Characteristics

In Priority Development Area  
*No*

Watershed  
*Pulgas Creek*

### Green Infrastructure Performance

Drainage Management Area  
*1.3 ac*

Annual Runoff Captured  
*2.5 ac-ft*

Bioretention Area / Storage Volume  
*3,300 sf / 0.11 ac-sf*

### Active Transportation Performance

Key Transportation Benefits  
*» Increased bike visibility*



## Concept Perspectives



*Existing condition*



*Proposed condition*

## Site Elements

3-6



*Class II bike lane, San Francisco CA*



*Green gutter*



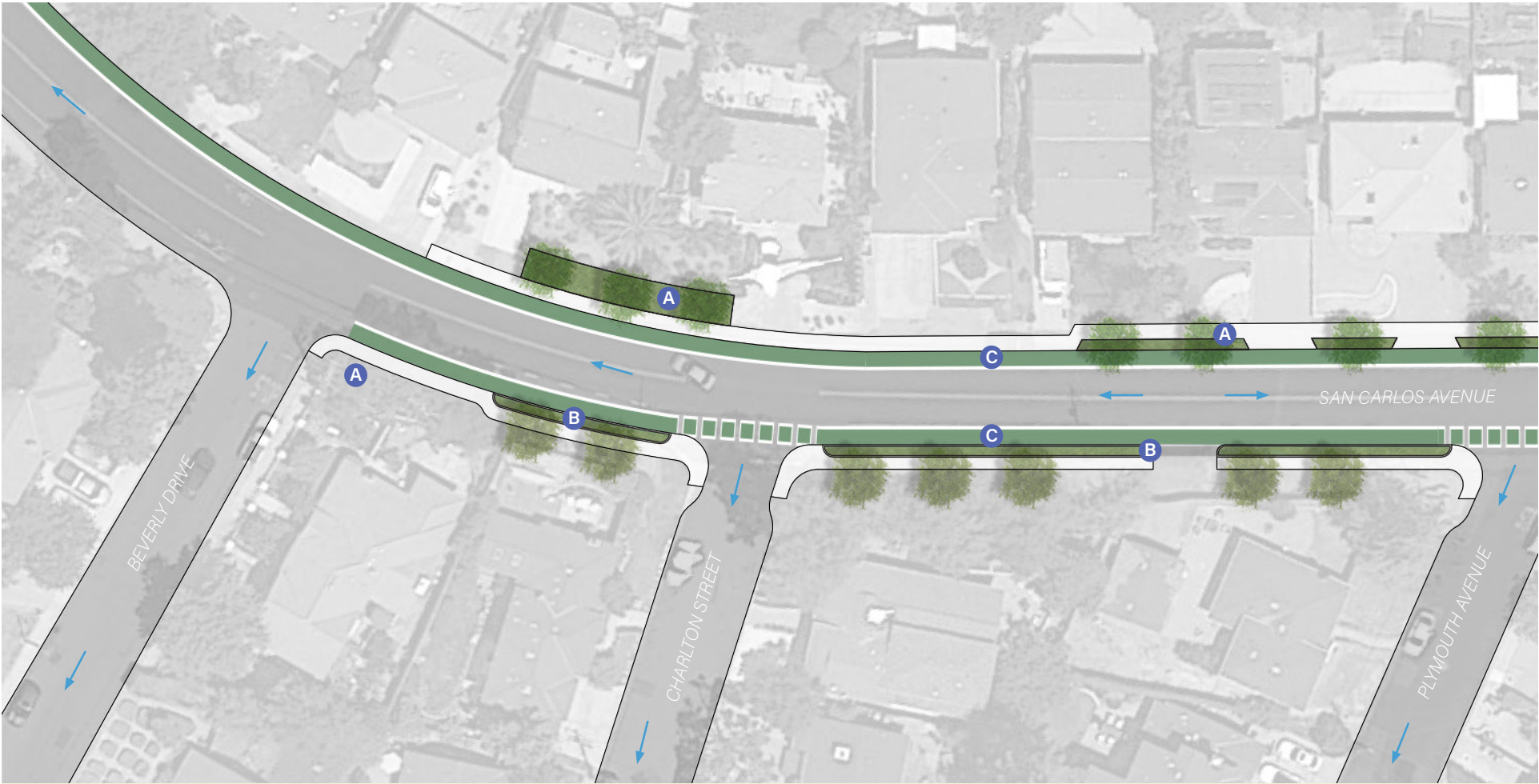
*Sidewalk bioretention planter, Philadelphia PA*



*Green gutter*



# San Carlos Avenue San Carlos



## KEY SITE IMPROVEMENTS

- A** *Proposed bioretention planter*
- B** *Proposed green gutter*
- C** *Proposed bike lane*

Concept Detail 1: San Carlos Avenue (west), San Carlos



#### KEY SITE IMPROVEMENTS

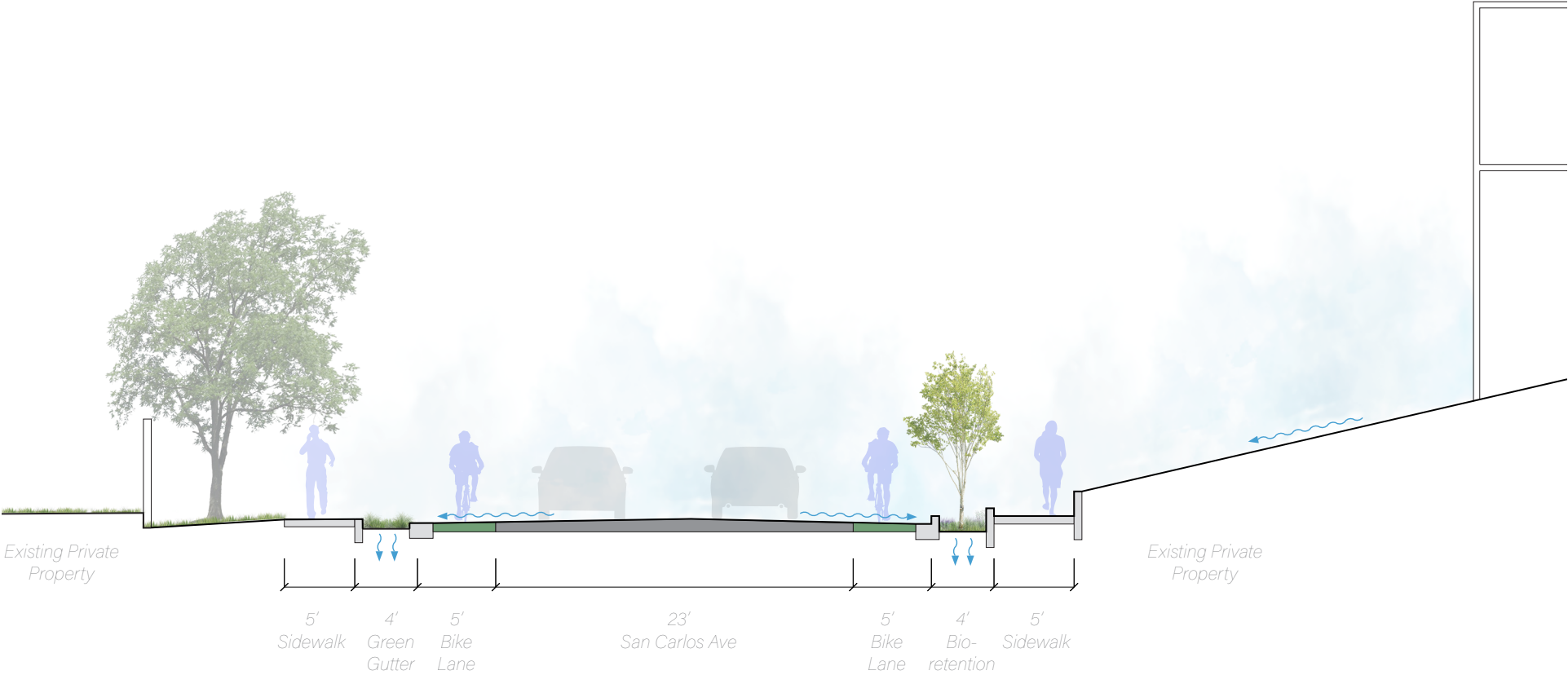
- A** *Proposed bioretention planter*
- B** *Proposed green gutter*
- C** *Proposed bike lane*

**Concept Detail 2: San Carlos Avenue (east), San Carlos**





# San Carlos Avenue San Carlos



Typical Section Detail: San Carlos Avenue

## Project Benefits



**Bikeability & Safety**  
*Colored bike lanes increase visibility*



**Groundwater Recharge**  
*Recharge of San Mateo Plain Groundwater Basins*



**Increased Trees**  
*Shade for walking comfort  
Heat and carbon emission reduction*



**Neighborhood Beautification**  
*Increased vegetation  
Provide engaging streets to walk on*



**Bike Network**  
*Part of larger network for connectivity  
Promote biking with more connectivity*



**Re-establishes Natural Hydrology**  
*Bioretention planters capture and infiltrate stormwater*

## Planning-Level Cost Estimate

DESCRIPTION	UNIT COST	UNIT COST	QUANTITY	SUBTOTAL
Utilities Protection/Relocation	\$190,000	LS	1	\$190,000
Sawcutting Pavement	\$12	LF	1,590	\$19,080
Concrete Demo, Excavation & Offhaul	\$11	SF	3,240	\$35,600
Planter Excavation & Offhaul	\$70	CY	220	\$15,400
Planter Curb & 36" Sidewalls	\$160	LF	270	\$43,200
Curb and Gutter	\$40	LF	1,600	\$64,000
Bio-soil Media	\$250	CY	180	\$45,000
Underdrain Piping	\$6	SF	1,180	\$7,100
Drain Rock Subbase	\$160	CY	120	\$19,200
Bioretention Plantings & Mulch	\$25	SF	3,200	\$80,000
Storm Drain Connections	\$7,500	EA	4	\$30,000
Bioretention Curb Inlet	\$1,500	EA	17	\$25,500
Bioretention Curb Outlet	\$1,000	EA	12	\$12,000
Trees	\$1,500	EA	30	\$45,000
Sidewalk	\$15	SF	4,550	\$68,250
Bike Lane Striping	\$12	SF	7,800	\$93,600
Irrigation System	\$13,600	EA	3	\$40,800
Traffic Sign Relocation	\$900	EA	6	\$5,400
Impermeable Liner	\$6	SF	80	\$500
CONSTRUCTION SUBTOTAL				<b>\$840,000</b>
Traffic Control				\$42,000
Mobilization (10% construction)				\$84,000
Contingency (30% construction)				\$252,000
Design Fees (15% total)				\$183,000
TOTAL PROJECT COST (DESIGN + CONSTRUCTION)				<b>\$1,401,000</b>

This is a planning-level cost estimate (\$2020) for design and construction. Soft costs for City administration and project management and post-construction operations and maintenance are not included. Other factors that may affect the cost of future construction include escalation and market conditions.

# San Carlos Avenue San Carlos

## Additional Considerations

This project concept is presented for discussion only. This project concept is planning-level and subject to revision as additional information becomes available. Factors to be considered during design of this project include but are not limited to the following:

- » Infiltration Potential. The hydrologic soil group is unknown in the area around San Carlos Ave. Additionally there are steep slopes near the proposed bioretention planter footprints. A geotechnical investigation will be conducted during design development, including site-specific borings and infiltration tests, to ensure facilities are designed appropriately. Proposed green infrastructure improvements may be lined with impermeable geotextile and fitted with underdrain pipes to connect treated flows to existing storm drain line if infiltration is deemed infeasible.
- » Utility Conflict. Utility locations in San Carlos Ave were extrapolated from known locations at the intersection of San Carlos Ave and Wellington Drive. Utilities considered include sanitary sewer, storm sewer, water, and electrical. A utility box is located near the southwest corner of Beverly Drive and San Carlos Ave which may impact feasibility of the propose adjacent bioretention planter on that corner.
- » Run-on. The northern half of San Carlos Ave consists of hillside homes that contribute significant run-on to San Carlos Ave. Because the existing right-of-way has different conditions of developed homeowner frontage within this right-of-way space, negotiations may be required between the City of San Carlos and respective homeowners to implement proposed bioretention locations.
- » Expanded Project. The southern half of San Carlos Ave depicts proposed green gutters and sidewalk expansion as potential green infrastructure treatment and pedestrian access expansion in future phases of roadway improvements along San Carlos Ave.

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## Humboldt Street San Mateo



### Concept Description

Humboldt Street between Peninsula Ave and 3rd Ave is proposed to have a bike boulevard and bike lane installed which will provide a direct bike route to Downtown and to the 3rd Avenue Bike and Pedestrian Bridge, allowing for easy access to the Bay Trail and neighboring jurisdictions. Within this corridor are existing green infrastructure curb extensions that are performing well and providing safer pedestrian crossings.

Humboldt Street south of Peninsula Ave has opportunities to integrate additional green infrastructure with the proposed bike boulevard within red curbed areas. An existing curb extension in front of the San Mateo Superior Court can be expanded to provide additional stormwater management and increased pedestrian visibility.

A new mid-block curb extension located where Humboldt Street's roadway reduces from 40-feet wide to 35-feet south of Peninsula Ave can provide additional stormwater management taking advantage of the wider roadway.

Within the curb extensions, bioretention planters provide infiltration of stormwater runoff and habitat for trees and plants. A total of 2,500 square feet of bioretention planter is proposed, capturing stormwater from approximately 1.7 acres of roadway and providing capture of 3.1 acre-feet of runoff per year. This project is expected to retain 69% of runoff.

### Site Characteristics

In Priority Development Area  
*No*

Watershed  
*San Mateo Creek & Borel Creek*

### Green Infrastructure Performance

Drainage Management Area  
*1.7 ac*

Annual Runoff Captured  
*3.1 ac-ft*

Bioretention Area / Storage Volume  
*2,500 sf / 0.09 ac-ft*

### Active Transportation Performance

#### Key Transportation Benefits

- » *Reduced pedestrian crossing distance*
- » *Traffic calming*

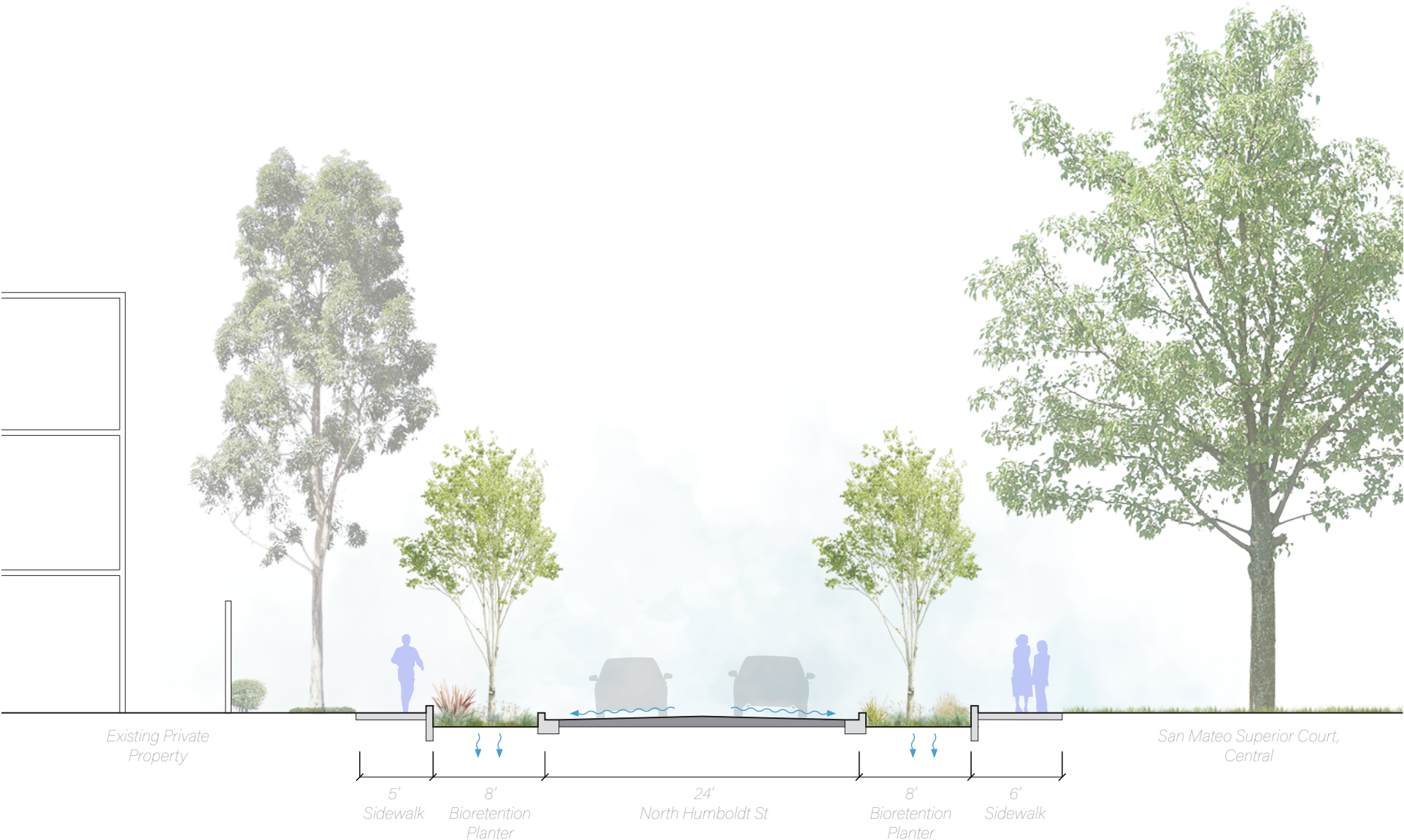


**KEY SITE IMPROVEMENTS**

- A** *Proposed bioretention planter*
- B** *Proposed planter buffer*
- C** *Existing crosswalk curb extension*



# Humboldt Street San Mateo



Typical Cross Section: North Humboldt Street



## Concept Perspectives



*Existing condition, Humboldt St looking south from Peninsula Ave*



*Proposed condition*

## Site Elements



*Bioretention planter bump-out, Philadelphia PA*



*Planter buffer bump-out*



*Stormwater curb and crosswalk extension, Portland OR*



*Residential sharrow bike lane, Brighton NY*

# Humboldt Street San Mateo

## Project Benefits



Increased Trees  
Shade for walking comfort  
Heat and carbon emission reduction



Neighborhood Beautification  
Increased vegetation  
Provide engaging streets to walk on



Reestablishes Natural Hydrology  
Bioretention planters capture and infiltrate stormwater



Walkability & Safety  
Curb extensions for safer street crossing  
Connection to commercial areas



Groundwater Recharge  
Recharge of the San Mateo Plain  
Groundwater Basin

## Planning-Level Cost Estimate

DESCRIPTION	UNIT COST	UNIT COST	QUANTITY	SUBTOTAL
Utilities Protection/Relocation	\$50,000	LS	1	\$50,000
Sawcutting Pavement	\$12	LF	660	\$7,920
Concrete Demo, Excavation & Offhaul	\$11	SF	2,700	\$29,700
Planter Excavation & Offhaul	\$70	CY	240	\$16,800
Planter Curb & 36" Sidewalls	\$195	LF	210	\$41,000
Planter Curb & Gutter & 36" Sidewalls	\$215	LF	350	\$75,300
Bio-soil Media	\$250	CY	120	\$30,000
Underdrains	\$6	SF	2,480	\$14,900
Drain Rock Subbase	\$160	CY	80	\$12,800
Bioretention Plantings & Mulch	\$25	SF	2,480	\$62,000
Catch Basin Relocation	\$8,000	EA	4	\$32,000
Storm Drain Connections	\$7,500	EA	2	\$15,000
Bioretention Curb Inlet	\$1,500	EA	5	\$7,500
Sidewalk Repair	\$15	SF	300	\$4,500
Irrigation System	\$16,850	EA	4	\$67,400
Trees	\$1,500	EA	12	\$18,000
Landscaping Soil	\$125	CY	20	\$2,500
Landscaping Plantings & Mulch	\$20	SF	220	\$4,400
CONSTRUCTION SUBTOTAL				<b>\$492,000</b>
Traffic Control				\$24,600
Mobilization (10% construction)				\$49,000
Contingency (30% construction)				\$148,000
Design Fees (15% total)				\$107,000
TOTAL PROJECT COST (DESIGN + CONSTRUCTION)				<b>\$821,000</b>

This is a planning-level cost estimate (\$2020) for design and construction. Soft costs for City administration and project management and post-construction operations and maintenance are not included. Other factors that may affect the cost of future construction include escalation and market conditions.



## Additional Considerations

This project concept is presented for discussion only. This project concept is planning-level and subject to revision as additional information becomes available. Factors to be considered during design of this project include but are not limited to the following:

- » **Infiltration Potential.** The hydrologic soil group is unknown along Humboldt Street. A geotechnical investigation will be conducted during design development, including site-specific borings and infiltration tests, to ensure facilities are designed appropriately. Proposed green infrastructure improvements may be lined with impermeable geotextile and fitted with underdrain pipes to connect treated flows to existing storm drain line if infiltration is deemed infeasible.
- » **Utility Conflict.** Initial utility assessments were conducted for sanitary sewer and storm sewer. Bioretention facilities are proposed in configurations that minimize disruption of sewer lines. Other utilities such as water and power were not available for consideration during the development of this concept and should be assessed during design development.
- » **Facility Sizing.** The proposed bioretention planters are 8 feet wide within red curb zones and designed to accommodate two 12-foot driving lanes. Due to the limited amount of space available for green infrastructure, the proposed planters may be undersized for their contributing drainage area. During design development the flow path of runoff should be taken into account to minimize erosion and sediment loading in the planters.



## Edison Way County Of San Mateo



### Concept Description

Edison Way has several parcels that are redeveloping between 1st Ave and 9th Ave, including 2949 Edison Way which is proposing to build a 7-story residential development. This project envisions streetscape and frontage improvements to be constructed in concert with redevelopment. Improvements include integrated green infrastructure such as permeable pavement and stormwater curb extensions.

Permeable pavement is proposed on both sides of the street between 1st and 3rd Ave which will delineate street parking and manage runoff from the full roadway. The proposed permeable pavement will minimize runoff generated from impervious areas by capturing and infiltrating runoff.

Stormwater curb extensions are proposed at the intersection of Edison Way and 2nd Ave to improve pedestrian safety through decreased crossing distance and greater visibility for oncoming cars. Curb extensions will include stormwater planters that will capture and infiltrate stormwater runoff from the roadway and sidewalks. The stormwater planters will also be integrated with proposed streetscape between 1st and 5th Avenue that will provide traffic calming for cars and shade comfort for pedestrians.

This project will manage runoff from approximately 1.0 acres of roadway and sidewalk area, providing capture of 2.0 acre-feet of runoff per year.

### Site Characteristics

In Priority Development Area  
Yes

Watershed  
Redwood Creek

### Green Infrastructure Performance

Drainage Management Area  
1.05 acres

Annual Runoff Captured  
2.0 ac-ft

Bioretention Area / Storage Volume  
925 sf / 0.03 ac-ft

Permeable Pavement Area / Storage Volume  
25,000 sf / 0.34 ac-ft

### Active Transportation Performance

#### Key Transportation Benefits

- » Reduced pedestrian crossing distance
- » Traffic calming

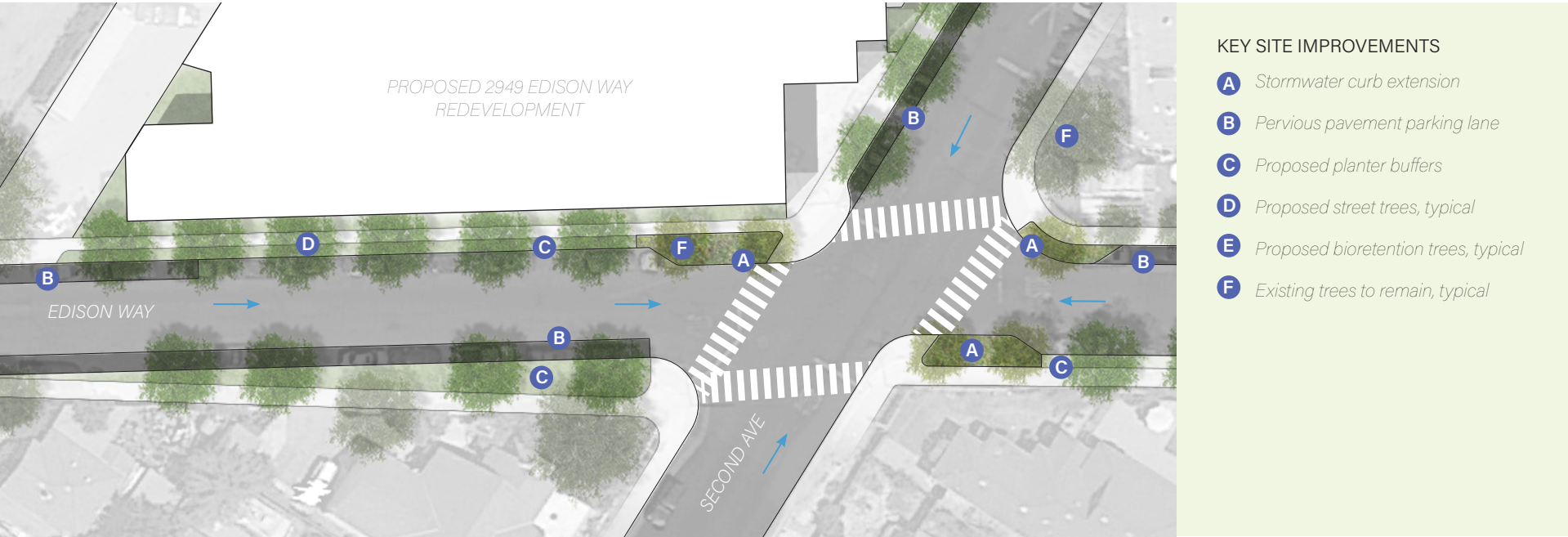


**Site Plan Context: Edison Way, County of San Mateo**

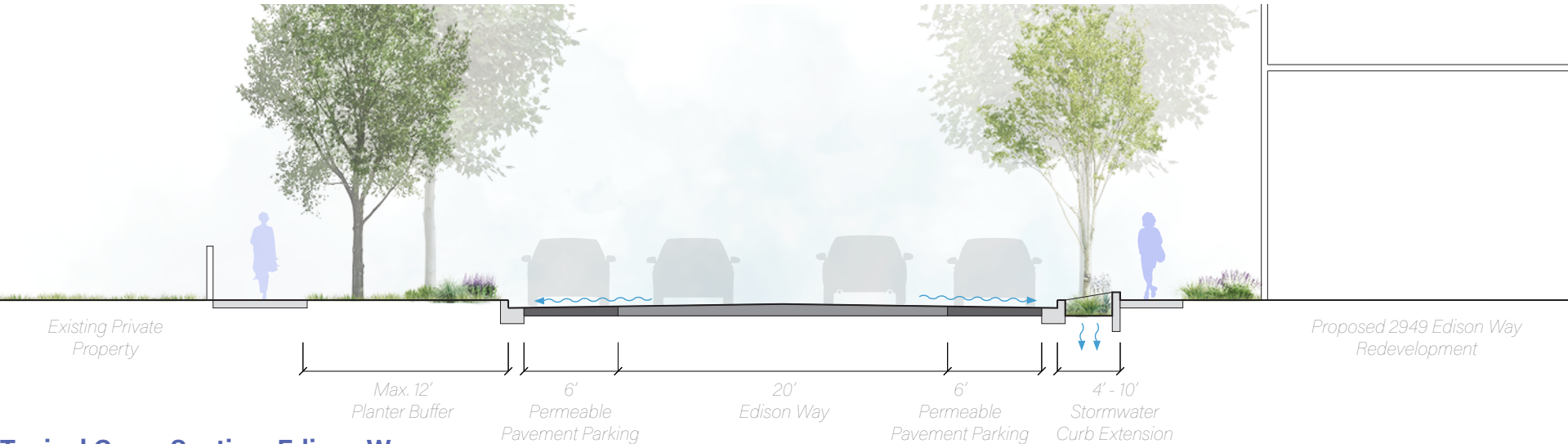




# Edison Way County Of San Mateo

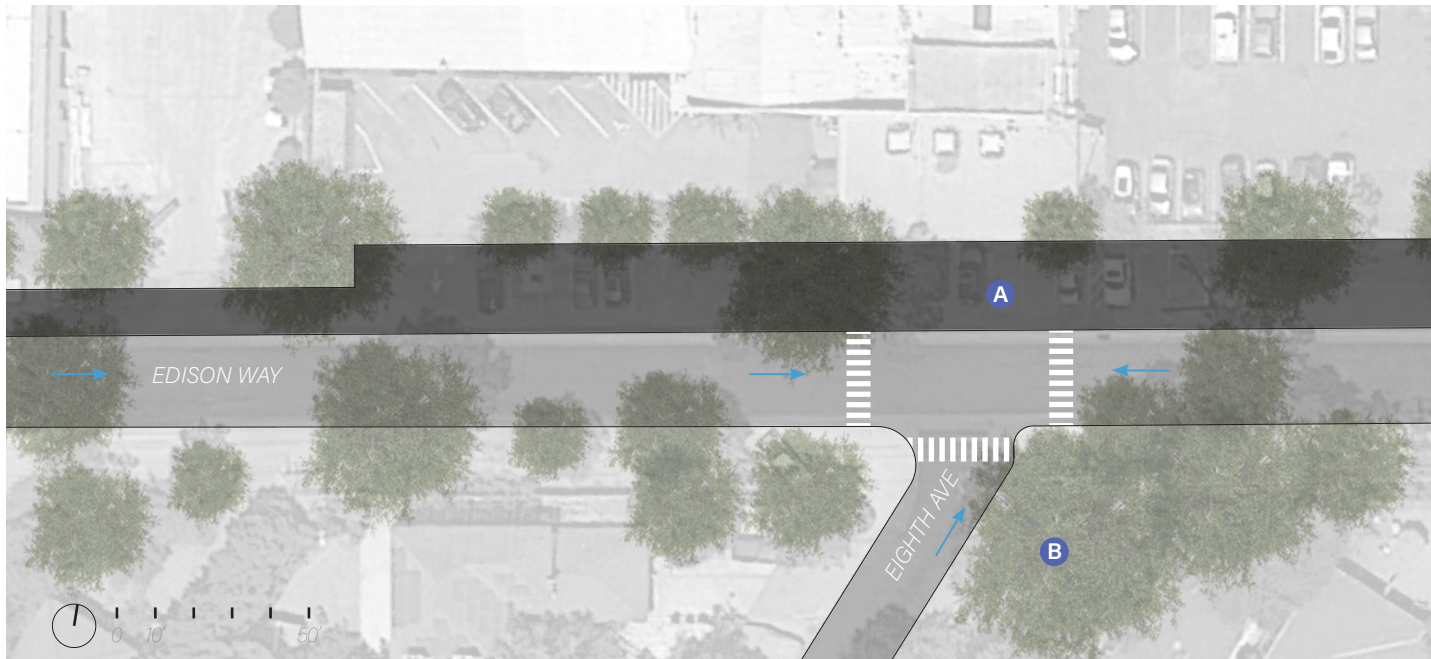


Concept Detail 1: Edison Way & 2nd Avenue



Typical Cross Section: Edison Way

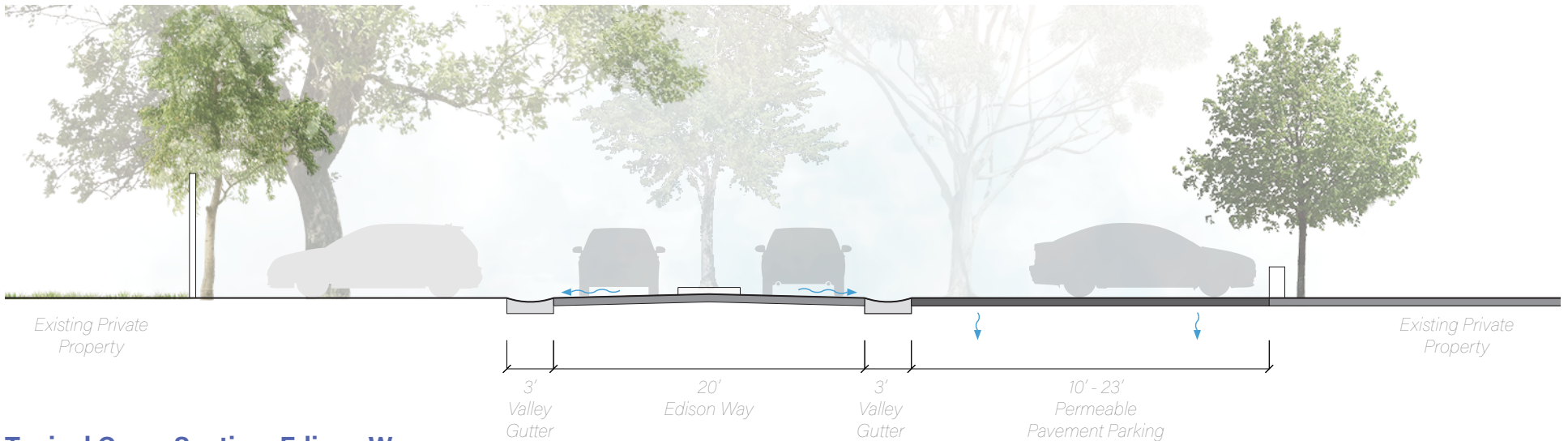




**KEY SITE IMPROVEMENTS**

- A** *Pervious pavement parking lane*
- B** *Existing trees to remain, typical*

**Concept Detail 2: Edison Way & 8th Avenue**



**Typical Cross Section: Edison Way**



# Edison Way County Of San Mateo

## Concept Perspectives



Existing condition, intersection at Edison Way & 2nd Avenue



Proposed condition

## Site Elements



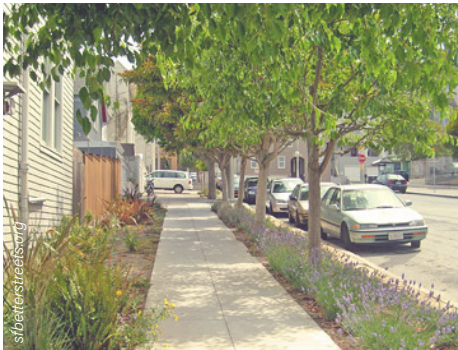
Permeable pavement parking shoulder, Holloway St, San Francisco



Permeable pavement parking spots, Beach Chalet, San Francisco



Stormwater curb extension, Hoboken NJ



Sidewalk planter landscaping, San Francisco

## Project Benefits



**Prioritize Non-Motorized Users**  
*Promote more active transportation*



**Increased Trees**  
*Shade for walking comfort*  
*Heat and carbon emission reduction*



**Traffic Calming**  
*Curb extensions slow vehicles*



**Walkability & Safety**  
*Curb extensions for safer street crossing*  
*Connection to commercial areas*



**Neighborhood Beautification**  
*Increased vegetation*  
*Provide engaging streets to walk on*



**Reestablishes Natural Hydrology**  
*Bioretention planters capture and infiltration stormwater*

## Planning-Level Cost Estimate

DESCRIPTION	UNIT COST	UNIT COST	QUANTITY	SUBTOTAL
Utilities Protection/Relocation	\$232,000	LS	1	\$232,000
Sawcutting Pavement	\$12	LF	4,800	\$57,600
Concrete Demo, Excavation & Offhaul	\$11	SF	29,900	\$328,900
Landscaping Soil	\$125	CY	310	\$38,800
Planter Curb & 36" Sidewalls	\$160	LF	300	\$48,000
Curb and Gutter	\$40	LF	200	\$8,000
Bio-soil Media	\$250	CY	40	\$10,000
Underdrains	\$6	SF	8,080	\$48,500
Drain Rock Subbase	\$160	CY	1,000	\$160,000
Bioretention Plantings & Mulch	\$25	SF	800	\$20,000
Catch Basin Relocation	\$8,000	EA	2	\$16,000
Storm Drain Connections	\$7,500	EA	6	\$45,000
Bioretention Curb Inlet	\$1,500	EA	3	\$4,500
Flush Curb Ribbon	\$60	LF	1,720	\$103,200
Curb Ramps	\$6,000	EA	23	\$138,000
Crosswalk Striping	\$2,000	EA	29	\$58,000
Sidewalk Repair	\$15	SF	30	\$500
Irrigation System	\$15,400	EA	4	\$61,600
Traffic Sign Relocation	\$900	EA	12	\$10,800
New Sidewalk	\$15	SF	6,810	\$102,200
Permeable Pavement	\$25	SF	26,200	\$655,000
Landscaping Plantings & Mulch	\$20	SF	4,300	\$86,000
Trees	\$1,500	EA	33	\$49,500
<b>CONSTRUCTION SUBTOTAL</b>				<b>\$2,282,000</b>
Traffic Control				\$114,100
Mobilization (10% construction)				\$228,000
Contingency (30% construction)				\$685,000
Design Fees (15% total)				\$496,000
<b>TOTAL PROJECT COST (DESIGN + CONSTRUCTION)</b>				<b>\$3,805,000</b>

This is a planning-level cost estimate (\$2020) for design and construction. Soft costs for City administration and project management and post-construction operations and maintenance are not included. Other factors that may affect the cost of future construction include escalation and market conditions.



# Edison Way County Of San Mateo

## Additional Considerations

This project concept is presented for discussion only. This project concept is planning-level and subject to revision as additional information becomes available. Factors to be considered during design of this project include but are not limited to the following:

- » Infiltration Potential. The hydrologic soil group is unknown in the area around Edison Way. A geotechnical investigation will be conducted during design development, including site-specific borings and infiltration tests, to ensure facilities are designed appropriately. Proposed green infrastructure improvements may be lined with impermeable geotextile and fitted with underdrain pipes to connect treated flows to existing storm drain line if infiltration is deemed infeasible.
- » Utility Conflict. Initial utility assessments were conducted for sanitary sewer, storm sewer, water, and electrical. Sanitary sewer main conflicts were found on the south side of Edison Way between 2nd Ave and 9th Ave; water main conflicts were found on the a portion of the north side between 1st and 2nd Ave, on the north side between 3rd Ave and 5th Ave, and on the south side between 5th Ave and 9th Ave; and gas main conflicts were found along both sides of the street between 5th and 9th Ave. These sites were precluded from GI considerations, and proposed GI footprints may be modified based on field visits.

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## Grand Avenue South San Francisco



### Concept Description

South San Francisco has a goal to revitalize, improve, and support the downtown area. The City plans to improve circulation and connectivity and to create an attractive and vibrant pedestrian environment along the Grand Avenue corridor. This sustainable street concept envisions a reconfiguration of Grand Ave between Maple Ave and Linden Ave with increased pedestrian spaces and integrated stormwater management within green infrastructure facilities.

This project would realign parking from angles to parallel on both sides of Grand Ave to allow space for a bike lane and increased pedestrian areas. The parking lane is proposed to be permeable pavement which will provide infiltration of runoff. The mid-block area is proposed to include a wider sidewalk and colored paving within the

driving lanes to promote traffic calming and increased pedestrian safety. Sidewalk and pedestrian spaces will be installed as boardwalks overlaying bioretention planters. This will provide large stormwater facilities that can manage roadway and sidewalk runoff while preserving space for pedestrian use along the busy commercial and mixed-use corridor. Street trees will be integrated along the parking lane and within the pedestrian boardwalk.

A total of 5,600 square feet of permeable pavement is proposed and a total of 10,200 square feet of bioretention planter integrated in boardwalks are proposed. These are estimated to capture stormwater runoff from approximately 1.2 acres of roadway, providing capture of 2.5 acre-feet of runoff per year. This project is expected to retain 68% or runoff.

### Site Characteristics

In Priority Development Area  
Yes

Watershed  
Colma Creek

### Green Infrastructure Performance


Drainage Management Area  
1.2 ac

Annual Runoff Captured  
2.5 ac-ft

Bioretention Area / Storage Volume  
10,200 sf / 0.35 ac-ft

Permeable Pavement Area / Storage Volume  
5,600 sf / 0.08 ac-ft

### Active Transportation Performance

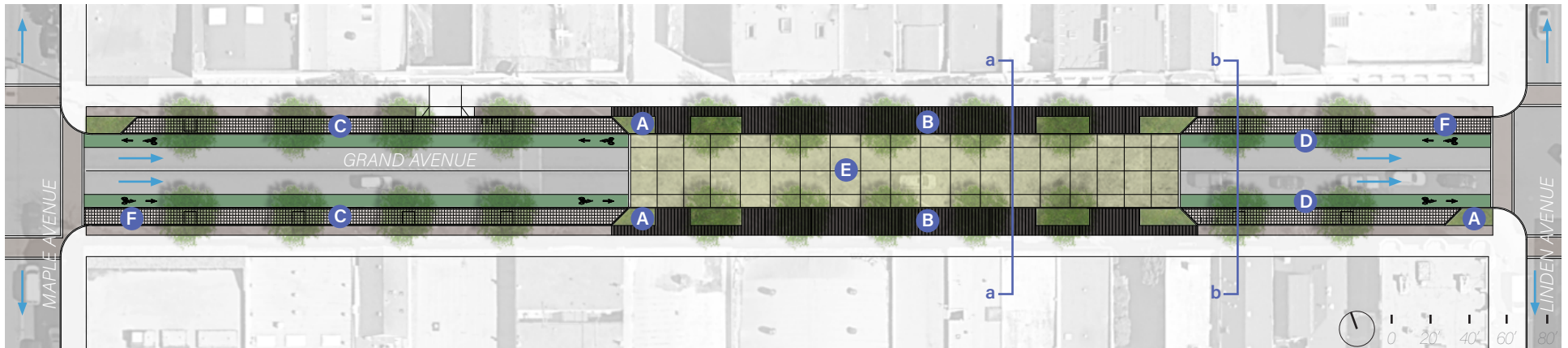
Change in Bicycle Level of Traffic Stress (LTS)   
LTS 4 to LTS 3

Increase in % Likely Bicyclist Usage  
11%

#### Key Transportation Benefits

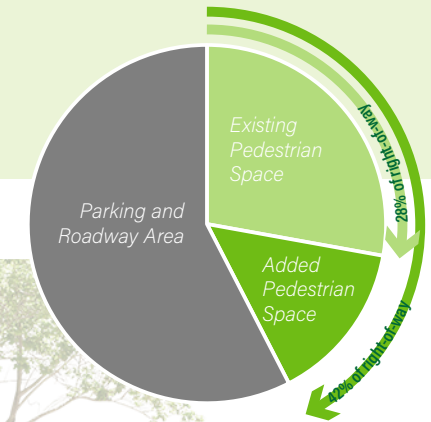
- » Reduced pedestrian crossing distance
- » Increased pedestrian space
- » Traffic calming
- » Added bike lane



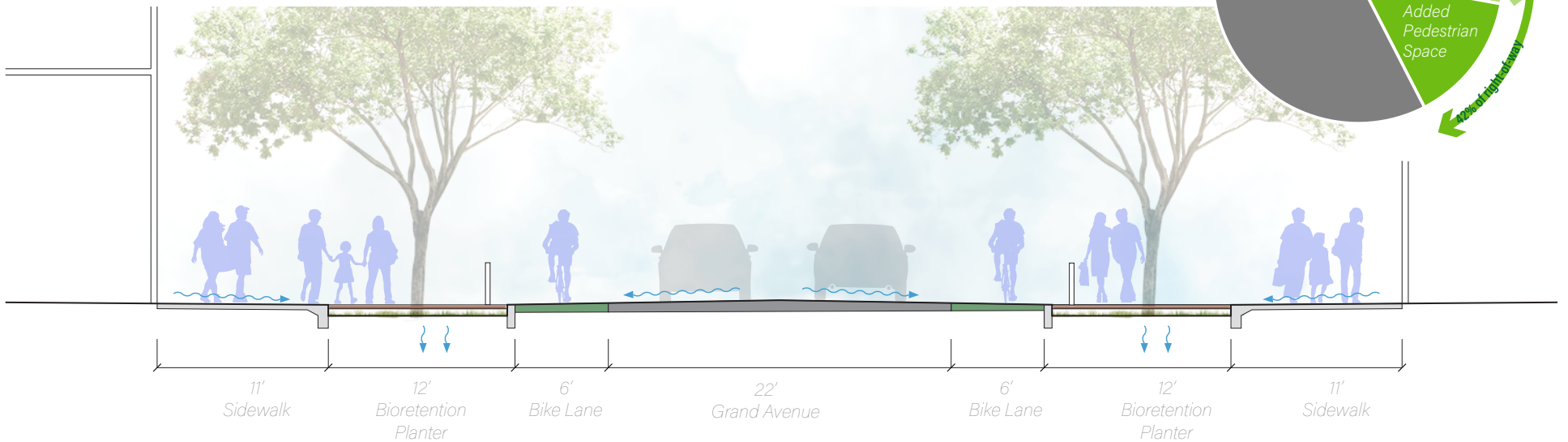


**KEY SITE IMPROVEMENTS**

- |  |                                      |                                  |
|--|--------------------------------------|----------------------------------|
| <b>A</b> Proposed bioretention planter                         | <b>C</b> Proposed permeable pavement | <b>E</b> Proposed plaza crossing |
| <b>B</b> Proposed suspended pavement over bioretention planter | <b>D</b> Proposed bike lane          | <b>F</b> Existing bus stop       |

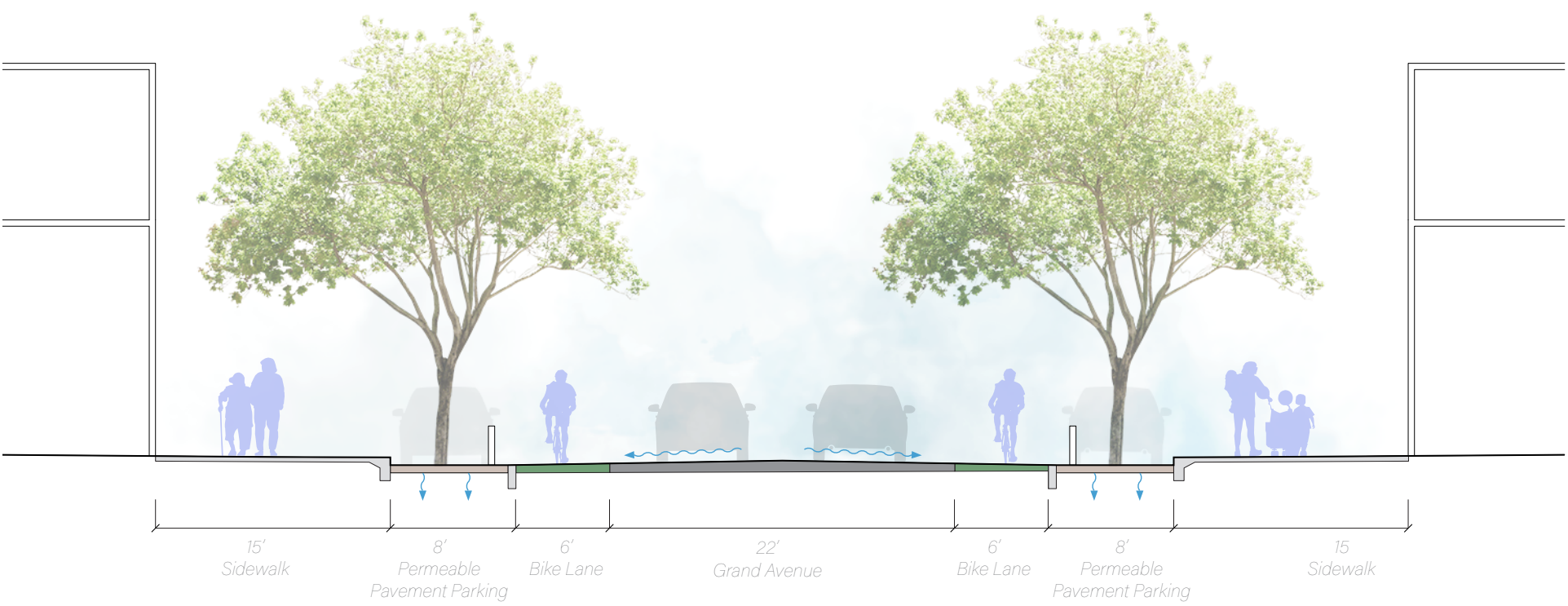


**Concept Site Plan Detail: Grand Avenue, South San Francisco**



**Typical Cross Section a-a: Grand Avenue**

# Grand Avenue South San Francisco



Typical Cross Section b-b: Grand Avenue

## Site Elements



Permeable pavement parking and step-out zone



Tree dividers between parking stalls



Paver sidewalk and furnishing zone



Flex-use parking lane converting to outdoor seating



## Concept Perspectives



Existing condition, Grand Ave between Maple Ave and Linden Ave



Proposed condition

## Site Elements



Downtown street plaza space



Downtown street plaza space



Boardwalk over bioretention basin as sidewalk space



Boardwalk & paver sidewalk space with protective bollards



# Grand Avenue South San Francisco

## Project Benefits



**Prioritize Non-Motorized Users**  
*Promote more active transportation*



**Neighborhood Beautification**  
*Increased vegetation*  
*Provide engaging streets to walk on*



**Bike Network**  
*Part of larger network for connectivity*  
*Promote biking with more connectivity*



**Increased Trees**  
*Shade for walking comfort*  
*Heat and carbon emission reduction*



**Groundwater Recharge**  
*Recharge of the Westside Groundwater Basin*



**Bikeability & Safety**  
*Increased protected bike lanes*  
*Increased bike-share roads*



**Walkability & Safety**  
*Curb extensions for safer street crossing*  
*Connection to commercial areas*



**Reestablishes Natural Hydrology**  
*Bioretention planters capture and infiltrate stormwater*

## Planning-Level Cost Estimate

DESCRIPTION	UNIT COST	UNIT COST	QUANTITY	SUBTOTAL
Utilities Protection/Relocation	\$120,000	LS	1	\$120,000
Sawcutting Pavement	\$12	LF	2,600	\$31,200
Concrete Demo, Excavation & Offhaul	\$11	SF	15,600	\$171,600
Planter Excavation & Offhaul	\$70	CY	980	\$68,600
Planter Curb & 36" Sidewalls	\$160	LF	620	\$99,200
Planter Curb & Gutter & 36" Sidewalls	\$180	LF	600	\$108,000
Bio-soil Media	\$250	CY	390	\$97,500
Underdrains	\$6	SF	2,730	\$16,400
Drain Rock Subbase	\$160	CY	490	\$78,400
Bioretention Plantings & Mulch	\$25	SF	1,670	\$41,800
Storm Drain Connections	\$7,500	EA	4	\$30,000
Bioretention Curb Inlet	\$1,500	EA	10	\$15,000
Permanent Tree Protection	\$165	LF	192	\$31,700
Flush Curb Ribbon	\$60	LF	1,570	\$94,200
Permeable Pavement	\$25	SF	6,020	\$150,500
Bikelane Striping	\$12	SF	5,100	\$61,200
Irrigation System	\$13,240	EA	6	\$79,400
Traffic Sign Relocation	\$900	EA	6	\$5,400
Trees	\$1,500	EA	22	\$33,000
Boardwalk Surfacing	\$50	SF	5,320	\$266,000
Plaza Road Paint	\$5	SF	5,500	\$27,500
CONSTRUCTION SUBTOTAL				\$1,627,000
Traffic Control				\$81,350
Mobilization (10% construction)				\$163,000
Contingency (30% construction)				\$488,000
Design Fees (15% total)				\$354,000
TOTAL PROJECT COST (DESIGN + CONSTRUCTION)				\$2,713,000

This is a planning-level cost estimate (\$2020) for design and construction. Soft costs for City administration and project management and post-construction operations and maintenance are not included. Other factors that may affect the cost of future construction include escalation and market conditions.

## Additional Considerations

This project concept is presented for discussion only. This project concept is planning-level and subject to revision as additional information becomes available. Factors to be considered during design of this project include but are not limited to the following:

- » **Infiltration Potential.** The hydrologic soil group is unknown along Grand Ave. A geotechnical investigation will be conducted during design development, including site-specific borings and infiltration tests, to ensure facilities are designed appropriately. This design incorporates bioretention below boardwalk areas within the sidewalk resulting in a large amount of facility area relative to the roadway drainage area. Therefore, bioretention facilities will likely be able to manage roadway runoff without the need for underdrains even if slow draining soils are present on site.
- » **Utility Conflict.** Initial utility assessments were conducted for sanitary sewer, storm sewer, and water mains. Bioretention facilities are proposed in configurations that minimize disruption of sewer and water lines. Other utilities such as power and gas were not available for consideration during the development of this concept and should be assessed during design development.
- » **Street Trees.** Trees are proposed within the parking lane. These will be protected with curbs or fencing. They are proposed to divide every two parking spots. The trees will provide shade and assist in stormwater management within the roadway.
- » **Maintenance.** Bioretention planters located under pedestrian boardwalks will require minimal maintenance as they will not be planted and smaller exposed bioretention planters will serve as the inlet and outlet of these systems. The inlet planters will capture the majority of the sediment load and prevent the downstream planters below the boardwalk from needing frequent maintenance.