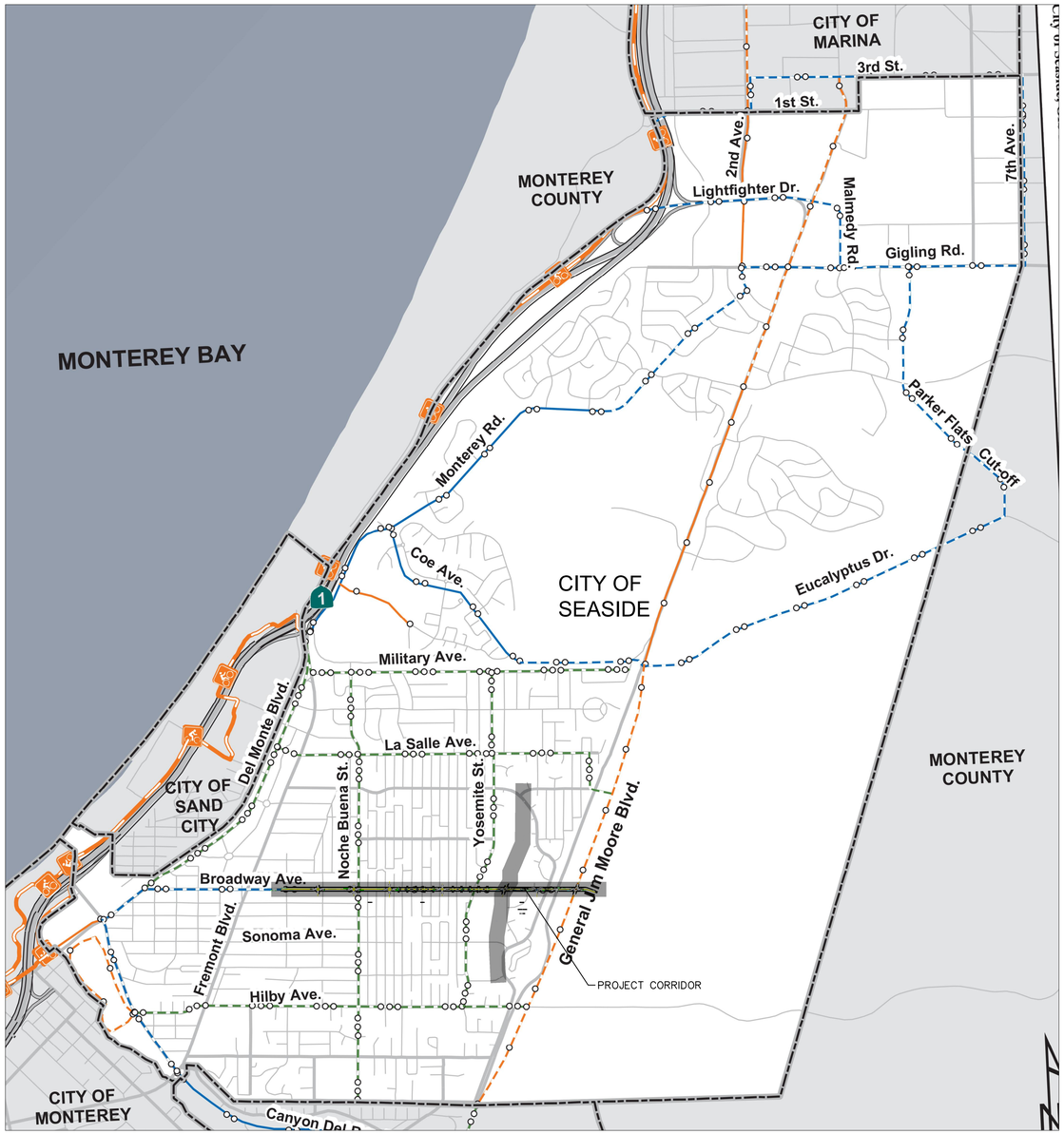
Kimley»Horn

| Table of Contents | |
|---|---|
| **Appendix** | |
| A | Vicinity Map |
| B | Project Layout and Typical Cross Sections |
| C | Project Specific ICE Evaluations |
| D | Full City of Seaside ICE Study |
| E | NDS Traffic Counts and Intersection Volume Summaries |
| F | Growth Rate Memo |

# Appendix A




# BROADWAY AVENUE VICINITY MAP

FREMONT BLVD TO GENERAL JIM MOORE BLVD
AUGUST 2020

NORTH

GRAPHIC SCALE IN FEET
0 750 1500 3000

Kimley»Horn ©2018

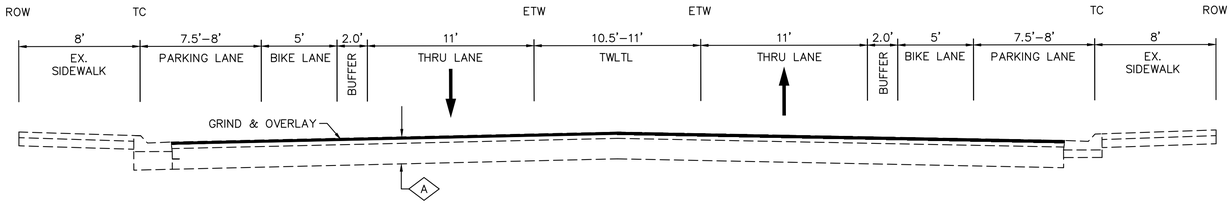
# Appendix B

## EXISTING PAVEMENT STRUCTURAL SECTIONS

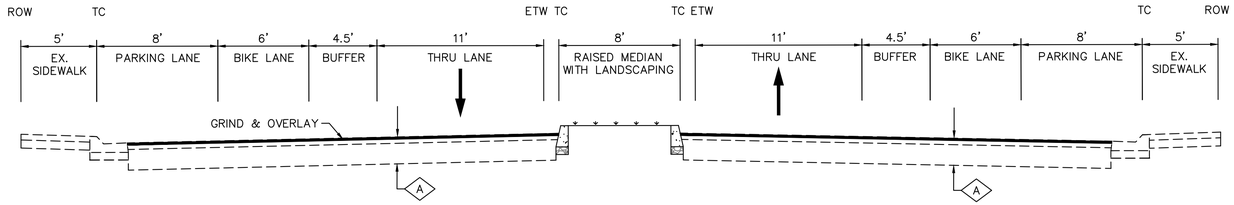
A — 0.33 – 0.67' HMA (TYPE A)
1' – 2' AB (CLASS 2)

## PAVEMENT STRUCTURAL SECTIONS

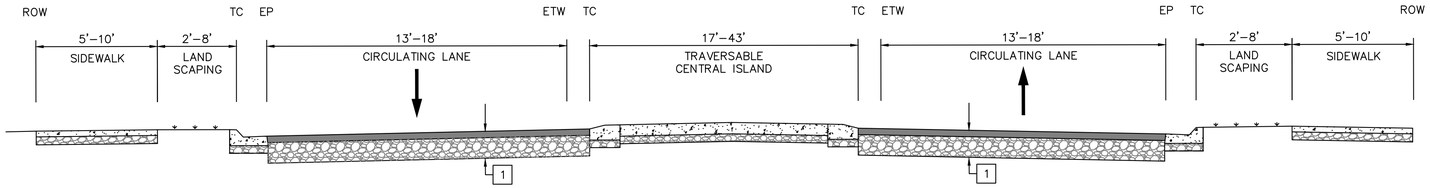
1 — 0.45' HMA (TYPE A)
1.35' AB (CLASS 2)



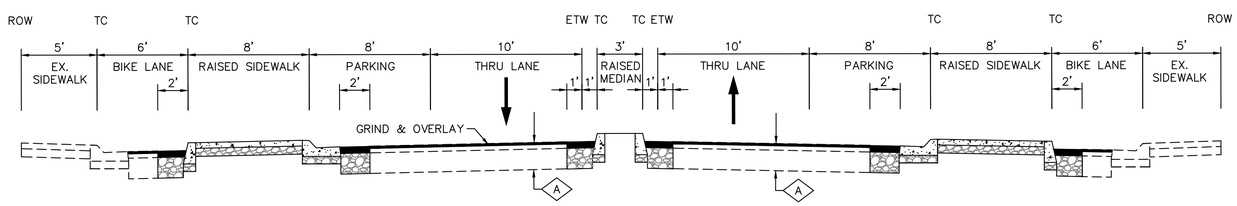

TYPICAL SECTION FREEMONT BLVD TO NOCHE BUENA ST




TYPICAL SECTION NOCHE BUENA ST TO YOSEMITE ST




ROUNDABOUT TYPICAL CROSS SECTION




TYPICAL SECTION YOSEMITE ST TO GENERAL JIM MOORE AVE

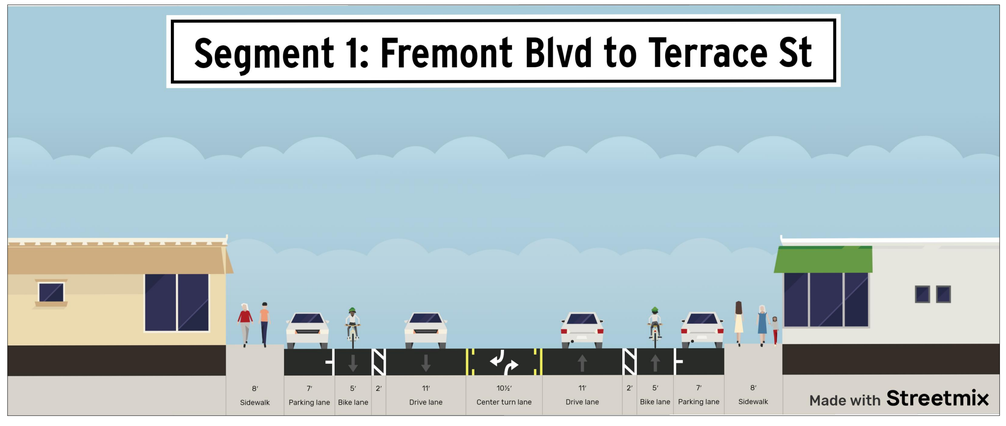
# BROADWAY AVENUE CONCEPT TYPICAL SECTIONS

FREMONT BLVD TO GENERAL JIM MOORE BLVD
SHEET 1 OF 7
AUGUST 2020

GRAPHIC SCALE IN FEET
0 2.5 5 10

Kimley»Horn ©2018

# Proposed Conditions


NOTE: Roundabout to replace existing traffic signal

LEGEND

- ASPHALT
- SIDEWALK
- MOUNTABLE TRUCK APRON
- HARDSCAPE
- LANDSCAPE
- GREEN PAVEMENT MARKING

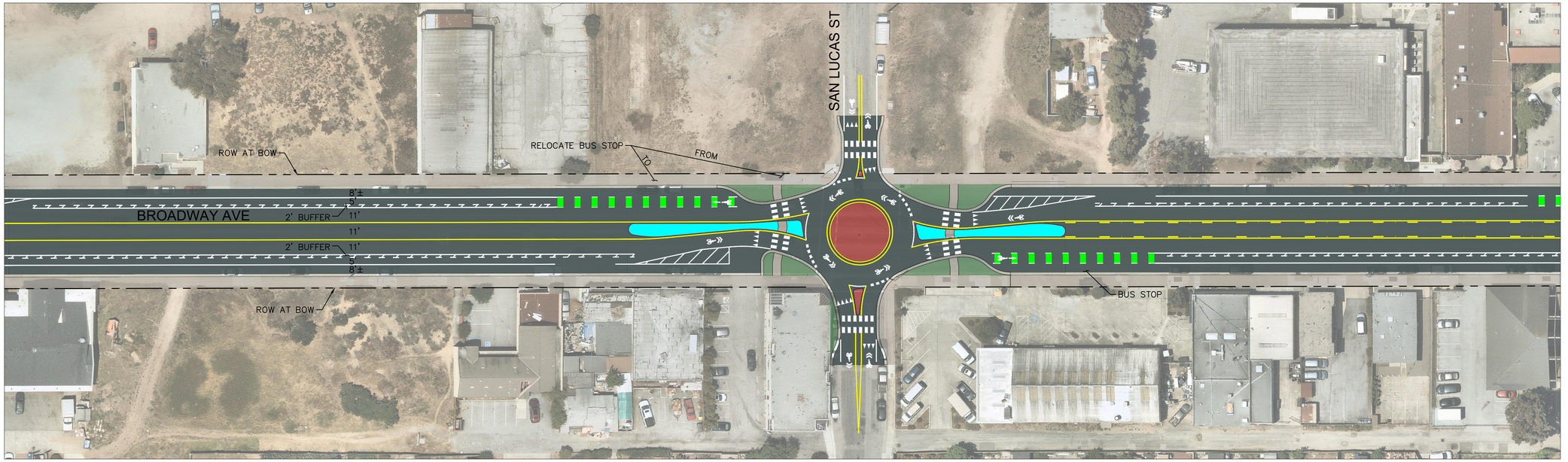
# BROADWAY AVENUE CONCEPTS

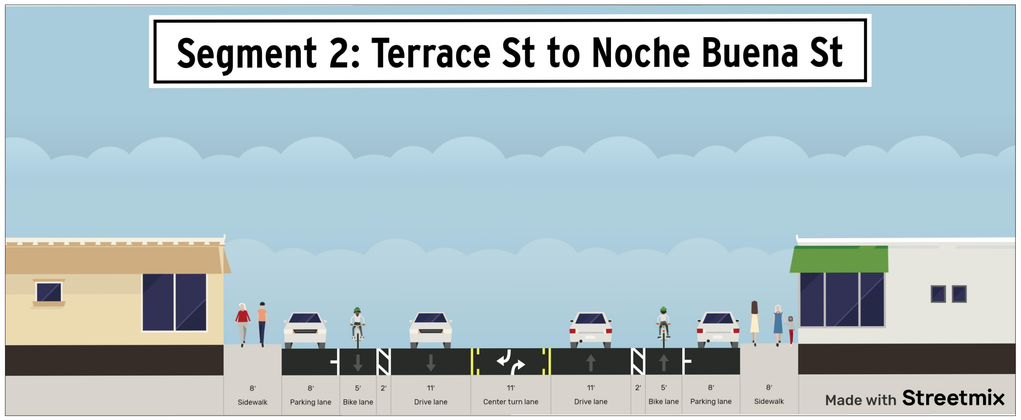
FREMONT BLVD TO GENERAL JIM MOORE BLVD
SHEET 2 OF 7
AUGUST 2020

NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

Kimley»Horn ©2018




NOTE: Roundabout to replace existing traffic signal per ICE Study (Appendix C)

LEGEND

- ASPHALT
- HARDSCAPE
- SIDEWALK
- LANDSCAPE
- MOUNTABLE TRUCK APRON
- GREEN PAVEMENT MARKING

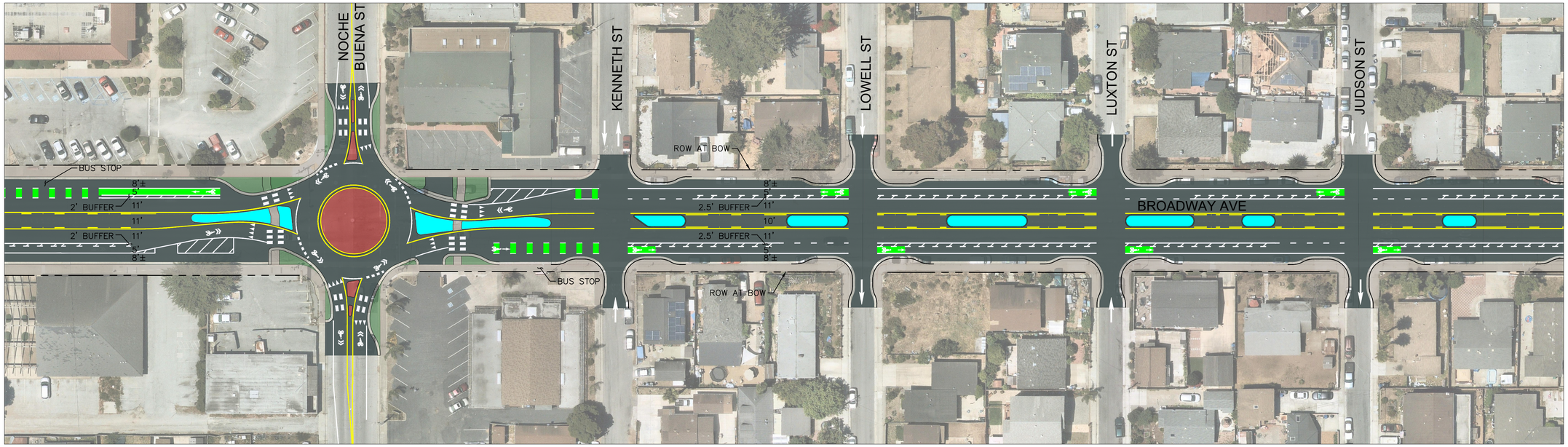
# BROADWAY AVENUE CONCEPTS

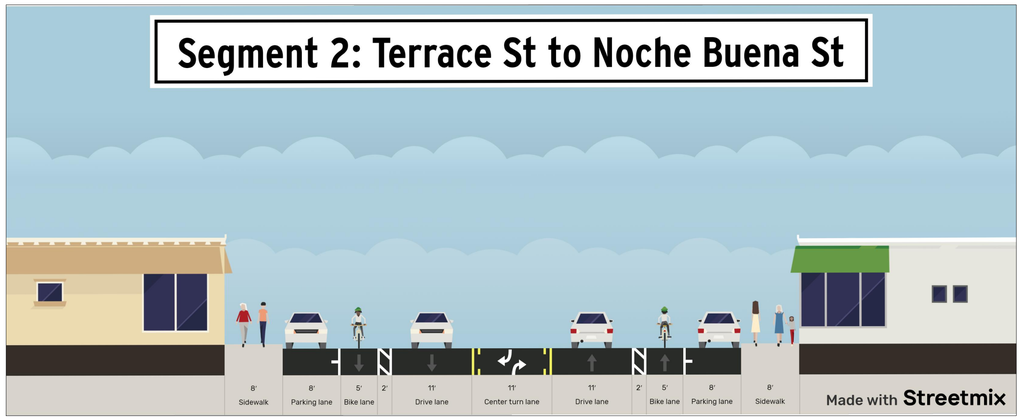
FREMONT BLVD TO GENERAL JIM MOORE BLVD
SHEET 3 OF 7
AUGUST 2020

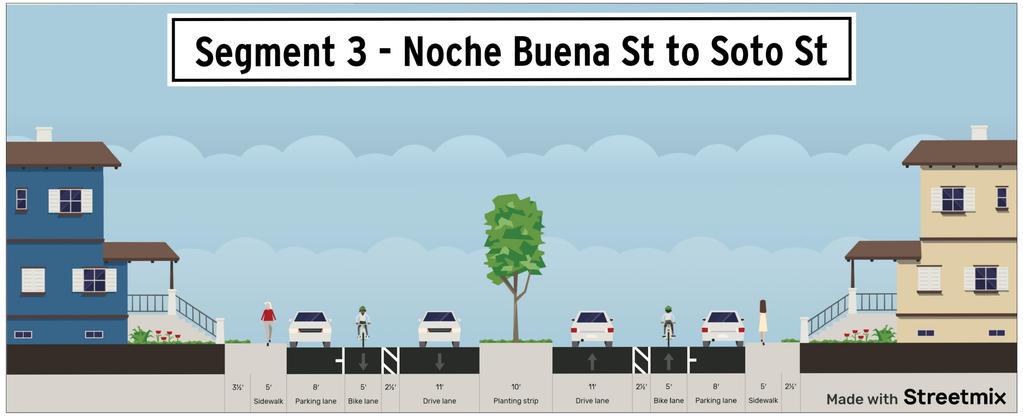
NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

Kimley»Horn ©2018




LEGEND

- ASPHALT
- SIDEWALK
- MOUNTABLE TRUCK APRON
- HARDSCAPE
- LANDSCAPE
- GREEN PAVEMENT MARKING

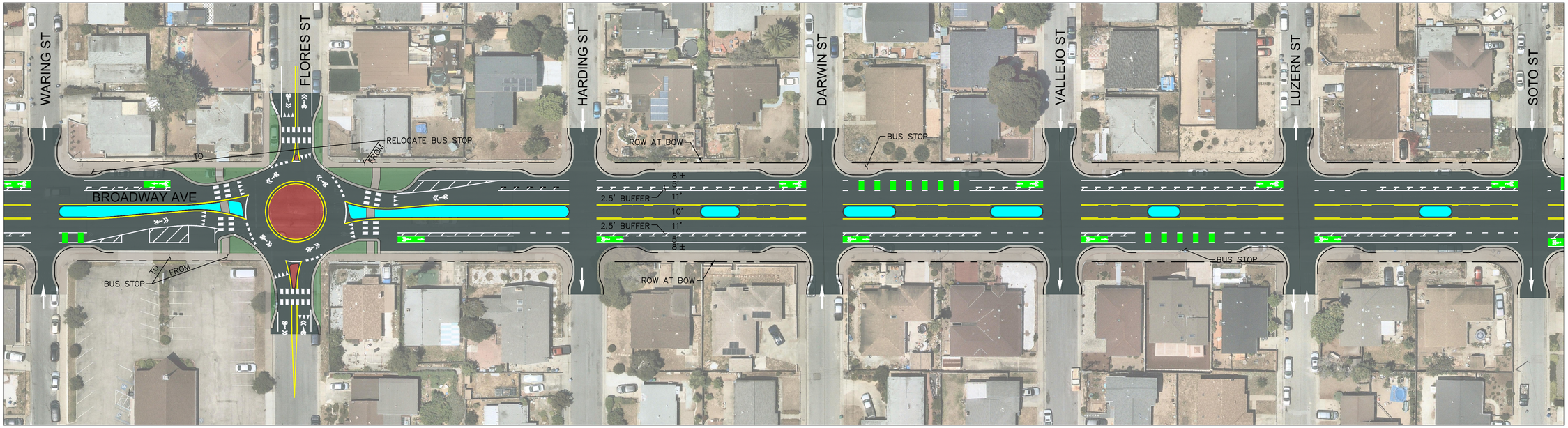
NORTH

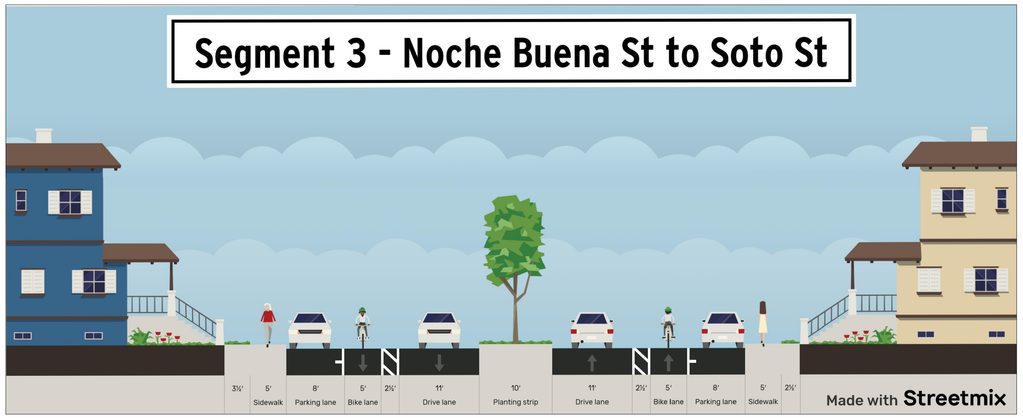
GRAPHIC SCALE IN FEET
0 20 40 80

# BROADWAY AVENUE CONCEPTS

FREMONT BLVD TO GENERAL JIM MOORE BLVD
SHEET 4 OF 7
AUGUST 2020

Kimley»Horn ©2018




LEGEND

- ASPHALT
- SIDEWALK
- MOUNTABLE TRUCK APRON
- HARDSCAPE
- LANDSCAPE
- GREEN PAVEMENT MARKING

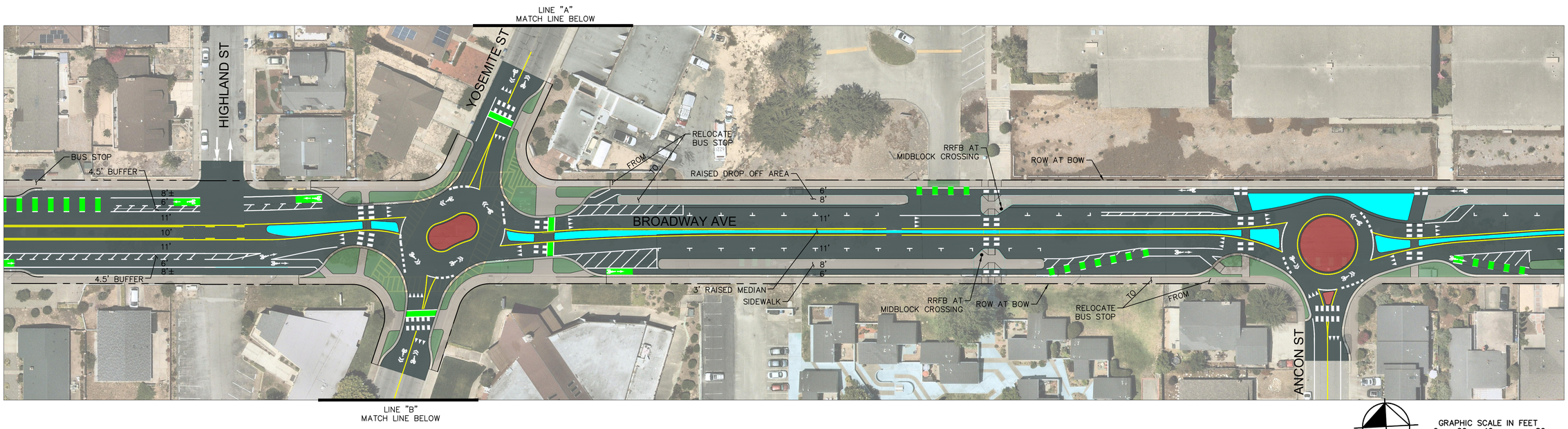
# BROADWAY AVENUE CONCEPTS

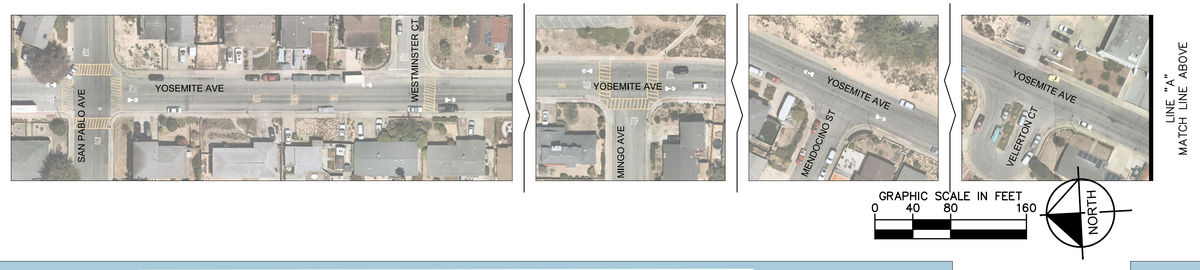
FREMONT BLVD TO GENERAL JIM MOORE BLVD
SHEET 5 OF 7
AUGUST 2020

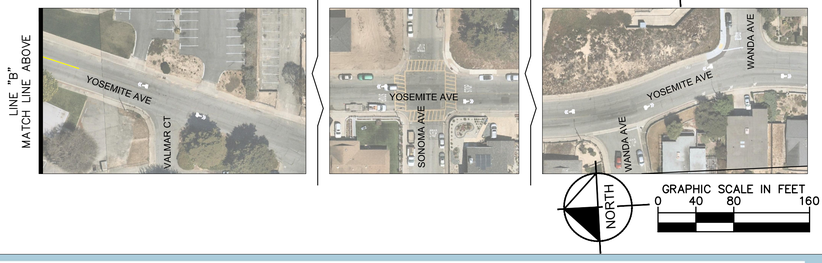
NORTH

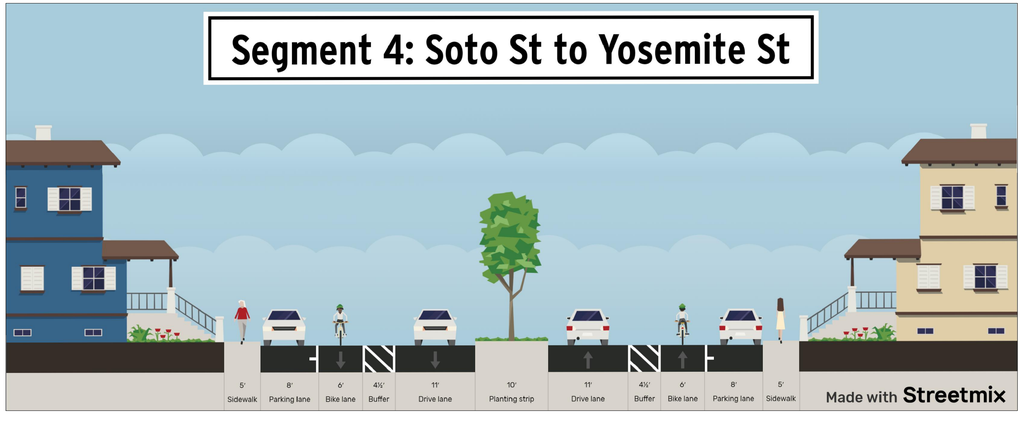
GRAPHIC SCALE IN FEET
0 20 40 80

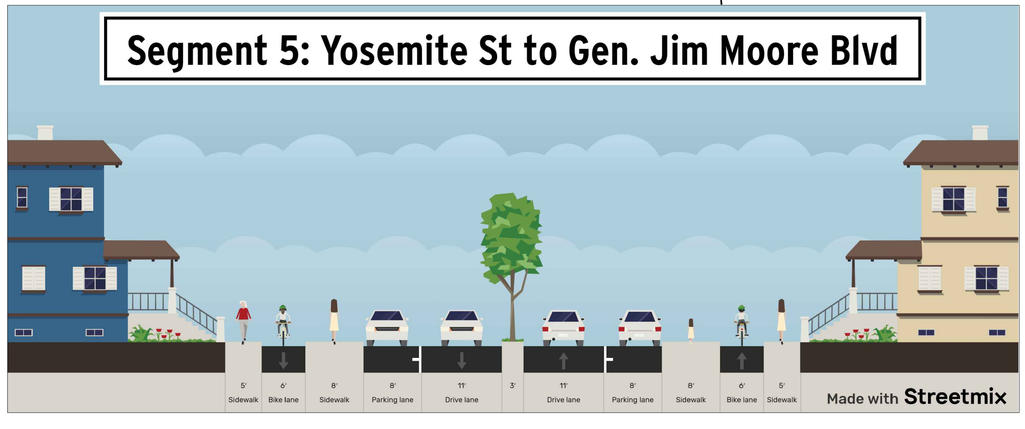
Kimley»Horn ©2018



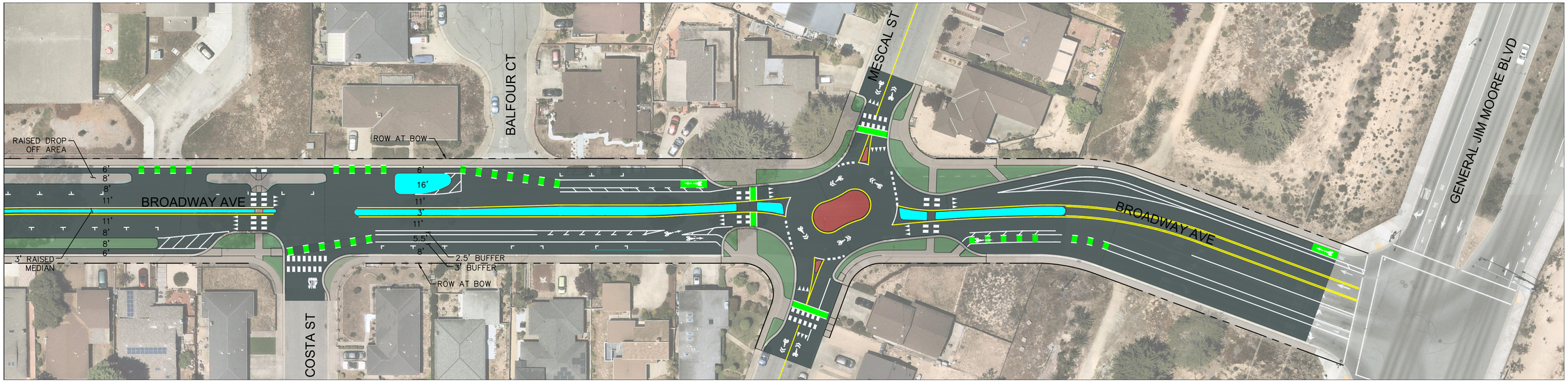



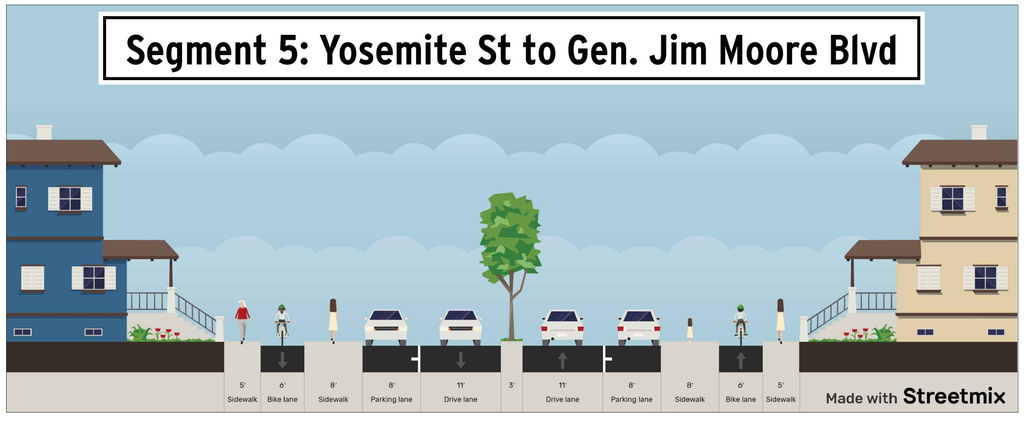

# BROADWAY AVENUE CONCEPTS

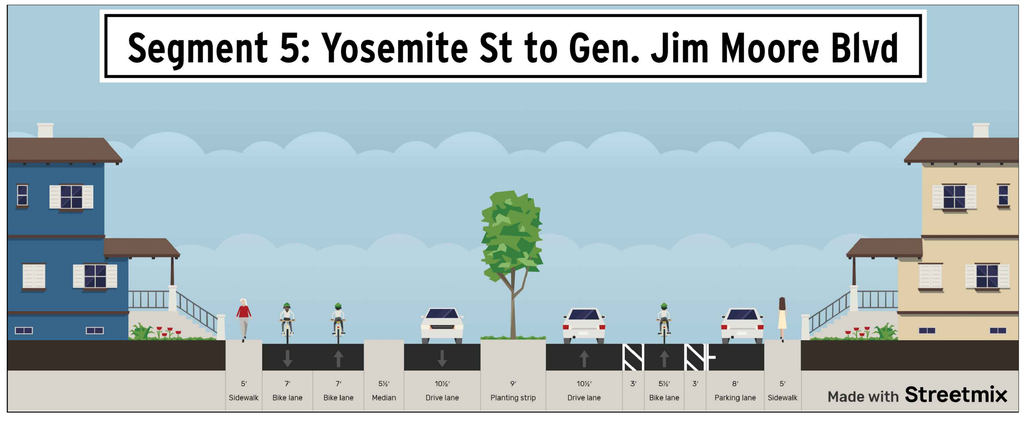
FREMONT BLVD TO GENERAL JIM MOORE BLVD
SHEET 6 OF 7
AUGUST 2020

LEGEND

- ASPHALT
- MOUNTABLE TRUCK APRON
- LANDSCAPE
- SIDEWALK
- HARDSCAPE
- GREEN PAVEMENT MARKING




LEGEND

- ASPHALT
- SIDEWALK
- MOUNTABLE TRUCK APRON
- HARDSCAPE
- LANDSCAPE
- GREEN PAVEMENT MARKING

NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

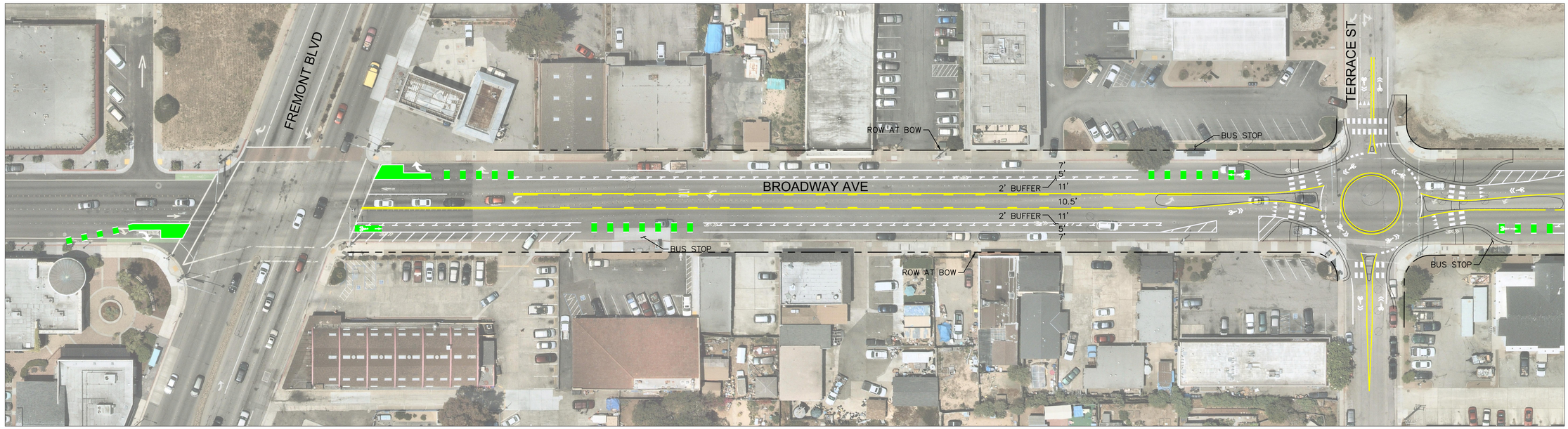
# BROADWAY AVENUE CONCEPTS

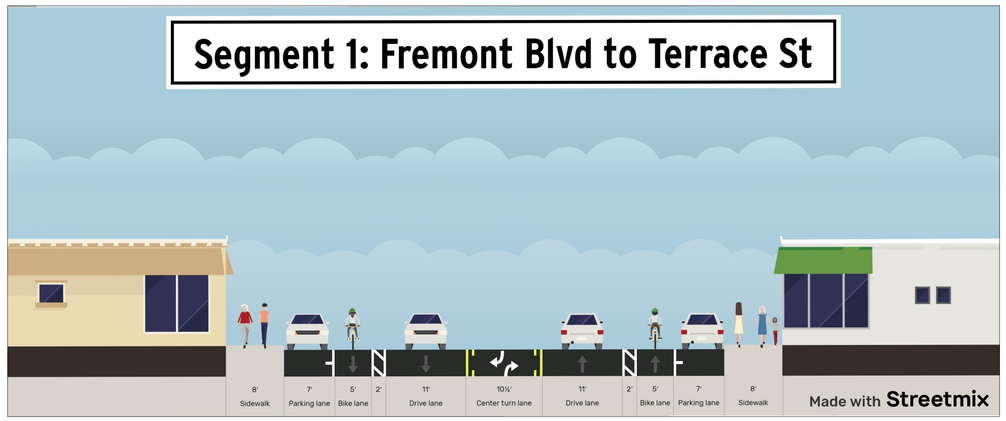
FREMONT BLVD TO GENERAL JIM MOORE BLVD
SHEET 7 OF 7
AUGUST 2020

Kimley»Horn ©2018

Kimley»Horn

# Proposed Conditions
# (with existing aerial imagery)



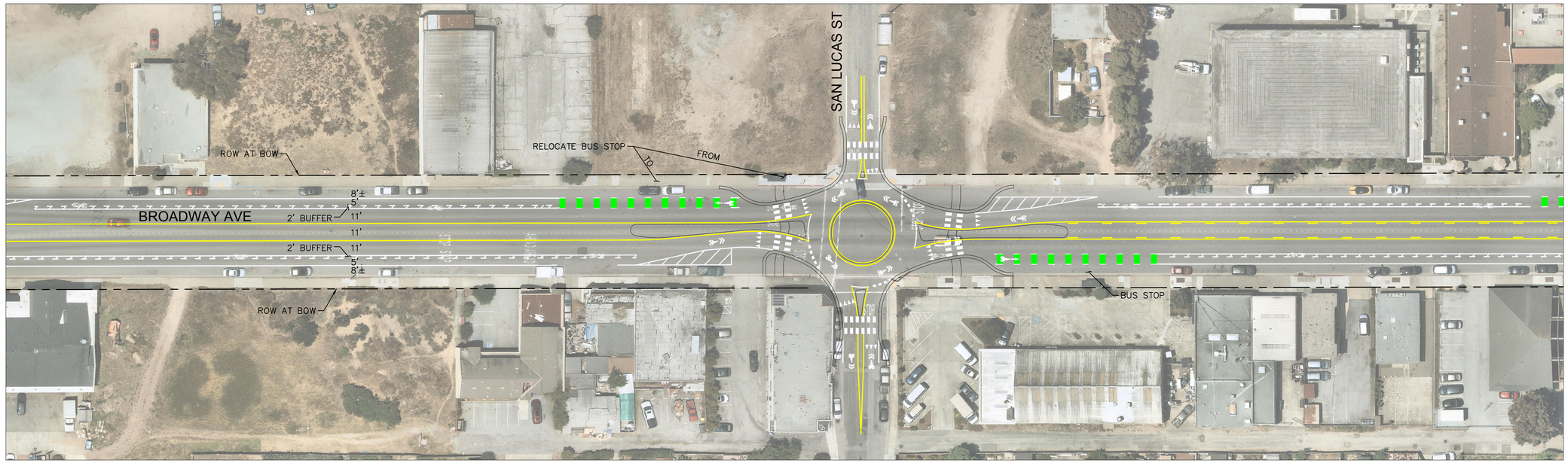

# BROADWAY AVENUE CONCEPTS

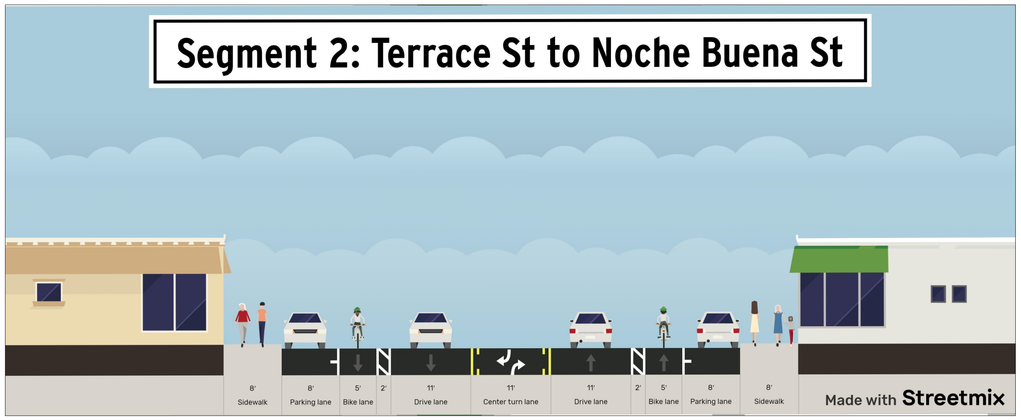
FREMONT BLVD TO GENERAL JIM MOORE BLVD
SHEET 2 OF 7
AUGUST 2020

NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

Kimley»Horn ©2018



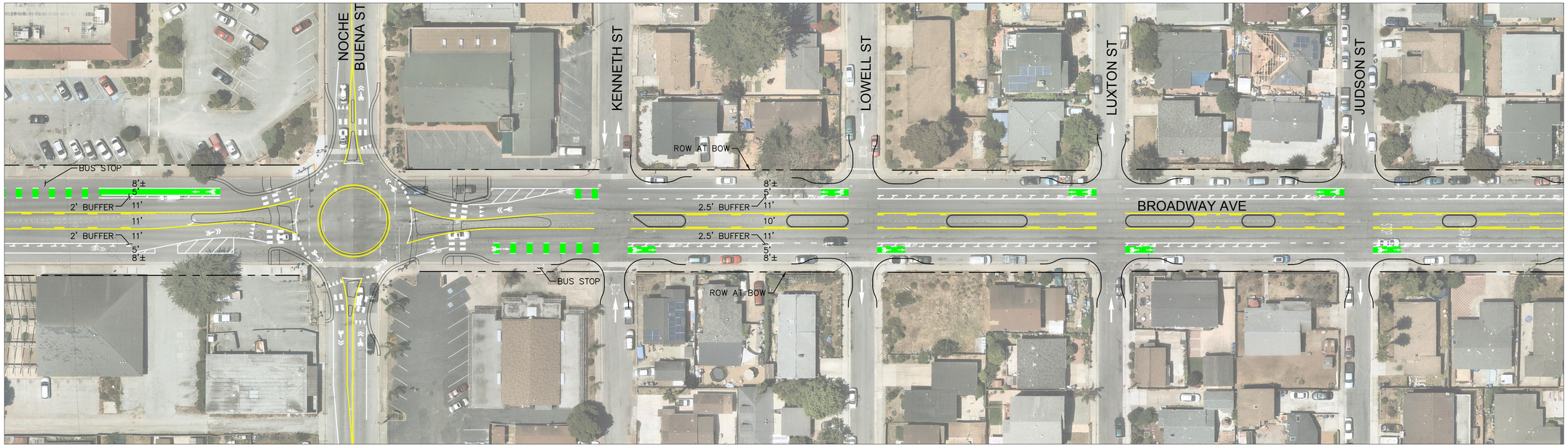

# BROADWAY AVENUE CONCEPTS

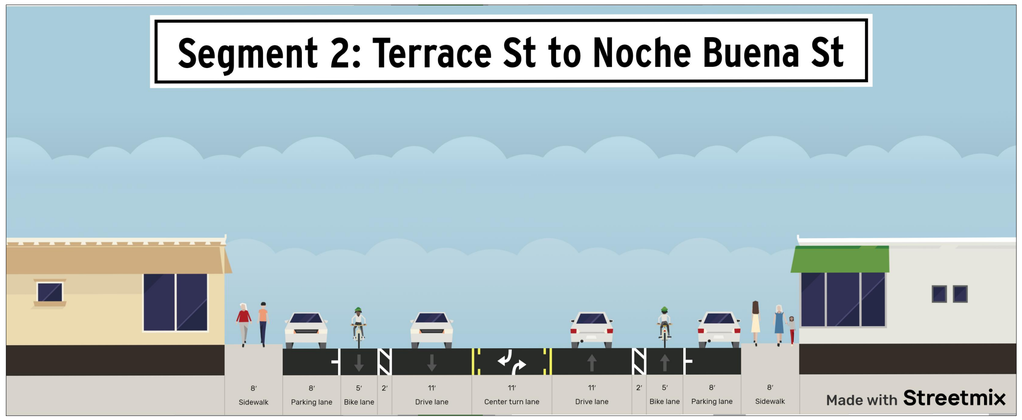
FREMONT BLVD TO GENERAL JIM MOORE BLVD
SHEET 3 OF 7
AUGUST 2020

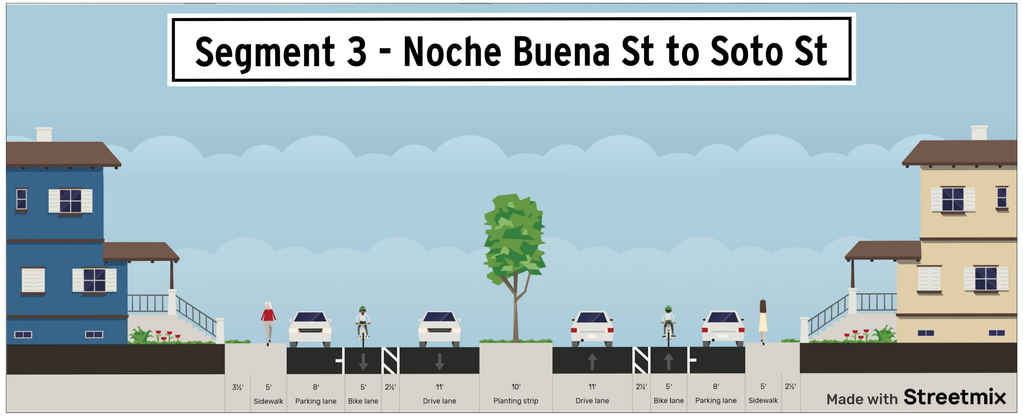
NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

Kimley»Horn ©2018



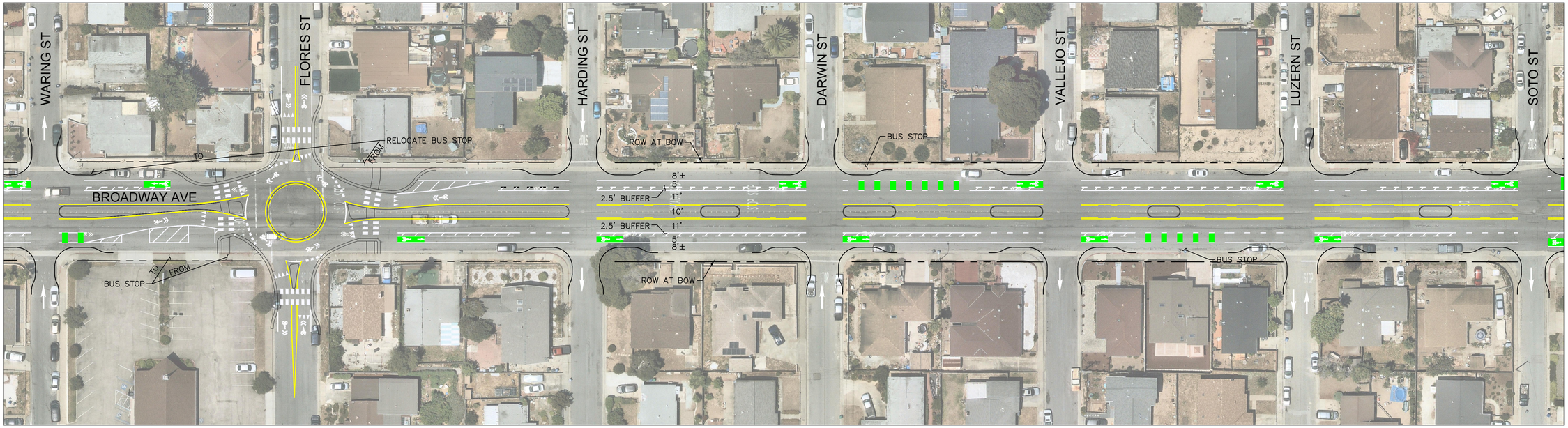

# BROADWAY AVENUE CONCEPTS

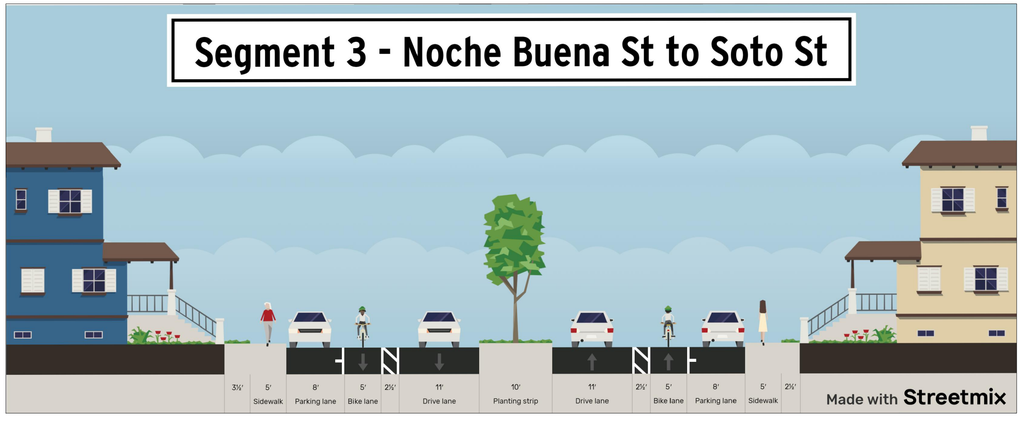
FREMONT BLVD TO GENERAL JIM MOORE BLVD
SHEET 4 OF 7
AUGUST 2020

NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

Kimley»Horn ©2018




LEGEND

- ASPHALT
- SIDEWALK
- MOUNTABLE TRUCK APRON
- HARDSCAPE
- LANDSCAPE
- GREEN PAVEMENT MARKING

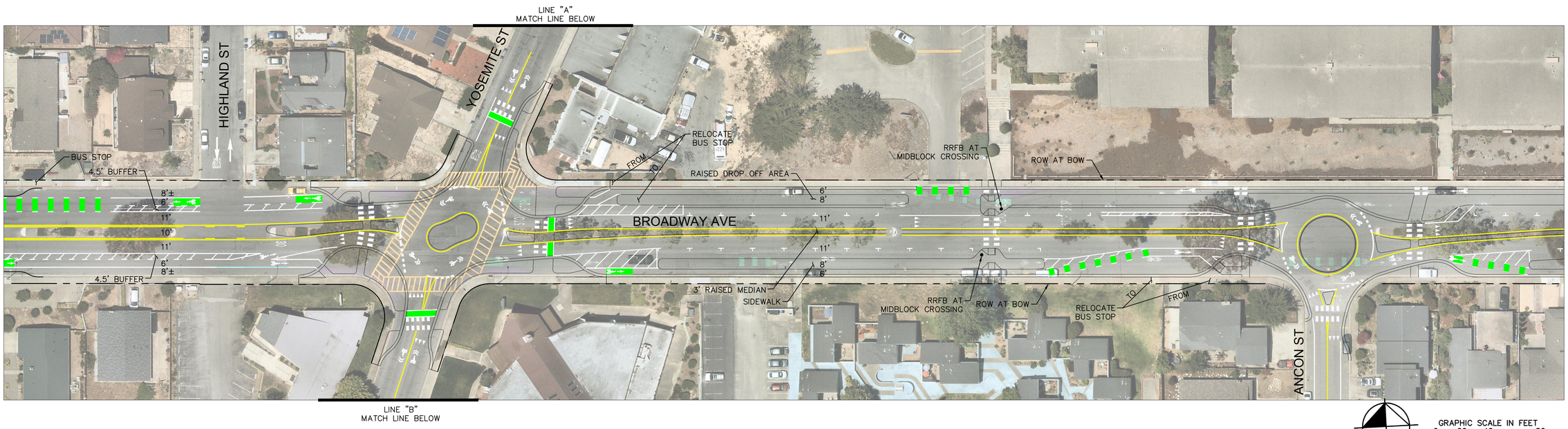
# BROADWAY AVENUE CONCEPTS

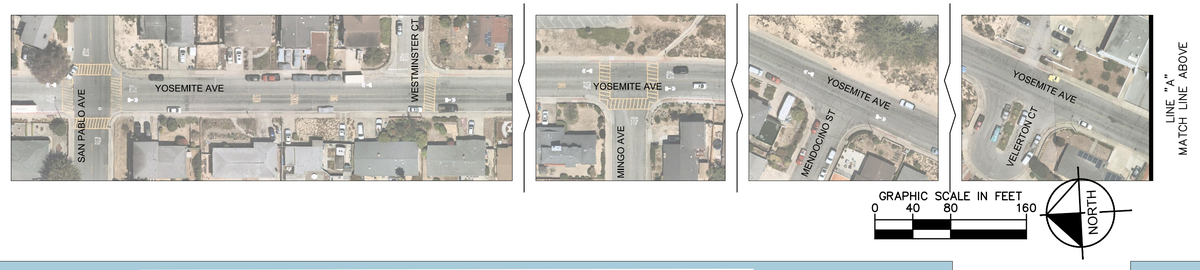
FREMONT BLVD TO GENERAL JIM MOORE BLVD
SHEET 5 OF 7
AUGUST 2020

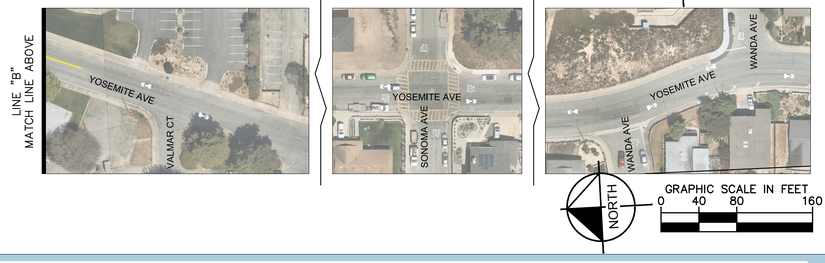
NORTH

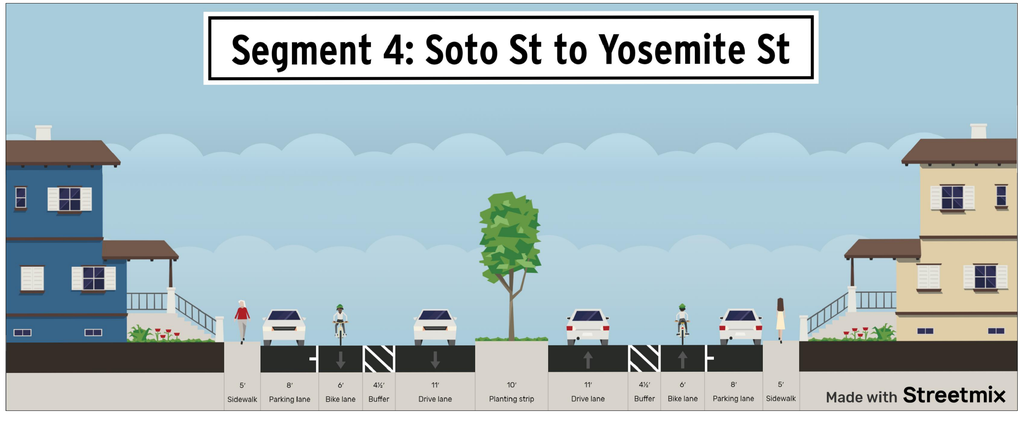
GRAPHIC SCALE IN FEET
0 20 40 80

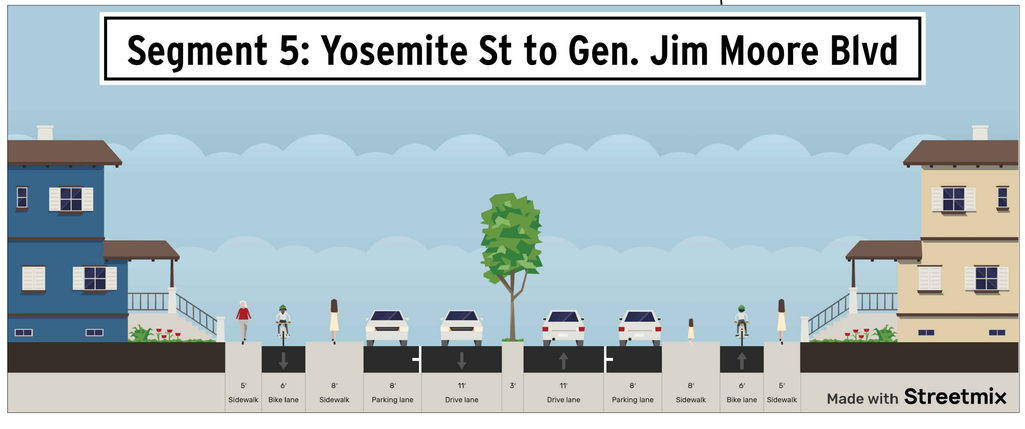
Kimley»Horn ©2018



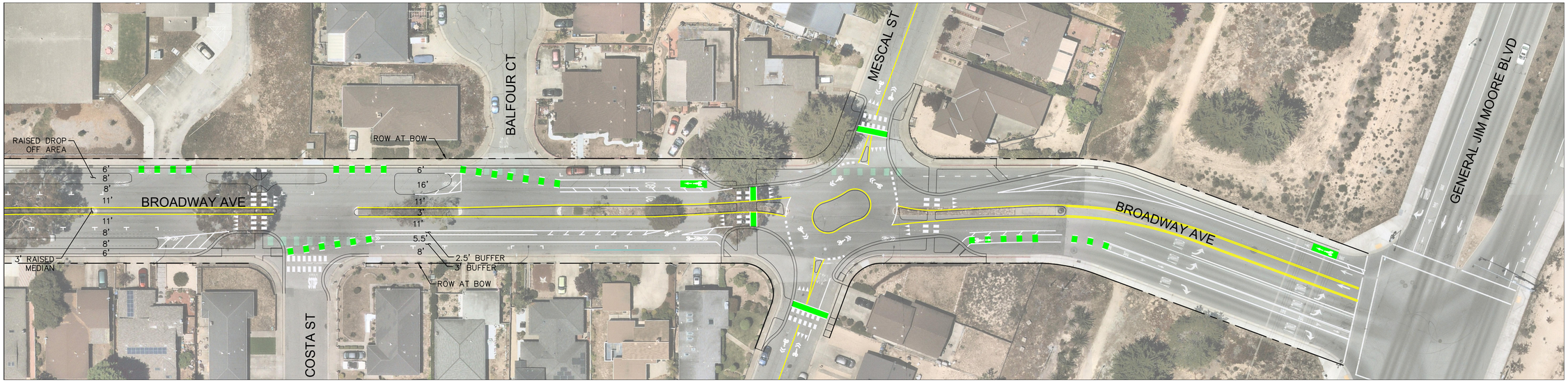



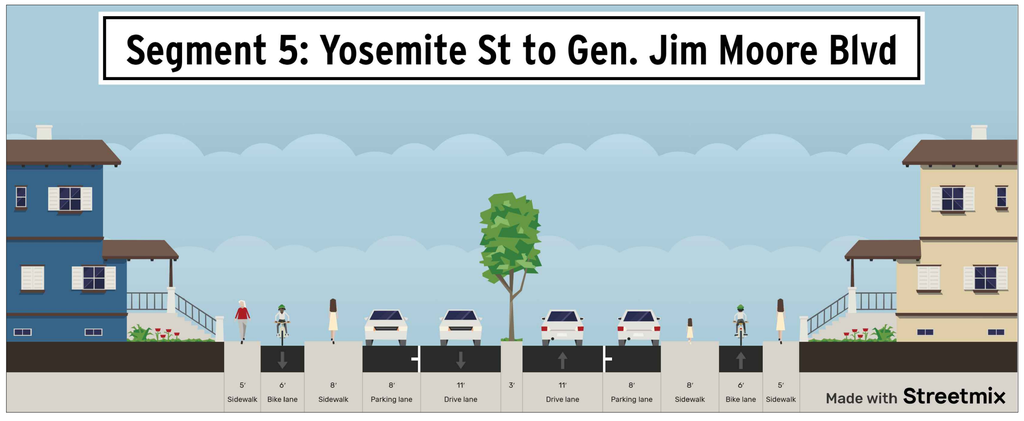



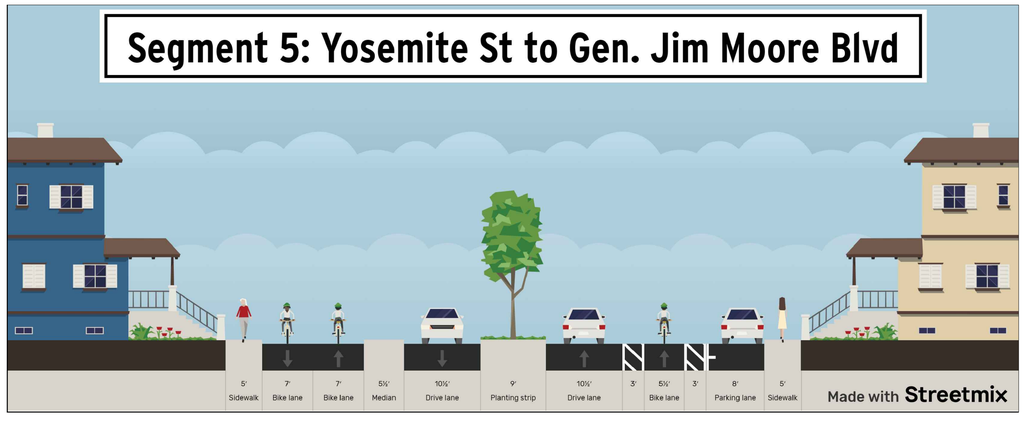




# BROADWAY AVENUE CONCEPTS

FREMONT BLVD TO GENERAL JIM MOORE BLVD
SHEET 6 OF 7
AUGUST 2020




# BROADWAY AVENUE CONCEPTS

FREMONT BLVD TO GENERAL JIM MOORE BLVD

SHEET 7 OF 7

AUGUST 2020

NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

Kimley»Horn ©2018

# Appendix C

# INTERSECTION 2.4 – BROADWAY AVENUE AT NOCHE BUENA STREET

## INTERSECTION CONTROL ALTERNATIVES

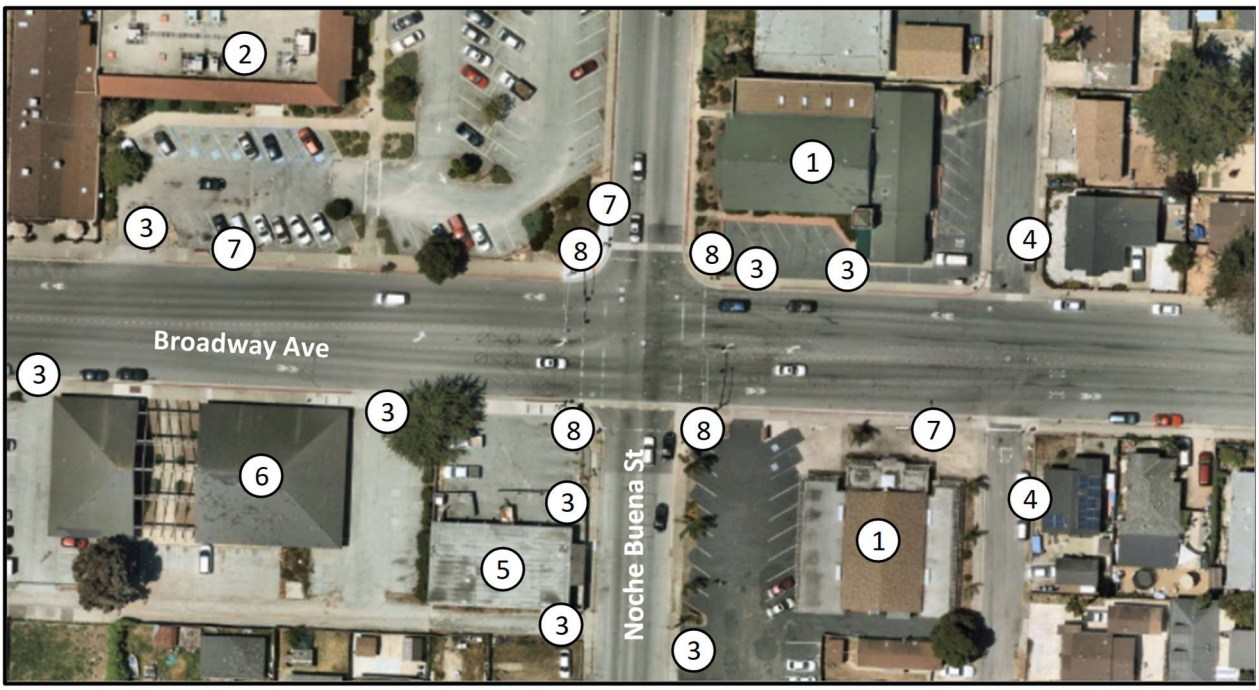
The two intersection control types analyzed include:

1. Existing Signal with Optimized Signal Timing
2. Mini-Roundabout

## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Broadway Ave at Noche Buena St is currently controlled by signals. Design constraints at the intersection include:

1. Place of Worship
2. Monterey County Social Services
3. Driveway
4. Proximity to Kenneth St
5. Liquor Store
6. Preschool
7. Bus stop
8. Right-of-way encroachment



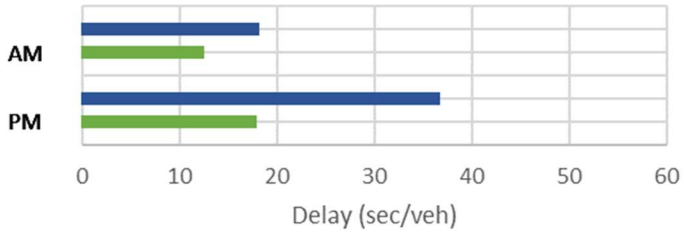
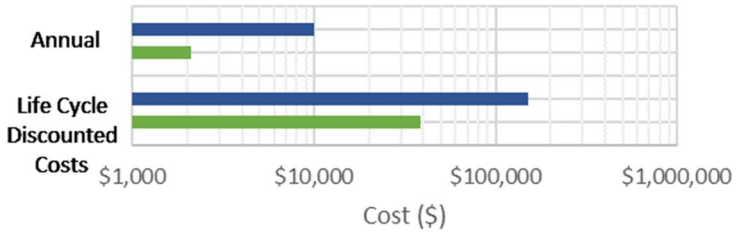
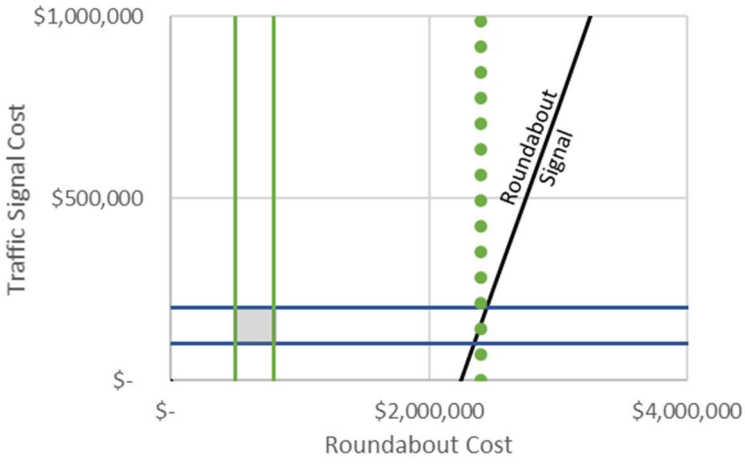

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| **INT 2.4** | **Broadway Ave at Noche Buena St** | | |
| | Urban Environment Focus | X | X |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | | X |
| | Minimize ROW Acquisition to Limit Initial Costs | X | X |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for signal and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Signal Roundabout |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Signal Roundabout |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Signal Roundabout |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget.<br>RAB ICC Range<br>Signal ICC Range<br>RAB Budget<br>B/C=1<br>Estimated ICC |  |  |

# INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | |
|---|---|---|
| **Safety** | | |
| | **Signal** | **Roundabout** |
| Annual Cost of Collisions | $ 192,639 | $ 93,748 |
| Discounted Life Cycle Cost of Collisions | $ 2,702,565 | $ 1,315,209 |
| **Delay** | | |
| | **Signal** | **Roundabout** |
| Annual Quantity (hours) | 6,851 | 4,131 |
| Annual Cost | $ 89,197 | $ 54,775 |
| Total Discounted Life Cycle Cost | $ 1,962,332 | $ 1,205,050 |
| **O&M** | | |
| | **Signal** | **Roundabout** |
| Annual O&M Costs | 9,220 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 129,349 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 25,862 | $ 21,983 |
| Total O&M Costs | $ 155,211 | $ 48,919 |
| **Initial Capital** | | |
| | **Signal** | **Roundabout** |
| High Approximation | $ 200,000 | $ 800,000 |
| Low Approximation | $ 100,000 | $ 500,000 |

**Benefit-Cost Ratio Calculations**

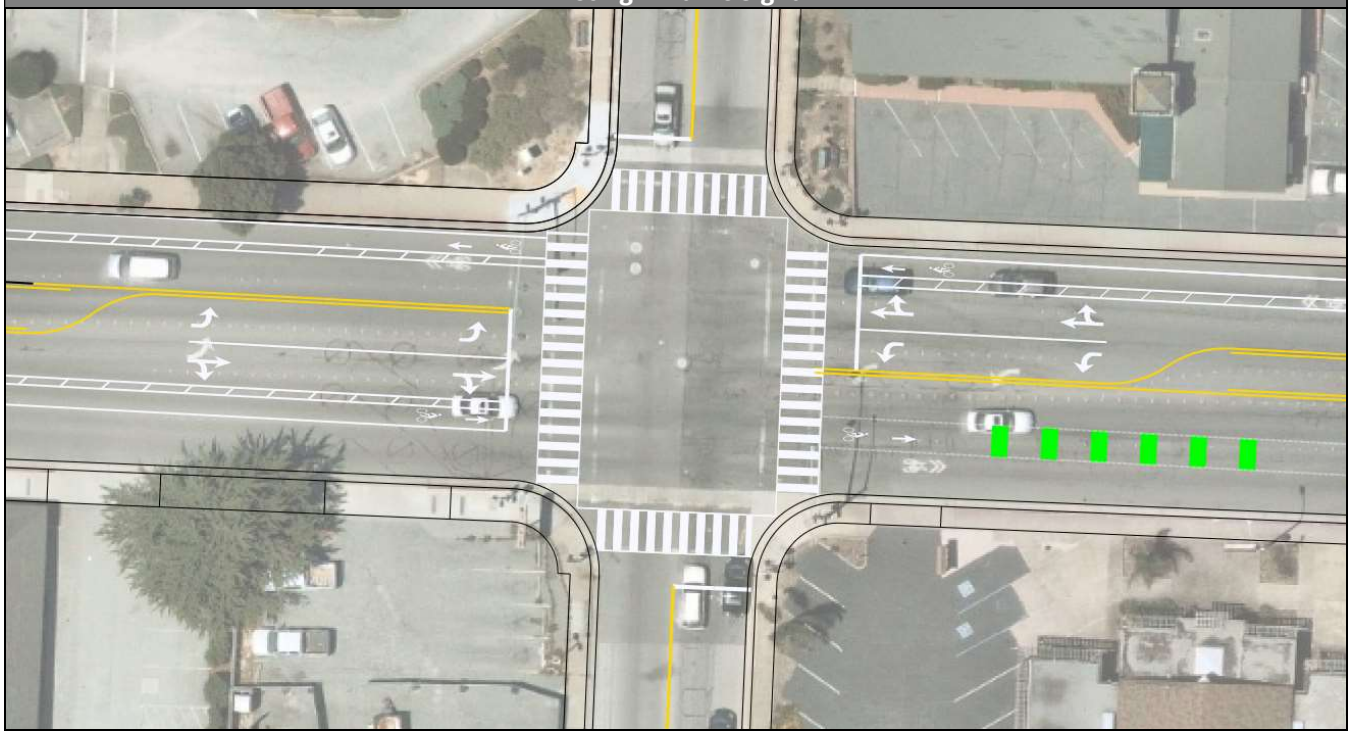
| | Capital Cost | | | Project Constraints | | | |
|---|---|---|---|---|---|---|---|
| B/C Target | Traffic Signal (a) | Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Added O&M Cost for Roundabout (d) | Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
| High | $ 200,000 | $ 500,000 | $ 300,000 | | | $ 195,254 | 10.98 |
| Low | $ 100,000 | $ 800,000 | $ 700,000 | $ (104,746) | $ 2,144,638 | $ 595,254 | 3.60 |
| Roundabout Budget | $ 150,000 | $ 2,399,383 | $ 2,249,383 | | | $ 2,144,638 | 1.00 |

# PREFERRED INTERSECTION ALTERNATIVE

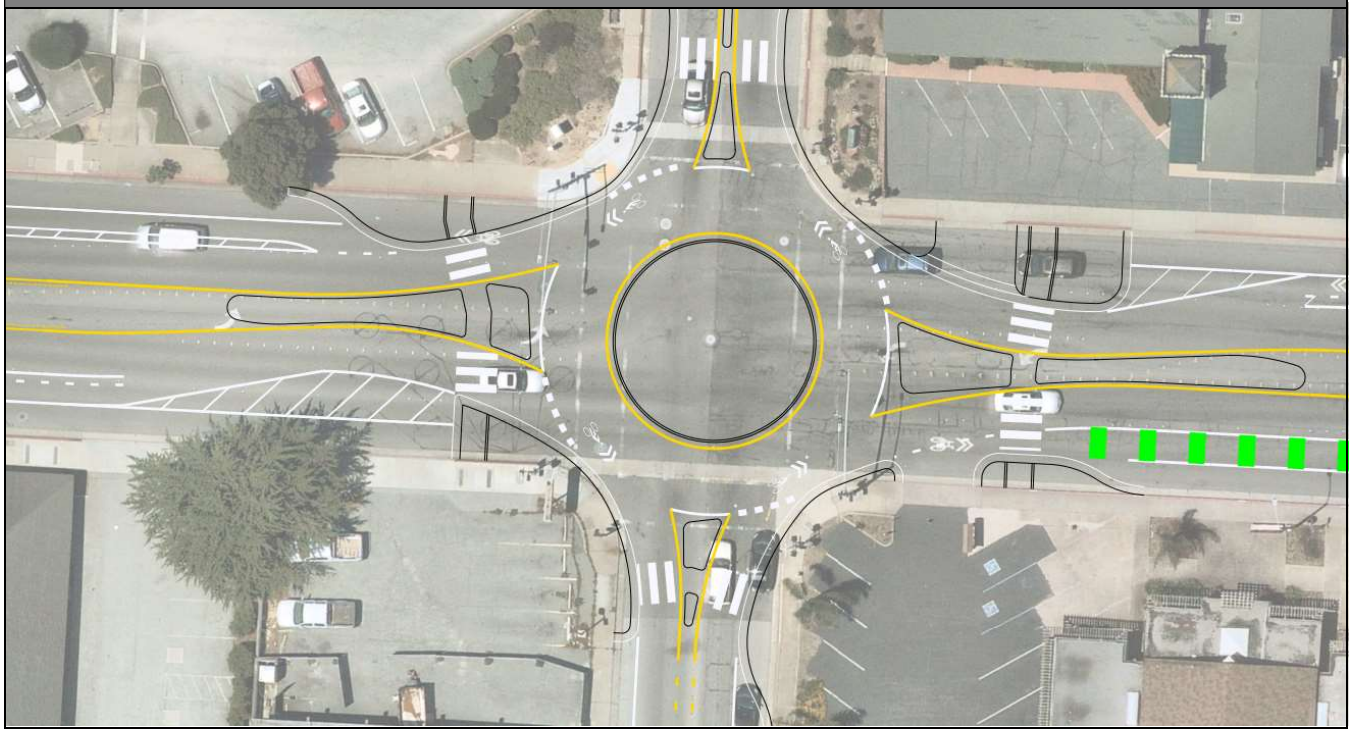
The preferred alternative based on B/C ratio for this intersection is roundabout control.

## INTERSECTION CONTROL CONCEPT LAYOUTS

**Existing - Traffic Signal**



**Mini-Roundabout**



# INTERSECTION 2.5 – BROADWAY AVENUE AT YOSEMITE STREET

## INTERSECTION CONTROL ALTERNATIVES

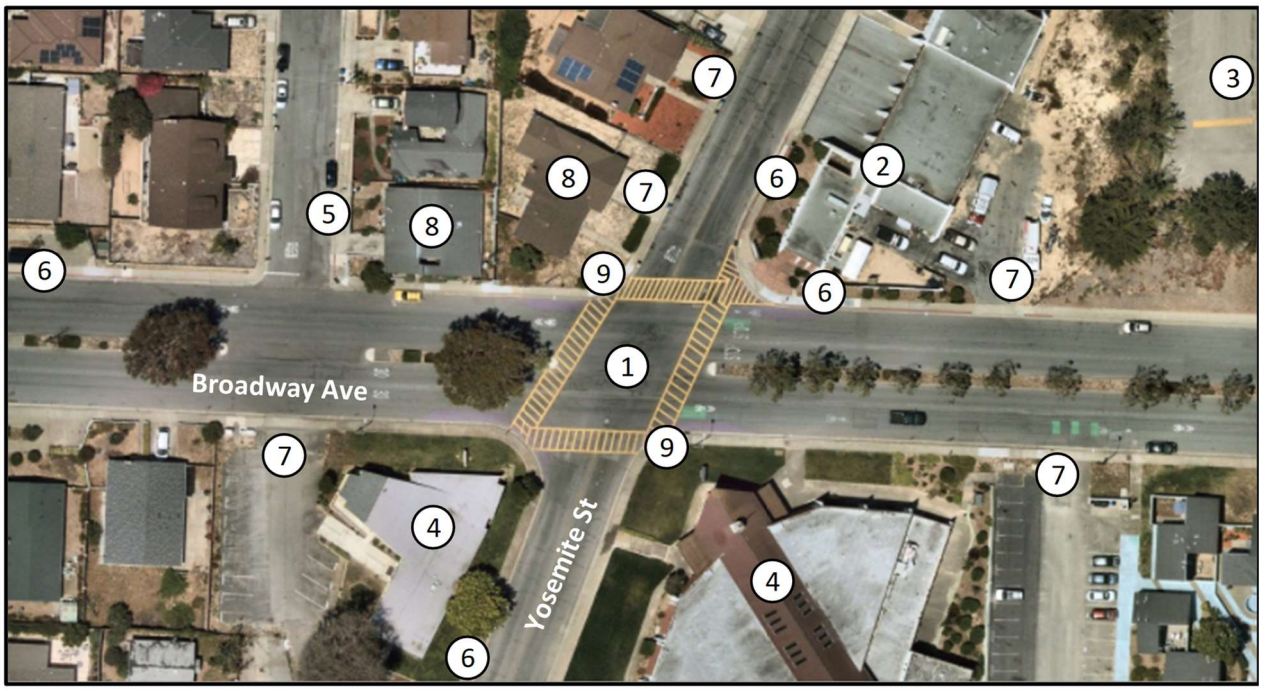
The two intersection control types analyzed include:

1. Traffic Signal
2. Elongated Roundabout

## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Broadway Ave at Yosemite St is currently controlled by signals. Design constraints at the intersection include:

1. Skewed intersection geometry
2. Fire Department
3. King Middle School
4. Place of Worship
5. Proximity to Highland St
6. Bus stop
7. Driveway
8. Single family residence
9. Right-of-way encroachment



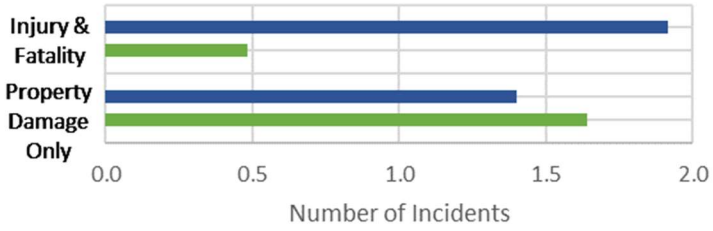
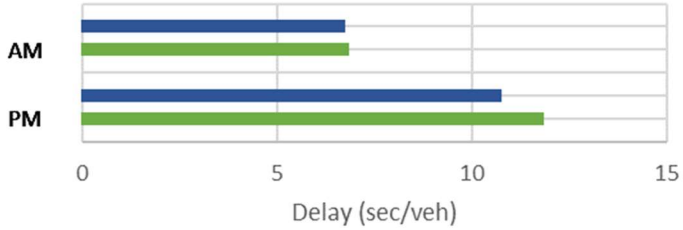
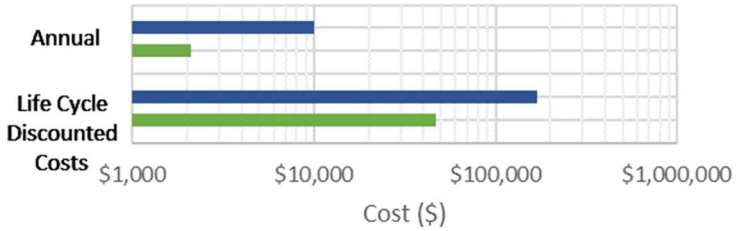
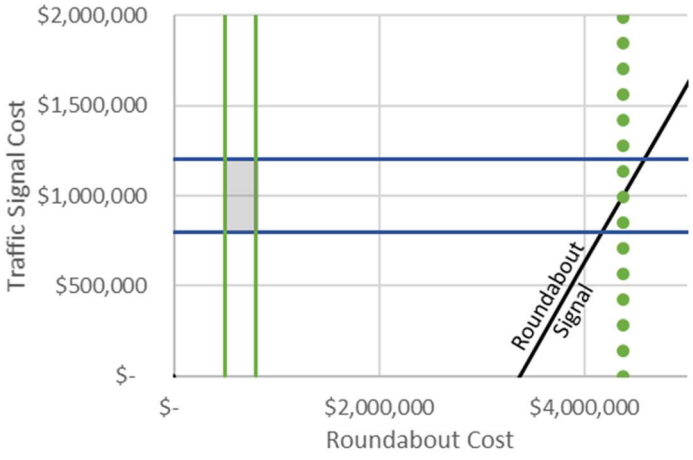

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| INT 2.5 | **Broadway Ave at Yosemite St** | | |
| | Urban Environment Focus | X | X |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | N/A | N/A |
| | Minimize ROW Acquisition to Limit Initial Costs | X | X |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for signal and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Signal Roundabout |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Signal Roundabout |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Signal Roundabout |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget.<br>RAB ICC Range<br>Signal ICC Range<br>RAB Budget<br>B/C=1<br>Estimated ICC |  |  |

# INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | | |
|---|---|---|---|
| **Safety** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Annual Cost of Collisions | $ 218,092 | $ 313,743 | $ 78,336 |
| Discounted Life Cycle Cost of Collisions | $ 3,059,649 | $ 4,401,547 | $ 1,098,993 |
| **Delay** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Annual Quantity (hours) | 4,393 | 1,913 | 2,047 |
| Annual Cost | $ 57,987 | $ 25,321 | $ 27,058 |
| Total Discounted Life Cycle Cost | $ 1,275,718 | $ 557,062 | $ 595,280 |
| **O&M** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Annual O&M Costs | 1000 | 9,220 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 14,029 | $ 129,349 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 18,255 | $ 25,558 | $ 16,734 |
| Total O&M Costs | $ 32,285 | $ 154,907 | $ 43,670 |
| **Initial Capital** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| High Approximation | $ 80,000 | $ 1,200,000 | $ 800,000 |
| Low Approximation | $ 50,000 | $ 800,000 | $ 500,000 |
| **Life Cycle Benefit-Cost Ratio** | | | |
| | **Total Benefits (B)** | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Safety | $ - | $ (1,341,898) | $ 1,960,656 |
| Delay | $ - | $ 718,657 | $ 680,438 |
| Total Benefits | **$ -** | **$ (623,242)** | **$ 2,641,094** |
| | **Total Costs (C)** | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| O&M | $ - | $ 122,622 | $ 11,386 |
| Budget | $ - | $ 935,000 | $ 585,000 |
| Total Costs | **$ -** | **$ 1,057,622** | **$ 596,386** |
| **B/C Ratio Compared to Existing** | **NA** | **-0.59** | **4.43** |

**Benefit-Cost Ratio Calculations**

| B/C Target | Capital Cost: Traffic Signal (a) | Capital Cost: Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Project Constraints: Added O&M Cost for Roundabout (d) | Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
|---|---|---|---|---|---|---|---|
| High | $ 1,200,000 | $ 500,000 | $ (700,000) | | | $ (811,439) | NA-R |
| Low | $ 800,000 | $ 800,000 | $ - | $ (111,439) | $ 3,264,336 | $ (111,439) | NA-R |
| Roundabout Budget | $ 1,000,000 | $ 4,375,775 | $ 3,375,775 | | | $ 3,264,336 | 1.00 |

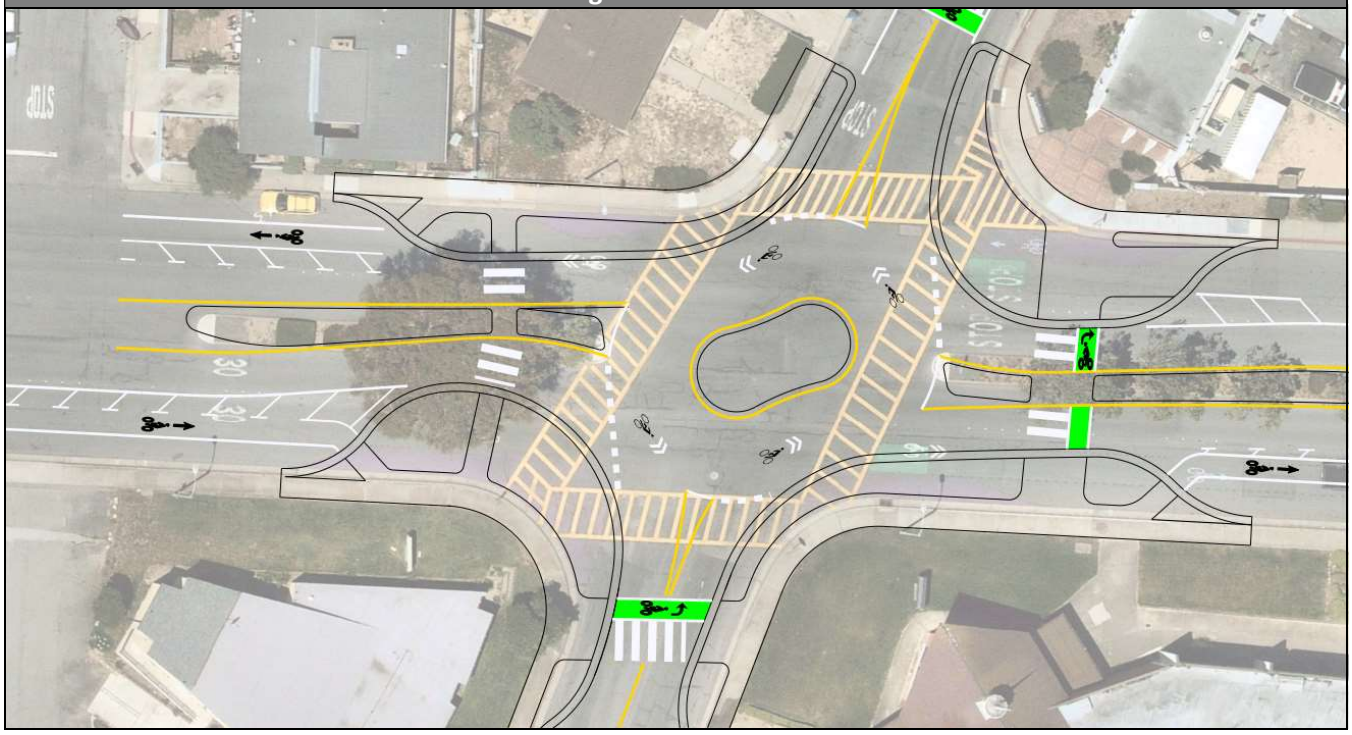
## PREFERRED INTERSECTION ALTERNATIVE

The preferred alternative based on B/C ratio for this intersection is roundabout control.

# INTERSECTION CONTROL CONCEPT LAYOUTS

**Traffic Signal**

**Elongated Roundabout**



# Memorandum

**To:** Misty Bradshaw, P.E.
City of Seaside

**From:** Sean Houck, P.E.
Kimley-Horn & Associates

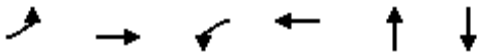
**Re:** City of Seaside Intersection Control Evaluations Studies
*Additional Roundabouts along Broadway Corridor*

**Date:** September 2020

Roundabouts were studied in the Intersection Control Evaluation at the intersections of Broadway Avenue and Noche Buena Street, and Broadway Avenue and Yosemite Street. Further studies were completed to evaluate if traditional intersection controls (All Way Stop or Traffic Signal) would provide appropriate Level-of-Service at the intersections at Terrace Street, San Lucas Street, Flores Street, and Ancon Street after the implementation of the road diet. Using a Synchro 10 model (see attached), Kimley-Horn evaluated the most congested intersection (highest cross street volumes) and found that the aforementioned intersections fail to meet appropriate Levels-of-Service:

- Road Diet, Existing Volumes, Signal – LOS C
- Road Diet, Existing Volumes, AWSC – LOS F
- Road Diet, Future Volumes, Signal – LOS D
- Road Diet, Future Volumes, AWSC – LOS F

As Terrace, San Lucas, Flores, and Ancon Streets have similar configurations and similar (or less) ADT volumes to Buena Vista and Yosemite Street, the use of roundabouts at these locations will provide an appropriate LOS and Benefit to Cost ratio while implementing the Broadway Corridor Road Diet.



| Lane Group | EBL | EBT | WBL | WBT | NBT | SBT |
|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 56 | 407 | 110 | 759 | 346 | 422 |
| v/c Ratio | 0.45 | 0.54 | 0.49 | 0.90 | 0.66 | 0.85 |
| Control Delay | 53.4 | 23.6 | 44.1 | 37.2 | 28.7 | 42.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 53.4 | 23.6 | 44.1 | 37.2 | 28.7 | 42.0 |
| Queue Length 50th (ft) | 31 | 169 | 58 | 374 | 145 | 198 |
| Queue Length 95th (ft) | #68 | 242 | 98 | #531 | 204 | 270 |
| Internal Link Dist (ft) | | 652 | | 1016 | 486 | 546 |
| Turn Bay Length (ft) | 100 | | 100 | | | |
| Base Capacity (vph) | 124 | 812 | 287 | 950 | 666 | 628 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.45 | 0.50 | 0.38 | 0.80 | 0.52 | 0.67 |

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 45 | 292 | 38 | 89 | 513 | 102 | 39 | 147 | 95 | 63 | 164 | 115 |
| Future Volume (veh/h) | 45 | 292 | 38 | 89 | 513 | 102 | 39 | 147 | 95 | 63 | 164 | 115 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 0.99 | 1.00 | | 0.99 | 1.00 | | 0.99 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 56 | 360 | 47 | 110 | 633 | 126 | 48 | 181 | 117 | 78 | 202 | 142 |
| Peak Hour Factor | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 82 | 695 | 91 | 142 | 699 | 139 | 100 | 290 | 171 | 127 | 260 | 167 |
| Arrive On Green | 0.05 | 0.43 | 0.43 | 0.08 | 0.46 | 0.46 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 |
| Sat Flow, veh/h | 1781 | 1620 | 212 | 1781 | 1512 | 301 | 144 | 938 | 553 | 223 | 842 | 540 |
| Grp Volume(v), veh/h | 56 | 0 | 407 | 110 | 0 | 759 | 346 | 0 | 0 | 422 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 0 | 1832 | 1781 | 0 | 1813 | 1636 | 0 | 0 | 1605 | 0 | 0 |
| Q Serve(g_s), s | 2.3 | 0.0 | 12.1 | 4.5 | 0.0 | 28.7 | 0.0 | 0.0 | 0.0 | 4.8 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 2.3 | 0.0 | 12.1 | 4.5 | 0.0 | 28.7 | 13.3 | 0.0 | 0.0 | 18.1 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 0.12 | 1.00 | | 0.17 | 0.14 | | 0.34 | 0.18 | | 0.34 |
| Lane Grp Cap(c), veh/h | 82 | 0 | 786 | 142 | 0 | 838 | 561 | 0 | 0 | 554 | 0 | 0 |
| V/C Ratio(X) | 0.68 | 0.00 | 0.52 | 0.77 | 0.00 | 0.91 | 0.62 | 0.00 | 0.00 | 0.76 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 127 | 0 | 803 | 295 | 0 | 966 | 749 | 0 | 0 | 738 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 34.8 | 0.0 | 15.6 | 33.5 | 0.0 | 18.4 | 22.1 | 0.0 | 0.0 | 23.7 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 9.5 | 0.0 | 0.6 | 8.6 | 0.0 | 10.9 | 1.1 | 0.0 | 0.0 | 3.3 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.2 | 0.0 | 4.8 | 2.2 | 0.0 | 13.2 | 5.1 | 0.0 | 0.0 | 7.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 44.3 | 0.0 | 16.1 | 42.1 | 0.0 | 29.3 | 23.2 | 0.0 | 0.0 | 27.0 | 0.0 | 0.0 |
| LnGrp LOS | D | A | B | D | A | C | C | A | A | C | A | A |
| Approach Vol, veh/h | | 463 | | | 869 | | | 346 | | | 422 | |
| Approach Delay, s/veh | | 19.5 | | | 30.9 | | | 23.2 | | | 27.0 | |
| Approach LOS | | B | | | C | | | C | | | C | |

| Timer - Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 27.4 | 10.4 | 36.3 | | 27.4 | 7.9 | 38.8 | | | | |
| Change Period (Y+Rc), s | | 4.5 | 4.5 | 4.5 | | 4.5 | 4.5 | 4.5 | | | | |
| Max Green Setting (Gmax), s | | 31.7 | 12.3 | 32.5 | | 31.7 | 5.3 | 39.5 | | | | |
| Max Q Clear Time (g_c+I1), s | | 15.3 | 6.5 | 14.1 | | 20.1 | 4.3 | 30.7 | | | | |
| Green Ext Time (p_c), s | | 2.0 | 0.1 | 2.4 | | 2.2 | 0.0 | 3.6 | | | | |

| Intersection Summary | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HCM 6th Ctrl Delay | | | 26.4 | | | | | | | | | |
| HCM 6th LOS | | | C | | | | | | | | | |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 224.4 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 45 | 292 | 38 | 89 | 513 | 102 | 39 | 147 | 95 | 63 | 164 | 115 |
| Future Vol, veh/h | 45 | 292 | 38 | 89 | 513 | 102 | 39 | 147 | 95 | 63 | 164 | 115 |
| Peak Hour Factor | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 56 | 360 | 47 | 110 | 633 | 126 | 48 | 181 | 117 | 78 | 202 | 142 |
| Number of Lanes | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 2 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 2 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 2 | 2 |
| HCM Control Delay | 93.4 | 413.9 | 67.4 | 106.8 |
| HCM LOS | F | F | F | F |

| Lane | NBLn1 | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBLn1 |
|---|---|---|---|---|---|---|
| Vol Left, % | 14% | 100% | 0% | 100% | 0% | 18% |
| Vol Thru, % | 52% | 0% | 88% | 0% | 83% | 48% |
| Vol Right, % | 34% | 0% | 12% | 0% | 17% | 34% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 281 | 45 | 330 | 89 | 615 | 342 |
| LT Vol | 39 | 45 | 0 | 89 | 0 | 63 |
| Through Vol | 147 | 0 | 292 | 0 | 513 | 164 |
| RT Vol | 95 | 0 | 38 | 0 | 102 | 115 |
| Lane Flow Rate | 347 | 56 | 407 | 110 | 759 | 422 |
| Geometry Grp | 2 | 7 | 7 | 7 | 7 | 2 |
| Degree of Util (X) | 0.91 | 0.154 | 1.065 | 0.305 | 1.976 | 1.074 |
| Departure Headway (Hd) | 11.923 | 11.978 | 11.358 | 10.615 | 9.964 | 11.319 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 309 | 301 | 322 | 341 | 372 | 325 |
| Service Time | 9.923 | 9.678 | 9.058 | 8.315 | 7.664 | 9.319 |
| HCM Lane V/C Ratio | 1.123 | 0.186 | 1.264 | 0.323 | 2.04 | 1.298 |
| HCM Control Delay | 67.4 | 16.8 | 103.9 | 17.9 | 471.2 | 106.8 |
| HCM Lane LOS | F | C | F | C | F | F |
| HCM 95th-tile Q | 8.6 | 0.5 | 12.6 | 1.3 | 49.5 | 12.9 |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 292.7 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 51 | 334 | 43 | 102 | 586 | 117 | 39 | 147 | 95 | 63 | 164 | 115 |
| Future Vol, veh/h | 51 | 334 | 43 | 102 | 586 | 117 | 39 | 147 | 95 | 63 | 164 | 115 |
| Peak Hour Factor | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 63 | 412 | 53 | 126 | 723 | 144 | 48 | 181 | 117 | 78 | 202 | 142 |
| Number of Lanes | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 2 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 2 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 2 | 2 |
| HCM Control Delay | 141.9 | 527.9 | 69 | 111.5 |
| HCM LOS | F | F | F | F |

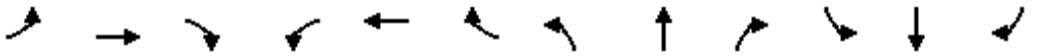
| Lane | NBLn1 | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBLn1 |
|---|---|---|---|---|---|---|
| Vol Left, % | 14% | 100% | 0% | 100% | 0% | 18% |
| Vol Thru, % | 52% | 0% | 89% | 0% | 83% | 48% |
| Vol Right, % | 34% | 0% | 11% | 0% | 17% | 34% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 281 | 51 | 377 | 102 | 703 | 342 |
| LT Vol | 39 | 51 | 0 | 102 | 0 | 63 |
| Through Vol | 147 | 0 | 334 | 0 | 586 | 164 |
| RT Vol | 95 | 0 | 43 | 0 | 117 | 115 |
| Lane Flow Rate | 347 | 63 | 465 | 126 | 868 | 422 |
| Geometry Grp | 2 | 7 | 7 | 7 | 7 | 2 |
| Degree of Util (X) | 0.902 | 0.175 | 1.222 | 0.351 | 2.269 | 1.08 |
| Departure Headway (Hd) | 12.757 | 12.29 | 11.669 | 10.891 | 10.238 | 12.014 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 288 | 294 | 316 | 332 | 365 | 304 |
| Service Time | 10.757 | 9.99 | 9.369 | 8.591 | 7.938 | 10.014 |
| HCM Lane V/C Ratio | 1.205 | 0.214 | 1.472 | 0.38 | 2.378 | 1.388 |
| HCM Control Delay | 69 | 17.6 | 158.7 | 19.4 | 601.7 | 111.5 |
| HCM Lane LOS | F | C | F | C | F | F |
| HCM 95th-tile Q | 8.2 | 0.6 | 16.9 | 1.5 | 60.7 | 12.6 |

| Lane Group | EBL | EBT | WBL | WBT | NBT | SBT |
|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 63 | 465 | 126 | 867 | 346 | 422 |
| v/c Ratio | 0.57 | 0.60 | 0.66 | 0.96 | 0.70 | 0.92 |
| Control Delay | 62.1 | 23.5 | 56.2 | 47.0 | 32.4 | 53.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 62.1 | 23.5 | 56.2 | 47.0 | 32.4 | 53.4 |
| Queue Length 50th (ft) | 36 | 199 | 70 | ~530 | 152 | 209 |
| Queue Length 95th (ft) | #79 | 257 | #121 | #631 | 214 | #313 |
| Internal Link Dist (ft) | | 652 | | 1016 | 486 | 546 |
| Turn Bay Length (ft) | 100 | | 100 | | | |
| Base Capacity (vph) | 111 | 811 | 204 | 899 | 555 | 519 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.57 | 0.57 | 0.62 | 0.96 | 0.62 | 0.81 |

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 51 | 334 | 43 | 102 | 586 | 117 | 39 | 147 | 95 | 63 | 164 | 115 |
| Future Volume (veh/h) | 51 | 334 | 43 | 102 | 586 | 117 | 39 | 147 | 95 | 63 | 164 | 115 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 0.99 | 1.00 | | 0.99 | 1.00 | | 0.99 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 63 | 412 | 53 | 126 | 723 | 144 | 48 | 181 | 117 | 78 | 202 | 142 |
| Peak Hour Factor | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 81 | 726 | 93 | 158 | 741 | 148 | 92 | 275 | 163 | 117 | 247 | 159 |
| Arrive On Green | 0.05 | 0.45 | 0.45 | 0.09 | 0.49 | 0.49 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| Sat Flow, veh/h | 1781 | 1624 | 209 | 1781 | 1512 | 301 | 142 | 904 | 534 | 220 | 810 | 522 |
| Grp Volume(v), veh/h | 63 | 0 | 465 | 126 | 0 | 867 | 346 | 0 | 0 | 422 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 0 | 1832 | 1781 | 0 | 1813 | 1580 | 0 | 0 | 1553 | 0 | 0 |
| Q Serve(g_s), s | 3.0 | 0.0 | 15.9 | 5.9 | 0.0 | 39.5 | 0.0 | 0.0 | 0.0 | 6.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 3.0 | 0.0 | 15.9 | 5.9 | 0.0 | 39.5 | 16.0 | 0.0 | 0.0 | 22.0 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 0.11 | 1.00 | | 0.17 | 0.14 | | 0.34 | 0.18 | | 0.34 |
| Lane Grp Cap(c), veh/h | 81 | 0 | 820 | 158 | 0 | 889 | 530 | 0 | 0 | 523 | 0 | 0 |
| V/C Ratio(X) | 0.77 | 0.00 | 0.57 | 0.80 | 0.00 | 0.98 | 0.65 | 0.00 | 0.00 | 0.81 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 112 | 0 | 820 | 204 | 0 | 889 | 603 | 0 | 0 | 596 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 40.0 | 0.0 | 17.3 | 37.8 | 0.0 | 21.1 | 25.7 | 0.0 | 0.0 | 27.9 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 20.2 | 0.0 | 0.9 | 15.3 | 0.0 | 24.2 | 2.1 | 0.0 | 0.0 | 7.2 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.7 | 0.0 | 6.5 | 3.2 | 0.0 | 21.1 | 6.2 | 0.0 | 0.0 | 8.9 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 60.1 | 0.0 | 18.2 | 53.1 | 0.0 | 45.2 | 27.8 | 0.0 | 0.0 | 35.1 | 0.0 | 0.0 |
| LnGrp LOS | E | A | B | D | A | D | C | A | A | D | A | A |
| Approach Vol, veh/h | | 528 | | | 993 | | | 346 | | | 422 | |
| Approach Delay, s/veh | | 23.2 | | | 46.2 | | | 27.8 | | | 35.1 | |
| Approach LOS | | C | | | D | | | C | | | D | |

| Timer - Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 30.3 | 12.0 | 42.4 | | 30.3 | 8.4 | 46.0 | | | | |
| Change Period (Y+Rc), s | | 4.5 | 4.5 | 4.5 | | 4.5 | 4.5 | 4.5 | | | | |
| Max Green Setting (Gmax), s | | 29.7 | 9.7 | 37.1 | | 29.7 | 5.3 | 41.5 | | | | |
| Max Q Clear Time (g_c+I1), s | | 18.0 | 7.9 | 17.9 | | 24.0 | 5.0 | 41.5 | | | | |
| Green Ext Time (p_c), s | | 1.7 | 0.0 | 2.9 | | 1.4 | 0.0 | 0.0 | | | | |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 36.1 |
| HCM 6th LOS | D |

**Notes**

User approved pedestrian interval to be less than phase max green.

# Appendix D

# City of Seaside ICE Study

## Phase 1 Intersection Control Evaluation

June 1, 2020

Prepared by Kimley-Horn & Associates

# OVERALL INTERSECTION SUMMARY

## INTERSECTION CONTROL ALTERNATIVE SUMMARY

Eighteen intersections were evaluated in the City of Seaside Intersection Control Evaluation Study. The existing intersection control as well one or two alternative controls were evaluated at each intersection. The legend (right) displays the symbols used throughout this report to represent the existing and proposed control types. The Intersection Control Alternative Summary table (below) is a summary of the alternatives evaluated and resulting recommendations for each intersection.

| Legend | | |
|---|---|---|
| **Control Type** | **Existing** | **Proposed** |
| Stop Sign |  | N/A |
| Traffic Signal |  |  |
| Rounabout | N/A |  |

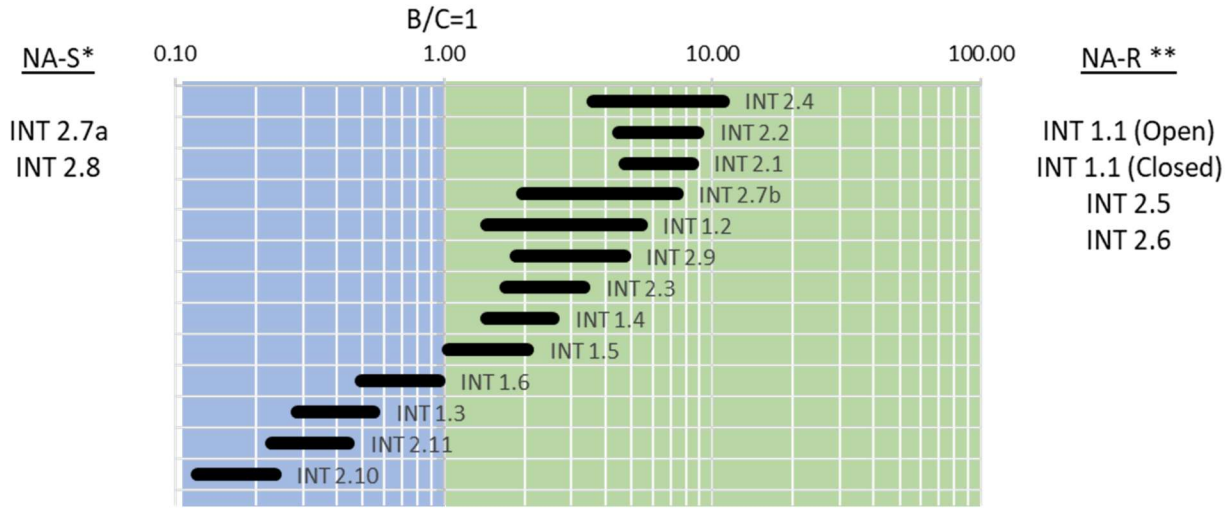
| Intersection Control Alternative Summary | | | | | |
|---|---|---|---|---|---|
| **Intersection** | | **Existing Control** | **Evaluated Alternatives** | | **Recommendation** |
| **INT 1.1** | **Coe Ave at Paralta Ave (Gate Closed)** |  |  |  |  |
| **INT 1.1** | **Coe Ave at Paralta Ave (Gate Open)** |  |  |  |  |
| **INT 1.2** | **Coe Ave at GJM Blvd** |  |  |  |  |
| **INT 1.3** | **Broadway Ave at GJM Blvd** |  |  |  |  |
| **INT 1.4** | **La Salle Ave at Yosemite St** |  |  |  |  |
| **INT 1.5** | **Sonoma Ave at Yosemite St** |  |  |  |  |
| **INT 1.6** | **Broadway Ave at Fremont Blvd** |  |  |  |  |
| **INT 2.1** | **Ord Grove at Noche Buena St** |  |  |  |  |
| **INT 2.2** | **La Salle Ave at Noche Buena St** |  |  |  |  |
| **INT 2.3** | **La Salle Ave at Fremont Blvd** |  |  |  |  |
| **INT 2.4** | **Broadway Ave at Noche Buena St** |  |  |  |  |
| **INT 2.5** | **Broadway Ave at Yosemite St** |  |  |  |  |
| **INT 2.6** | **Military Ave at Noche Buena St** |  |  |  |  |
| **INT 2.7a** | **Lightfighter Dr at First Ave** |  |  |  |  |
| **INT 2.7b** | **Lightfighter Dr at SR-1 NB Ramps** |  |  |  |  |

| Intersection | | Existing Control | Evaluated Alternatives | | Recommendation |
|---|---|---|---|---|---|
| **INT 2.8** | **Lightfighter Dr at Second Ave** | | | | |
| **INT 2.9** | **Mescal St a Yosemite St** | STOP | STOP | | |
| **INT 2.10** | **San Pable Ave at GJM Blvd** | | | | |
| **INT 2.11** | **Hilby Ave at GJM Blvd** | | | | |

## BENEFIT-COST RATIO SUMMARY

Below is a summary of the benefit-cost (B/C) analysis for each intersection. The bars in the graph (logarithmic scale) depict ranges of estimated benefit-cost ratios of roundabouts to traditional intersection controls.

**Benefit-Cost Ratio Summary Chart**




B/C = 1.00: A B/C Ratio of 1.00 is a neutral rating. This indicates that the return on investment for a proposed intersection control type is equal to the existing intersection control type.

B/C < 1.00: A B/C Ratio less than 1.00 indicates that the existing intersection control will provide a better return on investment when compared to the proposed intersection improvement.

B/C > 1.00: A B/C Ratio greater than 1.00 indicates that the proposed intersection control alternative provides a better return on investment when compared to the existing intersection control type.

*NA-S: Signal Preferred. When the absolute value of the total safety and delay costs for a signal is less than that of a roundabout, the resulting B/C ratio is negative.

**NA-R: Roundabout Preferred. When the additional initial capital cost of a roundabout is less than the absolute value of the added O&M cost of a roundabout, and the roundabout provides benefit over the traffic signal, a B/C ratio cannot be computed.

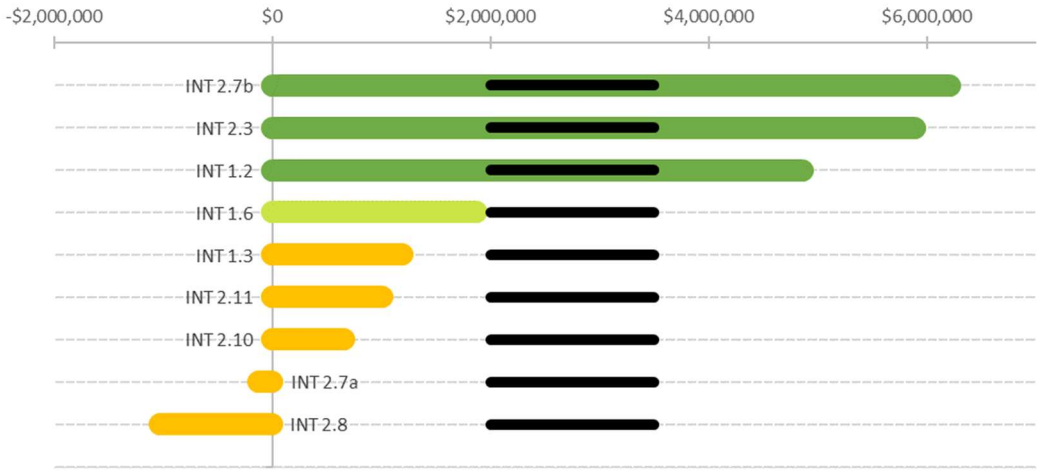
## ROUNDABOUT BUDGET SUMMARY

The budget to construct a roundabout while remaining cost effective compared to an alternative traditional intersection control is the Roundabout Budget. The Roundabout Budget is determined by comparing the benefit and cost performance measures for an assumed B/C = 1.0. The Roundabout Budget is defined as:

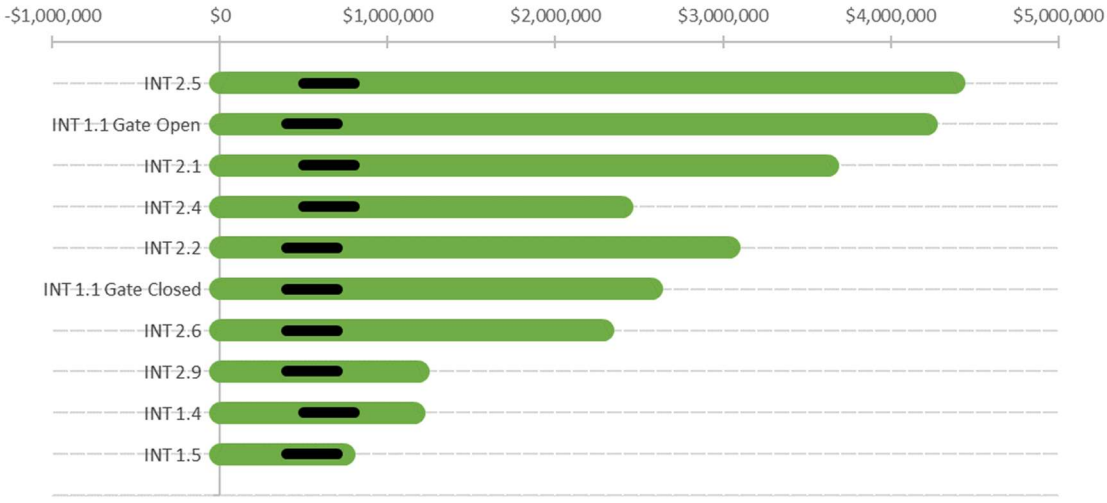
$$\textbf{Roundabout Budget} = \sum \textbf{Benefits of a roundabout} - (\textbf{Added O\&M cost of a roundabout}) + (\textbf{Initial Capital cost of a signal})$$

Below is a summary of the Roundabout Budget for each intersection.

**Multi-Lane Roundabouts**




**Mini & Elongated Roundabouts**




**Legend**

- Range of Estimated Magnitude Order of Costs
- Roundabout Budget Larger than Estimated Costs
- Roundabout Budget Within the Estimated Costs
- Roundabout Budget Less than the Estimated Costs

# INTERSECTION 1.1 – COE AVENUE AT PARALTA AVENUE (GATE CLOSED)

## INTERSECTION CONTROL ALTERNATIVES

The two intersection control types analyzed include:

1. Traffic Signal
2. Mini-Roundabout

## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Coe Ave at Paralta Ave is currently controlled by signals. Design constraints at the intersection include:

1. Bus Stop
2. Proximity to GJM Blvd
3. Steep slope and grass-lined channel
4. Seaside Middle School
5. Single family residential
6. Intersection pinch point/Existing Gate
7. Water utilities facility
8. Driveway

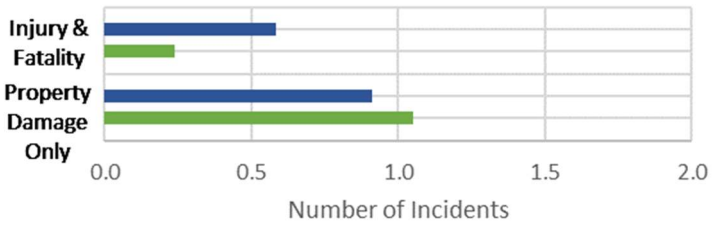
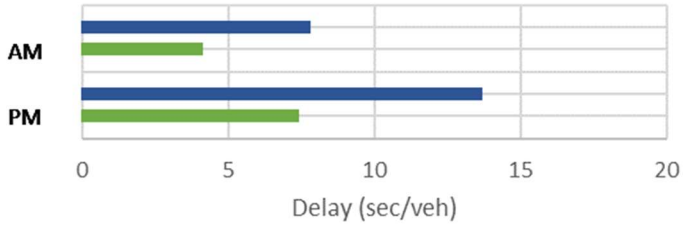
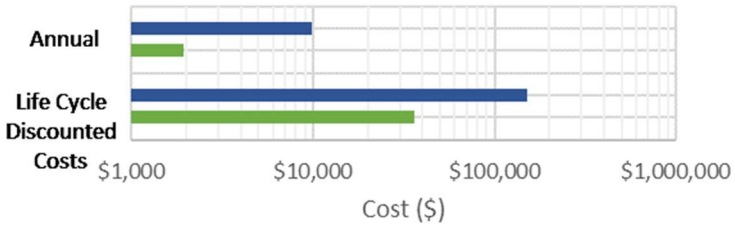
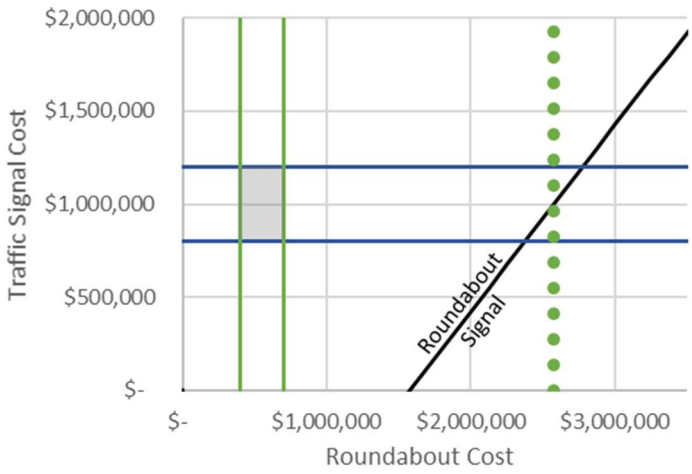

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| INT 1.1 | **Coe Ave at Paralta Ave (Gate Closed)** | | |
| | Urban Environment Focus | N/A | N/A |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | N/A | N/A |
| | Minimize ROW Acquisition to Limit Initial Costs | X | |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for signal and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Signal Roundabout |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Signal Roundabout |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Signal Roundabout |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget.<br>RAB ICC Range<br>Signal ICC Range<br>RAB Budget<br>B/C=1<br>Estimated ICC |  |  |

# INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | | |
|---|---|---|---|
| **Safety** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Annual Cost of Collisions | $ 124,259 | $ 128,998 | $ 36,427 |
| Discounted Life Cycle Cost of Collisions | $ 1,743,253 | $ 1,809,735 | $ 511,044 |
| **Delay** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Annual Quantity (hours) | 11465 | 1293 | 698 |
| Annual Cost | $ 133,974 | $ 17,085 | $ 9,243 |
| Total Discounted Life Cycle Cost | $ 2,947,428 | $ 375,864 | $ 203,351 |
| **O&M** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Annual O&M Costs | 520 | 9,220 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 7,295 | $ 129,349 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 8,418 | $ 10,750 | $ 10,750 |
| Total O&M Costs | $ 15,713 | $ 140,099 | $ 37,686 |
| **Initial Capital** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| High Approximation | $ 100,000 | $ 1,200,000 | $ 700,000 |
| Low Approximation | $ 50,000 | $ 800,000 | $ 400,000 |
| **Life Cycle Benefit Cost Ratio** | | | |
| | | **Total Benefits (B)** | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Safety | $ - | $ (66,482) | $ 1,232,209 |
| Delay | $ - | $ 2,571,565 | $ 2,744,077 |
| Total Benefits | **$ -** | **$ 2,505,083** | **$ 3,976,286** |
| | | **Total Costs (C)** | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| O&M | $ - | $ 124,386 | $ 21,973 |
| Budget | $ - | $ 925,000 | $ 475,000 |
| Total Costs | **$ -** | **$ 1,049,386** | **$ 496,973** |
| **B/C Ratio Compared to Existing** | **NA** | **2.39** | **8.00** |

**Benefit-Cost Ratio Calculations**

| B/C Target | Capital Cost: Traffic Signal (a) | Capital Cost: Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Project Constraints: Added O&M Cost for Roundabout (d) | Project Constraints: Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
|---|---|---|---|---|---|---|---|
| High | $ 1,200,000 | $ 400,000 | $ (800,000) | | | $ (904,746) | NA-R |
| Low | $ 800,000 | $ 700,000 | $ (100,000) | $ (104,746) | $ 1,471,204 | $ (204,746) | NA-R |
| Roundabout Budget | $ 1,000,000 | $ 2,575,949 | $ 1,575,949 | | | $ 1,471,204 | 1.00 |

The high B/C target is calculated assuming the high-end of the traffic signal initial capital costs and the low-end of the roundabout initial capital costs.

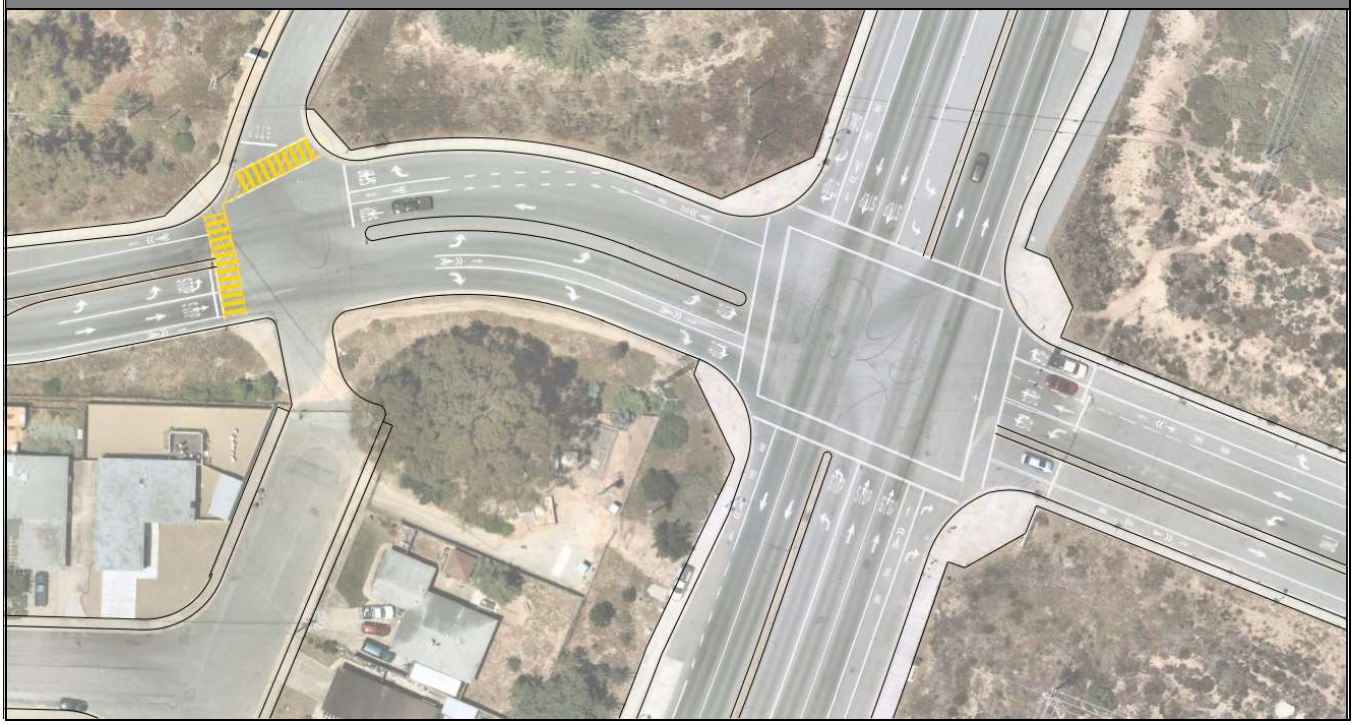
The low B/C target is calculated assuming the low-end of the traffic signal initial capital costs and the high-end of the roundabout initial capital costs.

## PREFERRED INTERSECTION ALTERNATIVE

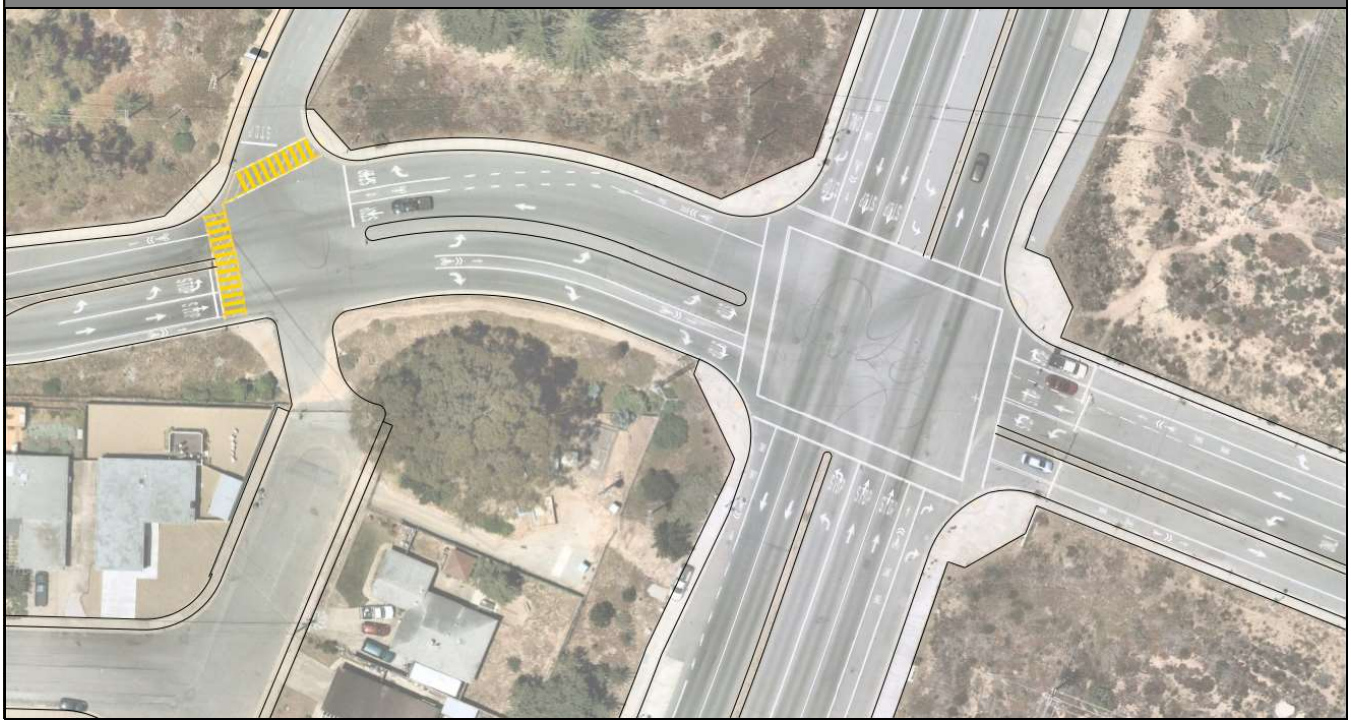
The preferred alternative based on B/C ratio for this intersection is roundabout control.

## INTERSECTION CONTROL CONCEPT LAYOUTS

**Traffic Signal**



**Mini-Roundabout**



# INTERSECTION 1.1 – COE AVENUE AT PARALTA AVENUE (GATE OPEN)

## INTERSECTION CONTROL ALTERNATIVES

The two intersection control types analyzed include:

1. Traffic Signal
2. Mini-Roundabout

## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Coe Ave at Paralta Ave is currently controlled by signals. Design constraints at the intersection include:

1. Bus Stop
2. Proximity to GJM Blvd
3. Steep slope and grass-lined channel
4. Seaside Middle School
5. Single family residential
6. Intersection pinch point/Existing Gate
7. Water utilities facility
8. Driveway

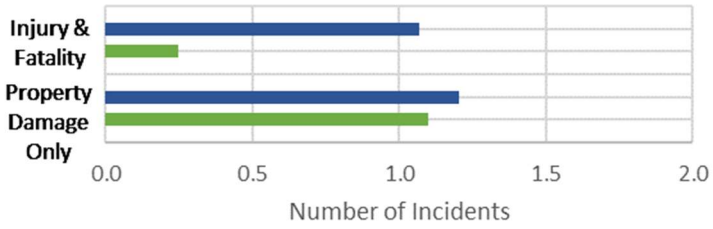
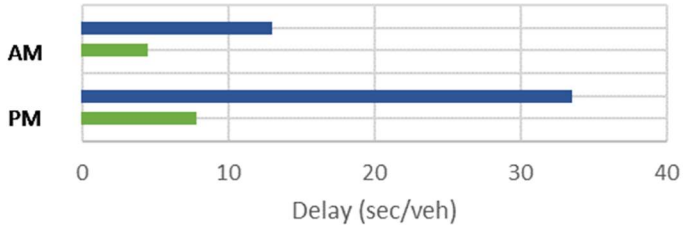
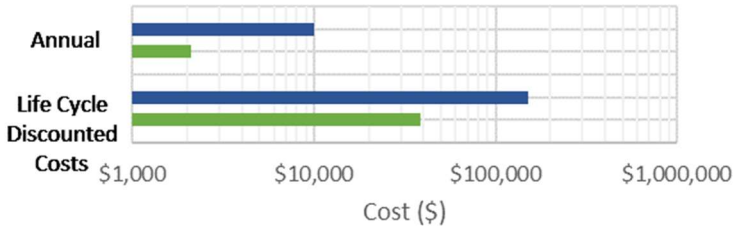
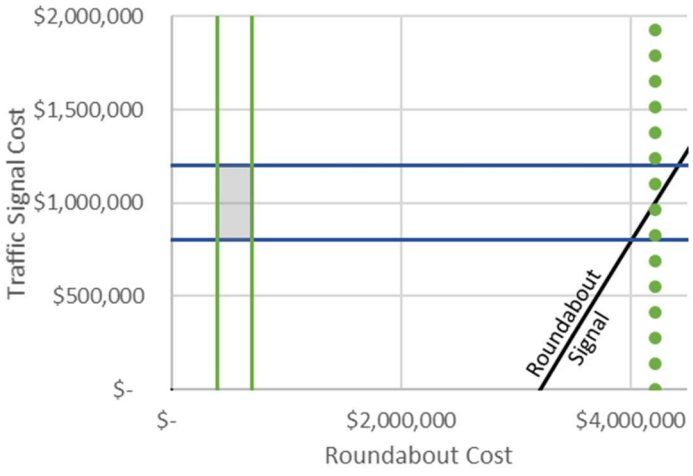

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| **INT 1.1** | **Coe Ave at Paralta Ave (Gate Open)** | | |
| | Urban Environment Focus | N/A | N/A |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | N/A | N/A |
| | Minimize ROW Acquisition to Limit Initial Costs | X | |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for signal and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Signal Roundabout |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Signal Roundabout |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Signal Roundabout |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget.<br>RAB ICC Range<br>Signal ICC Range<br>RAB Budget<br>B/C=1<br>Estimated ICC |  |  |

# INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | | |
|---|---|---|---|
| **Safety** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Annual Cost of Collisions | $ 128,998 | $ 231,355 | $ 38,066 |
| Discounted Life Cycle Cost of Collisions | $ 1,809,735 | $ 3,245,712 | $ 534,033 |
| **Delay** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Annual Quantity (hours) | 12,166 | 2,136 | 768 |
| Annual Cost | $ 143,363 | $ 28,243 | $ 10,188 |
| Total Discounted Life Cycle Cost | $ 3,153,980 | $ 621,343 | $ 224,131 |
| **O&M** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Annual O&M Costs | 520 | 9,220 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 7,295 | $ 129,349 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 10,750 | $ 10,750 | $ 8,418 |
| Total O&M Costs | $ 18,046 | $ 140,099 | $ 35,354 |
| **Initial Capital** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| High Approximation | $ 100,000 | $ 1,200,000 | $ 700,000 |
| Low Approximation | $ 50,000 | $ 800,000 | $ 400,000 |
| **Life Cycle Benefit-Cost Ratio** | | | |
| | | **Total Benefits (B)** | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Safety | $ - | $ (1,435,977) | $ 1,275,702 |
| Delay | $ - | $ 2,532,637 | $ 2,929,849 |
| Total Benefits | **$ -** | **$ 1,096,660** | **$ 4,205,551** |
| | | **Total Costs (C)** | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| O&M | $ - | $ 122,054 | $ 17,308 |
| Budget | $ - | $ 925,000 | $ 475,000 |
| Total Costs | **$ -** | **$ 1,047,054** | **$ 492,308** |
| **B/C Ratio Compared to Existing** | **NA** | **1.05** | **8.54** |

**Benefit-Cost Ratio Calculations**

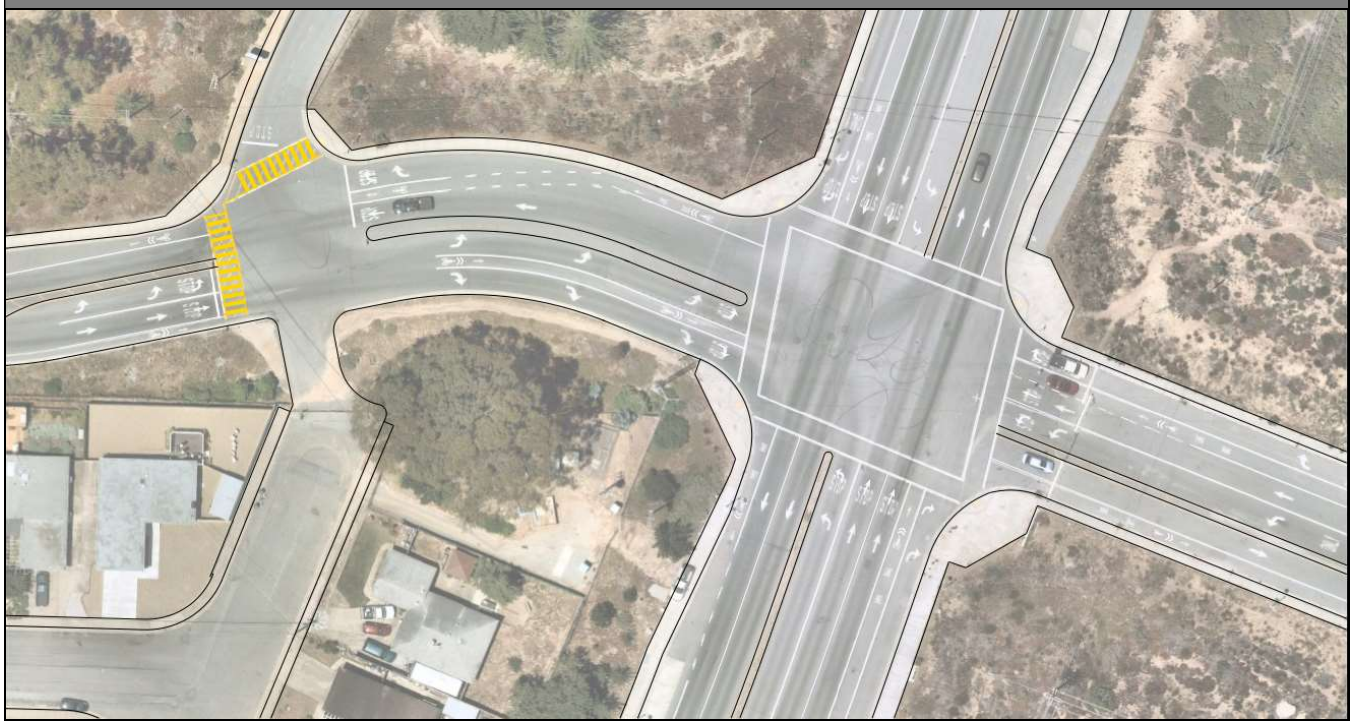
| B/C Target | Capital Cost: Traffic Signal (a) | Capital Cost: Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Project Constraints: Added O&M Cost for Roundabout (d) | Project Constraints: Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
|---|---|---|---|---|---|---|---|
| High | $ 1,200,000 | $ 400,000 | $ (800,000) | | | $ (904,746) | NA-R |
| Low | $ 800,000 | $ 700,000 | $ (100,000) | $ (104,746) | $ 3,108,891 | $ (204,746) | NA-R |
| Roundabout Budget | $ 1,000,000 | $ 4,213,636 | $ 3,213,636 | | | $ 3,108,891 | 1.00 |

## PREFERRED INTERSECTION ALTERNATIVE

The preferred alternative based on B/C ratio for this intersection is roundabout control.

## INTERSECTION CONTROL CONCEPT LAYOUTS

**Traffic Signal**



**Mini-Roundabout**

# INTERSECTION 1.2 – COE AVENUE AT GENERAL JIM MOORE BOULEVARD

## INTERSECTION CONTROL ALTERNATIVES

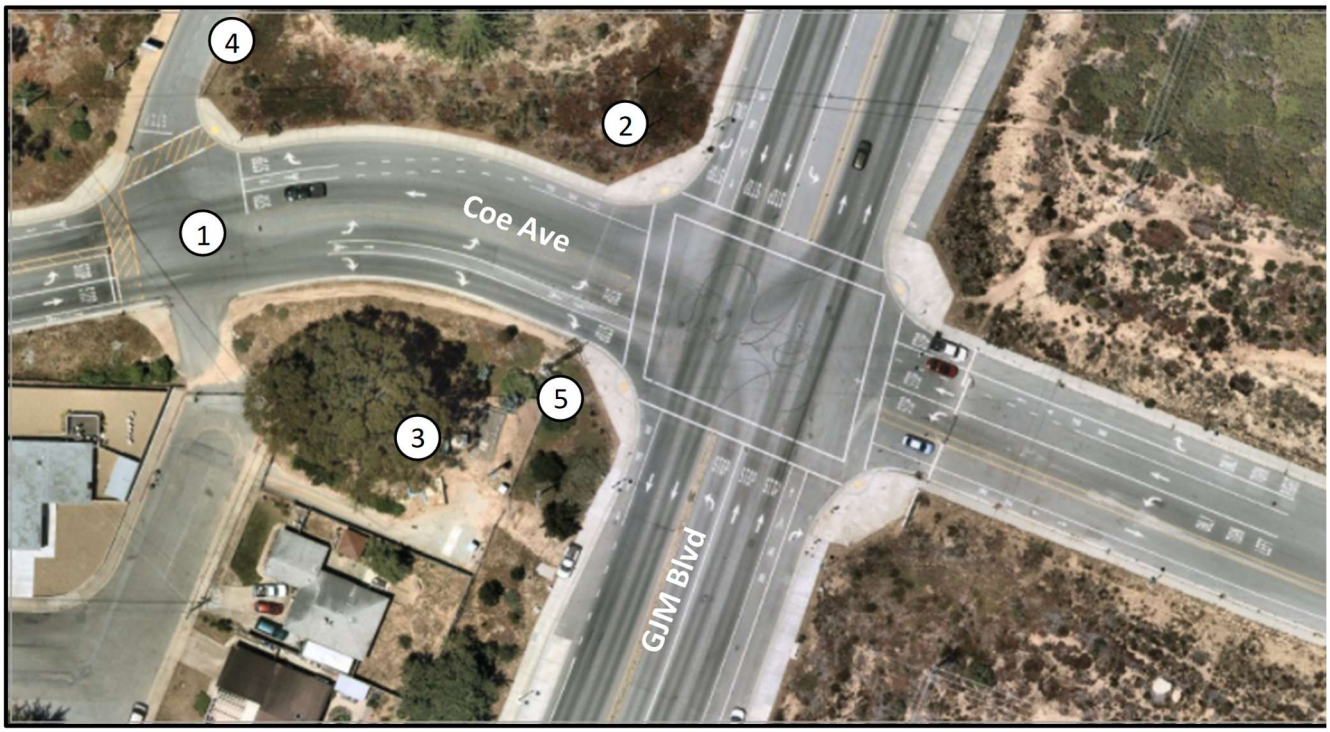
The two intersection control types analyzed include:

1. Traffic Signal
2. Multi-lane Roundabout

## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Coe Ave at General Jim Moore Blvd is currently controlled by signals. Design constraints at the intersection include:

1. Proximity to Paralta Ave
2. Steep grade
3. Water utilities facility
4. Seaside Middle School
5. Telephone Pole



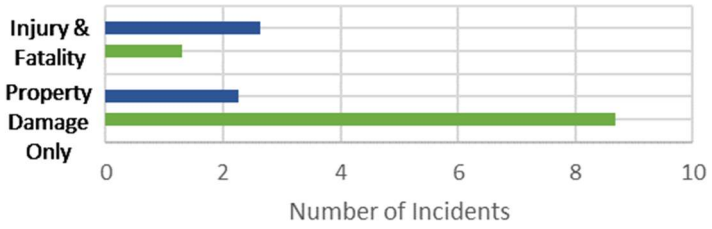
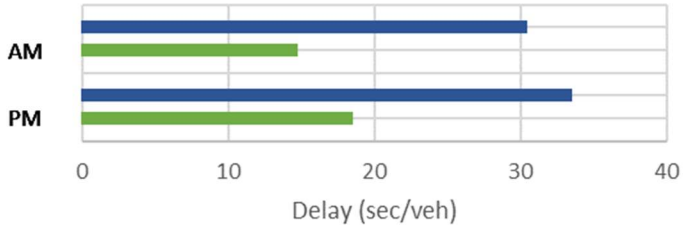
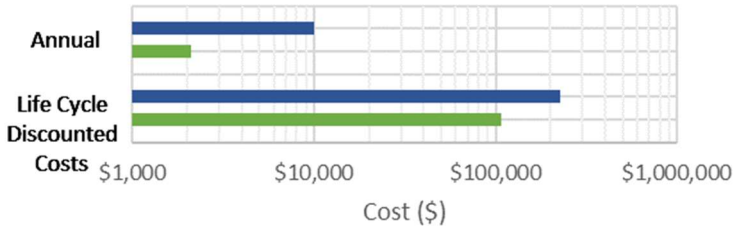
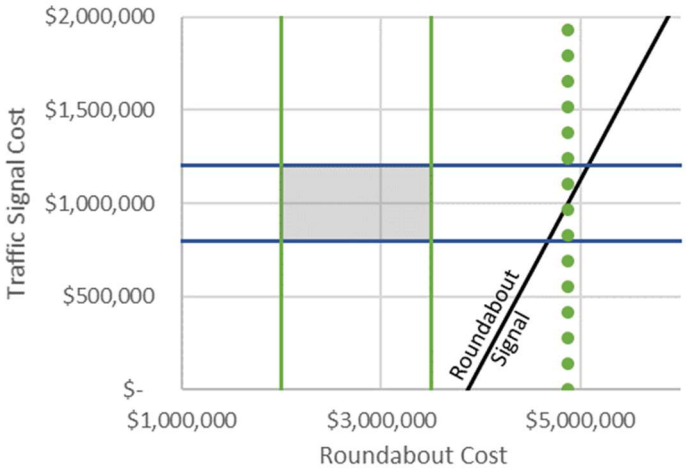

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| **INT 1.2** | **Coe Ave at GJM Blvd** | | |
| | Urban Environment Focus | N/A | N/A |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | N/A | N/A |
| | Minimize ROW Acquisition to Limit Initial Costs | X | |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for signal and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Signal Roundabout |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Signal Roundabout |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Signal Roundabout |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget.<br>RAB ICC Range<br>Signal ICC Range<br>RAB Budget<br>B/C=1<br>Estimated ICC |  |  |

# INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | | |
|---|---|---|---|
| **Safety** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Annual Cost of Collisions | $ 343,848 | $ 383,700 | $ 227,347 |
| Discounted Life Cycle Cost of Collisions | $ 4,823,902 | $ 5,382,986 | $ 3,189,483 |
| **Delay** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Annual Quantity (hours) | 52564 | 10400 | 4843 |
| Annual Cost | $ 609,740 | $ 129,777 | $ 58,768 |
| Total Discounted Life Cycle Cost | $ 13,414,274 | $ 2,855,089 | $ 1,292,895 |
| **O&M** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Annual O&M Costs | 520 | 9,220 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 7,295 | $ 129,349 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 80,628 | $ 80,628 | $ 72,515 |
| Total O&M Costs | $ 87,924 | $ 209,977 | $ 99,451 |
| **Initial Capital** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| High Approximation | $ 100,000 | $ 1,200,000 | $ 3,500,000 |
| Low Approximation | $ 50,000 | $ 800,000 | $ 2,000,000 |
| **Life Cycle Benefit-Cost Ratio** | | | |
| | | **Total Benefits (B)** | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Safety | $ - | $ (559,084) | $ 1,634,419 |
| Delay | $ - | $ 10,559,185 | $ 12,121,379 |
| Total Benefits | **$ -** | **$ 10,000,101** | **$ 13,755,798** |
| | | **Total Costs (C)** | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| O&M | $ - | $ 122,054 | $ 11,527 |
| Budget | $ - | $ 925,000 | $ 2,675,000 |
| Total Costs | **$ -** | **$ 1,047,054** | **$ 2,686,527** |
| **B/C Ratio Compared to Existing** | **NA** | **9.55** | **5.12** |

**Benefit-Cost Ratio Calculations**

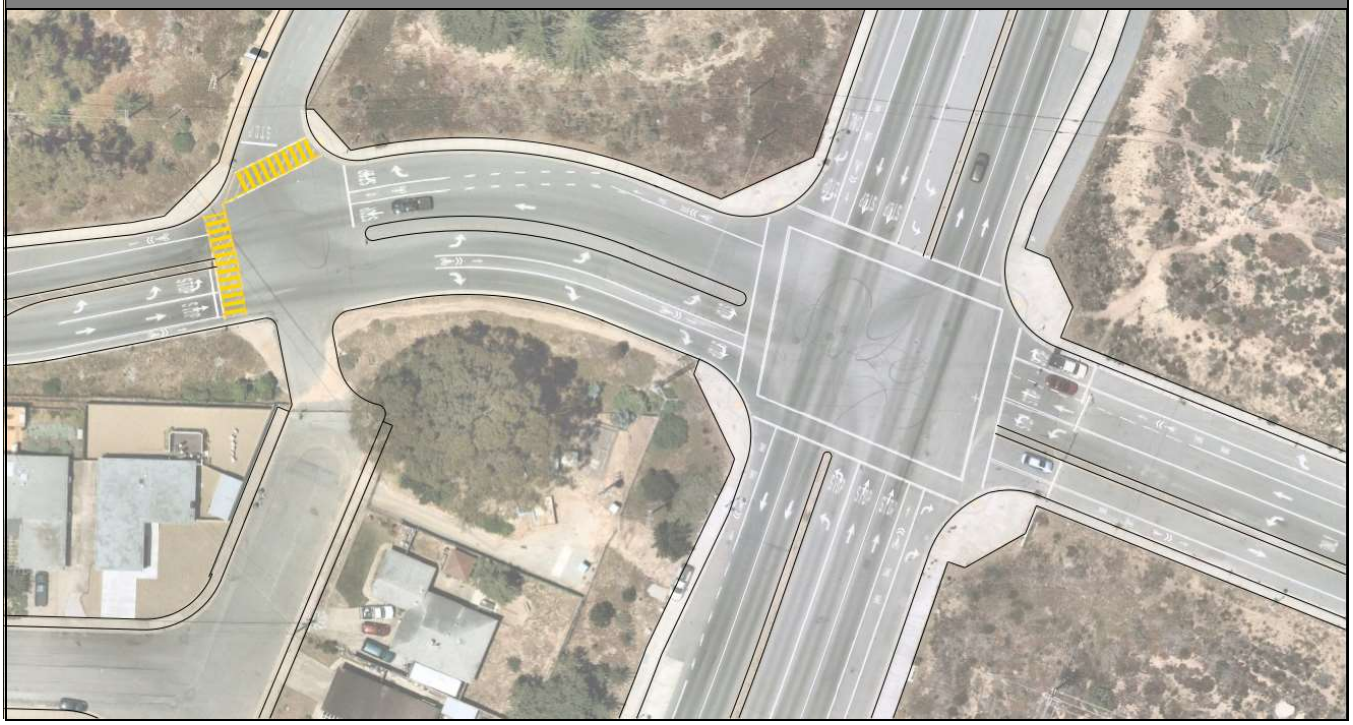
| B/C Target | Capital Cost: Traffic Signal (a) | Capital Cost: Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Project Constraints: Added O&M Cost for Roundabout (d) | Project Constraints: Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
|---|---|---|---|---|---|---|---|
| High | $ 1,200,000 | $ 2,000,000 | $ 800,000 | | | $ 689,879 | 5.44 |
| Low | $ 800,000 | $ 3,500,000 | $ 2,700,000 | $ (110,121) | $ 3,755,697 | $ 2,589,879 | 1.45 |
| Roundabout Budget | $ 1,000,000 | $ 4,865,818 | $ 3,865,818 | | | $ 3,755,697 | 1.00 |

## PREFERRED INTERSECTION ALTERNATIVE

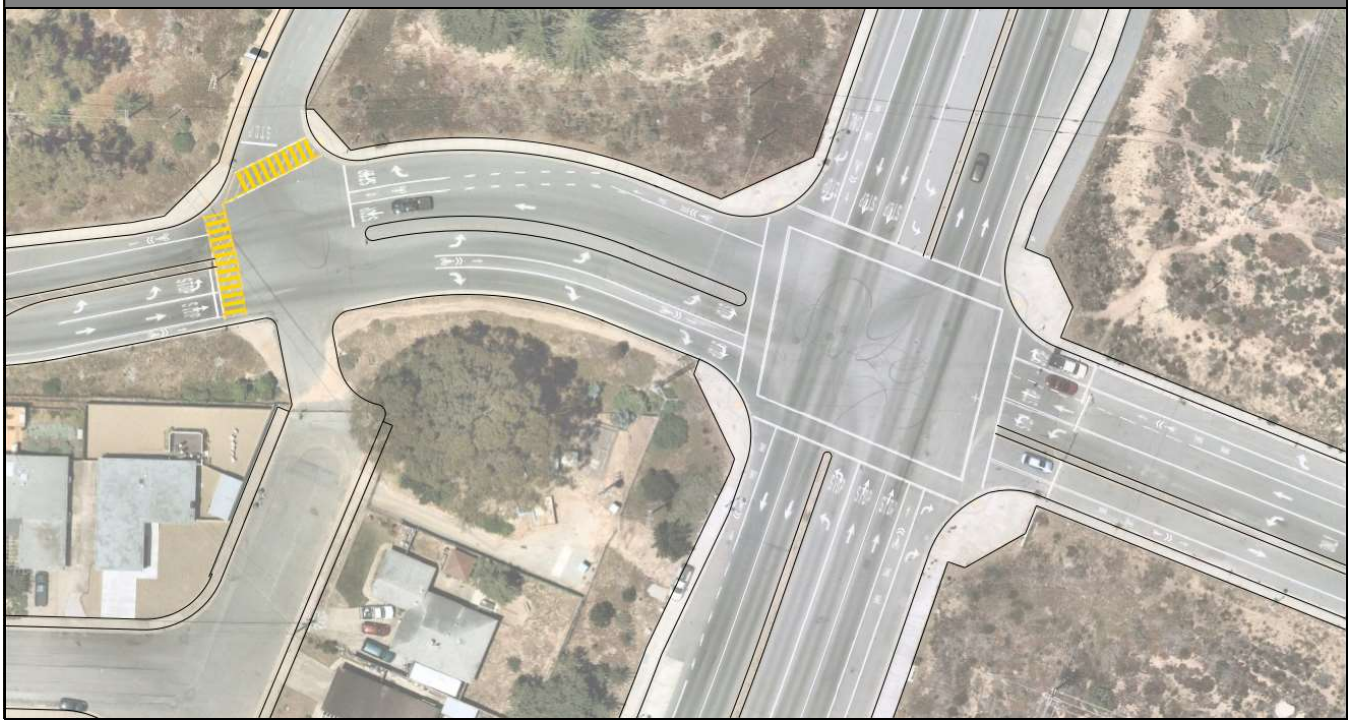
The preferred alternative based on B/C ratio for this intersection is roundabout control.

# INTERSECTION CONTROL CONCEPT LAYOUTS

**Traffic Signal**



**Multi-Lane Roundabout**



# INTERSECTION 1.3 – BROADWAY AVENUE AT GENERAL JIM MOORE BOULEVARD

## INTERSECTION CONTROL ALTERNATIVES

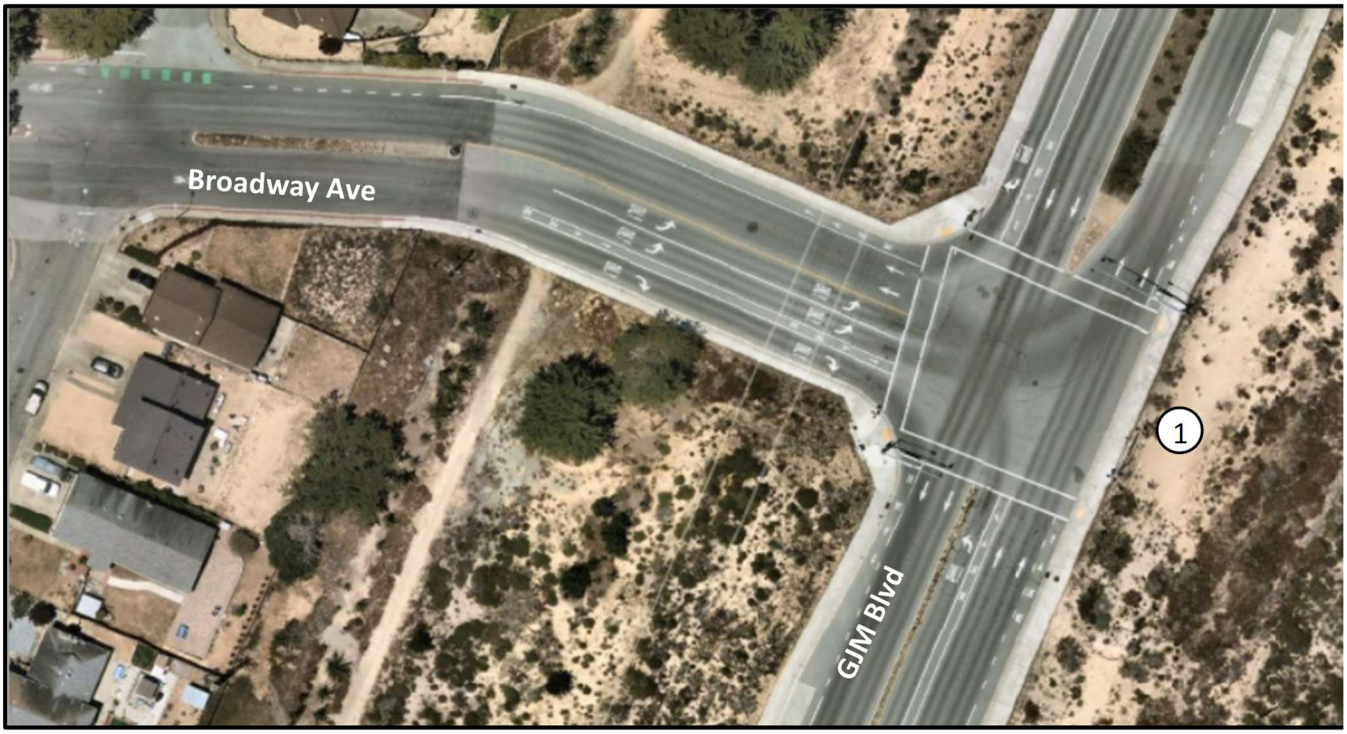
The two intersection control types analyzed include:

1. Existing Signal with Optimized Signal Timing
2. Multi-lane Roundabout

## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Broadway Ave at General Jim Moore Blvd is currently controlled by signals. Design constraints at the intersection include:

1. Steep uphill grade



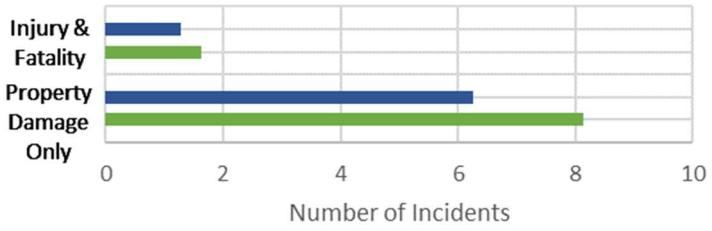
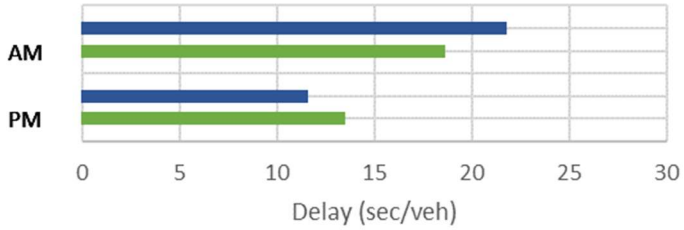
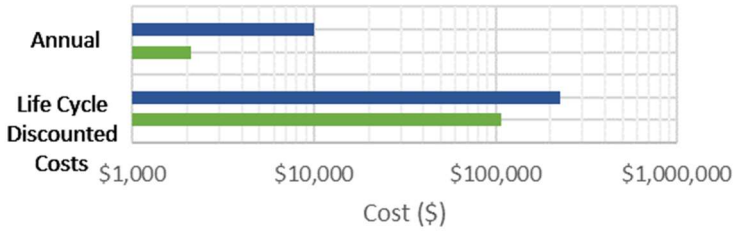
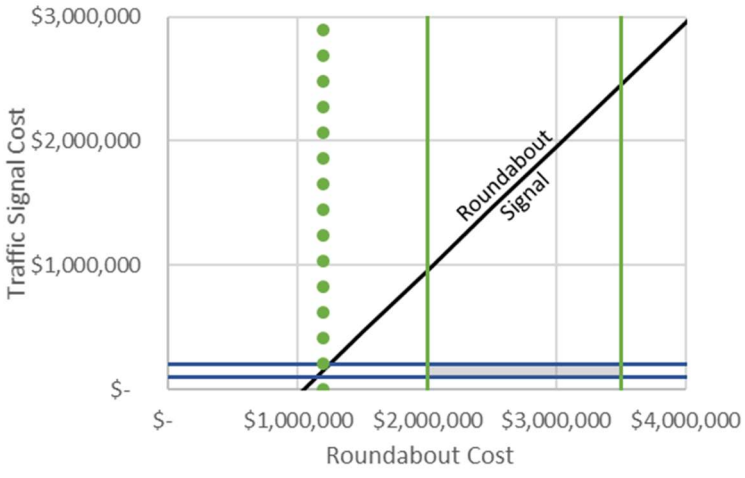

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| INT 1.3 | **Broadway Ave at GJM Blvd** | | |
| | Urban Environment Focus | | |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | N/A | N/A |
| | Minimize ROW Acquisition to Limit Initial Costs | | |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for signal and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Signal Roundabout |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Signal Roundabout |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Signal Roundabout |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget.<br>RAB ICC Range<br>Signal ICC Range<br>RAB Budget<br>B/C=1<br>Estimated ICC |  |  |

# INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | | |
|---|---|---|---|
| **Safety** | | | |
| | **Existing (Signal)** | **Proposed Signal** | **Roundabout** |
| Annual Cost of Collisions | $ 170,075 | $ 379,933 | $ 157,539 |
| Discounted Life Cycle Cost of Collisions | $ 2,386,011 | $ 5,330,142 | $ 2,210,145 |
| **Delay** | | | |
| | **Existing (Signal)** | **Proposed Signal** | **Roundabout** |
| Annual Quantity (hours) | 5,682 | 5,819 | 5,319 |
| Annual Cost | $ 70,036 | $ 71,254 | $ 64,308 |
| Total Discounted Life Cycle Cost | $ 1,540,790 | $ 1,567,599 | $ 1,414,770 |
| **O&M** | | | |
| | **Existing (Signal)** | **Proposed Signal** | **Roundabout** |
| Annual O&M Costs | 9,220 | 9,220 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 129,349 | $ 129,349 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 80,628 | $ 80,628 | $ 72,515 |
| Total O&M Costs | $ 209,977 | $ 209,977 | $ 99,451 |
| **Initial Capital** | | | |
| | **Existing (Signal)** | **Proposed Signal** | **Roundabout** |
| High Approximation | $ 100,000 | $ 200,000 | $ 3,500,000 |
| Low Approximation | $ 50,000 | $ 100,000 | $ 2,000,000 |
| **Life Cycle Benefit-Cost Ratio** | | | |
| | | **Total Benefits (B)** | |
| | **Existing (Signal)** | **Proposed Signal** | **Roundabout** |
| Safety | $ - | $ (2,944,131) | $ 175,866 |
| Delay | $ - | $ (26,809) | $ 126,020 |
| Total Benefits | **$ -** | **$ (2,970,940)** | **$ 301,886** |
| | | **Total Costs (C)** | |
| | **Existing (Signal)** | **Proposed Signal** | **Roundabout** |
| O&M | $ - | $ - | $ (110,526) |
| Budget | $ - | $ 75,000 | $ 2,675,000 |
| Total Costs | **$ -** | **$ 75,000** | **$ 2,564,474** |
| **B/C Ratio Compared to Existing** | **NA** | **-39.61** | **0.12** |

**Benefit-Cost Ratio Calculations**

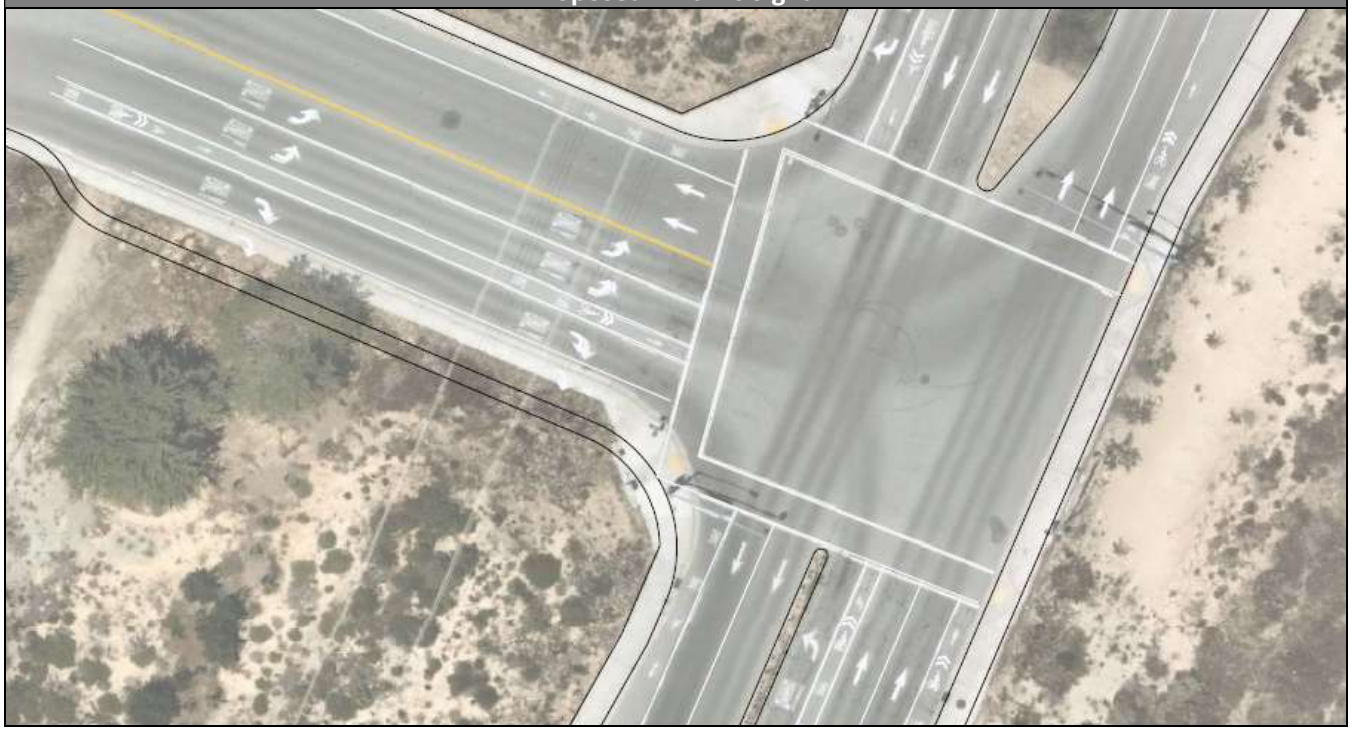
| B/C Target | Capital Cost: Traffic Signal (a) | Capital Cost: Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Project Constraints: Added O&M Cost for Roundabout (d) | Project Constraints: Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
|---|---|---|---|---|---|---|---|
| High | $ 200,000 | $ 2,000,000 | $ 1,800,000 | | | $ 1,689,879 | 0.55 |
| Low | $ 100,000 | $ 3,500,000 | $ 3,400,000 | $ (110,121) | $ 931,923 | $ 3,289,879 | 0.28 |
| Roundabout Budget | $ 150,000 | $ 1,192,044 | $ 1,042,044 | | | $ 931,923 | 1.00 |

## PREFERRED INTERSECTION ALTERNATIVE

The preferred alternative for this intersection is a roundabout based on the added safety and delay benefits a roundabout will provide.

# INTERSECTION CONTROL CONCEPT LAYOUTS

**Proposed - Traffic Signal**



**Multi-Lane Roundabout**

# INTERSECTION 1.4 – LA SALLE AVENUE AT YOSEMITE STREET

## INTERSECTION CONTROL ALTERNATIVES

The two intersection control types analyzed include:

1. Existing All-Way Stop Control
2. Elongated Roundabout


## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

La Salle Ave at Yosemite St is currently controlled by signals. Design constraints at the intersection include:

1. Offset intersection
2. Single family residential
3. Ord Terrace Elementary School
4. Driveway

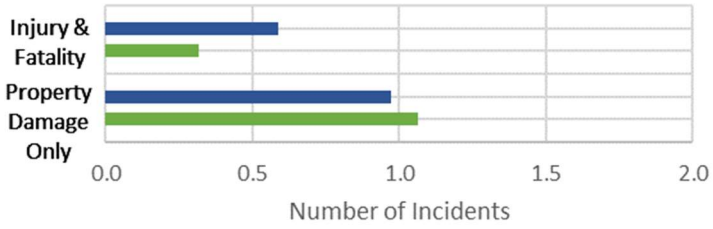
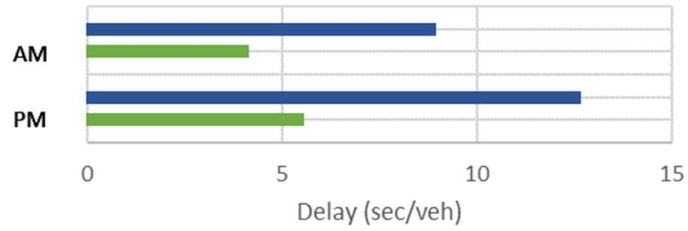
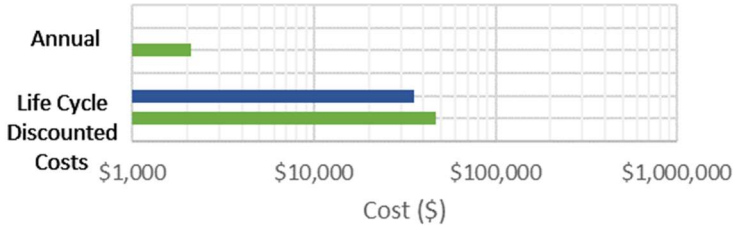
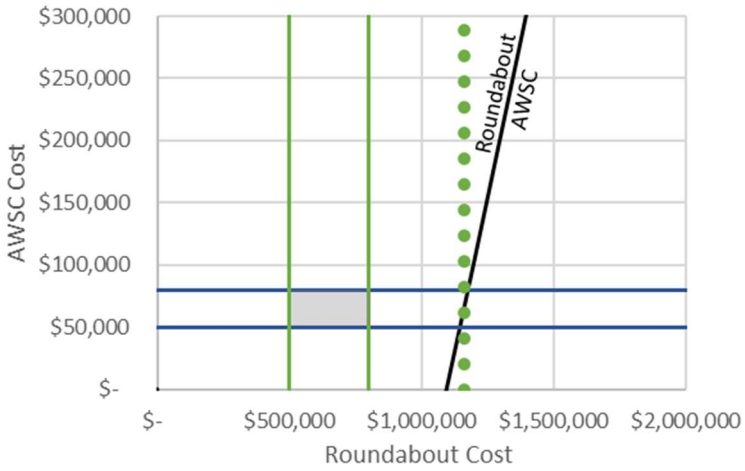

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| INT 1.4 | **La Salle Ave at Yosemite St** | | |
| | Urban Environment Focus | X | X |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | | X |
| | Minimize ROW Acquisition to Limit Initial Costs | X | X |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for stop control and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents. |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection. |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget. |  |  |

## INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | |
|---|---|---|
| **Safety** | | |
| | **Existing (AWSC)** | **Roundabout** |
| Annual Cost of Collisions | $ 130,413 | $ 48,325 |
| Discounted Life Cycle Cost of Collisions | $ 1,829,590 | $ 677,952 |
| **Delay** | | |
| | **Existing (AWSC)** | **Roundabout** |
| Annual Quantity (hours) | 1,440 | 624 |
| Annual Cost | $ 18,963 | $ 8,199 |
| Total Discounted Life Cycle Cost | $ 417,189 | $ 180,368 |
| **O&M** | | |
| | **Existing (AWSC)** | **Roundabout** |
| Annual O&M Costs | 520 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 7,295 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 10,750 | $ 8,418 |
| Total O&M Costs | $ 18,046 | $ 35,354 |
| **Initial Capital** | | |
| | **Existing (AWSC)** | **Roundabout** |
| High Approximation | $ 80,000 | $ 800,000 |
| Low Approximation | $ 50,000 | $ 500,000 |

**Benefit-Cost Ratio Calculations**

| | Capital Cost | | | Project Constraints | | | |
|---|---|---|---|---|---|---|---|
| B/C Target | AWSC (a) | Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Added O&M Cost for Roundabout (d) | Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
| High | $ 80,000 | $ 500,000 | $ 420,000 | | | $ 430,615 | 2.56 |
| Low | $ 50,000 | $ 800,000 | $ 750,000 | $ 10,615 | $ 1,104,086 | $ 760,615 | 1.45 |
| Roundabout Budget | $ 65,000 | $ 1,158,472 | $ 1,093,472 | | | $ 1,104,086 | 1.00 |

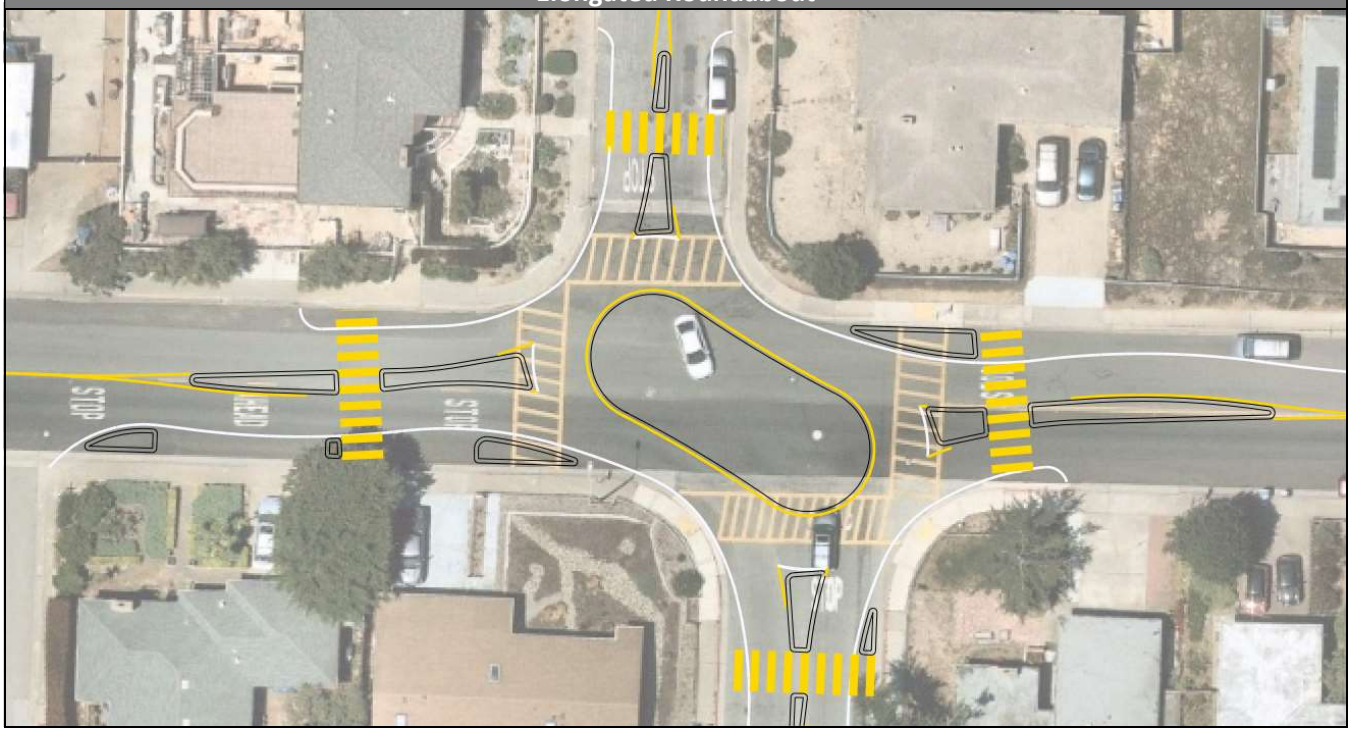
## PREFERRED INTERSECTION ALTERNATIVE

The preferred alternative based on B/C ratio for this intersection is roundabout control.

# INTERSECTION CONTROL CONCEPT LAYOUTS

**Existing – AWSC**


**Elongated Roundabout**



# INTERSECTION 1.5 – SONOMA AVENUE AT YOSEMITE STREET

## INTERSECTION CONTROL ALTERNATIVES

The two intersection control types analyzed include:

1. Existing All-Way Stop Control
2. Mini-Roundabout


## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Sonoma Ave at Yosemite St is currently controlled by signals. Design constraints at the intersection include:

1. Highland Elementary School
2. Single family residential
3. Bus Stop
4. Multi-family residence
5. Driveway
6. Right-of-way encroachment

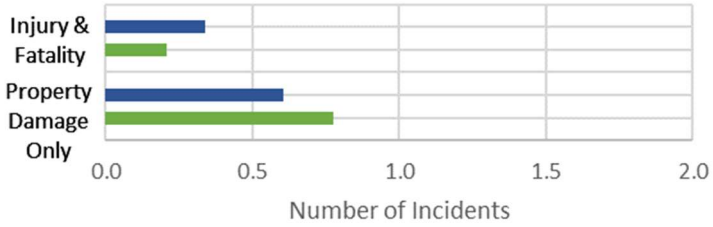
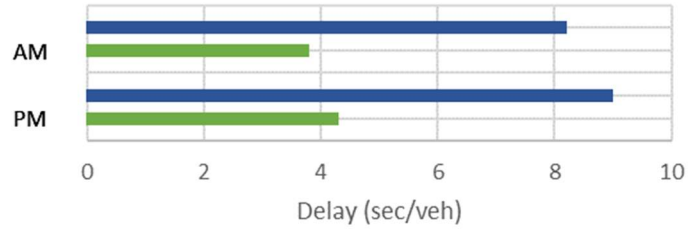
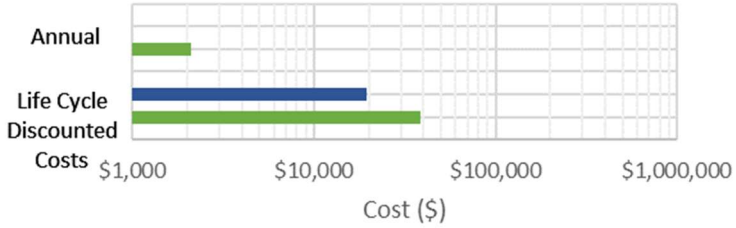
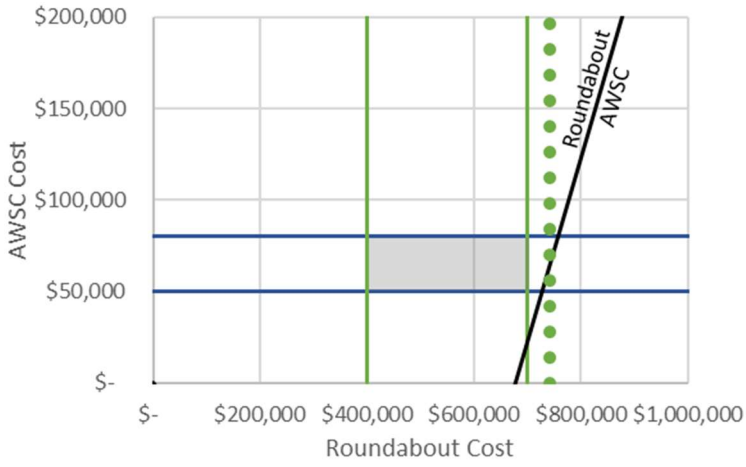

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| INT 1.5 | **Sonoma Ave at Yosemite St** | | |
| | Urban Environment Focus | X | X |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | | X |
| | Minimize ROW Acquisition to Limit Initial Costs | X | X |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for stop control and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents. |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection. |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget. |  |  |

## INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | |
|---|---|---|
| **Safety** | | |
| | **Existing (AWSC)** | **Roundabout** |
| Annual Cost of Collisions | $ 72,797 | $ 30,321 |
| Discounted Life Cycle Cost of Collisions | $ 1,021,279 | $ 425,378 |
| **Delay** | | |
| | **Existing (AWSC)** | **Roundabout** |
| Annual Quantity (hours) | 636 | 299 |
| Annual Cost | $ 8,456 | $ 3,973 |
| Total Discounted Life Cycle Cost | $ 186,038 | $ 87,400 |
| **O&M** | | |
| | **Existing (AWSC)** | **Roundabout** |
| Annual O&M Costs | 520 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 7,295 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 10,750 | $ 8,418 |
| Total O&M Costs | $ 18,046 | $ 35,354 |
| **Initial Capital** | | |
| | **Existing (AWSC)** | **Roundabout** |
| High Approximation | $ 80,000 | $ 700,000 |
| Low Approximation | $ 50,000 | $ 400,000 |

**Benefit-Cost Ratio Calculations**

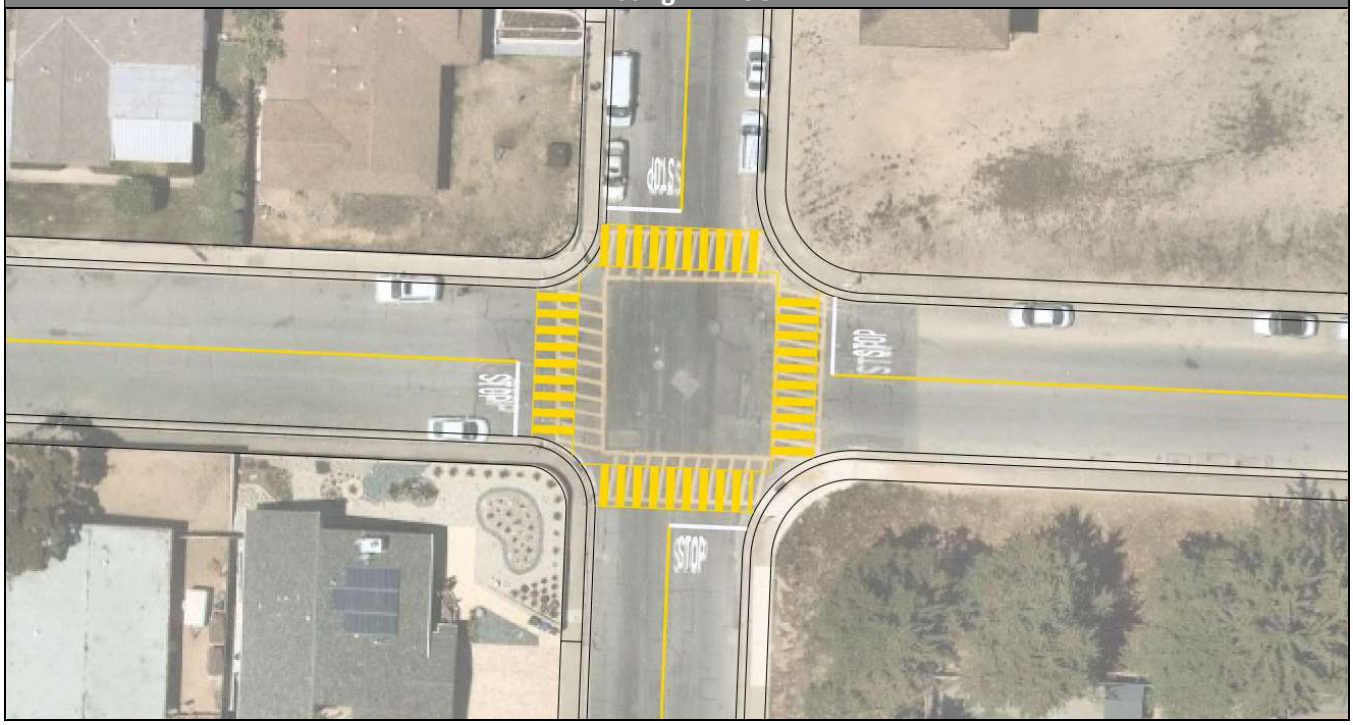
| | Capital Cost | | | Project Constraints | | | |
|---|---|---|---|---|---|---|---|
| B/C Target | AWSC (a) | Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Added O&M Cost for Roundabout (d) | Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
| High | $ 80,000 | $ 400,000 | $ 320,000 | | | $ 337,308 | 2.06 |
| Low | $ 50,000 | $ 700,000 | $ 650,000 | $ 17,308 | $ 694,538 | $ 667,308 | 1.04 |
| Roundabout Budget | $ 65,000 | $ 742,230 | $ 677,230 | | | $ 694,538 | 1.00 |

## PREFERRED INTERSECTION ALTERNATIVE

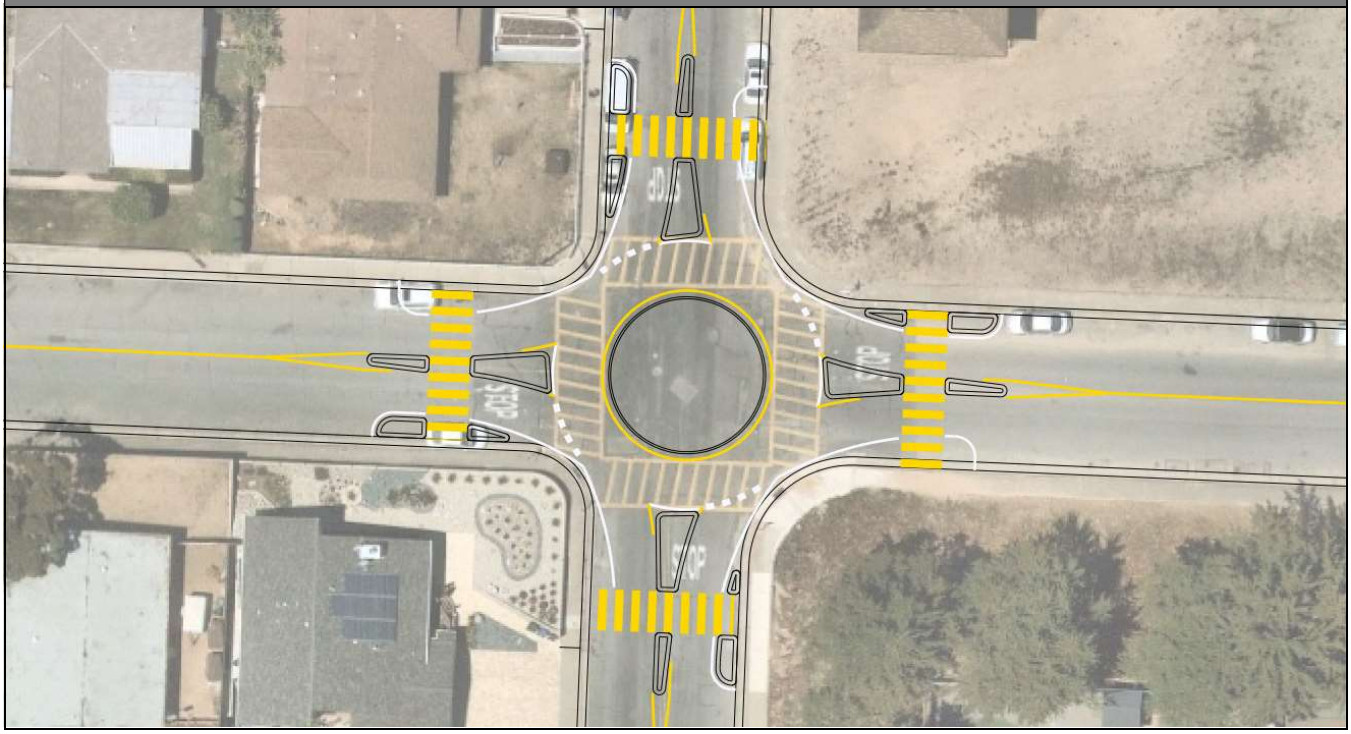
The preferred alternative based on B/C ratio for this intersection is roundabout control.

## INTERSECTION CONTROL CONCEPT LAYOUTS

**Existing - AWSC**




**Mini-Roundabout**



# INT 1.6 – BROADWAY AVE AT FREMONT BLVD

## INTERSECTION CONTROL ALTERNATIVES

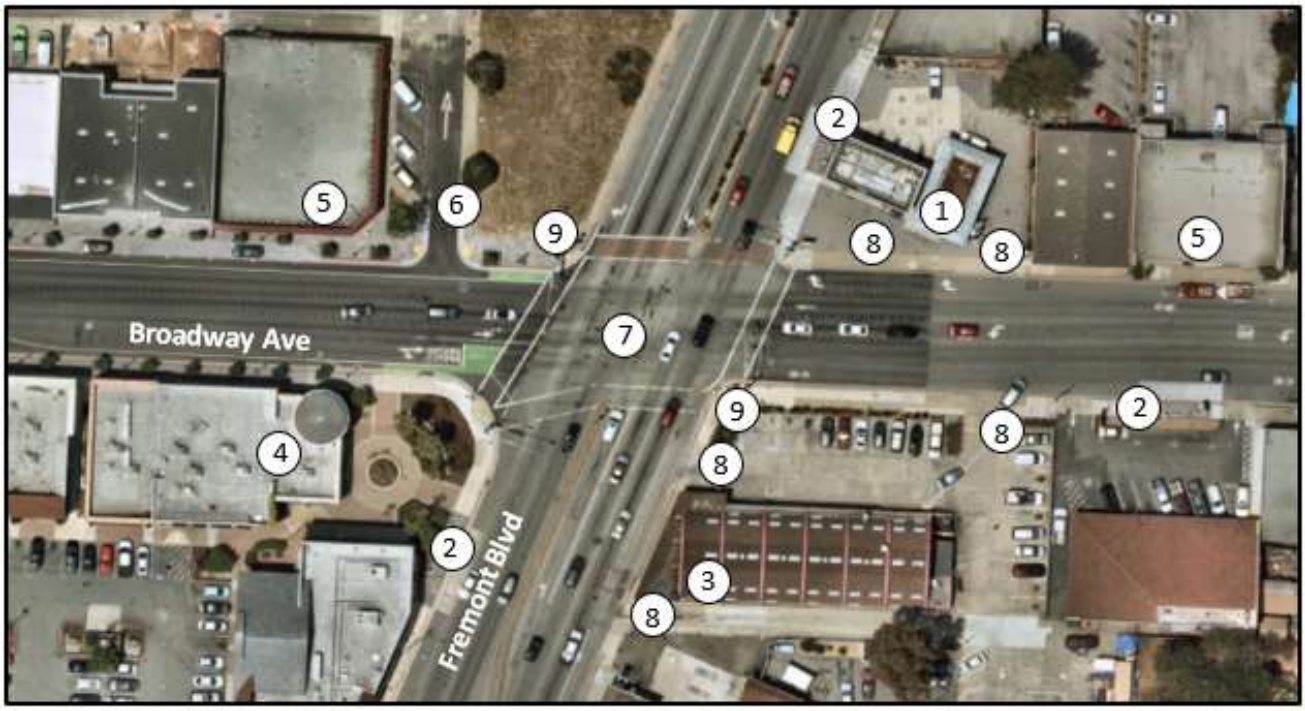
The two intersection control types analyzed include:

1. Existing Signal with Optimized Signal Timing
2. Multi-lane Roundabout

## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Broadway Ave at Fremont Blvd is currently controlled by signals. Design constraints at the intersection include:

1. Gas Station
2. Bus Stop
3. Grocery Sore
4. Restaurant
5. Retail Store
6. Proximity to Santa Barbara St
7. Skewed Intersection Geometry
8. Driveways
9. Right-of-way encroachment



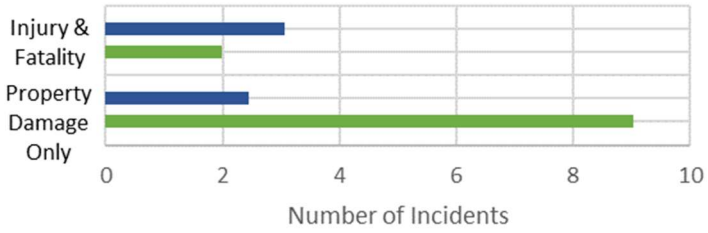
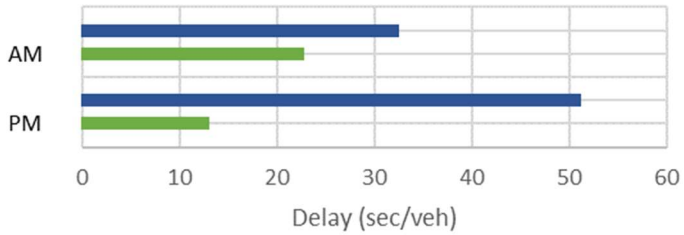
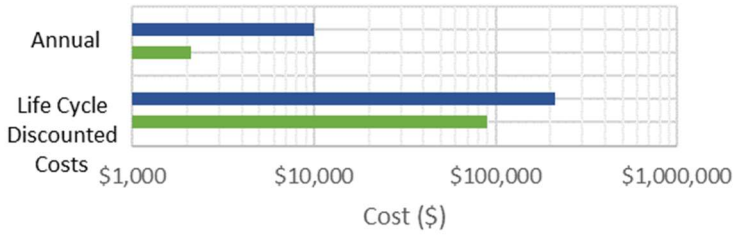
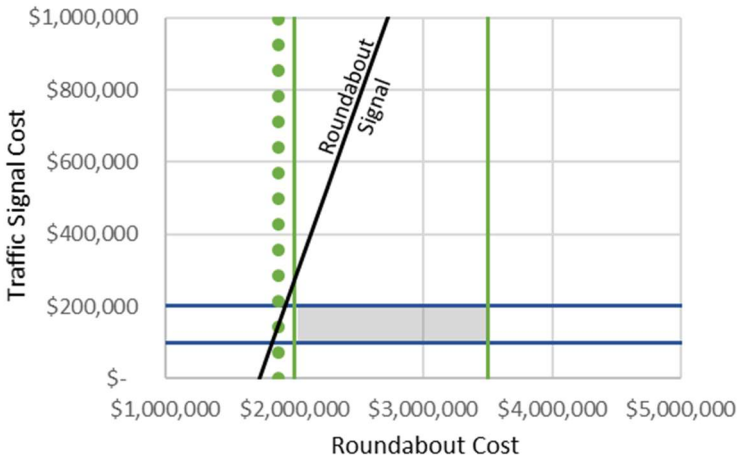

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| INT 1.6 | **Broadway Ave at Fremont Blvd** | | |
| | Urban Environment Focus | X | X |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | | X |
| | Minimize ROW Acquisition to Limit Initial Costs | | |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for signal and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Signal Roundabout |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Signal Roundabout |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Signal Roundabout |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget.<br>RAB ICC Range<br>Signal ICC Range<br>RAB Budget<br>B/C=1<br>Estimated ICC |  |  |

## INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | |
|---|---|---|
| **Safety** | | |
| | **Existing (Signal)** | **Roundabout** |
| Annual Cost of Collisions | $ 425,480 | $ 344,120 |
| Discounted Life Cycle Cost of Collisions | $ 5,969,123 | $ 4,827,711 |
| **Delay** | | |
| | **Existing (Signal)** | **Roundabout** |
| Annual Quantity (hours) | 13,968 | 6,274 |
| Annual Cost | $ 179,511 | $ 80,576 |
| Total Discounted Life Cycle Cost | $ 3,949,246 | $ 1,772,676 |
| **O&M** | | |
| | **Existing (Signal)** | **Roundabout** |
| Annual O&M Costs | 9,220 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 129,349 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 65,923 | $ 56,034 |
| Total O&M Costs | $ 195,271 | $ 82,970 |
| **Initial Capital** | | |
| | **Existing (Signal)** | **Roundabout** |
| High Approximation | $ 200,000 | $ 3,500,000 |
| Low Approximation | $ 100,000 | $ 2,000,000 |

**Benefit-Cost Ratio Calculations**

| | Capital Cost | | | Project Constraints | | | |
|---|---|---|---|---|---|---|---|
| B/C Target | Traffic Signal (a) | Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Added O&M Cost for Roundabout (d) | Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
| High | $ 200,000 | $ 2,000,000 | $ 1,800,000 | | | $ 1,687,699 | 0.96 |
| Low | $ 100,000 | $ 3,500,000 | $ 3,400,000 | $ (112,301) | $ 1,614,978 | $ 3,287,699 | 0.49 |
| Roundabout Budget | $ 150,000 | $ 1,877,279 | $ 1,727,279 | | | $ 1,614,978 | 1.00 |

## PREFERRED INTERSECTION ALTERNATIVE

The preferred alternative based on B/C ratio for this intersection is roundabout control.

# INTERSECTION CONTROL CONCEPT LAYOUTS

**Existing - Traffic Signal**

**Multi-Lane Roundabout**

# INTERSECTION 2.1 – ORD GROVE AVENUE AT NOCHE BUENA STREET

## INTERSECTION CONTROL ALTERNATIVES

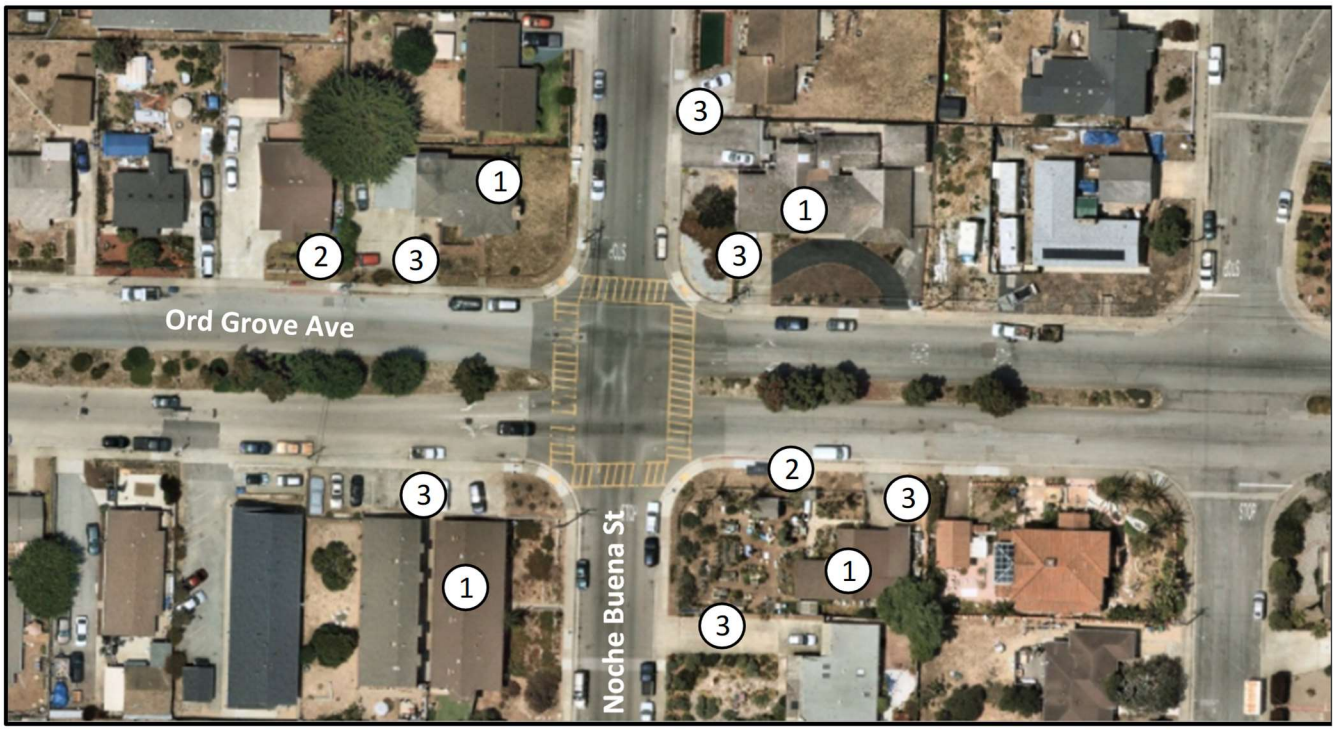
The two intersection control types analyzed include:

1. Existing All-Way Stop Control
2. Mini-Roundabout


## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Ord Grove Ave at Noche Buena St is currently controlled by signals. Design constraints at the intersection include:

1. Single family residential
2. Bus stop
3. Driveway



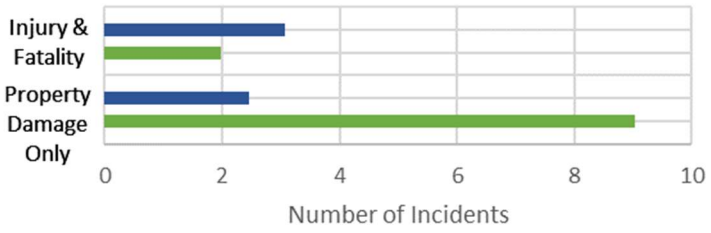
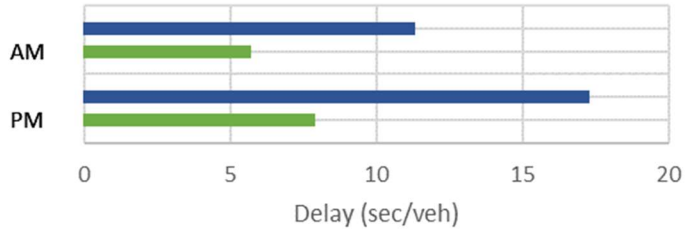
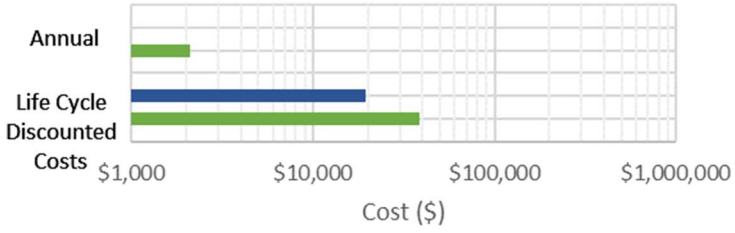
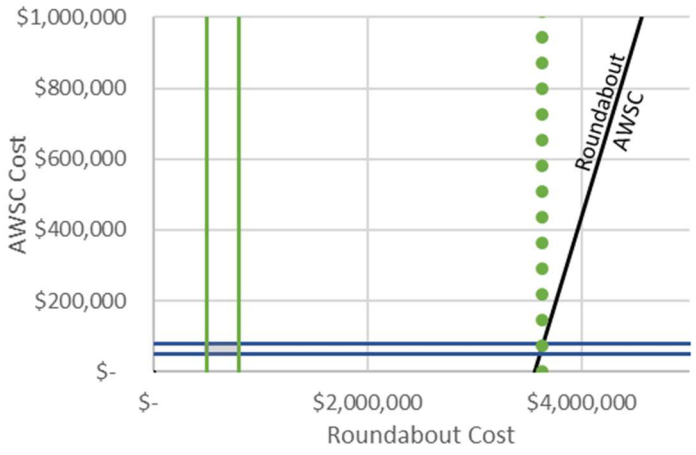

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| **INT 2.1** | **Ord Grove at Noche Buena St** | | |
| | Urban Environment Focus | X | X |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | | X |
| | Minimize ROW Acquisition to Limit Initial Costs | X | X |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for stop control and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Roundabout  Stop Control |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Roundabout  Stop Control |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Roundabout  Stop Control |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget.<br>RAB ICC Range  AWSC ICC Range  Estimated ICC  RAB Budget  B/C=1 |  |  |

## INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | |
|---|---|---|
| **Safety** | | |
| | **Existing (AWSC)** | **Roundabout** |
| Annual Cost of Collisions | $ 188,949 | $ 51,343 |
| Discounted Life Cycle Cost of Collisions | $ 2,650,800 | $ 720,299 |
| **Delay** | | |
| | **Existing (AWSC)** | **Roundabout** |
| Annual Quantity (hours) | 2,959 | 1,351 |
| Annual Cost | $ 38,247 | $ 17,398 |
| Total Discounted Life Cycle Cost | $ 841,440 | $ 382,766 |
| **O&M** | | |
| | **Existing (AWSC)** | **Roundabout** |
| Annual O&M Costs | 520 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 7,295 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 10,750 | $ 8,418 |
| Total O&M Costs | $ 18,046 | $ 35,354 |
| **Initial Capital** | | |
| | **Existing (AWSC)** | **Roundabout** |
| High Approximation | $ 80,000 | $ 800,000 |
| Low Approximation | $ 50,000 | $ 500,000 |

**Benefit-Cost Ratio Calculations**

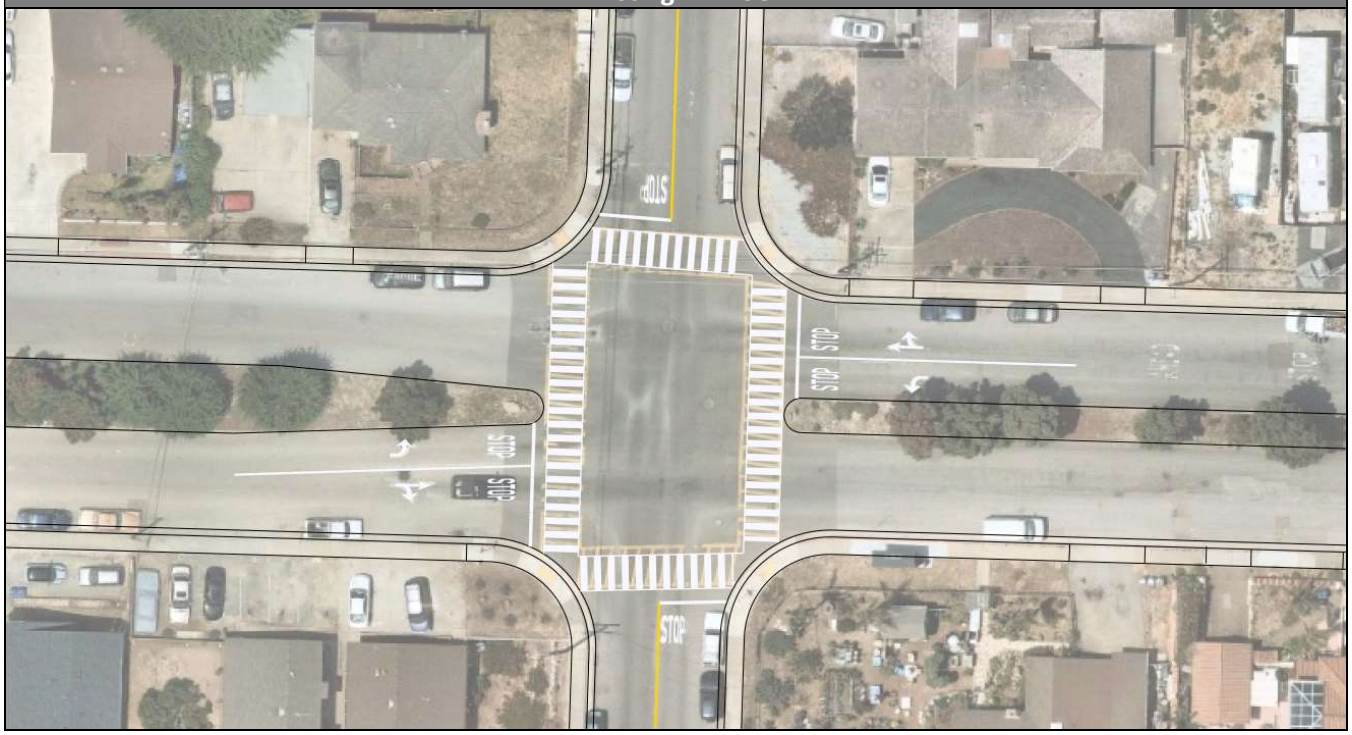
| | Capital Cost | | | Project Constraints | | | |
|---|---|---|---|---|---|---|---|
| B/C Target | AWSC (a) | Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Added O&M Cost for Roundabout (d) | Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
| High | $ 80,000 | $ 500,000 | $ 420,000 | | | $ 422,501 | 8.44 |
| Low | $ 50,000 | $ 800,000 | $ 750,000 | $ 2,501 | $ 3,564,777 | $ 752,501 | 4.74 |
| Roundabout Budget | $ 65,000 | $ 3,627,276 | $ 3,562,276 | | | $ 3,564,777 | 1.00 |

## PREFERRED INTERSECTION ALTERNATIVE

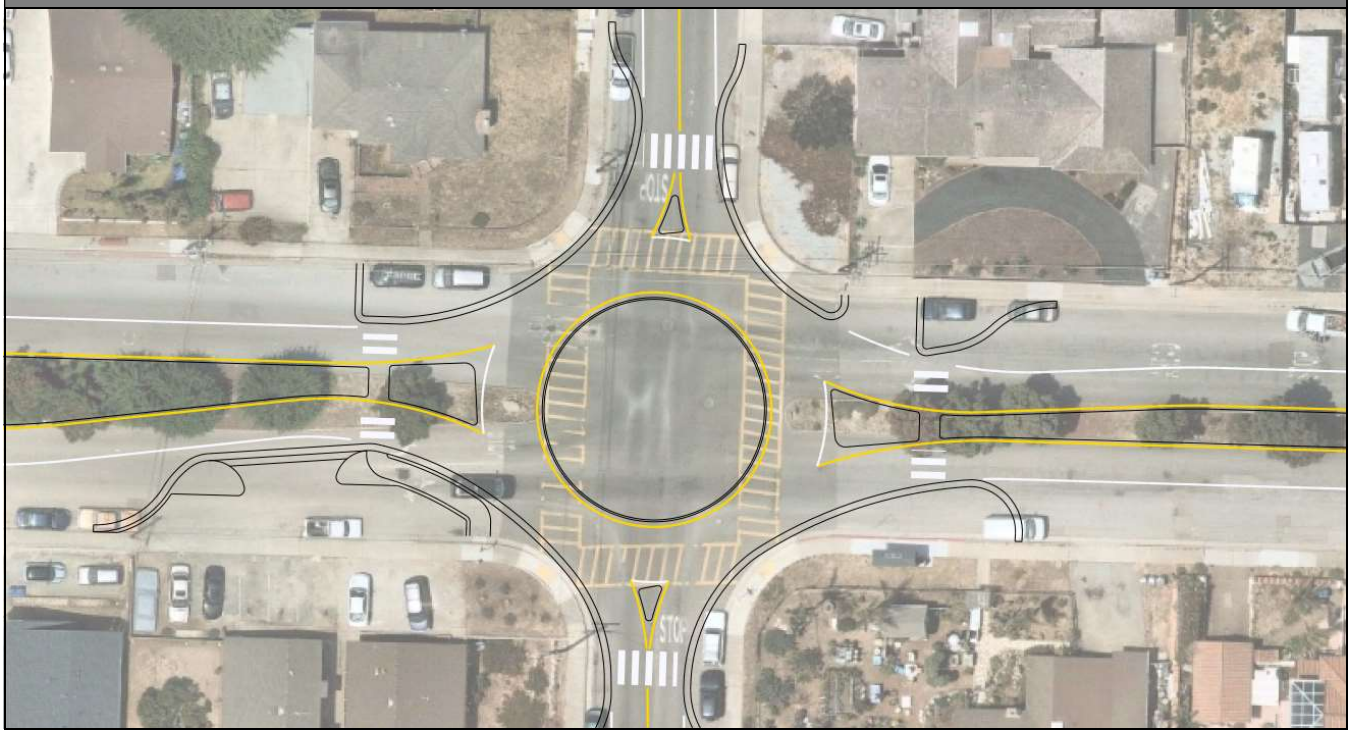
The preferred alternative based on B/C ratio for this intersection is roundabout control.

## INTERSECTION CONTROL CONCEPT LAYOUTS

**Existing - AWSC**




**Mini-Roundabout**



# INTERSECTION 2.2 – LA SALLE AVENUE AT NOCHE BUENA STREET

## INTERSECTION CONTROL ALTERNATIVES

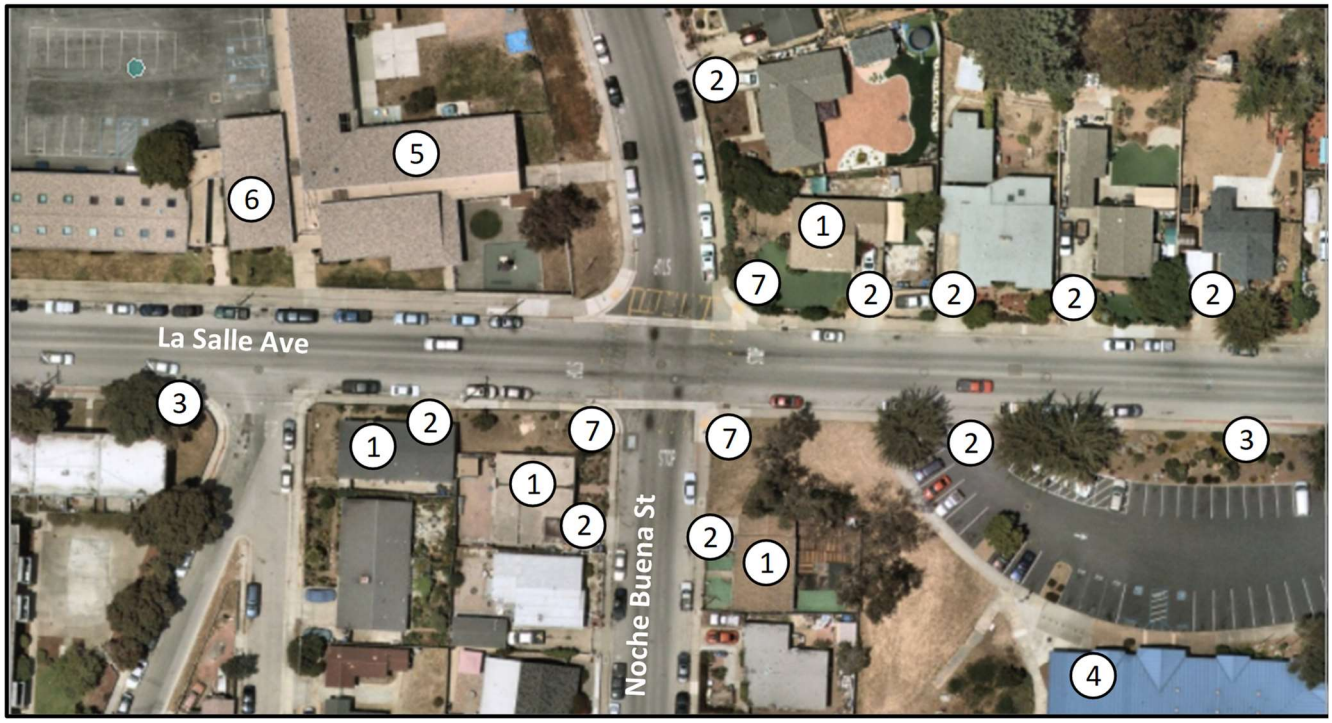
The two intersection control types analyzed include:

1. Existing All-Way Stop Control
2. Mini-Roundabout


## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

La Salle Ave at Noche Buena St is currently controlled by signals. Design constraints at the intersection include:

1. Single family residential
2. Driveway
3. Bus Stop
4. Boys and Girls Club of Monterey
5. Preschool
6. Adult School
7. Right-of-way encroachment



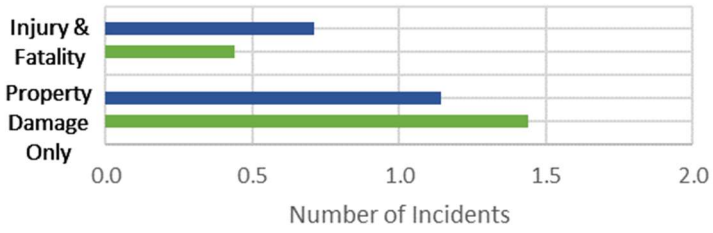
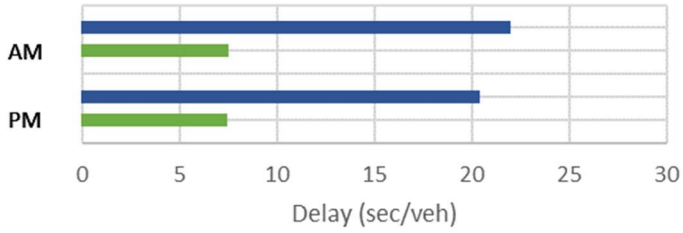
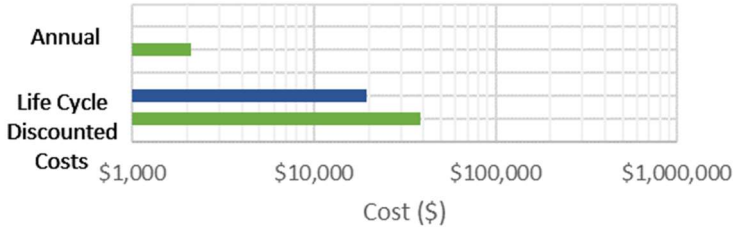
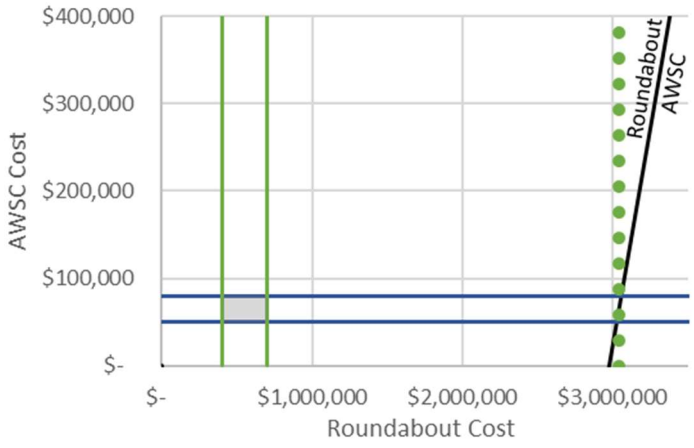

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| INT 2.2 | **La Salle Ave at Noche Buena St** | | |
| | Urban Environment Focus | X | X |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | | X |
| | Minimize ROW Acquisition to Limit Initial Costs | X | X |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for stop control and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents. |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection. |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget. |  |  |

## INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | |
|---|---|---|
| **Safety** | | |
| | **Existing (AWSC)** | **Roundabout** |
| Annual Cost of Collisions | $ 157,907 | $ 67,830 |
| Discounted Life Cycle Cost of Collisions | $ 2,215,305 | $ 951,593 |
| **Delay** | | |
| | **Existing (AWSC)** | **Roundabout** |
| Annual Quantity (hours) | 3,902 | 1,355 |
| Annual Cost | $ 51,489 | $ 17,926 |
| Total Discounted Life Cycle Cost | $ 1,132,750 | $ 394,362 |
| **O&M** | | |
| | **Existing (AWSC)** | **Roundabout** |
| Annual O&M Costs | 520 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 7,295 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 10,750 | $ 8,418 |
| Total O&M Costs | $ 18,046 | $ 35,354 |
| **Initial Capital** | | |
| | **Existing (AWSC)** | **Roundabout** |
| High Approximation | $ 80,000 | $ 700,000 |
| Low Approximation | $ 50,000 | $ 400,000 |

**Benefit-Cost Ratio Calculations**

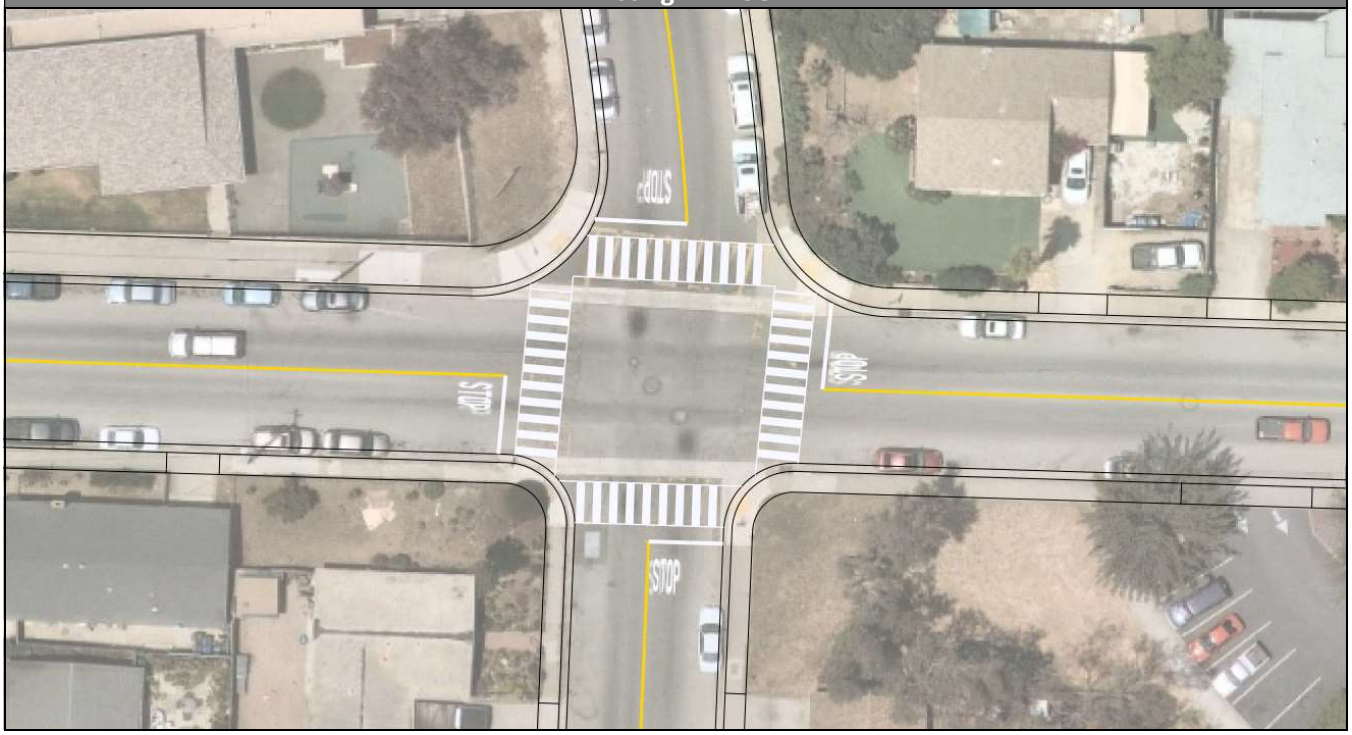
| | Capital Cost | | | Project Constraints | | | |
|---|---|---|---|---|---|---|---|
| B/C Target | AWSC (a) | Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Added O&M Cost for Roundabout (d) | Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
| High | $ 80,000 | $ 400,000 | $ 320,000 | | | $ 337,308 | 8.87 |
| Low | $ 50,000 | $ 700,000 | $ 650,000 | $ 17,308 | $ 2,991,307 | $ 667,308 | 4.48 |
| Roundabout Budget | $ 65,000 | $ 3,038,999 | $ 2,973,999 | | | $ 2,991,307 | 1.00 |

## PREFERRED INTERSECTION ALTERNATIVE

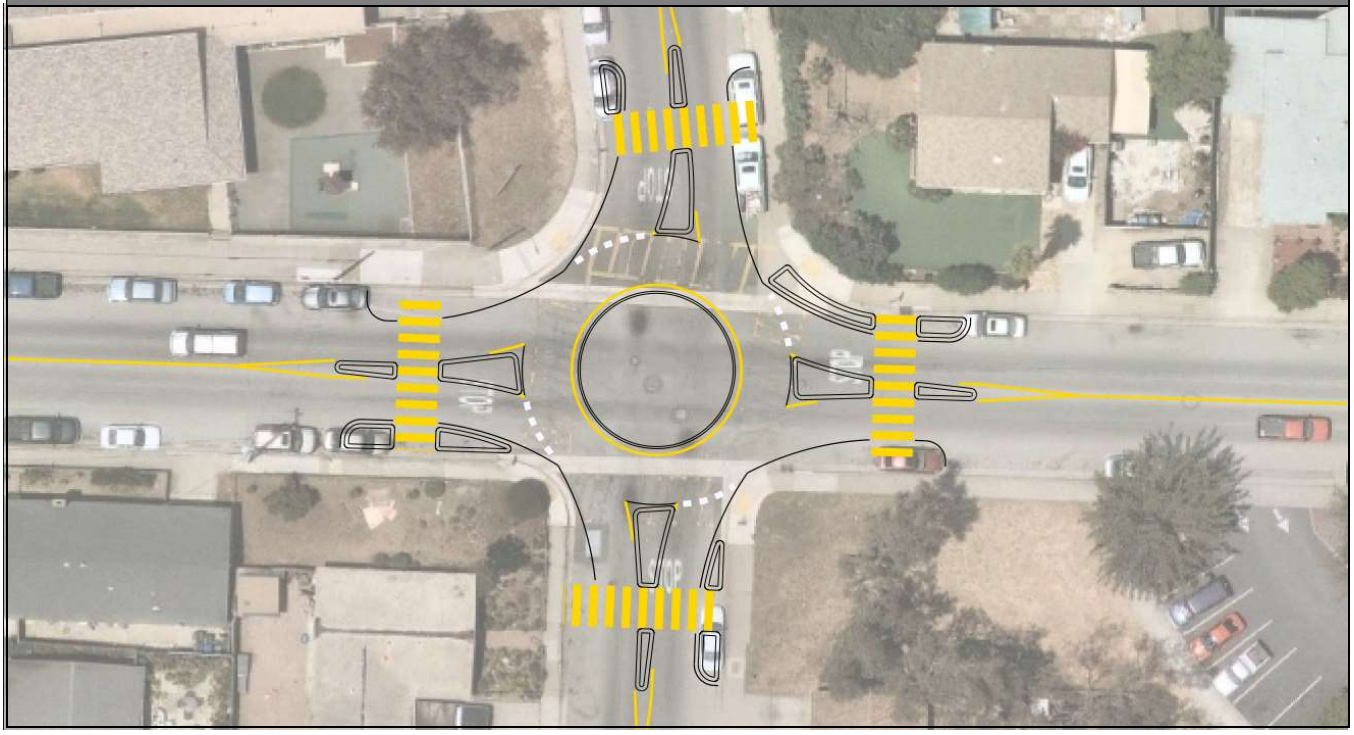
The preferred alternative based on B/C ratio for this intersection is roundabout control.

## INTERSECTION CONTROL CONCEPT LAYOUTS

**Existing - AWSC**




**Mini-Roundabout**



# INTERSECTION 2.3 – LA SALLE AVENUE AT FREMONT BOULEVARD

## INTERSECTION CONTROL ALTERNATIVES

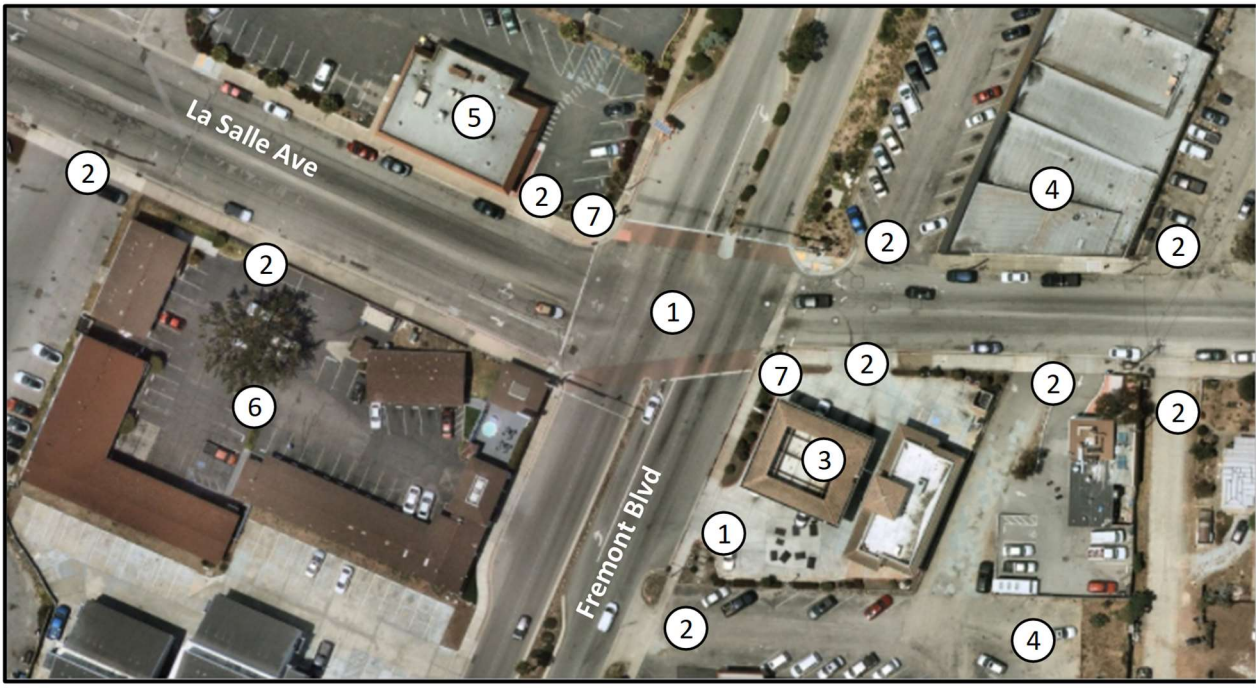
The two intersection control types analyzed include:

1. Existing Signal with Optimized Signal Timing
2. Multi-lane Roundabout

## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

La Salle Ave at Fremont Blvd is currently controlled by signals. Design constraints at the intersection include:

1. Skewed intersection geometry
2. Driveway
3. Gas Station
4. Shopping Center
5. Restaurant
6. Hotel
7. Right-of-way encroachment



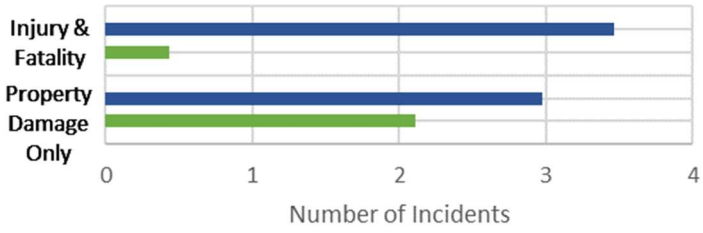
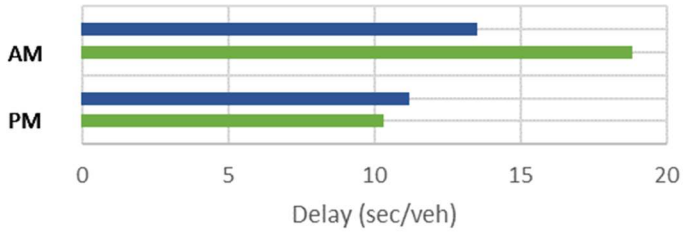
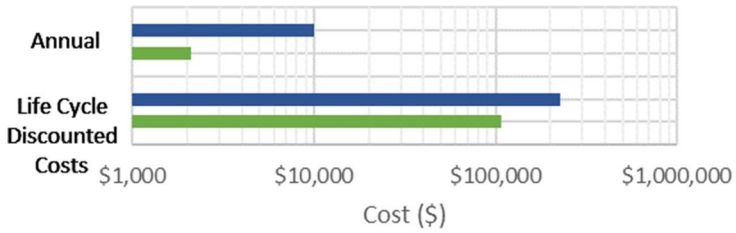
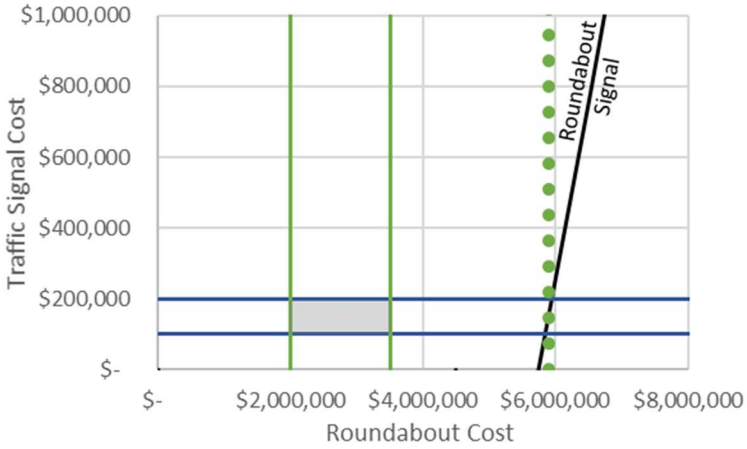

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| **INT 2.3** | **La Salle Ave at Fremont Blvd** | | |
| | Urban Environment Focus | X | X |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | | X |
| | Minimize ROW Acquisition to Limit Initial Costs | X | |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for signal and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Signal Roundabout |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Signal Roundabout |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Signal Roundabout |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget.<br>RAB ICC Range<br>Signal ICC Range<br>RAB Budget<br>B/C=1<br>Estimated ICC |  |  |

# INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | |
|---|---|---|
| **Safety** | | |
| | **Existing (Signal)** | **Roundabout** |
| Annual Cost of Collisions | $ 477,940 | $ 62,866 |
| Discounted Life Cycle Cost of Collisions | $ 6,705,102 | $ 881,964 |
| **Delay** | | |
| | **Existing (Signal)** | **Roundabout** |
| Annual Quantity (hours) | 3,727 | 4,409 |
| Annual Cost | $ 49,699 | $ 58,537 |
| Total Discounted Life Cycle Cost | $ 1,093,370 | $ 1,287,811 |
| **O&M** | | |
| | **Existing (Signal)** | **Roundabout** |
| Annual O&M Costs | 9,220 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 129,349 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 50,710 | $ 43,103 |
| Total O&M Costs | $ 180,059 | $ 70,039 |
| **Initial Capital** | | |
| | **Existing (Signal)** | **Roundabout** |
| High Approximation | $ 200,000 | $ 3,500,000 |
| Low Approximation | $ 100,000 | $ 2,000,000 |

**Benefit-Cost Ratio Calculations**

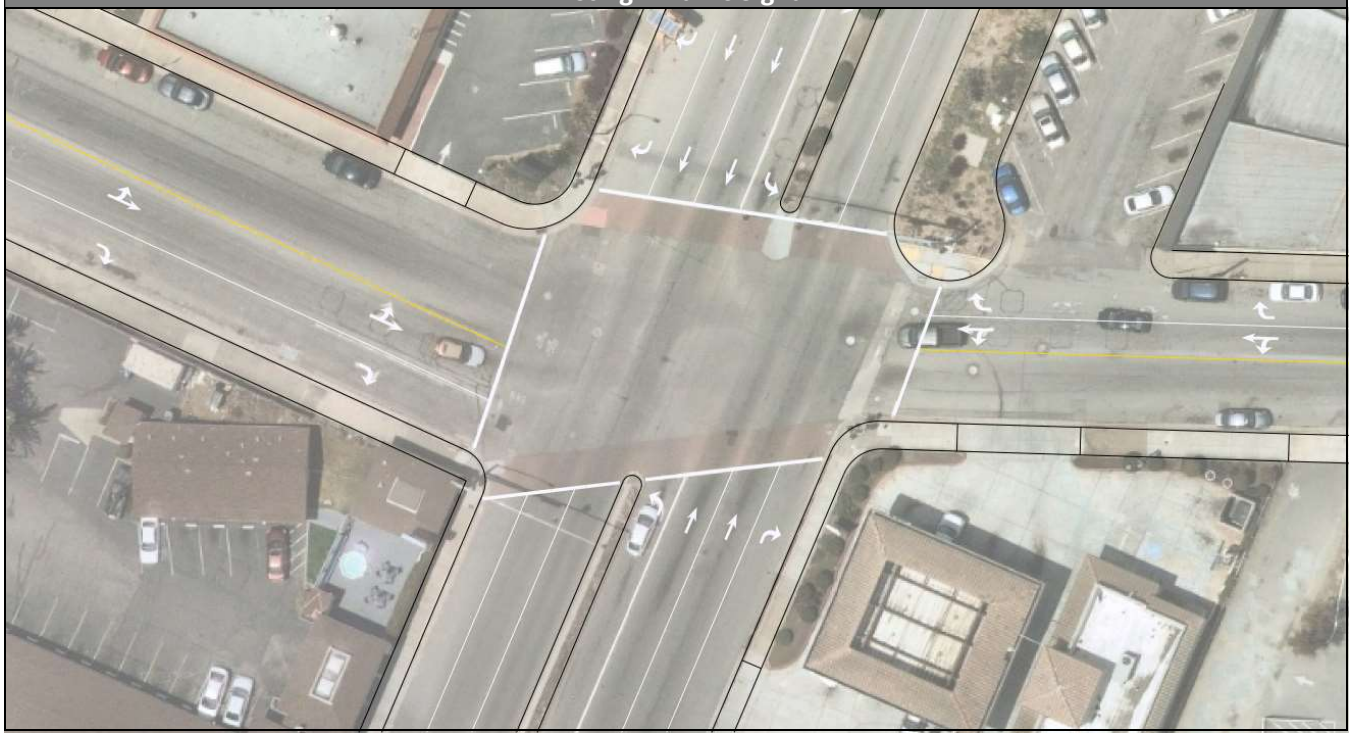
| | Capital Cost | | | Project Constraints | | | |
|---|---|---|---|---|---|---|---|
| B/C Target | Traffic Signal (a) | Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Added O&M Cost for Roundabout (d) | Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
| High | $ 200,000 | $ 2,000,000 | $ 1,800,000 | | | $ 1,689,879 | 3.33 |
| Low | $ 100,000 | $ 3,500,000 | $ 3,400,000 | $ (110,121) | $ 5,628,697 | $ 3,289,879 | 1.71 |
| Roundabout Budget | $ 150,000 | $ 5,888,818 | $ 5,738,818 | | | $ 5,628,697 | 1.00 |

# PREFERRED INTERSECTION ALTERNATIVE

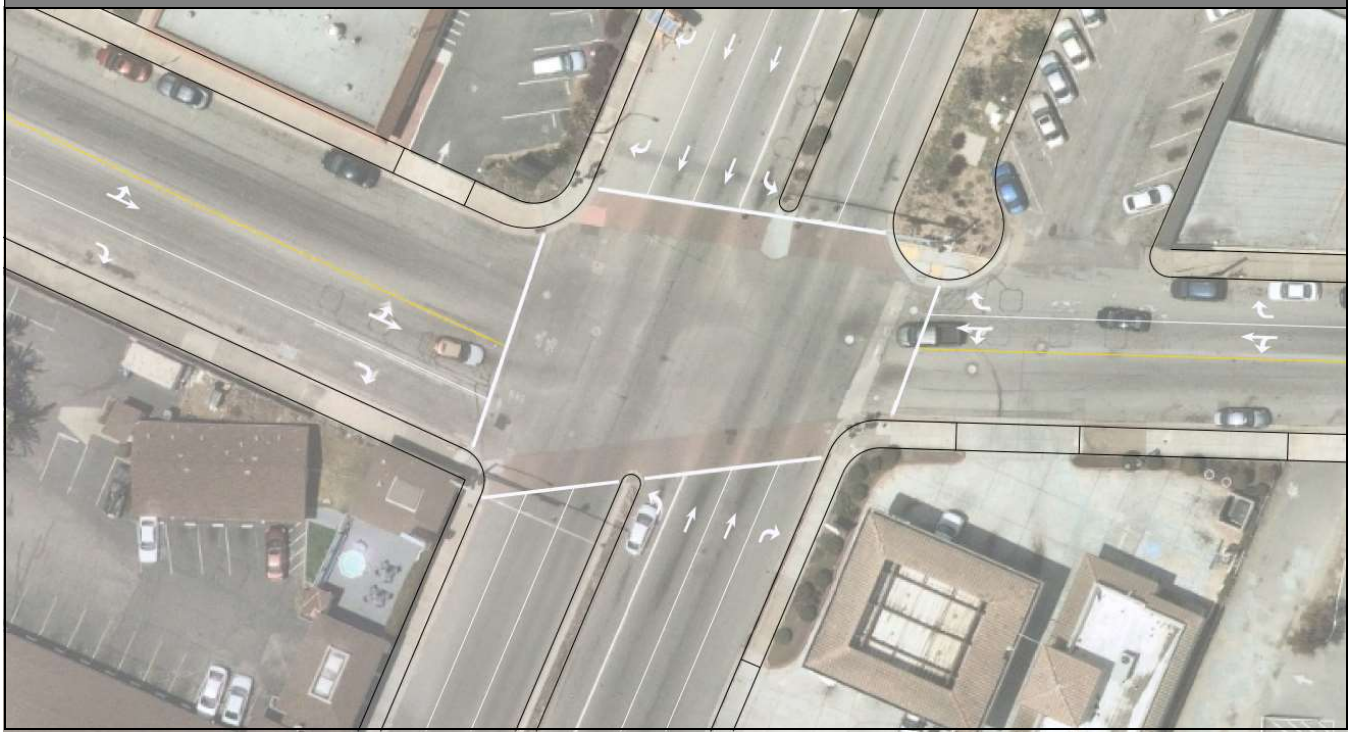
The preferred alternative based on B/C ratio for this intersection is roundabout control.

# INTERSECTION CONTROL CONCEPT LAYOUTS

**Existing - Traffic Signal**



**Multi-Lane Roundabout**



# INTERSECTION 2.4 – BROADWAY AVENUE AT NOCHE BUENA STREET

## INTERSECTION CONTROL ALTERNATIVES

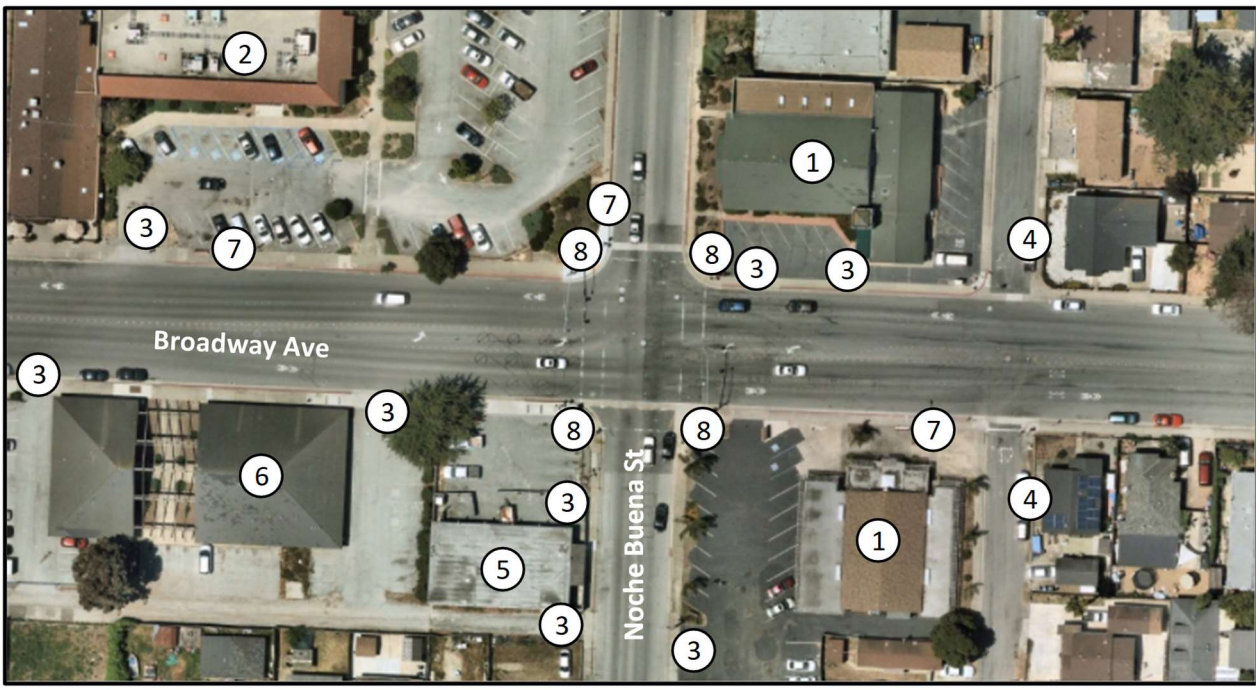
The two intersection control types analyzed include:

1. Existing Signal with Optimized Signal Timing
2. Mini-Roundabout

## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Broadway Ave at Noche Buena St is currently controlled by signals. Design constraints at the intersection include:

1. Place of Worship
2. Monterey County Social Services
3. Driveway
4. Proximity to Kenneth St
5. Liquor Store
6. Preschool
7. Bus stop
8. Right-of-way encroachment



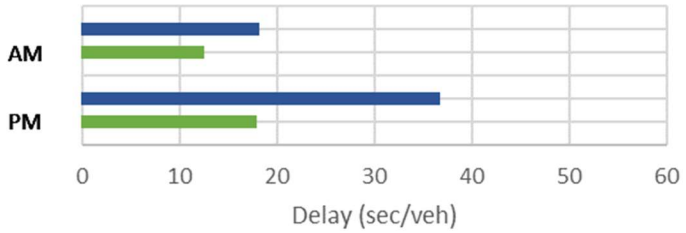
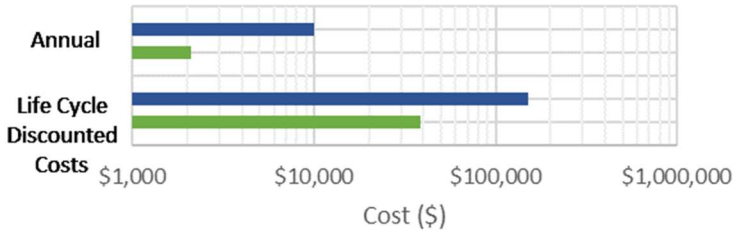
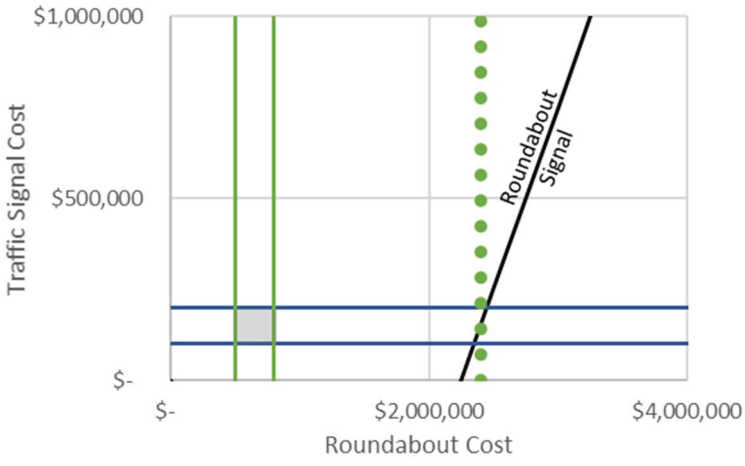

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| **INT 2.4** | **Broadway Ave at Noche Buena St** | | |
| | Urban Environment Focus | X | X |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | | X |
| | Minimize ROW Acquisition to Limit Initial Costs | X | X |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for signal and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Signal Roundabout |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Signal Roundabout |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Signal Roundabout |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget.<br>RAB ICC Range<br>Signal ICC Range<br>RAB Budget<br>B/C=1<br>Estimated ICC |  |  |

# INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | |
|---|---|---|
| **Safety** | | |
| | **Signal** | **Roundabout** |
| Annual Cost of Collisions | $ 192,639 | $ 93,748 |
| Discounted Life Cycle Cost of Collisions | $ 2,702,565 | $ 1,315,209 |
| **Delay** | | |
| | **Signal** | **Roundabout** |
| Annual Quantity (hours) | 6,851 | 4,131 |
| Annual Cost | $ 89,197 | $ 54,775 |
| Total Discounted Life Cycle Cost | $ 1,962,332 | $ 1,205,050 |
| **O&M** | | |
| | **Signal** | **Roundabout** |
| Annual O&M Costs | 9,220 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 129,349 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 25,862 | $ 21,983 |
| Total O&M Costs | $ 155,211 | $ 48,919 |
| **Initial Capital** | | |
| | **Signal** | **Roundabout** |
| High Approximation | $ 200,000 | $ 800,000 |
| Low Approximation | $ 100,000 | $ 500,000 |

**Benefit-Cost Ratio Calculations**

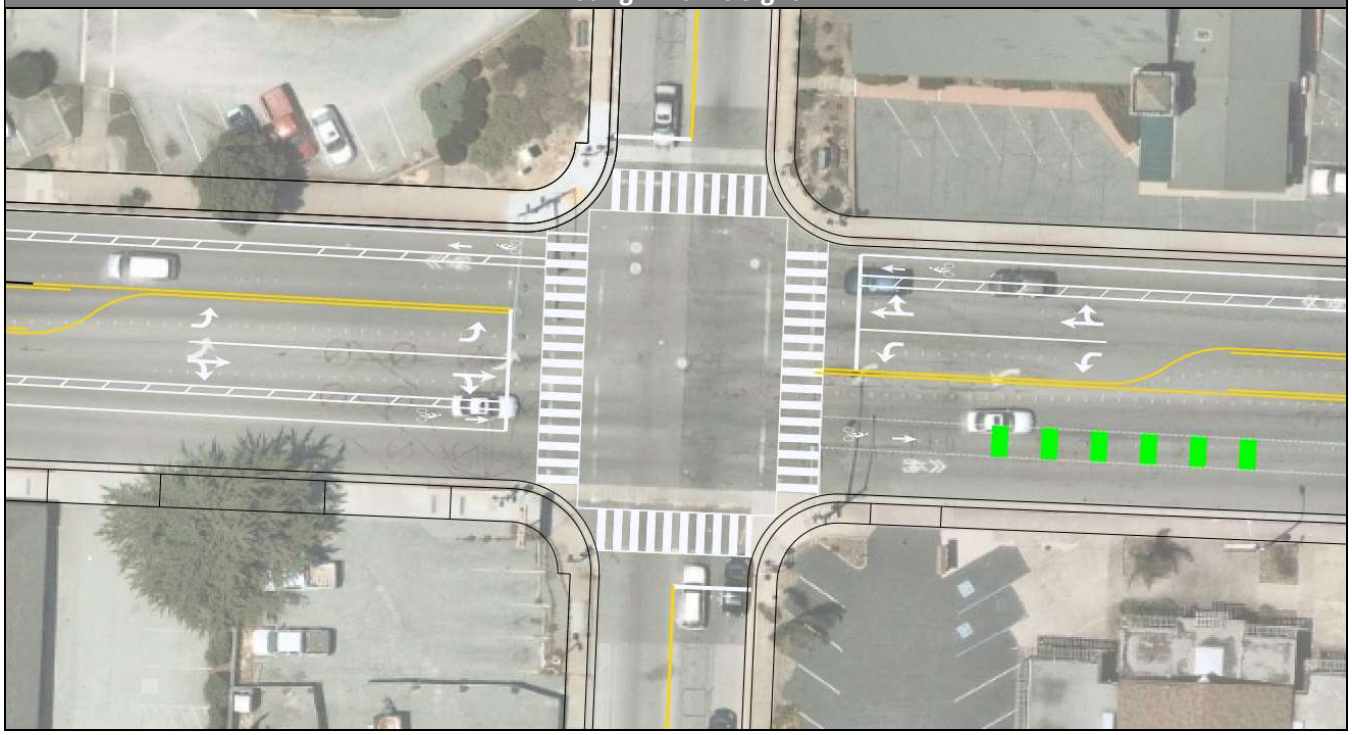
| | Capital Cost | | | Project Constraints | | | |
|---|---|---|---|---|---|---|---|
| B/C Target | Traffic Signal (a) | Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Added O&M Cost for Roundabout (d) | Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
| High | $ 200,000 | $ 500,000 | $ 300,000 | | | $ 195,254 | 10.98 |
| Low | $ 100,000 | $ 800,000 | $ 700,000 | $ (104,746) | $ 2,144,638 | $ 595,254 | 3.60 |
| Roundabout Budget | $ 150,000 | $ 2,399,383 | $ 2,249,383 | | | $ 2,144,638 | 1.00 |

# PREFERRED INTERSECTION ALTERNATIVE

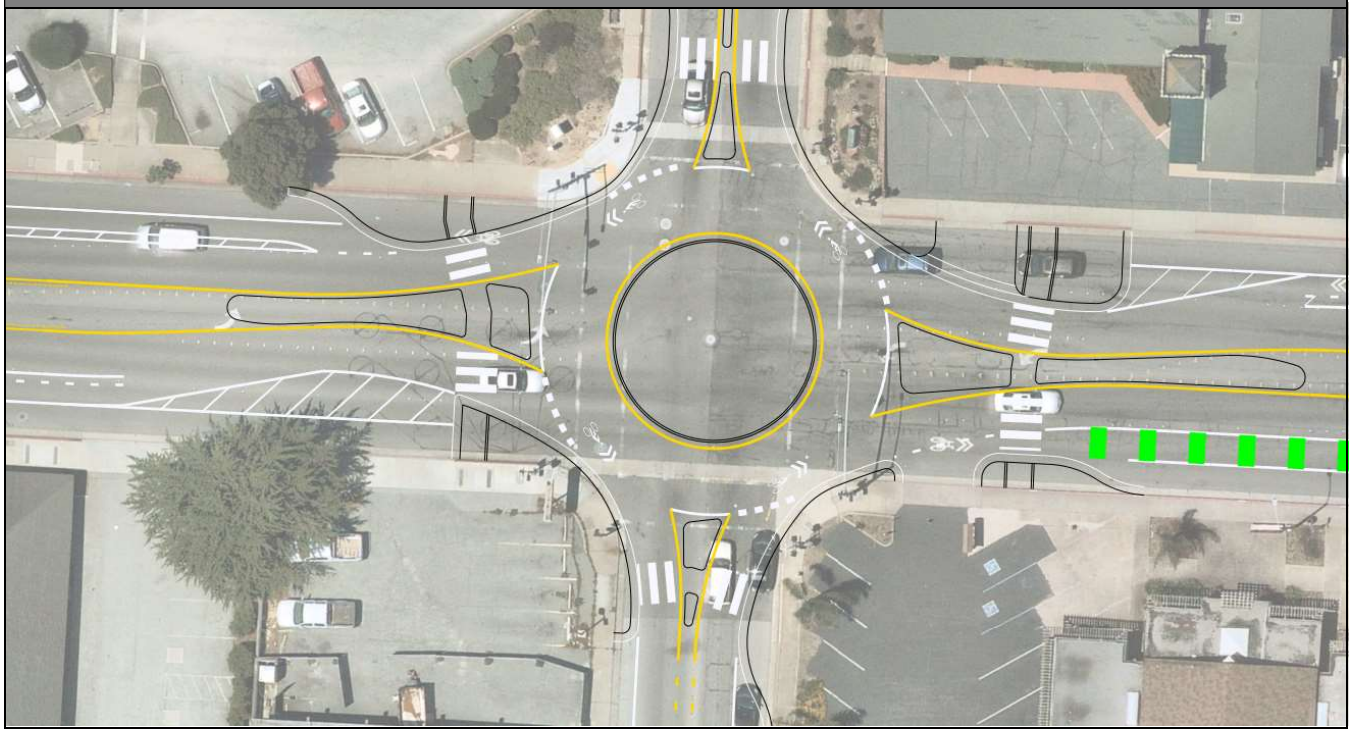
The preferred alternative based on B/C ratio for this intersection is roundabout control.

## INTERSECTION CONTROL CONCEPT LAYOUTS

**Existing - Traffic Signal**



**Mini-Roundabout**



# INTERSECTION 2.5 – BROADWAY AVENUE AT YOSEMITE STREET

## INTERSECTION CONTROL ALTERNATIVES

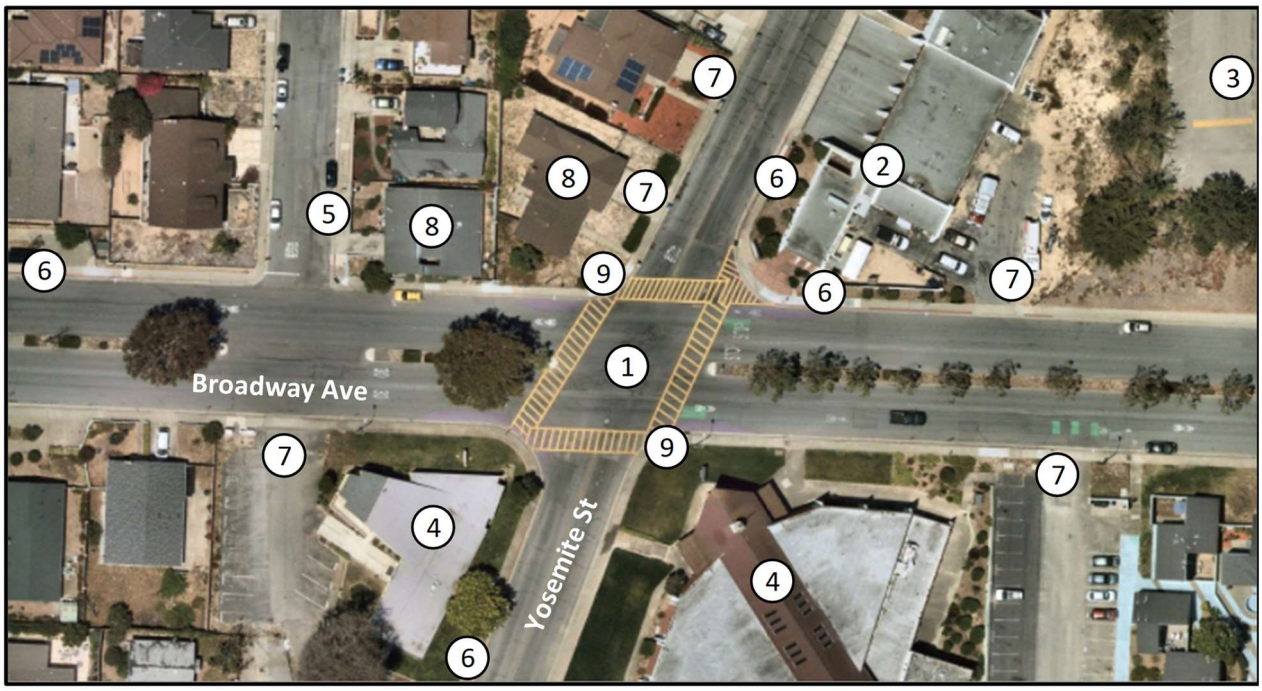
The two intersection control types analyzed include:

1. Traffic Signal
2. Elongated Roundabout

## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Broadway Ave at Yosemite St is currently controlled by signals. Design constraints at the intersection include:

1. Skewed intersection geometry
2. Fire Department
3. King Middle School
4. Place of Worship
5. Proximity to Highland St
6. Bus stop
7. Driveway
8. Single family residence
9. Right-of-way encroachment



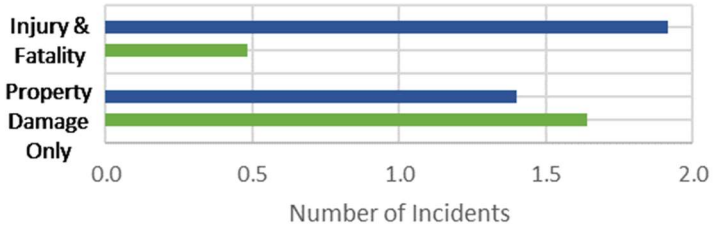
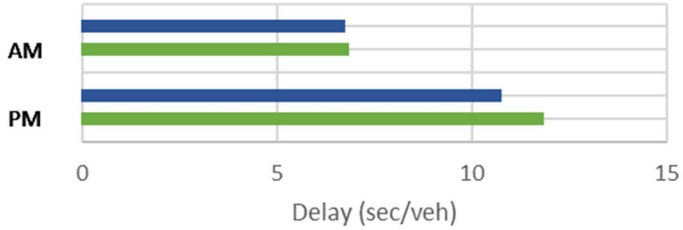
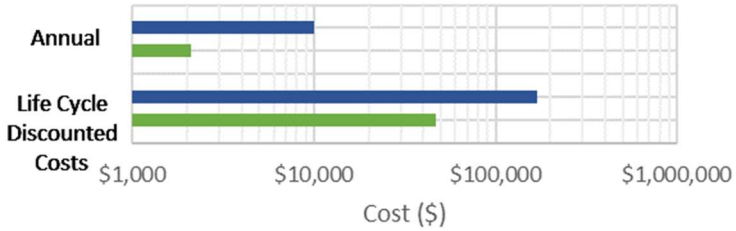
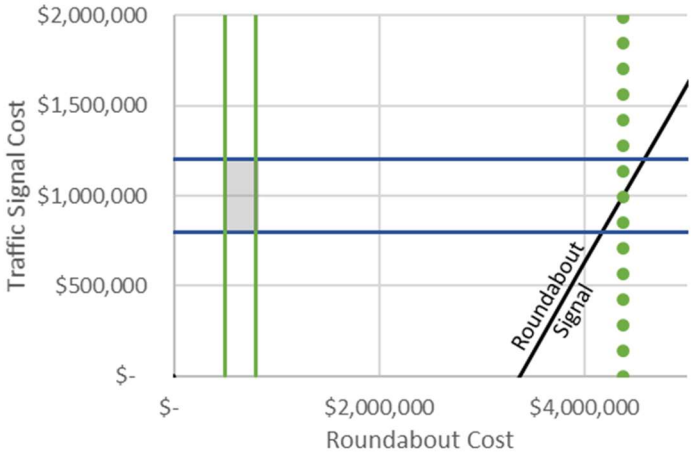

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| INT 2.5 | **Broadway Ave at Yosemite St** | | |
| | Urban Environment Focus | X | X |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | N/A | N/A |
| | Minimize ROW Acquisition to Limit Initial Costs | X | X |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for signal and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Signal Roundabout |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Signal Roundabout |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Signal Roundabout |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget.<br>RAB ICC Range<br>Signal ICC Range<br>RAB Budget<br>B/C=1<br>Estimated ICC |  |  |

# INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | | |
|---|---|---|---|
| **Safety** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Annual Cost of Collisions | $ 218,092 | $ 313,743 | $ 78,336 |
| Discounted Life Cycle Cost of Collisions | $ 3,059,649 | $ 4,401,547 | $ 1,098,993 |
| **Delay** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Annual Quantity (hours) | 4,393 | 1,913 | 2,047 |
| Annual Cost | $ 57,987 | $ 25,321 | $ 27,058 |
| Total Discounted Life Cycle Cost | $ 1,275,718 | $ 557,062 | $ 595,280 |
| **O&M** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Annual O&M Costs | 1000 | 9,220 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 14,029 | $ 129,349 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 18,255 | $ 25,558 | $ 16,734 |
| Total O&M Costs | $ 32,285 | $ 154,907 | $ 43,670 |
| **Initial Capital** | | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| High Approximation | $ 80,000 | $ 1,200,000 | $ 800,000 |
| Low Approximation | $ 50,000 | $ 800,000 | $ 500,000 |
| **Life Cycle Benefit-Cost Ratio** | | | |
| | **Total Benefits (B)** | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| Safety | $ - | $ (1,341,898) | $ 1,960,656 |
| Delay | $ - | $ 718,657 | $ 680,438 |
| Total Benefits | **$ -** | **$ (623,242)** | **$ 2,641,094** |
| | **Total Costs (C)** | | |
| | **Existing (AWSC)** | **Signal** | **Roundabout** |
| O&M | $ - | $ 122,622 | $ 11,386 |
| Budget | $ - | $ 935,000 | $ 585,000 |
| Total Costs | **$ -** | **$ 1,057,622** | **$ 596,386** |
| **B/C Ratio Compared to Existing** | **NA** | **-0.59** | **4.43** |

**Benefit-Cost Ratio Calculations**

| B/C Target | Capital Cost: Traffic Signal (a) | Capital Cost: Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Project Constraints: Added O&M Cost for Roundabout (d) | Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
|---|---|---|---|---|---|---|---|
| High | $ 1,200,000 | $ 500,000 | $ (700,000) | | | $ (811,439) | NA-R |
| Low | $ 800,000 | $ 800,000 | $ - | $ (111,439) | $ 3,264,336 | $ (111,439) | NA-R |
| Roundabout Budget | $ 1,000,000 | $ 4,375,775 | $ 3,375,775 | | | $ 3,264,336 | 1.00 |

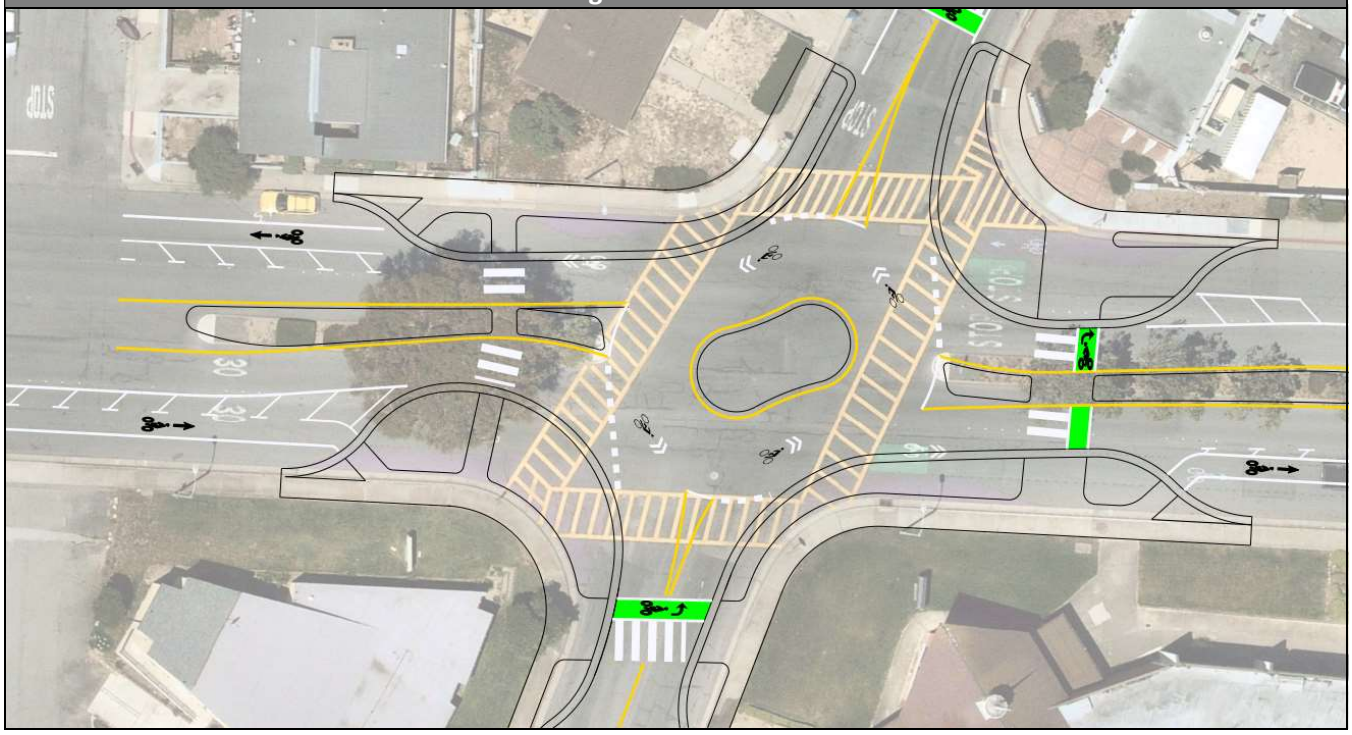
## PREFERRED INTERSECTION ALTERNATIVE

The preferred alternative based on B/C ratio for this intersection is roundabout control.

# INTERSECTION CONTROL CONCEPT LAYOUTS

**Traffic Signal**

**Elongated Roundabout**



# INTERSECTION 2.6 – MILITARY AVENUE AT NOCHE BUENA STREET

## INTERSECTION CONTROL ALTERNATIVES

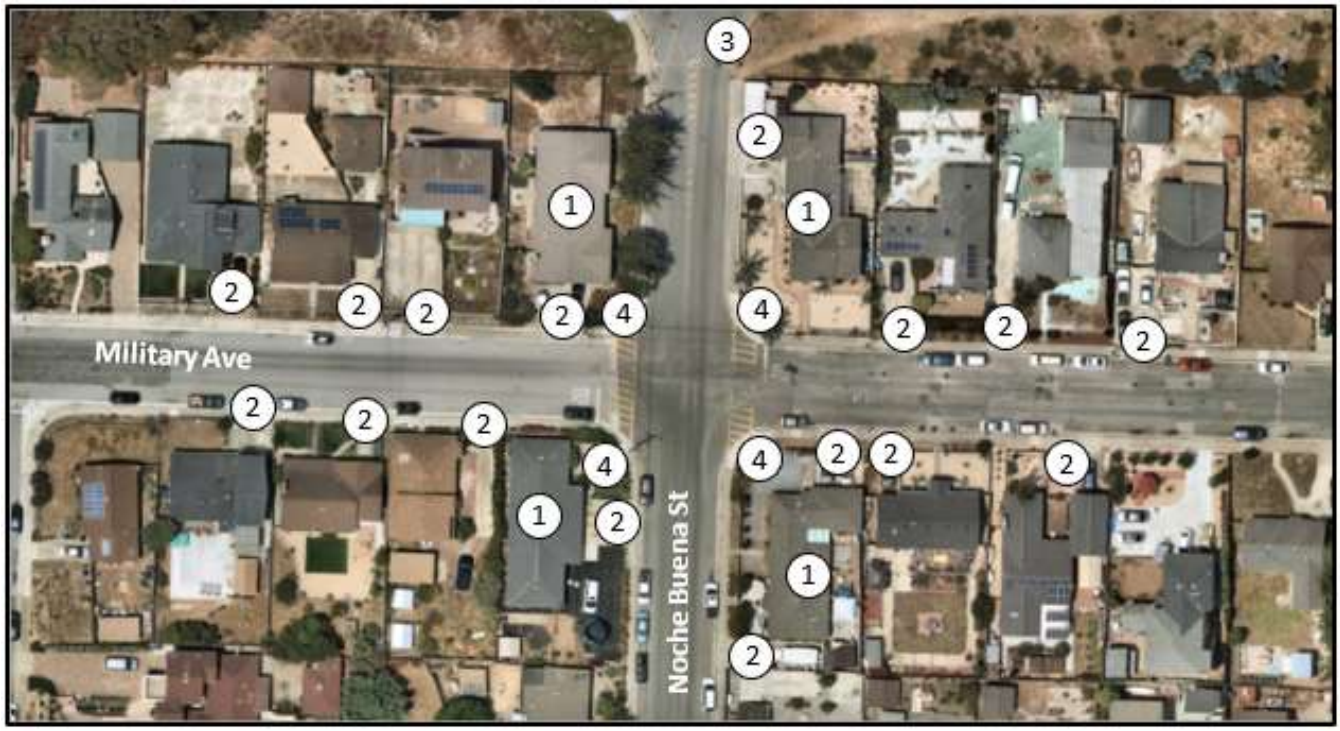
The two intersection control types analyzed include:

1. Traffic Signal
2. Mini-Roundabout

## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Military Ave at Noche Buena St is currently controlled by stop signs on Military Ave. Design constraints at the intersection include:

1. Single family residence
2. Driveway
3. Seaside High School
4. Right-of-way encroachment



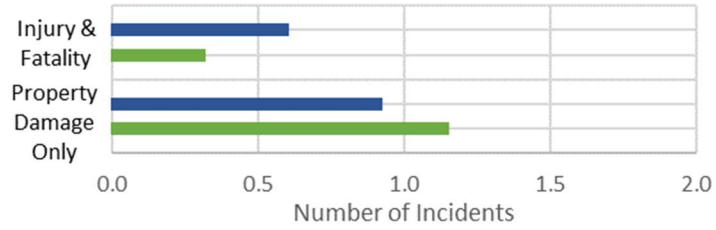
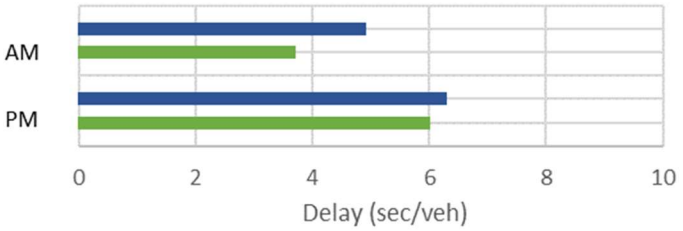
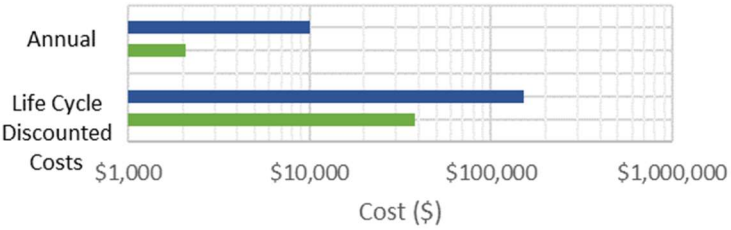
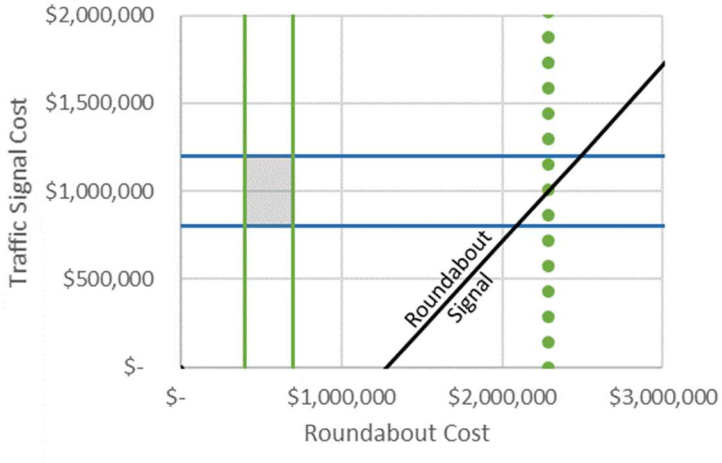

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of the alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| **INT 2.6** | **Military Ave at Noche Buena St** | | |
| | Urban Environment Focus | X | X |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | N/A | N/A |
| | Minimize ROW Acquisition to Limit Initial Costs | X | X |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

The following table summarizes performance measures used to calculate the B/C ratio.

| Performance Measure | Preferred Alternative | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Signal Roundabout | |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Signal Roundabout | |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Signal Roundabout | |  |
| **Initial Capital Cost**<br>Measures the initial capital costs needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget. | |  |

# INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | | |
|---|---|---|---|
| **Safety** | | | |
| | **Existing (TWSC)** | **Signal** | **Roundabout** |
| Annual Cost of Collisions | $ 143,140 | $ 133,396 | $ 50,162 |
| Discounted Life Cycle Cost of Collisions | $ 2,008,139 | $ 1,871,436 | $ 703,733 |
| **Delay** | | | |
| | **Existing (TWSC)** | **Signal** | **Roundabout** |
| Annual Quantity (hours) | 2,413 | 650 | 612 |
| Annual Cost | $ 35,279 | $ 8,779 | $ 8,300 |
| Total Discounted Life Cycle Cost | $ 776,131 | $ 193,137 | $ 182,601 |
| **O&M** | | | |
| | **Existing (TWSC)** | **Signal** | **Roundabout** |
| Annual O&M Costs | 520 | 9,220 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 7,295 | $ 129,349 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 10,750 | $ 10,750 | $ 8,418 |
| Total O&M Costs | $ 18,046 | $ 140,099 | $ 35,354 |
| **Initial Capital** | | | |
| | **Existing (TWSC)** | **Signal** | **Roundabout** |
| High Approximation | $ 80,000 | $ 1,200,000 | $ 700,000 |
| Low Approximation | $ 50,000 | $ 800,000 | $ 400,000 |
| **Life Cycle Benefit-Cost Ratio** | | | |
| | | **Total Benefits (B)** | |
| | **Existing (TWSC)** | **Signal** | **Roundabout** |
| Safety | $ - | $ 136,703 | $ 1,304,405 |
| Delay | $ - | $ 582,993 | $ 593,530 |
| Total Benefits | **$ -** | **$ 719,696** | **$ 1,897,935** |
| | | **Total Costs (C)** | |
| | **Existing (TWSC)** | **Signal** | **Roundabout** |
| O&M | $ - | $ 122,054 | $ 17,308 |
| Budget | $ - | $ 935,000 | $ 485,000 |
| Total Costs | **$ -** | **$ 1,057,054** | **$ 502,308** |
| **B/C Ratio Compared to Existing** | **NA** | **0.68** | **3.78** |

**Benefit-Cost Ratio Calculations**

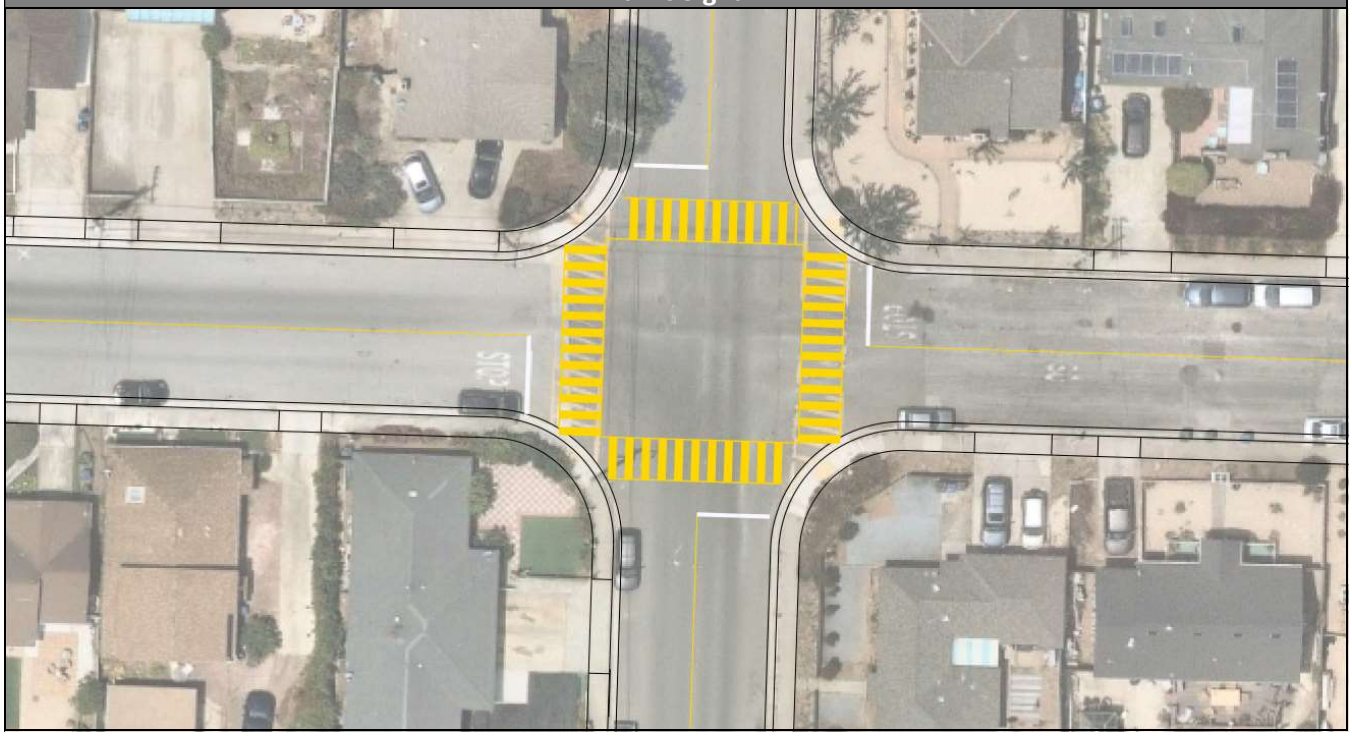
| B/C Target | Capital Cost: Traffic Signal (a) | Capital Cost: Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Project Constraints: Added O&M Cost for Roundabout (d) | Project Constraints: Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
|---|---|---|---|---|---|---|---|
| High | $ 1,200,000 | $ 400,000 | $ (800,000) | | | $ (904,746) | NA-R |
| Low | $ 800,000 | $ 700,000 | $ (100,000) | $ (104,746) | $ 1,178,239 | $ (204,746) | NA-R |
| Roundabout Budget | $ 1,000,000 | $ 2,282,984 | $ 1,282,984 | | | $ 1,178,239 | 1.00 |

## PREFERRED INTERSECTION ALTERNATIVE

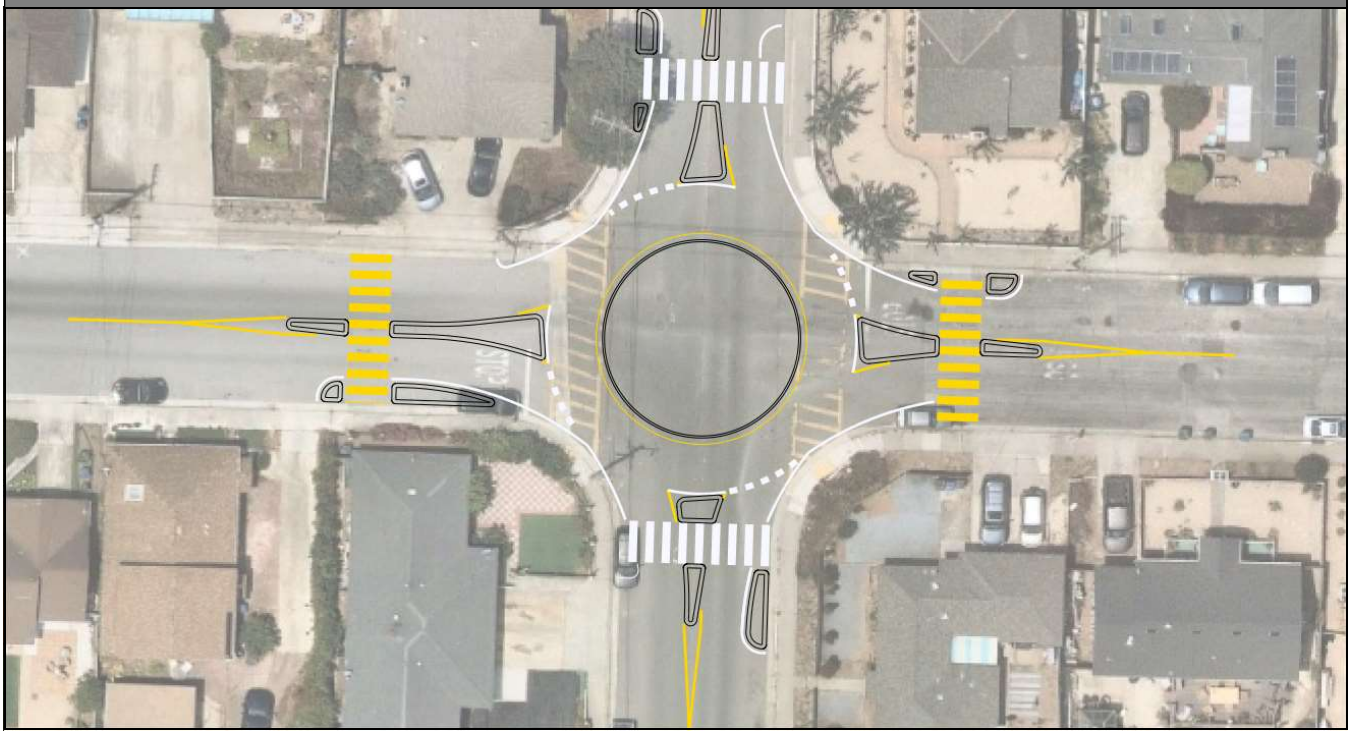
The preferred alternative based on B/C ratio for this intersection is roundabout control.

# INTERSECTION CONTROL CONCEPT LAYOUTS

**Traffic Signal**



**Mini-Roundabout**



# INTERSECTION 2.7A – LIGHTFIGHTER DRIVE AT FIRST AVENUE

## INTERSECTION CONTROL ALTERNATIVES

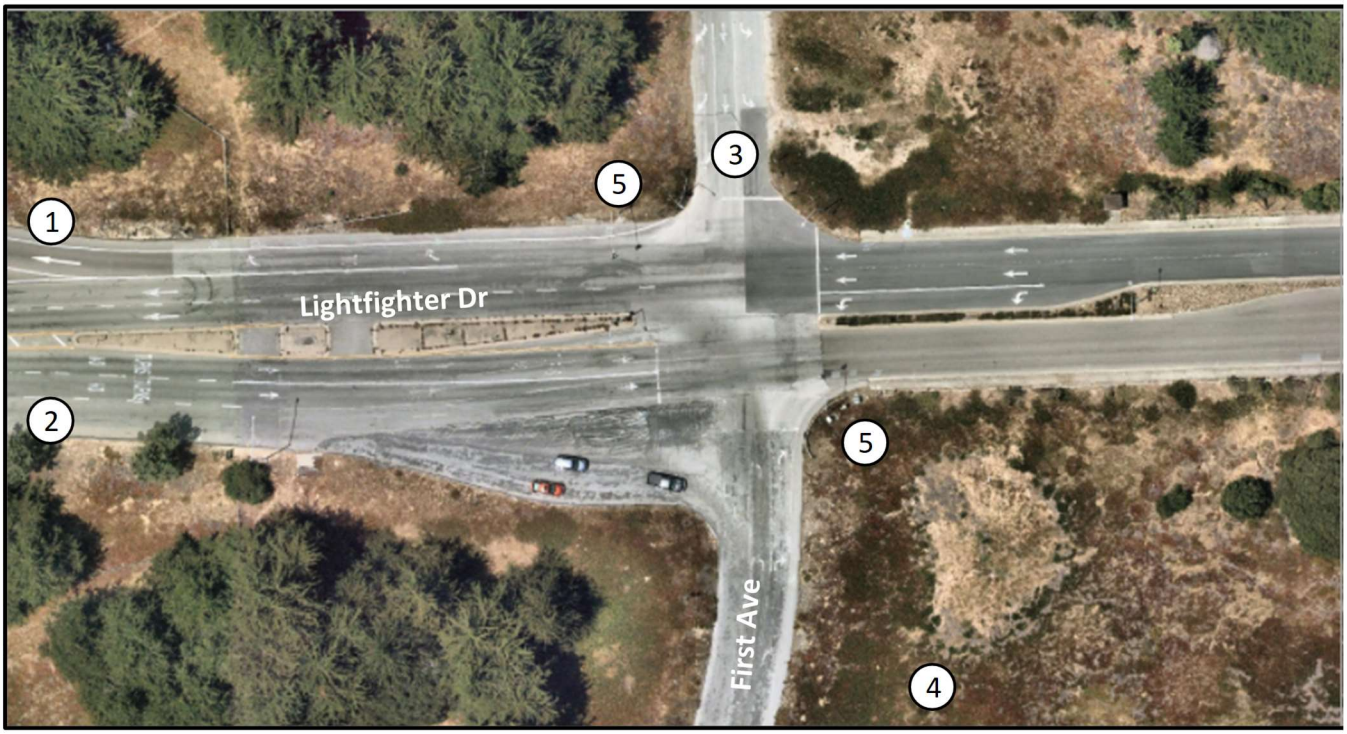
The two intersection control types analyzed include:

1. Existing Signal with Optimized Signal Timing
2. Multi-lane Roundabout

## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Lightfighter Dr at First Ave is currently controlled by signals. Design constraints at the intersection include:

1. SR-1 NB on-ramp
2. SR-1 NB off-ramp
3. One-Way traffic
4. Ord Community Commissary
5. Right-of-way encroachment



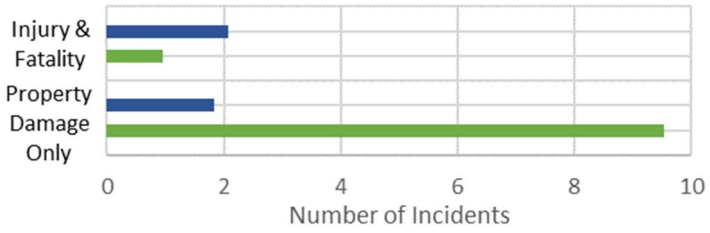
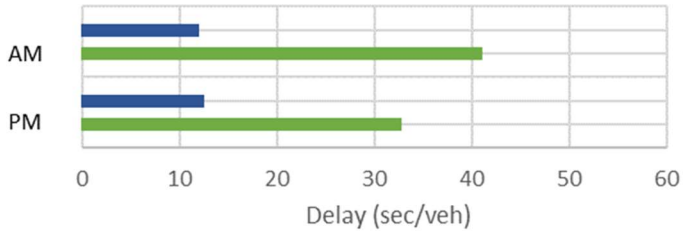
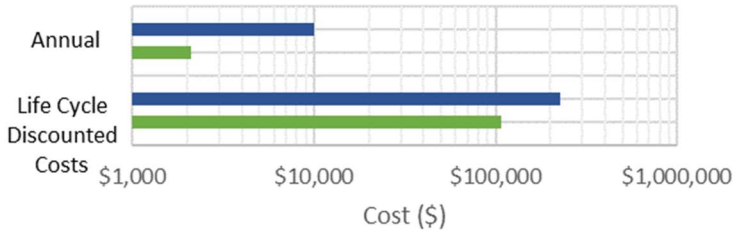
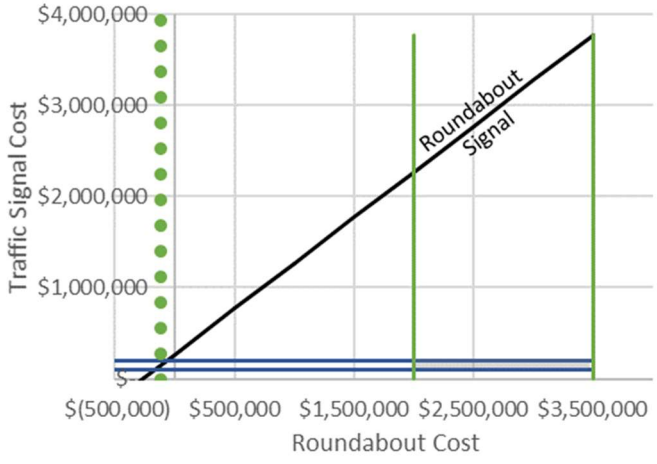

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| **INT 2.7a** | **Lightfighter Dr at First Ave** | | |
| | Urban Environment Focus | N/A | N/A |
| | Design for Pedestrians | | |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | N/A | N/A |
| | Minimize ROW Acquisition to Limit Initial Costs | X | |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for signal and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Signal Roundabout |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Signal Roundabout |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Signal Roundabout |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget.<br>RAB ICC Range<br>Signal ICC Range<br>RAB Budget<br>B/C=1<br>Estimated ICC |  |  |

## INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | |
|---|---|---|
| **Safety** | | |
| | **Existing (Signal)** | **Roundabout** |
| Annual Cost of Collisions | $ 318,030 | $ 177,065 |
| Discounted Life Cycle Cost of Collisions | $ 4,461,690 | $ 2,484,073 |
| **Delay** | | |
| | **Existing (Signal)** | **Roundabout** |
| Annual Quantity (hours) | 4,909 | 14,156 |
| Annual Cost | $ 59,202 | $ 166,524 |
| Total Discounted Life Cycle Cost | $ 1,302,454 | $ 3,663,524 |
| **O&M** | | |
| | **Existing (Signal)** | **Roundabout** |
| Annual O&M Costs | 9,220 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 129,349 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 80,324 | $ 72,718 |
| Total O&M Costs | $ 209,673 | $ 99,654 |
| **Initial Capital** | | |
| | **Existing (Signal)** | **Roundabout** |
| High Approximation | $ 200,000 | $ 3,500,000 |
| Low Approximation | $ 100,000 | $ 2,000,000 |

**Benefit-Cost Ratio Calculations**

| B/C Target | Capital Cost: Traffic Signal (a) | Capital Cost: Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Project Constraints: Added O&M Cost for Roundabout (d) | Project Constraints: Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
|---|---|---|---|---|---|---|---|
| High | $ 200,000 | $ 2,000,000 | $ 1,800,000 | | | $ 1,689,879 | NA-S |
| Low | $ 100,000 | $ 3,500,000 | $ 3,400,000 | $ (110,121) | $ (383,453) | $ 3,289,879 | NA-S |
| Roundabout Budget | $ 150,000 | $ (123,332) | $ (273,332) | | | $ (383,453) | 1.00 |

## PREFERRED INTERSECTION ALTERNATIVE

The preferred alternative based on B/C ratio for this intersection is traffic signal control.

# INTERSECTION CONTROL CONCEPT LAYOUTS

**Existing - Traffic Signal**

**Multi-Lane Roundabout**

# INTERSECTION 2.7B – LIGHTFIGHTER DRIVE AT SR-1 NORTHBOUND RAMPS

## INTERSECTION CONTROL ALTERNATIVES

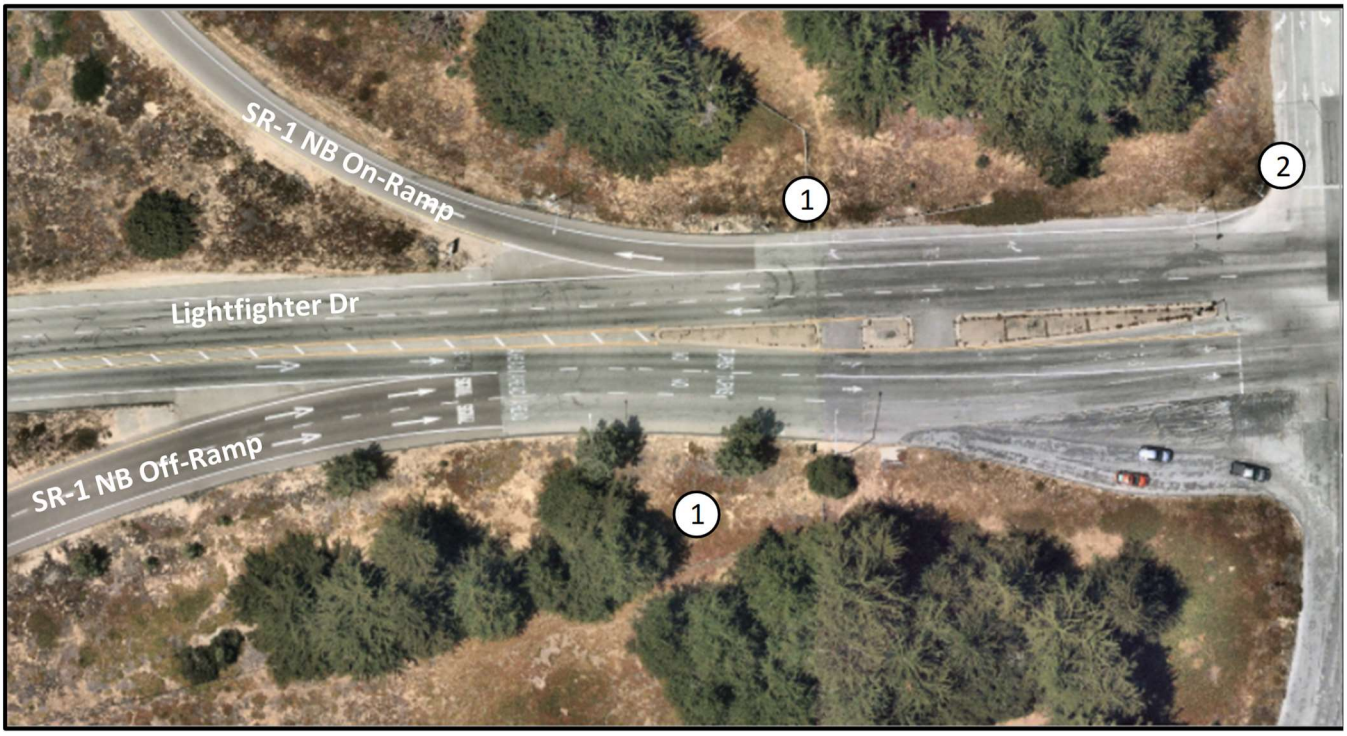
The two intersection control types analyzed include:

1. Traffic Signal
2. Multi-lane Roundabout

## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Lightfighter Dr at SR-1 Northbound Ramps is currently controlled by signals. Design constraints at the intersection include:

1. Right-of-way encroachment
2. Proximity to First Ave



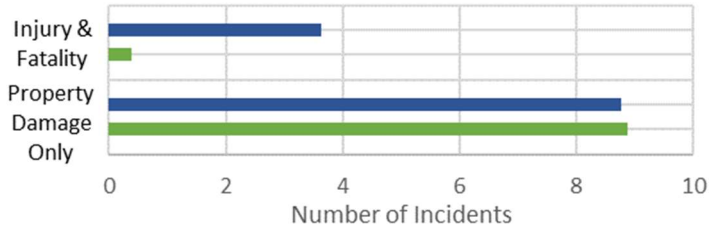
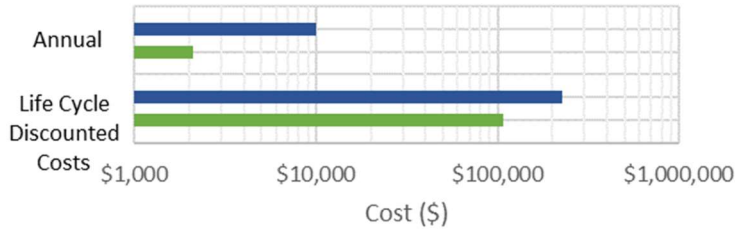
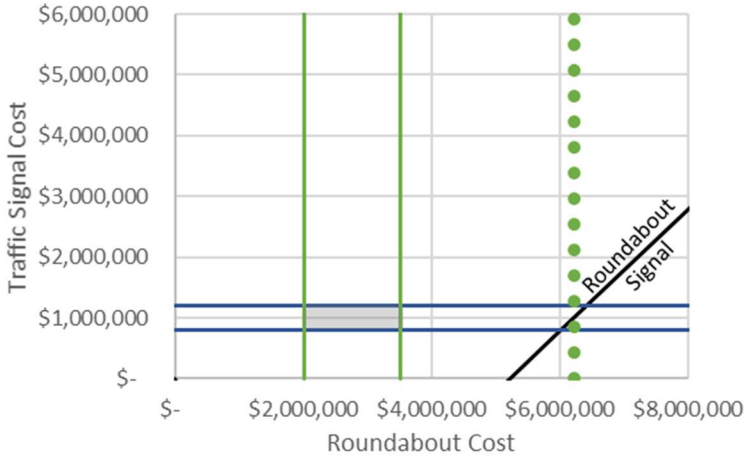

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| **INT 2.7b** | **Lightfighter Dr at SR-1 NB Ramps** | | |
| | Urban Environment Focus | N/A | N/A |
| | Design for Pedestrians | | |
| | Design for Bicyclists | | |
| | Slow Traffic Speeds to Benefit Local Businesses | N/A | N/A |
| | Minimize ROW Acquisition to Limit Initial Costs | X | |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for signal and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Signal Roundabout | |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Signal Roundabout | |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Signal Roundabout | |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget.<br>RAB ICC Range<br>Signal ICC Range<br>RAB Budget<br>B/C=1<br>Estimated ICC | |  |

# INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | | |
|---|---|---|---|
| **Safety** | | | |
| | **Existing (Ramps)** | **Signal** | **Roundabout** |
| Annual Cost of Collisions | $ 254,637 | $ 362,732 | $ 66,133 |
| Discounted Life Cycle Cost of Collisions | $ 3,572,346 | $ 5,088,830 | $ 927,785 |
| **Delay** | | | |
| | **Existing (Ramps)** | **Signal** | **Roundabout** |
| Annual Quantity (hours) | $ - | $ 8,425 | $ 4,931 |
| Annual Cost | $ - | $ 100,490 | $ 57,941 |
| Total Discounted Life Cycle Cost | $ - | $ 2,210,782 | $ 1,274,706 |
| **O&M** | | | |
| | **Existing (Ramps)** | **Signal** | **Roundabout** |
| Annual O&M Costs | $ 1,920 | $ 9,220 | $ 1,920 |
| Discounted Life Cycle O&M Costs | $ 26,936 | $ 129,349 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 54,766 | $ 66,531 | $ 56,551 |
| Total O&M Costs | $ 81,702 | $ 195,880 | $ 83,487 |
| **Initial Capital** | | | |
| | **Existing (Ramps)** | **Signal** | **Roundabout** |
| High Approximation | $100,000 | $1,200,000 | $3,500,000 |
| Low Approximation | $80,000 | $800,000 | $2,000,000 |
| **Life Cycle Benefit-Cost Ratio** | | | |
| | | **Total Benefits (B)** | |
| | **Existing (Ramps)** | **Signal** | **Roundabout** |
| Safety | $ - | $ (1,516,485) | $ 2,644,560 |
| Delay | $ - | $ (2,210,782) | $ (1,274,706) |
| Total Benefits | **$ -** | **$ (3,727,266)** | **$ 1,369,854** |
| | | **Total Costs (C)** | |
| | **Existing (Ramps)** | **Signal** | **Roundabout** |
| O&M | $ - | $ 114,178 | $ 1,785 |
| Budget | $ - | $ 910,000 | $ 2,660,000 |
| Total Costs | **$ -** | **$ 1,024,178** | **$ 2,661,785** |
| **B/C Ratio Compared to Existing** | **NA** | **-3.64** | **0.51** |

**Benefit-Cost Ratio Calculations**

| B/C Target | Capital Cost: Traffic Signal (a) | Capital Cost: Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Project Constraints: Added O&M Cost for Roundabout (d) | Project Constraints: Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
|---|---|---|---|---|---|---|---|
| High | $ 1,200,000 | $ 2,000,000 | $ 800,000 | | | $ 689,879 | 7.39 |
| Low | $ 800,000 | $ 3,500,000 | $ 2,700,000 | $ (110,121) | $ 5,097,120 | $ 2,589,879 | 1.97 |
| Roundabout Budget | $ 1,000,000 | $ 6,207,241 | $ 5,207,241 | | | $ 5,097,120 | 1.00 |

## PREFERRED INTERSECTION ALTERNATIVE

The preferred alternative based on B/C ratio for this intersection is roundabout control.

## INTERSECTION CONTROL CONCEPT LAYOUTS

**Traffic Signal**

**Multi-Lane Roundabout**

# INTERSECTION 2.8 – LIGHTFIGHTER DRIVE AT SECOND AVENUE

## INTERSECTION CONTROL ALTERNATIVES

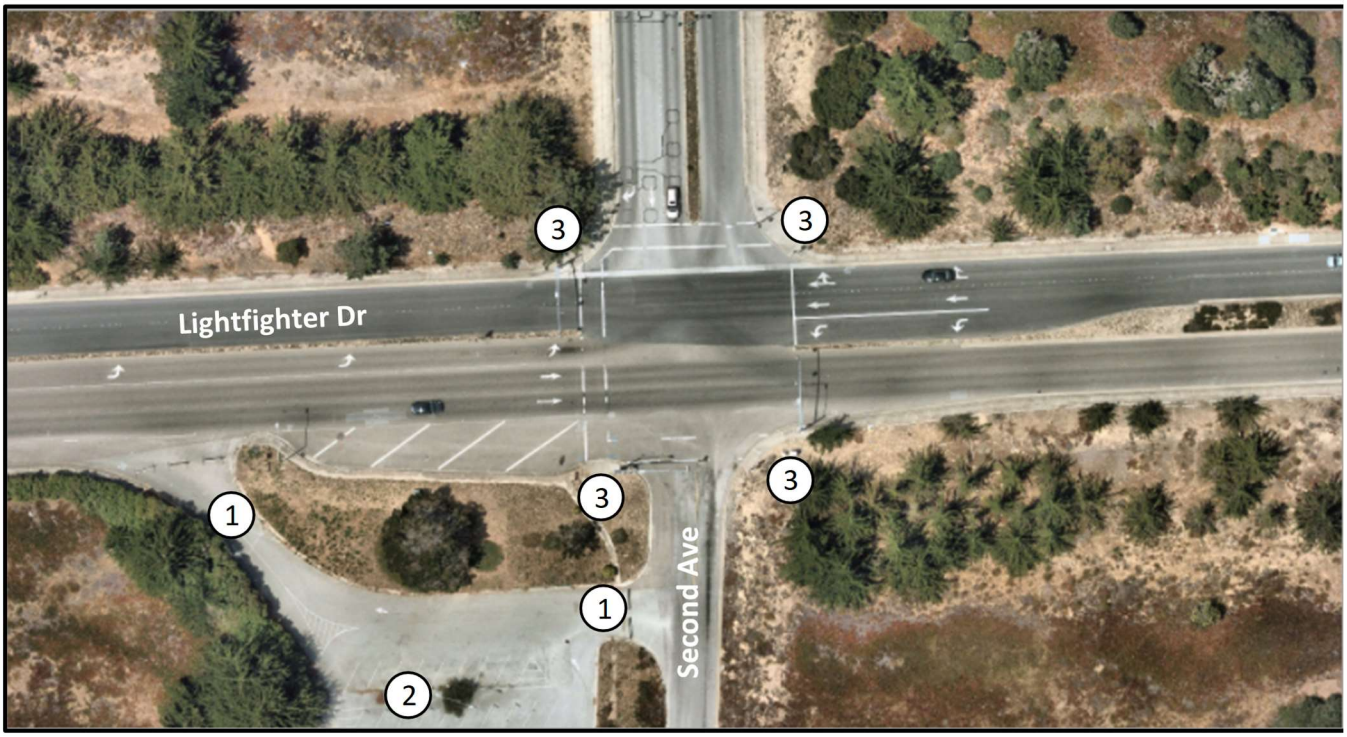
The two intersection control types analyzed include:

1. Existing Signal with optimized signal timing
2. Multi-lane Roundabout

## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Lightfighter Dr at Second Ave is currently controlled by signals. Design constraints at the intersection include:

1. Driveway
2. Parking Lot
3. Right-of-way encroachment



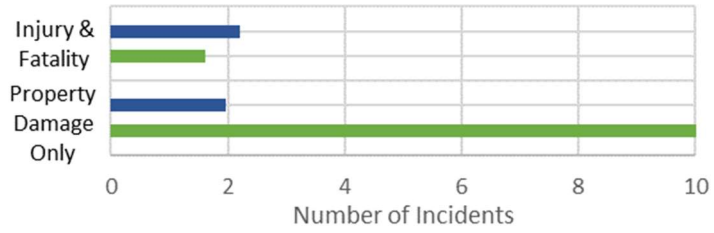
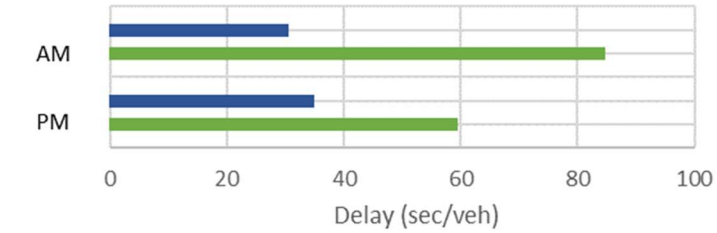
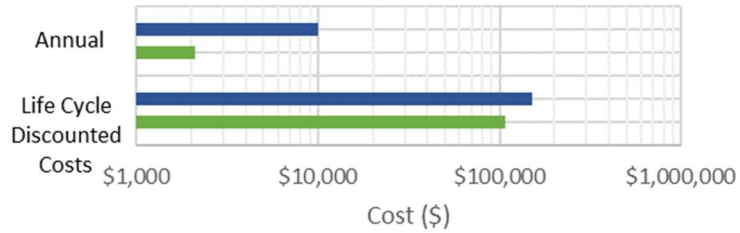
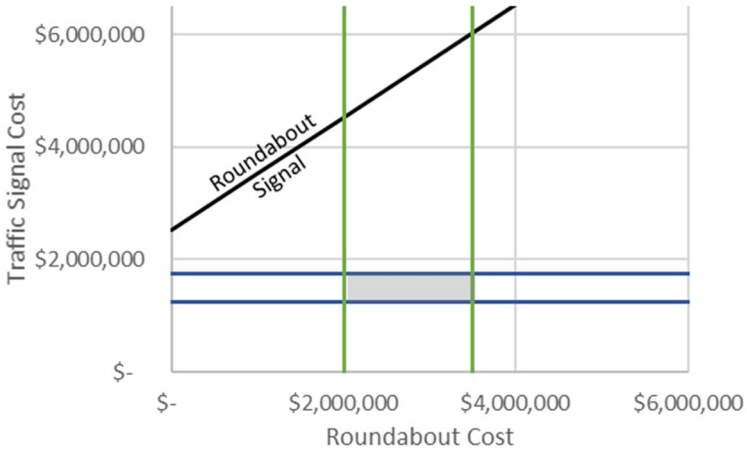

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| | **Lightfighter Dr at Second Ave** | | |
| **INT 2.8** | Urban Environment Focus | N/A | N/A |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | N/A | N/A |
| | Minimize ROW Acquisition to Limit Initial Costs | | |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for signal and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Signal Roundabout | |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Signal Roundabout | |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Signal Roundabout | |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget.<br>RAB ICC Range<br>Signal ICC Range<br>RAB Budget<br>B/C=1<br>Estimated ICC | |  |

# INTERSECTION LIFE CYCLE COST CALCULATIONS

## Performance Measure Life Cycle Cost (Net Present Value)

### Safety

| | Existing (Signal) | Signal (Add. Lanes) | Roundabout |
|---|---|---|---|
| Annual Cost of Collisions | $ 310,992 | $ 317,608 | $ 289,905 |
| Discounted Life Cycle Cost of Collisions | $ 4,362,950 | $ 4,455,774 | $ 4,067,130 |

### Delay

| | Existing (Signal) | Signal (Add. Lanes) | Roundabout |
|---|---|---|---|
| Annual Quantity (hours) | 83,624 | 14,361 | 27,037 |
| Annual Cost | $ 969,626 | $ 175,815 | $ 313,394 |
| Total Discounted Life Cycle Cost | $ 21,331,763 | $ 3,867,940 | $ 6,894,663 |

### O&M

| | Existing (Signal) | Signal (Add. Lanes) | Roundabout |
|---|---|---|---|
| Annual O&M Costs | 9,220 | 9,220 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 129,349 | $ 129,349 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 80,324 | $ 80,324 | $ 72,718 |
| Total O&M Costs | $ 209,673 | $ 209,673 | $ 99,654 |

### Initial Capital

| | Existing (Signal) | Signal (Add. Lanes) | Roundabout |
|---|---|---|---|
| High Approximation | $ 80,000 | $ 1,250,000 | $ 3,500,000 |
| Low Approximation | $ 50,000 | $ 1,750,000 | $ 2,000,000 |

### Life Cycle Benefit-Cost Ratio

**Total Benefits (B)**

| | Existing (Signal) | Signal (Add. Lanes) | Roundabout |
|---|---|---|---|
| Safety | $ - | $ (92,823) | $ 295,820 |
| Delay | $ - | $ 17,463,823 | $ 14,437,100 |
| Total Benefits | **$ -** | **$ 17,370,999** | **$ 14,732,920** |

**Total Costs (C)**

| | Existing (Signal) | Signal (Add. Lanes) | Roundabout |
|---|---|---|---|
| O&M | $ - | $ - | $ (110,019) |
| Budget | $ - | $ 1,435,000 | $ 2,685,000 |
| Total Costs | **$ -** | **$ 1,435,000** | **$ 2,574,981** |

| | | | |
|---|---|---|---|
| **B/C Ratio Compared to Existing** | **NA** | **12.11** | **5.72** |

**Benefit-Cost Ratio Calculations**

| B/C Target | Capital Cost: Traffic Signal (a) | Capital Cost: Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Project Constraints: Added O&M Cost for Roundabout (d) | Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
|---|---|---|---|---|---|---|---|
| High | $ 1,750,000 | $ 2,000,000 | $ 250,000 | | | $ 139,879 | NA-S |
| Low | $ 1,250,000 | $ 3,500,000 | $ 2,250,000 | $ (110,121) | $ (2,638,080) | $ 2,139,879 | NA-S |
| Roundabout Budget | $ 1,500,000 | $ (1,027,959) | $ (2,527,959) | | | $ (2,638,080) | 1.00 |

## PREFERRED INTERSECTION ALTERNATIVE

The preferred alternative based on B/C ratio for this intersection is mini-roundabout control.

# INTERSECTION CONTROL CONCEPT LAYOUTS

**Traffic Signal**

**Multi-Lane Roundabout**

# INTERSECTION 2.9 – MESCAL STREET AT YOSEMITE STREET

## INTERSECTION CONTROL ALTERNATIVES

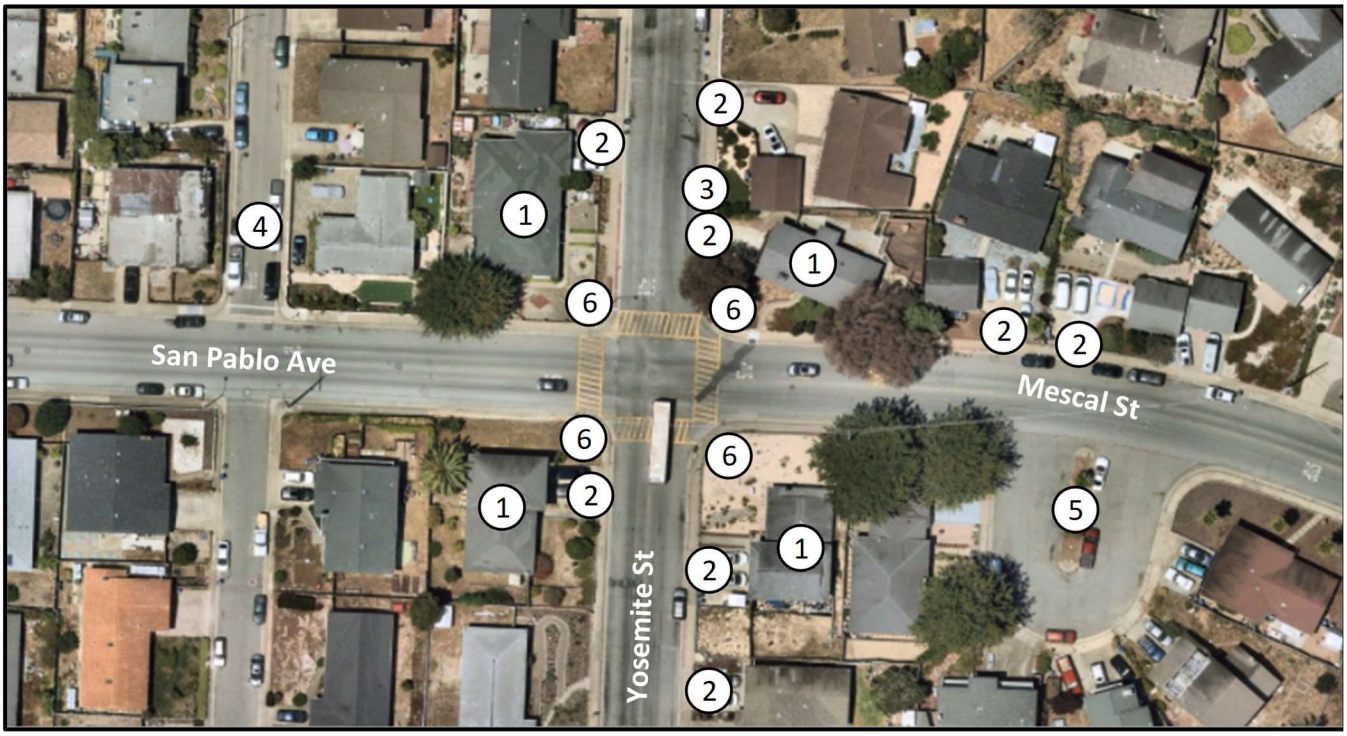
The two intersection control types analyzed include:

1. Existing All-Way Stop Control
2. Mini-Roundabout


## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Mescal St at Yosemite St is currently controlled by signals. Design constraints at the intersection include:

1. Single family residence
2. Driveway
3. Bus Stop
4. Proximity to St. Helena St
5. Proximity to Seminole Ct
6. Right-of-way encroachment



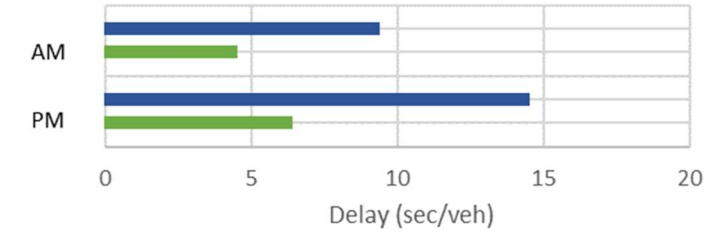
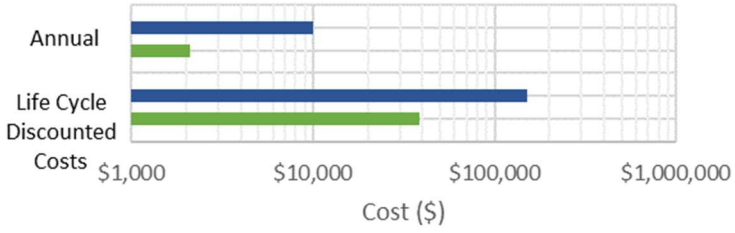
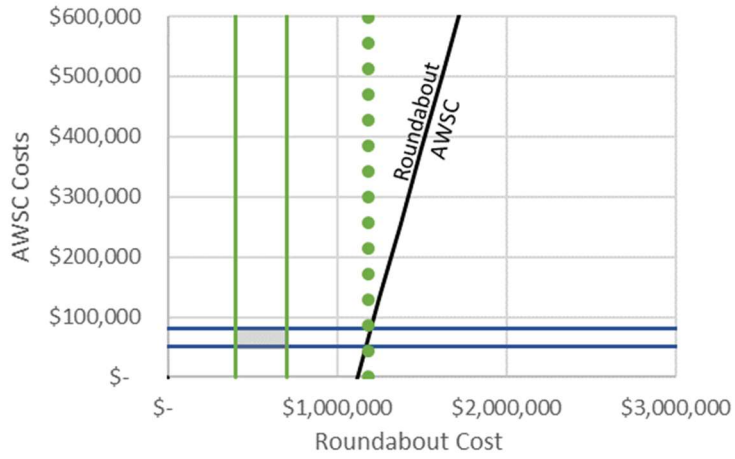

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| | **Mescal St a Yosemite St** | | |
| **INT 2.9** | Urban Environment Focus | X | X |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | N/A | N/A |
| | Minimize ROW Acquisition to Limit Initial Costs | X | X |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for stop control and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents. |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection. |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget. |  |  |

## INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | |
|---|---|---|
| **Safety** | | |
| | **Existing (AWSC)** | **Roundabout** |
| Annual Cost of Collisions | $ 128,664 | $ 58,394 |
| Discounted Life Cycle Cost of Collisions | $ 1,805,047 | $ 819,217 |
| **Delay** | | |
| | **Existing (AWSC)** | **Roundabout** |
| Annual Quantity (hours) | 1,614 | 710 |
| Annual Cost | $ 21,563 | $ 9,480 |
| Total Discounted Life Cycle Cost | $ 474,394 | $ 208,562 |
| **O&M** | | |
| | **Existing (AWSC)** | **Roundabout** |
| Annual O&M Costs | 520 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 7,295 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 10,750 | $ 8,418 |
| Total O&M Costs | $ 18,046 | $ 35,354 |
| **Initial Capital** | | |
| | **Existing (AWSC)** | **Roundabout** |
| High Approximation | $ 200,000 | $ 3,500,000 |
| Low Approximation | $ 100,000 | $ 2,000,000 |

**Benefit-Cost Ratio Calculations**

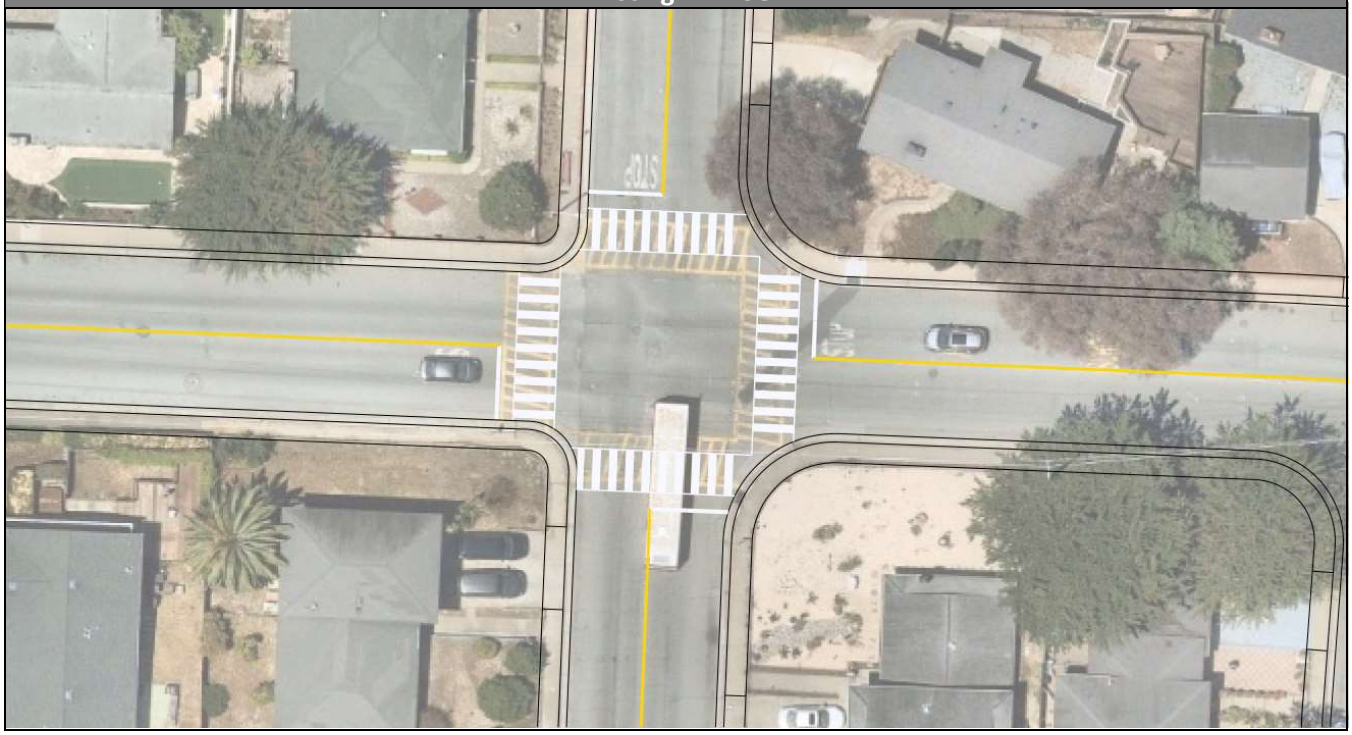
| | Capital Cost | | | Project Constraints | | | |
|---|---|---|---|---|---|---|---|
| B/C Target | AWSC (a) | Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Added O&M Cost for Roundabout (d) | Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
| High | $ 80,000 | $ 400,000 | $ 320,000 | | | $ 215,254 | 4.71 |
| Low | $ 50,000 | $ 700,000 | $ 650,000 | $ (104,746) | $ 1,013,653 | $ 545,254 | 1.86 |
| Roundabout Budget | $ 65,000 | $ 1,183,399 | $ 1,118,399 | | | $ 1,013,653 | 1.00 |

## PREFERRED INTERSECTION ALTERNATIVE

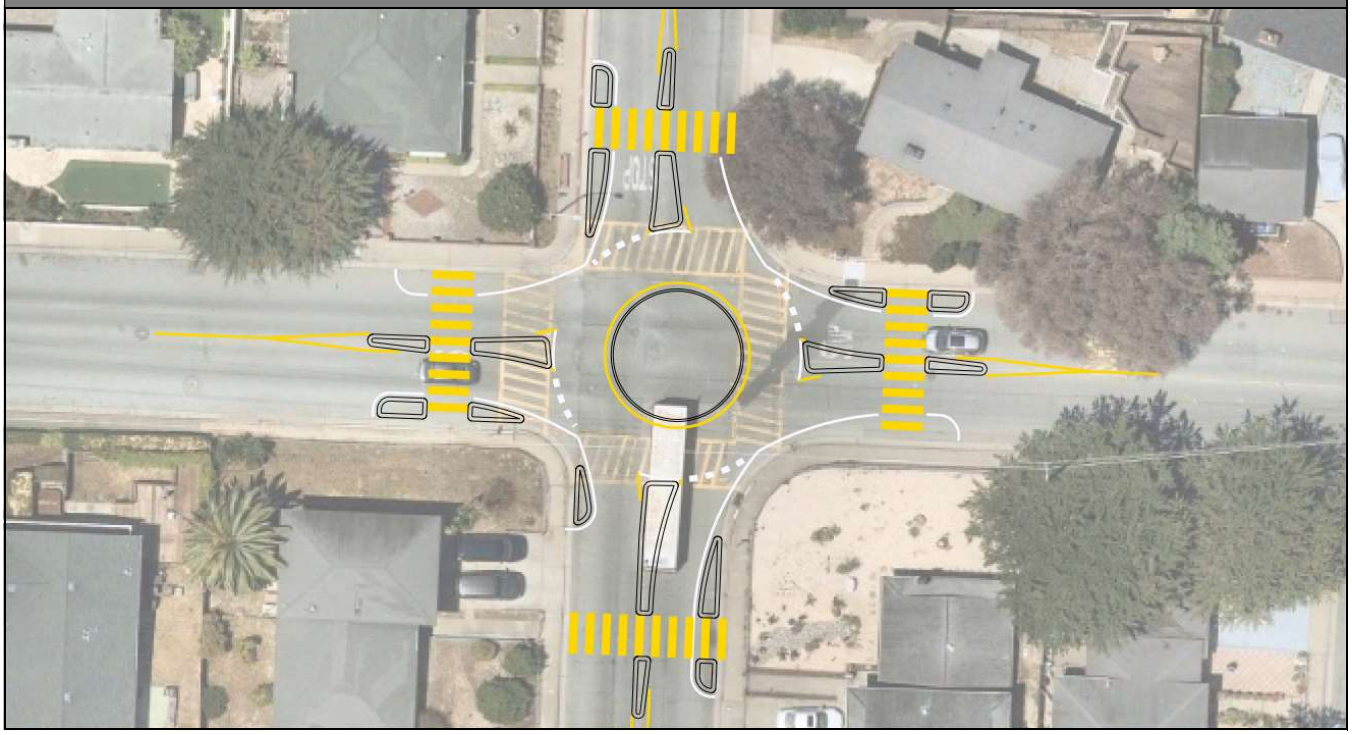
The preferred alternative based on B/C ratio for this intersection is mini-roundabout control.

## INTERSECTION CONTROL CONCEPT LAYOUTS

**Existing - AWSC**



**Mini-Roundabout**



# INTERSECTION 2.10 – SAN PABLO AVENUE AT GENERAL JIM MOORE BOULEVARD

## INTERSECTION CONTROL ALTERNATIVES

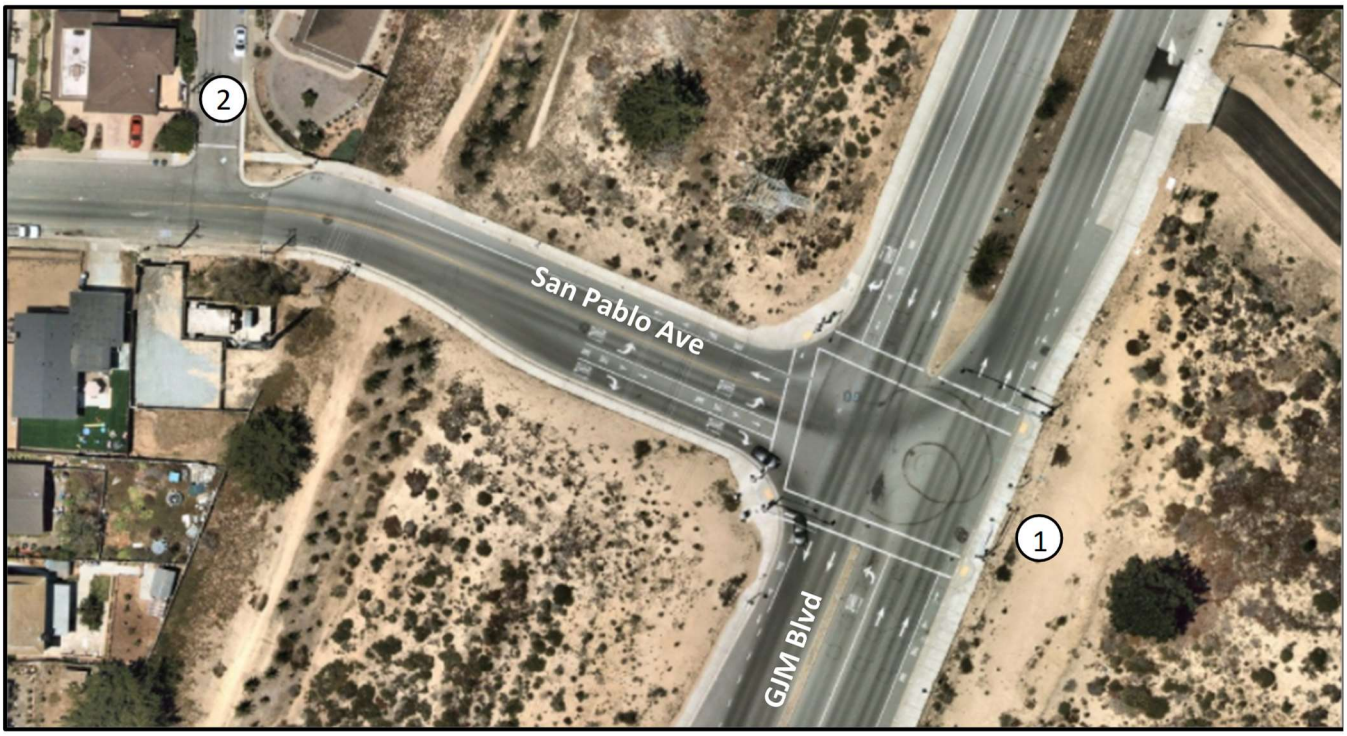
The two intersection control types analyzed include:

1. Existing Signal with Optimized Signal Timing
2. Multi-lane Roundabout

## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

San Pablo Ave at General Jim Moore Blvd is currently controlled by signals. Design constraints at the intersection include:

1. Steep uphill grade
2. Proximity to Mescal St



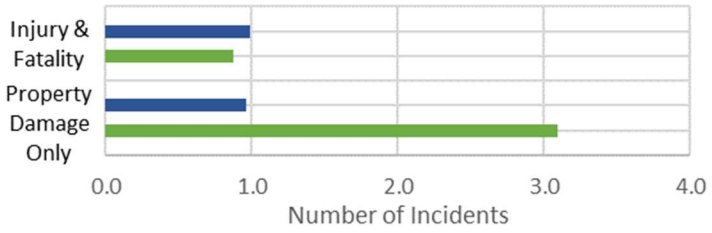
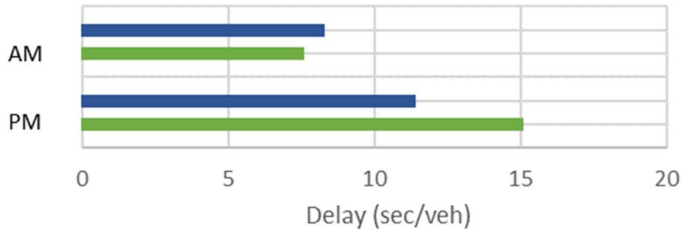
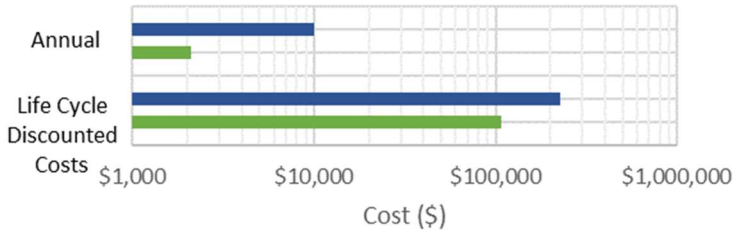
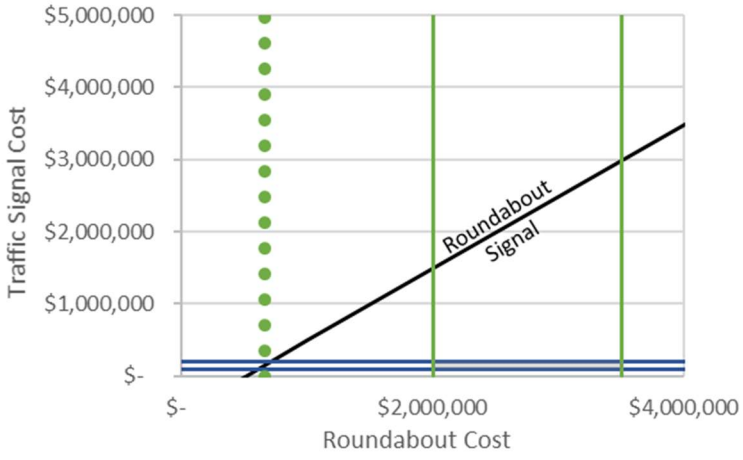

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| | **San Pable Ave at GJM Blvd** | | |
| **INT 2.10** | Urban Environment Focus | N/A | N/A |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | N/A | N/A |
| | Minimize ROW Acquisition to Limit Initial Costs | | |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for signal and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Signal Roundabout |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Signal Roundabout |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Signal Roundabout |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget.<br>RAB ICC Range<br>Signal ICC Range<br>RAB Budget<br>B/C=1<br>Estimated ICC |  |  |

## INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | |
|---|---|---|
| **Safety** | | |
| | **Existing (Signal)** | **Roundabout** |
| Annual Cost of Collisions | $ 146,104 | $ 137,659 |
| Discounted Life Cycle Cost of Collisions | $ 2,049,720 | $ 1,931,243 |
| **Delay** | | |
| | **Existing (Signal)** | **Roundabout** |
| Annual Quantity (hours) | 3,395 | 3,739 |
| Annual Cost | $ 43,104 | $ 46,583 |
| Total Discounted Life Cycle Cost | $ 948,293 | $ 1,024,826 |
| **O&M** | | |
| | **Existing (Signal)** | **Roundabout** |
| Annual O&M Costs | 9,220 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 129,349 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 80,426 | $ 72,718 |
| Total O&M Costs | $ 209,774 | $ 99,654 |
| **Initial Capital** | | |
| | **Existing (Signal)** | **Roundabout** |
| High Approximation | $ 200,000 | $ 3,500,000 |
| Low Approximation | $ 100,000 | $ 2,000,000 |

**Benefit-Cost Ratio Calculations**

| | Capital Cost | | | Project Constraints | | | |
|---|---|---|---|---|---|---|---|
| B/C Target | Traffic Signal (a) | Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Added O&M Cost for Roundabout (d) | Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
| High | $ 200,000 | $ 2,000,000 | $ 1,800,000 | | | $ 1,689,879 | 0.24 |
| Low | $ 100,000 | $ 3,500,000 | $ 3,400,000 | $ (110,121) | $ 398,580 | $ 3,289,879 | 0.12 |
| Roundabout Budget | $ 150,000 | $ 658,701 | $ 508,701 | | | $ 398,580 | 1.00 |

## PREFERRED INTERSECTION ALTERNATIVE

The preferred alternative based on B/C ratio for this intersection is existing traffic signal control with optimized signal timing.

INTERSECTION CONTROL CONCEPT LAYOUTS

**Existing - Traffic Signal**

**Multi-Lane Roundabout**

# INTERSECTION 2.11 – HILBY AVENUE AT GENERAL JIM MOORE BOULEVARD

## INTERSECTION CONTROL ALTERNATIVES

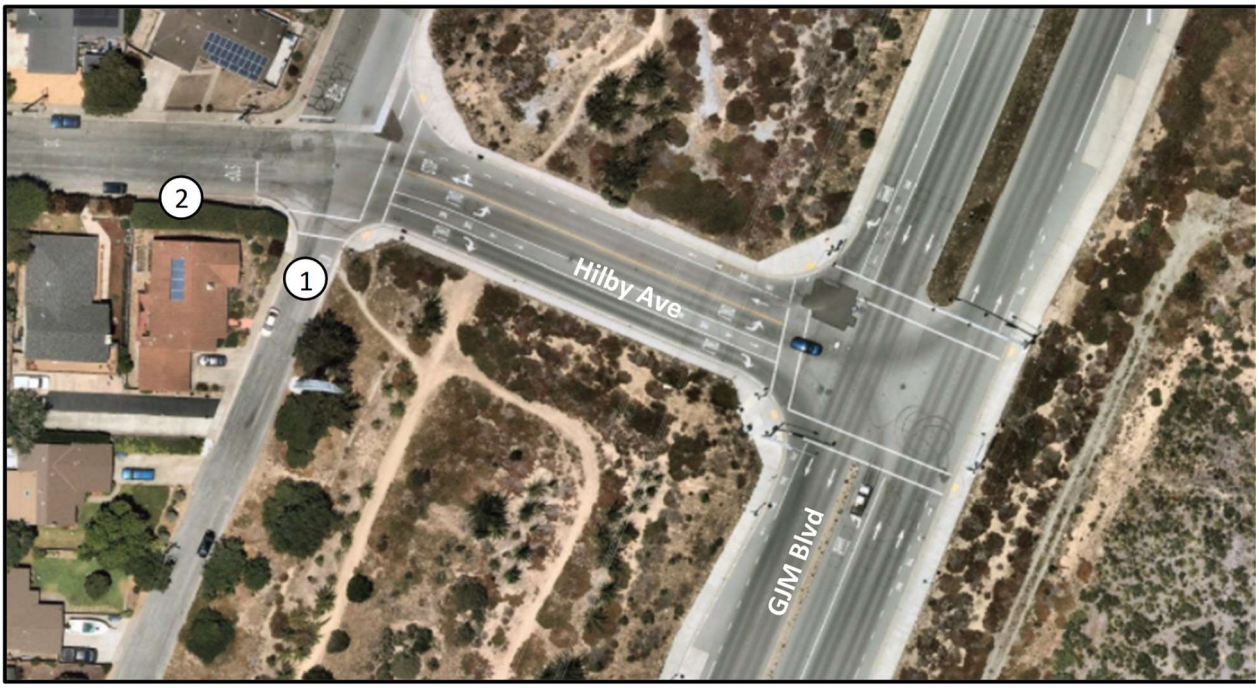
The two intersection control types analyzed include:

1. Existing Signal with Optimized Signal Timing
2. Multi-lane Roundabout

## EXISTING CONDITIONS AND PROJECT CONSTRAINTS

Hilby Ave at General Jim Moore Blvd is currently controlled by signals. Design constraints at the intersection include:

1. Proximity to Mescal St
2. Bus stop



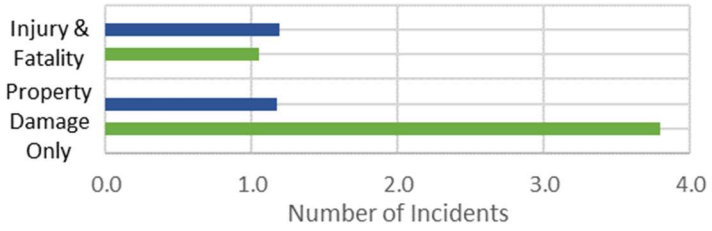
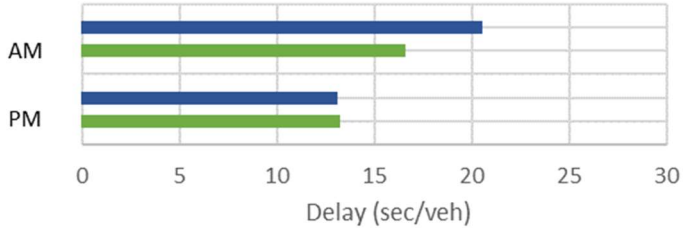
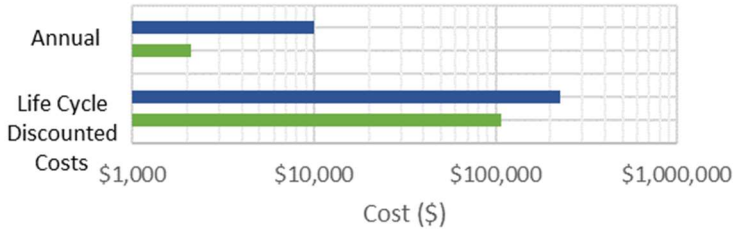
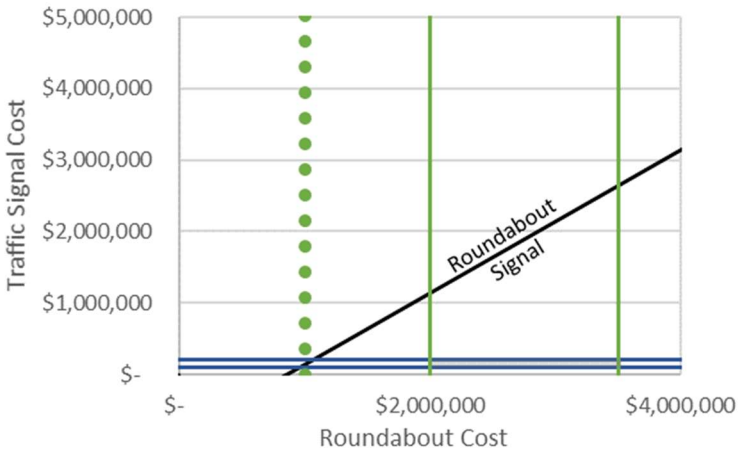

## QUALITATIVE ASSESSMENT

The following table summarizes qualitative factors that were considered in the design of each alternative.

| Qualitative Assessment | | Existing Control Feasibility | Roundabout Control Feasibility |
|---|---|---|---|
| **INT 2.11** | **Hilby Ave at GJM Blvd** | | |
| | Urban Environment Focus | N/A | N/A |
| | Design for Pedestrians | X | X |
| | Design for Bicyclists | X | X |
| | Slow Traffic Speeds to Benefit Local Businesses | N/A | N/A |
| | Minimize ROW Acquisition to Limit Initial Costs | | |
| | Minimize Left-Turn Movements to Improve Safety | | X |

## PERFORMANCE MEASURE SUMMARY

Four performance measures were evaluated at each intersection for signal and roundabout control. The table below summarizes the performance measures considered in this study.

| Performance Measure | Preferred Alt. | Visual Representation |
|---|---|---|
| **Benefits** | | |
| **Safety**<br>Safety measures the societal cost associated with the predicted number and severity and collisions. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters. Injury and Fatality crashes are on average 700-1,000 times more expense than Property Damage Only accidents.<br>Signal Roundabout |  |  |
| **Delay**<br>Delay measures the societal cost associated with the number of person-hours delayed in traffic. Overall societal costs are based on Caltrans Vehicle Operation Cost Parameters.<br>Signal Roundabout |  |  |
| **Costs** | | |
| **Operations and Maintenance**<br>O&M measures the common annualized costs associated with operating and maintaining the intersection.<br>Signal Roundabout |  |  |
| **Initial Capital Cost**<br>Measures the Initial Capital Costs (ICC) needed to plan, design, obtain project approvals, acquire right-of-way, and construct the intersection control. This graph (right) depicts the estimated range of Initial capital costs for the signal and roundabout alternatives as well as the roundabout budget.<br>RAB ICC Range<br>Signal ICC Range<br>RAB Budget<br>B/C=1<br>Estimated ICC |  |  |

## INTERSECTION LIFE CYCLE COST CALCULATIONS

| Performance Measure Life Cycle Cost (Net Present Value) | | |
|---|---|---|
| **Safety** | | |
| | **Existing (Signal)** | **Roundabout** |
| Annual Cost of Collisions | $ 178,403 | $ 168,464 |
| Discounted Life Cycle Cost of Collisions | $ 2,502,842 | $ 2,363,402 |
| **Delay** | | |
| | **Existing (Signal)** | **Roundabout** |
| Annual Quantity (hours) | 5,399 | 4,652 |
| Annual Cost | $ 65,595 | $ 56,189 |
| Total Discounted Life Cycle Cost | $ 1,443,091 | $ 1,236,162 |
| **O&M** | | |
| | **Existing (Signal)** | **Roundabout** |
| Annual O&M Costs | 9,220 | 1,920 |
| Discounted Life Cycle O&M Costs | $ 129,349 | $ 26,936 |
| Discounted Pavement Rehab Costs | $ 80,426 | $ 72,718 |
| Total O&M Costs | $ 209,774 | $ 99,654 |
| **Initial Capital** | | |
| | **Existing (Signal)** | **Roundabout** |
| High Approximation | $ 200,000 | $ 3,500,000 |
| Low Approximation | $ 100,000 | $ 2,000,000 |

**Benefit-Cost Ratio Calculations**

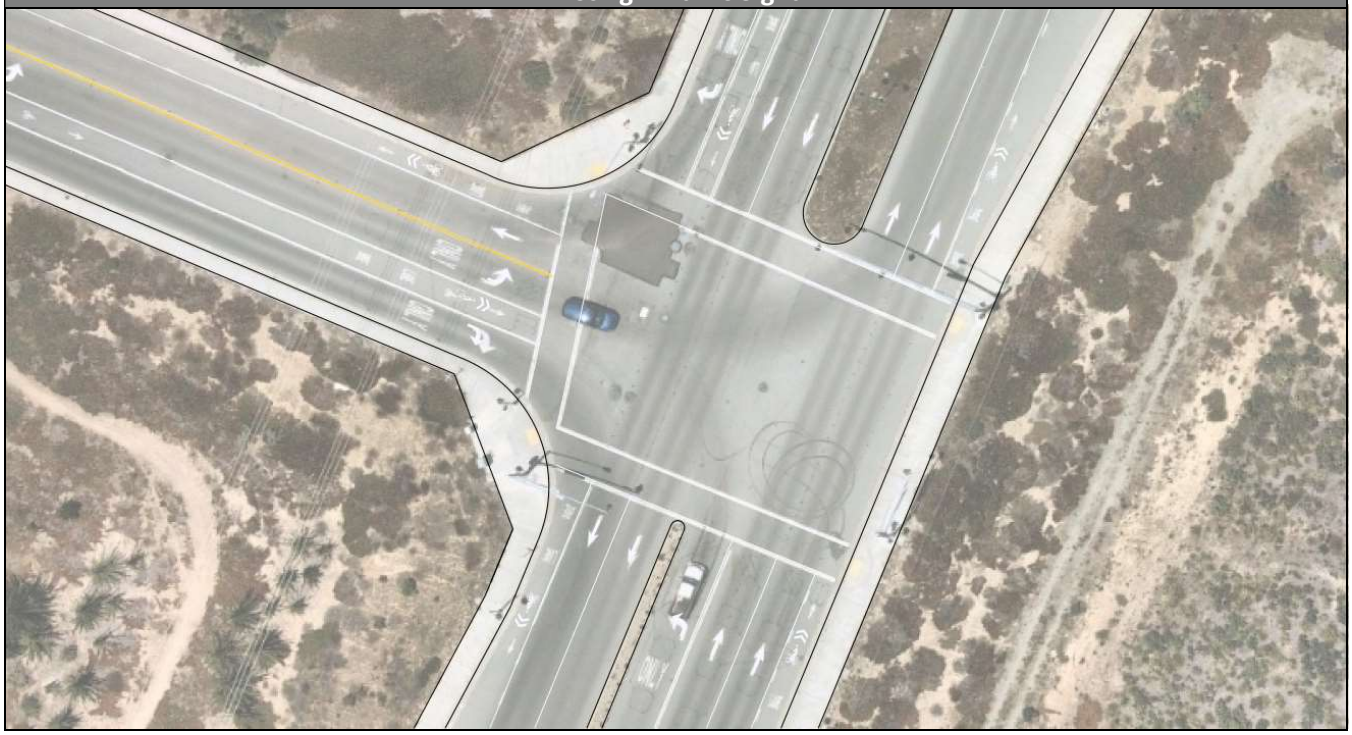
| | Capital Cost | | | Project Constraints | | | |
|---|---|---|---|---|---|---|---|
| B/C Target | Traffic Signal (a) | Roundabout (b) | Added Cost for Roundabout (c) = (b - a) | Added O&M Cost for Roundabout (d) | Total Benefits (e) | Total Costs (f) = (c + d) | B/C (g) = (e / f) |
| High | $ 200,000 | $ 2,000,000 | $ 1,800,000 | | | $ 1,689,879 | 0.44 |
| Low | $ 100,000 | $ 3,500,000 | $ 3,400,000 | $ (110,121) | $ 746,843 | $ 3,289,879 | 0.23 |
| Roundabout Budget | $ 150,000 | $ 1,006,964 | $ 856,964 | | | $ 746,843 | 1.00 |

## INTERSECTION CONTROL CONCEPT LAYOUTS

The preferred alternative based on B/C ratio for this intersection is existing traffic signal control with optimized signal timing.

# INTERSECTION CONTROL CONCEPT LAYOUTS

**Existing - Traffic Signal**



**Multi-Lane Roundabout**

# Appendix E

## INT-1.3: Broadway Avenue at General Jim Moore Boulevard

3/18/2020

### Scenario 1 - Existing Year (2019)

| AM 2019 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 64 | 227 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 926 | 305 | 0 | 195 | 0 | 178 |
| PHF | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 3 | | | | 0 | | | | 0 | | | | 2 | | | |
| Bicycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| PM 2019 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 189 | 862 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 186 | 124 | 0 | 169 | 0 | 59 |
| PHF | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 0 | | | | 0 | | | | 2 | | | | 1 | | | |
| Bicycles | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

*NOTE: Minimum PHF used in operations analysis is =0.70*

### Scenario 2 - Design Year (2030)

| AM 2030 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 69 | 592 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1224 | 327 | 0 | 209 | 0 | 191 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 3 | | | | 0 | | | | 0 | | | | 2 | | | |
| Bicycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| PM 2030 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 202 | 924 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 957 | 133 | 0 | 181 | 0 | 63 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 0 | | | | 0 | | | | 2 | | | | 1 | | | |
| Bicycles | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

*Source:*

### Scenario 3 - Horizon Year (2040)

| AM 2040 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 73 | 956 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1522 | 349 | 0 | 223 | 0 | 203 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 3 | | | | 0 | | | | 0 | | | | 2 | | | |
| Bicycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| PM 2040 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 216 | 986 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1729 | 142 | 0 | 193 | 0 | 67 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 0 | | | | 0 | | | | 2 | | | | 1 | | | |
| Bicycles | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

Prepared by National Data & Surveying Services

# General Jim Moore Blvd & Broadway Ave

## Peak Hour Turning Movement Count

**ID:** 19-08614-1.3
**City:** Seaside

**Day:** Tuesday
**Date:** 12/03/2019

| PEAK HOURS | COUNT PERIODS |
|---|---|
| 07:30 AM - 08:30 AM | 07:00 AM - 09:00 AM |
| NONE | NONE |
| 04:30 PM - 05:30 PM | 04:00 PM - 06:00 PM |

### General Jim Moore Blvd — SOUTHBOUND

| | | | | | | |
|---|---|---|---|---|---|---|
| AM | 305 | 926 | 0 | 0 | 422 | AM |
| NOON | 0 | 0 | 0 | 0 | 0 | NOON |
| PM | 124 | 186 | 0 | 0 | 1031 | PM |

### Broadway Ave — EASTBOUND

| AM | NOON | PM | |
|---|---|---|---|
| 369 | 0 | 313 | |
| 0 | 0 | 0 | 0 |
| 195 | 0 | 169 | 2 |
| 0 | 0 | 0 | 0 |
| 178 | 0 | 59 | 1 |

### WESTBOUND — Broadway Ave

| PM | NOON | AM | |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | |

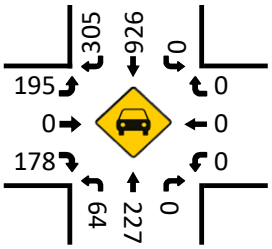
### General Jim Moore Blvd — NORTHBOUND

| | | | | | | |
|---|---|---|---|---|---|---|
| PM | 245 | 0 | 189 | 862 | 0 | PM |
| NOON | 0 | 0 | 0 | 0 | 0 | NOON |
| AM | 1104 | 0 | 64 | 227 | 0 | AM |

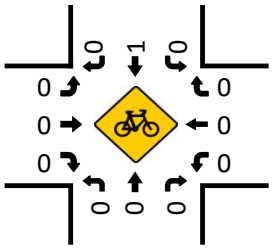
| | | | | |
|---|---|---|---|---|
| | 1 | 2 | 0 | 0 |
| | 0 | 1 | 2 | 0 |

| CONTROL | | | |
|---|---|---|---|
| Signalized | | | |
| TEV | 1895 | 0 | 1589 |
| | AM | NOON | PM |
| PHF | 0.94 | | 0.97 |

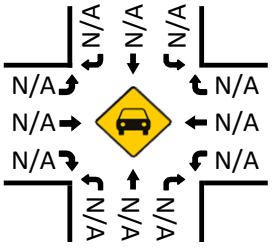
### Total Vehicles (AM)



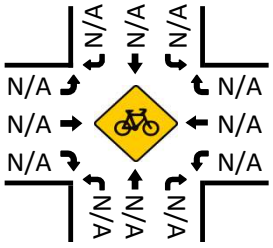

### Bikes (AM)



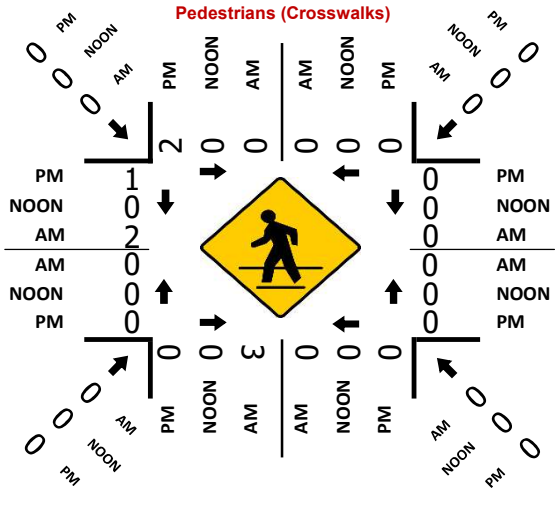

### Total Vehicles (NOON)



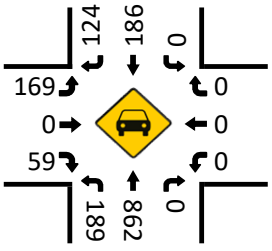

### Bikes (NOON)



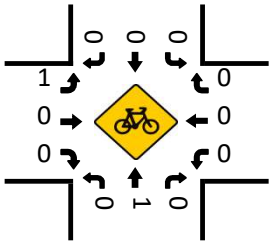

### Pedestrians (Crosswalks)




### Total Vehicles (PM)




### Bikes (PM)



## INT-1.6: Broadway Avenue at Fremont Boulevard

3/10/2020

### Scenario 1 - Existing Year (2019)

| AM 2019 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 7 | 56 | 346 | 79 | 0 | 208 | 431 | 76 | 4 | 59 | 438 | 76 | 0 | 69 | 198 | 26 |
| PHF | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 8 | | | | 13 | | | | 4 | | | | 3 | | | |
| Bicycles | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 |

| PM 2019 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 3 | 61 | 720 | 158 | 0 | 183 | 208 | 114 | 6 | 93 | 504 | 80 | 0 | 200 | 376 | 91 |
| PHF | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 14 | | | | 15 | | | | 8 | | | | 8 | | | |
| Bicycles | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 2 |

*NOTE: Minimum PHF used in operations analysis is =0.70*

### Scenario 2 - Design Year (2030)

| AM 2030 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 7 | 58 | 359 | 82 | 0 | 223 | 462 | 81 | 4 | 59 | 438 | 76 | 0 | 74 | 212 | 28 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 8 | | | | 13 | | | | 4 | | | | 3 | | | |
| Bicycles | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 |

| PM 2030 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 3 | 63 | 747 | 164 | 0 | 196 | 223 | 122 | 6 | 93 | 504 | 80 | 0 | 214 | 403 | 97 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 14 | | | | 15 | | | | 8 | | | | 8 | | | |
| Bicycles | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 2 |

*Source:*

### Scenario 3 - Horizon Year (2040)

| AM 2040 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 8 | 60 | 372 | 85 | 0 | 238 | 493 | 87 | 4 | 59 | 438 | 76 | 0 | 79 | 226 | 30 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 8 | | | | 13 | | | | 4 | | | | 3 | | | |
| Bicycles | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 |

| PM 2040 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 3 | 66 | 774 | 170 | 0 | 209 | 238 | 130 | 6 | 93 | 504 | 80 | 0 | 229 | 430 | 104 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 14 | | | | 15 | | | | 8 | | | | 8 | | | |
| Bicycles | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 2 |

Prepared by National Data & Surveying Services

# Fremont Blvd & Broadway Ave

## Peak Hour Turning Movement Count

**ID:** 19-08614-1.6
**City:** Seaside

**Day:** Tuesday
**Date:** 12/03/2019

| PEAK HOURS | COUNT PERIODS |
|---|---|
| 07:30 AM - 08:30 AM | 07:00 AM - 09:00 AM |
| NONE | NONE |
| 04:30 PM - 05:30 PM | 04:00 PM - 06:00 PM |

### Fremont Blvd — SOUTHBOUND

| | | | | | | |
|---|---|---|---|---|---|---|
| AM | 76 | 438 | 59 | 4 | 495 | AM |
| NOON | 0 | 0 | 0 | 0 | 0 | NOON |
| PM | 80 | 504 | 93 | 6 | 1040 | PM |
| | 1 | 2 | 1 | 0 | | |

### Broadway Ave — EASTBOUND

| AM | NOON | PM | |
|---|---|---|---|
| 563 | 0 | 349 | |
| 0 | 0 | 0 | 0 |
| 69 | 0 | 200 | 1 |
| 198 | 0 | 376 | 1.5 |
| 26 | 0 | 91 | 0.5 |
| AM | NOON | PM | |

### CONTROL

Signalized

| | | | |
|---|---|---|---|
| TEV | 2073 | 0 | 2797 |
| | AM | NOON | PM |
| PHF | 0.93 | | 0.99 |

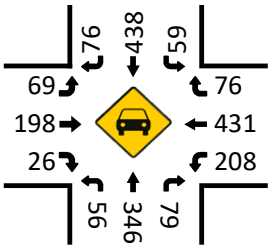
### Broadway Ave — WESTBOUND

| PM | NOON | AM | |
|---|---|---|---|
| 114 | 0 | 76 | 1 |
| 208 | 0 | 431 | 1 |
| 183 | 0 | 208 | 1 |
| 0 | 0 | 0 | 0 |
| 627 | 0 | 336 | |
| PM | NOON | AM | |

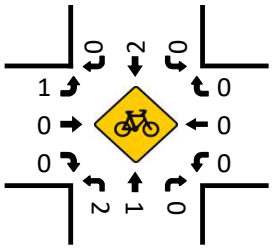
| | | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 1 | | |
| PM | 781 | 3 | 61 | 720 | 158 | PM |
| NOON | 0 | 0 | 0 | 0 | 0 | NOON |
| AM | 679 | 7 | 56 | 346 | 79 | AM |

### Fremont Blvd — NORTHBOUND

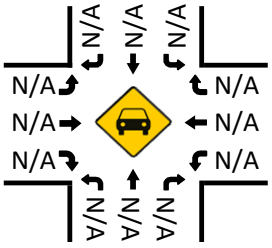
### Total Vehicles (AM)



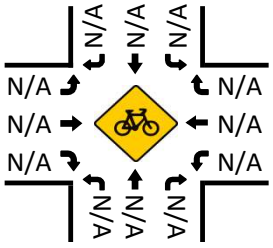

### Bikes (AM)



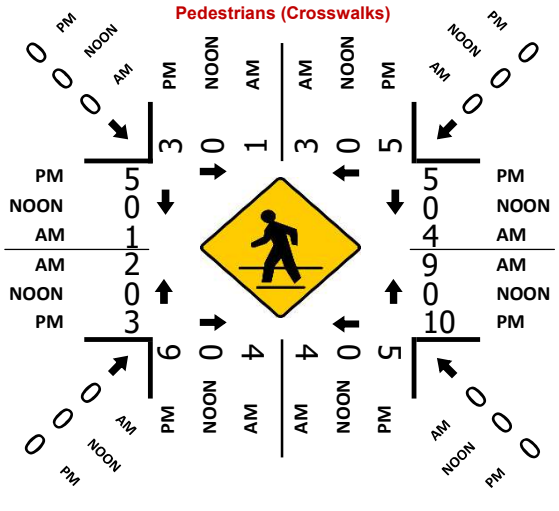

### Total Vehicles (Noon)



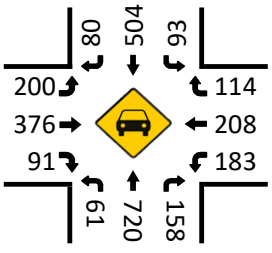

### Bikes (NOON)



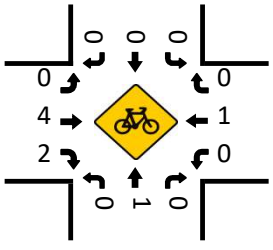

### Pedestrians (Crosswalks)




### Total Vehicles (PM)




### Bikes (PM)



## INT-2.4: Broadway Avenue at Noche Buena Street

3/9/2020

### Scenario 1 - Existing Year (2019)

| AM 2019 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 39 | 147 | 95 | 0 | 89 | 513 | 102 | 0 | 63 | 164 | 115 | 0 | 45 | 292 | 38 |
| PHF | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 1 | | | | 3 | | | | 9 | | | | 5 | | | |
| Bicycles | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| PM 2019 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 31 | 153 | 53 | 0 | 48 | 329 | 81 | 0 | 60 | 150 | 93 | 0 | 87 | 398 | 57 |
| PHF | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 4 | | | | 3 | | | | 10 | | | | 9 | | | |
| Bicycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 |

*NOTE: Minimum PHF used in operations analysis is =0.70*

### Scenario 2 - Design Year (2030)

| AM 2030 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 39 | 147 | 95 | 0 | 95 | 550 | 109 | 0 | 63 | 164 | 115 | 0 | 48 | 313 | 41 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 1 | | | | 3 | | | | 9 | | | | 5 | | | |
| Bicycles | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| PM 2030 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 31 | 153 | 53 | 0 | 51 | 352 | 87 | 0 | 60 | 150 | 93 | 0 | 93 | 426 | 61 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 4 | | | | 3 | | | | 10 | | | | 9 | | | |
| Bicycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 |

*Source:*

### Scenario 3 - Horizon Year (2040)

| AM 2040 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 39 | 147 | 95 | 0 | 102 | 586 | 117 | 0 | 63 | 164 | 115 | 0 | 51 | 334 | 43 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 1 | | | | 3 | | | | 9 | | | | 5 | | | |
| Bicycles | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| PM 2040 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 31 | 153 | 53 | 0 | 55 | 376 | 93 | 0 | 60 | 150 | 93 | 0 | 99 | 455 | 65 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 4 | | | | 3 | | | | 10 | | | | 9 | | | |
| Bicycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 |

Prepared by National Data & Surveying Services

# Noche Buena St & Broadway Ave

## Peak Hour Turning Movement Count

**ID:** 19-08614-2.4
**City:** Seaside

**Day:** Tuesday
**Date:** 12/03/2019

**PEAK HOURS**

AM: 07:30 AM - 08:30 AM
NOON: NONE
PM: 04:15 PM - 05:15 PM

**COUNT PERIODS**

AM: 07:00 AM - 09:00 AM
NOON: NONE
PM: 04:00 PM - 06:00 PM

### Noche Buena St — SOUTHBOUND

| | | | | | | |
|---|---|---|---|---|---|---|
| AM | 115 | 164 | 63 | 0 | 294 | AM |
| NOON | 0 | 0 | 0 | 0 | 0 | NOON |
| PM | 93 | 150 | 60 | 0 | 321 | PM |

### Broadway Ave — EASTBOUND

| AM | NOON | PM | | |
|---|---|---|---|---|
| 667 | 0 | 453 | ⇦ | |
| 0 | 0 | 0 | ↶ | 0 |
| 45 | 0 | 87 | ↱ | 1 |
| 292 | 0 | 398 | → | 2 |
| 38 | 0 | 57 | ↳ | 0 |
| AM | NOON | PM | | |

### Broadway Ave — WESTBOUND

| PM | NOON | AM | | |
|---|---|---|---|---|
| 81 | 0 | 102 | ↰ | 0 |
| 329 | 0 | 513 | ← | 2 |
| 48 | 0 | 89 | ↰ | 1 |
| 0 | 0 | 0 | ↶ | 0 |
| 511 | 0 | 450 | ⇨ | |
| PM | NOON | AM | | |

### Noche Buena St — NORTHBOUND

| | | | | | | |
|---|---|---|---|---|---|---|
| PM | 255 | 0 | 31 | 153 | 53 | PM |
| NOON | 0 | 0 | 0 | 0 | 0 | NOON |
| AM | 291 | 0 | 39 | 147 | 95 | AM |

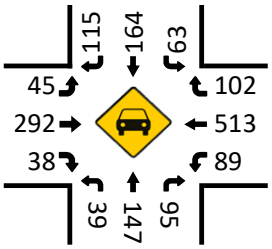
| | | | | |
|---|---|---|---|---|
| ⇩ | 0 | 0 | 1 | 0 |
| | ↶ | ↰ | ↑ | ↱ |

### CONTROL

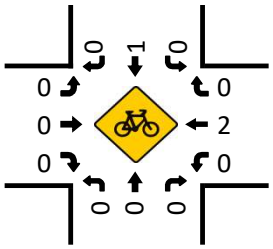
Signalized

| | | | |
|---|---|---|---|
| TEV | 1702 | 0 | 1540 |
| | AM | NOON | PM |
| PHF | 0.81 | | 0.96 |

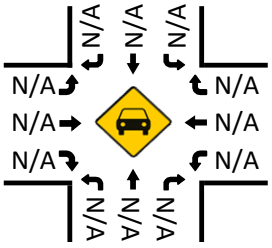
### Total Vehicles (AM)



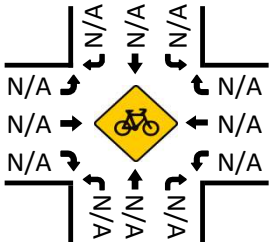

### Bikes (AM)



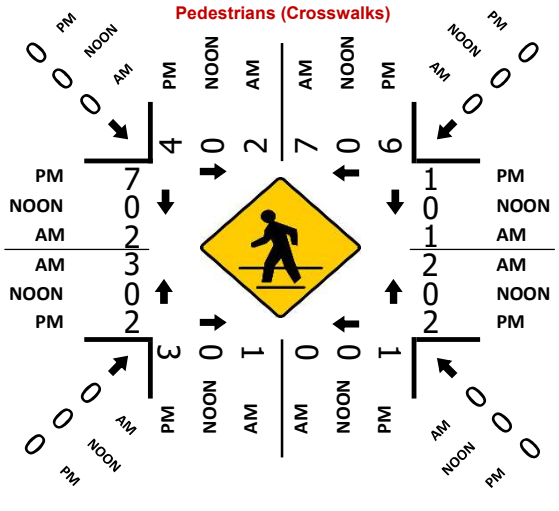

### Total Vehicles (Noon)



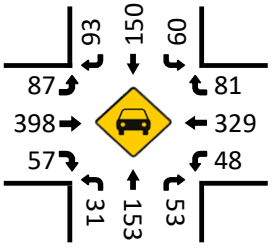

### Bikes (NOON)



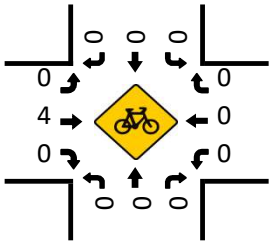

### Pedestrians (Crosswalks)




### Total Vehicles (PM)




### Bikes (PM)



## INT-2.5: Broadway Avenue at Yosemite Street

3/9/2020

### Scenario 1 - Existing Year (2019)

| AM 2019 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 78 | 64 | 40 | 41 | 25 | 407 | 92 | 0 | 106 | 59 | 68 | 0 | 49 | 328 | 64 |
| PHF | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 10 | | | | 7 | | | | 19 | | | | 9 | | | |
| Bicycles | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| PM 2019 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 75 | 47 | 16 | 2 | 18 | 274 | 60 | 0 | 34 | 52 | 50 | 0 | 45 | 221 | 65 |
| PHF | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 4 | | | | 4 | | | | 12 | | | | 2 | | | |
| Bicycles | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

*NOTE: Minimum PHF used in operations analysis is =0.70*

### Scenario 2 - Design Year (2030)

| AM 2030 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 84 | 69 | 43 | 44 | 27 | 436 | 99 | 0 | 114 | 63 | 73 | 0 | 52 | 351 | 69 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 10 | | | | 7 | | | | 19 | | | | 9 | | | |
| Bicycles | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| PM 2030 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 80 | 50 | 17 | 2 | 19 | 294 | 64 | 0 | 36 | 56 | 54 | 0 | 48 | 237 | 70 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 4 | | | | 4 | | | | 12 | | | | 2 | | | |
| Bicycles | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

*Source:*

### Scenario 3 - Horizon Year (2040)

| AM 2040 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 89 | 73 | 46 | 47 | 29 | 465 | 105 | 0 | 121 | 67 | 78 | 0 | 56 | 375 | 73 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 10 | | | | 7 | | | | 19 | | | | 9 | | | |
| Bicycles | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| PM 2040 | NB | | | | WB | | | | SB | | | | EB | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles | 0 | 86 | 54 | 18 | 2 | 21 | 313 | 69 | 0 | 39 | 59 | 57 | 0 | 51 | 253 | 74 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Truck % | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Pedestrians | 4 | | | | 4 | | | | 12 | | | | 2 | | | |
| Bicycles | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

Prepared by National Data & Surveying Services

# Yosemite St & Broadway Ave

## Peak Hour Turning Movement Count

**ID:** 19-08614-2.5
**City:** Seaside

**Day:** Tuesday
**Date:** 12/03/2019

| PEAK HOURS | COUNT PERIODS |
|---|---|
| 07:30 AM - 08:30 AM | 07:00 AM - 09:00 AM |
| NONE | NONE |
| 04:00 PM - 05:00 PM | 04:00 PM - 06:00 PM |

### SOUTHBOUND — Yosemite St

| | | | | | | |
|---|---|---|---|---|---|---|
| AM | 68 | 59 | 106 | 0 | 205 | AM |
| NOON | 0 | 0 | 0 | 0 | 0 | NOON |
| PM | 50 | 52 | 34 | 0 | 152 | PM |

### EASTBOUND — Broadway Ave

| AM | NOON | PM | |
|---|---|---|---|
| 553 | 0 | 399 | |
| 0 | 0 | 0 | 0 |
| 49 | 0 | 45 | 0 |
| 328 | 0 | 221 | 2 |
| 64 | 0 | 65 | 0 |

### WESTBOUND — Broadway Ave

| PM | NOON | AM | |
|---|---|---|---|
| 60 | 0 | 92 | 0 |
| 274 | 0 | 407 | 2 |
| 18 | 0 | 25 | 0 |
| 2 | 0 | 41 | 0 |
| 273 | 0 | 515 | |

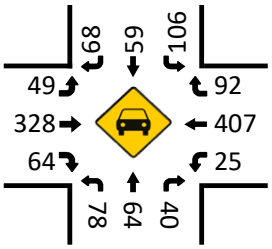
### NORTHBOUND — Yosemite St

| | | | | | | |
|---|---|---|---|---|---|---|
| PM | 135 | 0 | 75 | 47 | 16 | PM |
| NOON | 0 | 0 | 0 | 0 | 0 | NOON |
| AM | 148 | 0 | 78 | 64 | 40 | AM |

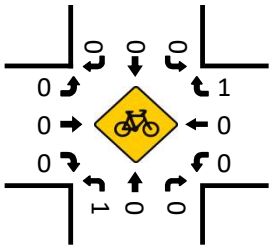
**CONTROL:** 4-Way Stop

| | AM | NOON | PM |
|---|---|---|---|
| TEV | 1421 | 0 | 959 |
| PHF | 0.79 | | 0.89 |

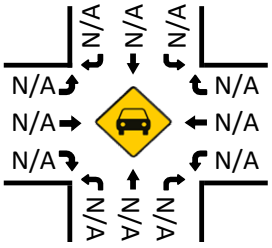
### Total Vehicles (AM)



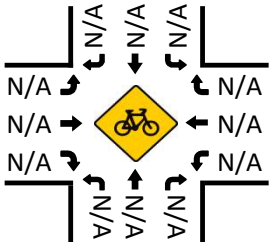

### Bikes (AM)



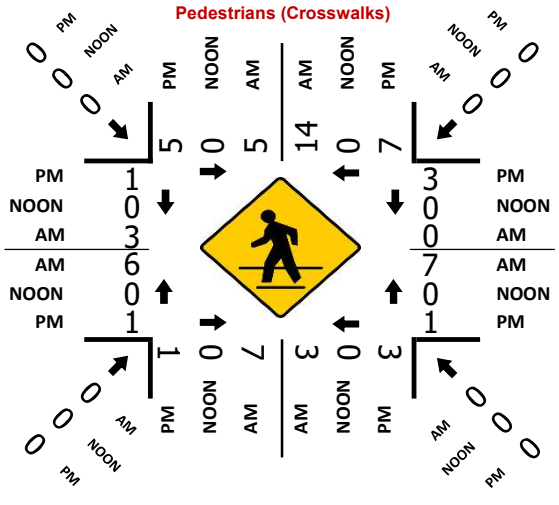

### Total Vehicles (Noon)



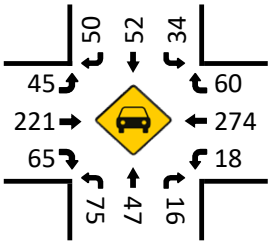

### Bikes (NOON)



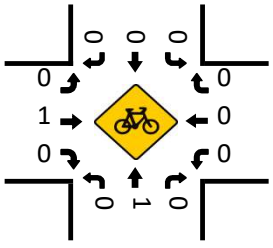

### Pedestrians (Crosswalks)




### Total Vehicles (PM)




### Bikes (PM)



# Appendix F

# Memorandum

To: Misty Bradshaw, P.E.
City of Seaside

From: Sean Houck, P.E.
Kimley-Horn & Associates

Re: City of Seaside Intersection Control Evaluations Studies
*Growth Rates: Broadway Corridor*

Date: March 16, 2020

Linear per annum growth rates were developed for the eighteen project intersections using the Regional Travel Demand Model (RTDM) created by the Association of Monterey Bay Area Governance (AMBAG). The growth rates from the model range from -0.71% to 6.72% per annum. The AMBAG 2018 Regional Growth Forecast provides anticipated growth rates for the City of Seaside between the years 2015 and 2040 based on historical growth data. The employment, housing, and population growth rates are summarized in Table 1. We recommend using the average city growth rate of 0.54% as the maximum growth rate for minor streets, and using the employment growth rate of 0.68% as the maximum growth rate for major arterials.

**Table 1: AMBAG Report Growth Rates**

| AMBAG 2018 Regional Growth Forecast | |
|---|---|
| Employment Growth Rate | 0.68% |
| Housing Growth Rate | 0.52% |
| Population Growth Rate | 0.42% |
| Average | 0.54% |

The RTDM Model shows significant growth on the Broadway Corridor when analyzed as a four-lane road. One of the proposed improvements on the Broadway corridor is a road diet, reducing it from a four-lane to a two-lane road. The model results vary significantly when the Broadway Corridor is changed from four-lane road to a two-lane road. Table 2 summarizes the RTDM Model and AMBAG Report growth rates for the Broadway Corridor. We recommend using the highest city growth rate of 0.68% as the maximum linear growth rate for the Broadway Corridor.

**Table 2: Summary of RTDM Model Growth Rates Along Broadway Corridor**

| | RTDM Model Growth Rates Along Broadway | | | | | | AMBAG 2018 Regional Growth Forecast | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 4-lane Corridor | | | 2-lane Corridor | | | Employment GR | | Average GR | |
| Intersection | WB | EB | 2040 V/C | WB | EB | 2040 V/C | GR | 2040 V/C | GR | 2040 V/C |
| Broadway at Fremont | 3.16% | 2.30% | 2.082 | 0.86% | 0.79% | 1.550 | 0.68% | 1.522 | 0.54% | 1.500 |
| Broadway at Noche Buena | 4.01% | 3.84% | 1.443 | 1.27% | 1.72% | 0.949 | 0.68% | 0.866 | 0.54% | 0.823 |
| Broadway at Yosemite | 5.77% | 3.01% | 1.367 | 1.17% | 0.93% | 0.746 | 0.68% | 0.665 | 0.54% | 0.644 |
| Broadway at General Jim Moore | - | 3.39% | 1.520 | - | 0.82% | 1.545 | 0.68% | 1.215 | 0.54% | 1.184 |
| Average | 4.31% | 3.13% | | 1.10% | 1.07% | | | | | |

The following two TIA's were used to determine the future volumes for the General Jim Moore and Lightfighter intersections, respectively:

- California Central Coast Veteran's Cemetery (CCCVC) by Kimley-Horn
    - General Jim Moore Blvd at Coe Ave
- Campus Town Specific Plan TIA by FEHR & PEERS
    - Lightfighter Drive at 1st Ave
    - Lightfighter Drive at 2nd Ave

The future volumes provided in the Campus Town TIA were directly used at the Coe intersection, and used to balance the San Pablo Ave, Broadway Ave, and Hilby Ave intersections along General Jim Moore Blvd. The RTDM Model was used as a base at the those three intersections. The projected future volumes from all southbound movements at Coe Ave were used to balance the southbound entering movements at San Pablo Ave, and the northbound entering movements at Coe Ave were used to balance the northbound exiting volumes at San Pablo Ave. The turning movements to and from the side streets were grown at their respective, capped model growth rates to remain consistent with the rest of the analysis.

Similarly, the future volumes provided in the CCCVC TIA were directly used at the 1st and 2nd Ave intersections, and used to balance the SR1 Ramp intersection along Lightfighter Drive. The growth rates used for the Lightfighter intersections from the CCCVC TIA result in the need for a triple lane roundabout at 1st Ave and 2nd Ave by the year 2040. Because the CCCVC TIA values were significantly higher than the RTDM Model, we recommend taking a phased build-out approach by designing for a two-lane roundabout and allowing room for expansion if future traffic growth necessitates.

A summary of the volume growth rates and sources for each intersection is provided in Table 3.

**Table 3: Summary of Growth Rates Used for All Intersections**

| Int | North-South Arterial (Major/Minor) | East-West Arterial (Major/Minor) | Growth Rate Source | | Growth Rate | | | |
|---|---|---|---|---|---|---|---|---|
| | | | North-South Arterial | East-West Arterial | NB | WB | SB | EB |
| 1.1 | Paralta Ave | Coe Ave | Model, Capped at average City growth of 0.54% | | 0.00% | 0.54% | 0.00% | 0.54% |
| 1.2 | General Jim Moore Blvd | Coe Ave | Near year and future year volumes from TIA, no growth rates used | | - | - | - | - |
| 1.3 | General Jim Moore Blvd | Broadway Ave | Volumes determined from TIA volumes at Int. 1.2 | Model, Capped at Employment Growth Rate of 0.68% | - | - | - | 0.68% |
| 1.4 | Yosemite St | La Salle Ave | Model, Capped at average City growth of 0.54% | | 0.00% | 0.54% | 0.00% | 0.54% |
| 1.5 | Yosemite St | Sonoma Ave | Model, Capped at average City growth of 0.54% | | 0.54% | 0.54% | 0.54% | 0.54% |
| 1.6 | Fremont Blvd | Broadway Ave | Model, Capped at Employment Growth Rate of 0.68% | | 0.36% | 0.68% | 0.00% | 0.68% |
| 2.1 | Noche Buena St | Ord Grove Ave | Model, Capped at average City growth of 0.54% | | 0.00% | 0.54% | 0.00% | 0.54% |
| 2.2 | Noche Buena St | La Salle Ave | Model, Capped at average City growth of 0.54% | | 0.00% | 0.46% | 0.10% | 0.30% |
| 2.3 | Fremont Blvd | La Salle Ave | Model, Capped at Employment Growth Rate of 0.68% | Model, Capped at average City growth of 0.54% | 0.00% | 0.00% | 0.00% | 0.40% |
| 2.4 | Noche Buena St | Broadway Ave | Model, Capped at Employment Growth Rate of 0.68% | | 0.01% | 0.68% | 0.00% | 0.68% |
| 2.5 | Yosemite St | Broadway Ave | Model, Capped at Employment Growth Rate of 0.68% | | 0.68% | 0.68% | 0.68% | 0.68% |
| 2.6 | Noche Buena St | Military Ave | Model, Capped at average City growth of 0.54% | | 0.00% | 0.00% | 0.00% | 0.00% |
| 2.7a | First Ave | Lightfighter Dr | Near year and future year volumes from TIA, no growth rates used | | - | - | - | - |
| 2.7b | SR 1 Ramps | Lightfighter Dr | Balanced using TIA and near year volumes | | - | - | - | - |
| 2.8 | Second Ave | Lightfighter Dr | Near year and future year volumes from TIA, no growth rates used | | - | - | - | - |
| 2.9 | Yosemite St | San Pablo Ave | Model, Capped at average City growth of 0.54% | | 0.54% | 0.54% | 0.54% | 0.00% |
| 2.10 | General Jim Moore Blvd | San Pablo Ave | Volumes determined from TIA volumes at Int. 1.2 | Model, Capped at average City growth of 0.54% | - | - | - | 0.54% |
| 2.11 | General Jim Moore Blvd | Hilby Ave | Volumes determined from TIA volumes at Int. 1.2 | Model, Capped at average City growth of 0.54% | - | - | - | 0.54% |

Assumptions:

1. Lightfighter Corridor Volumes per the CCCVC TIA.
2. General Jim Moore Boulevard Volumes balanced between the AMBAG Model Growth rates, the Campus Town TIA, and the Broadway Road Diet.
3. Fremont Boulevard Volumes per the AMBAG Model.