



Appendix G – Benefit/Cost Ratio Analysis Worksheets

- Auto Benefit/Cost Ratio Analysis Worksheets

Metropolitan Transportation Commission
Program for Arterial System Synchronization (PASS) - FY 13/14 Cycle
Measures of Effectiveness and Benefit-Cost Analysis

| | | | |
|-----------------------------|---|------------------------|---|
| Project Title: | City of Lafayette - PASS FY 13/14 Cycle Project | | |
| Project Corridors: | Mt. Diablo Boulevard & Moraga Road | | |
| Project Stakeholders: | City of Lafayette; MTC | | |
| Total # of Project Signals: | 12 | # of Caltrans Signals: | 0 |
| Local Agency Contact: | Tony Coe; tcoe@ci.lafayette.ca.us; (925) 299-3203 | | |
| Consultant Contact: | Ruta Jariwala; rjariwala@tjkm.com; 925-264-5023 | | |
| MTC Contact: | Linda Lee; MTC | | |

| Costs | |
|---|-----------------|
| Consultant Costs (Basic Services/Plans) | \$70,800 |
| Consultant Costs (Additional Plans, TSP, IM Flush Plans, etc.) | \$6,500 |
| Other Project Costs (GPS Clocks, Communications equipment, etc.) | \$3,960 |
| Agency Staff Costs (Local agency, MTC, Caltrans, etc.) ⁸ | \$17,700 |
| Total Costs | \$98,960 |

| Benefits | | | | |
|-----------------------------------|-------------------|--------------------------|---------------------------------------|--------------------------|
| <i>Measures</i> | <i>First Year</i> | | <i>Lifetime (5 Years)⁷</i> | |
| | <i>Savings</i> | <i>Monetized Savings</i> | <i>Savings</i> | <i>Monetized Savings</i> |
| Travel Time Savings (hrs) | 84,074 | \$1,640,735 | 225,533 | \$4,401,363 |
| Fuel Consumption Savings (gal) | 5,681 | \$21,923 | 15,239 | \$58,810 |
| ROG Emissions Reduction (tons) | 0.02 | \$28 | 0.06 | \$76 |
| NOx Emissions Reduction (tons) | 0.01 | \$244 | 0.04 | \$656 |
| PM2.5x Emissions Reduction (tons) | 0.00 | \$235 | 0.00 | \$630 |
| CO Emissions Reduction (tons) | 0.15 | \$12 | 0.41 | \$32 |
| Total Lifetime Benefits | | | | \$4,461,567 |

| Overall Project Benefits | Auto |
|---------------------------------|-------------|
| Average Decrease in Travel Time | 35% |
| Average Speed Increase | 62% |
| Average Fuel Savings | 24% |

| Benefit/Cost Ratio | 48 :1 |
|---------------------------|--------------|
|---------------------------|--------------|

Notes:

- General methodology, fuel consumption factors, and health costs of motor vehicle emissions based on California Department of Transportation, Office of Transportation Economics. California Life-Cycle Benefit/Cost Analysis Model and Technical Supplement to the User's Guide, 2009.
- Benefits claimed include travel time savings, fuel consumption savings, and health cost savings associated with emissions reductions for the coordinated peak periods indicated above. Yearly savings calculated based on 250 days of workdays in a year.
- Value of time assumed to be 50 percent of the wage rate for off-the-clock travel or \$19.52 in 2013 constant dollars. Bay Area average wage rate is \$20.82 per hour in 1990 constant dollars, based on Travel Demand Models for the San Francisco Bay Area [BAYCAST-90] Technical Summary, Table 4, p. 28, June 1997. Adjusted for inflation using CPI, from US Dept of Labor, Bureau of Labor Statistics, CPI - All Urban Consumers, San Francisco-Oakland-San Jose, CA area, All Items, Not Seasonally Adjusted (Series Id:CUURA422SA0). Vehicle fleet assumed to be 100 percent automobiles.
- Average vehicle occupancy assumed to be 1.118 persons per vehicle and is used in calculating travel-time savings in autos only. This is based on the San Francisco Bay Area Baycast Travel Model run for the RTP 2009 (using the 2010 network) developed by the Metropolitan Transportation Commission.
- Average fuel cost is from US Dept of Labor Bureau of Labor Statistics, CPI - Average Price Data, San Francisco-Oakland-San Jose, CA area, Gasoline unleaded regular per gallon. Average of monthly prices in the Bay Area from January 2013 – December 2013 is \$3.859
- Health cost of ROG Emissions (\$1,259 per ton), NOx Emissions (\$17,997 per ton), and CO Emissions (\$77 per ton) are based on the California Department of Transportation, Office of Transportation Economics from Exhibit III-43, p. III-69 of the California Life-Cycle Benefit/Cost Analysis Model Volume 3 Technical Supplement to User's Guide, Revision 2 (February 2012). The 2013 costs are calculated with a standard assumption of 2% increase per year from the 2011 costs. PM2.5x Emissions (\$312,351 per ton) costs, are based on Victoria Transport Policy Institute's Air Pollution Costs, with 2013 costs calculated with a standard assumption of 2% increase per year from 2007 costs.
- Project life assumed to be five years. Benefits assumed to be 100 percent on first day after implementation, declining steadily to zero by end of the fourth year. Benefits equivalent to sum of discounted average annual benefits, where averages are 90% of First Year for year 0, 70% for year 1, 50% for year 2, 30% for year 3, and 10% for year 4.
- All public agencies involved staff costs assumed to be 25% of the project consultant costs.

**Metropolitan Transportation Commission
Program for Arterial System Synchronization (PASS) - FY 13/14 Cycle
Measures of Effectiveness and Benefit-Cost Analysis**

| AUTO | | | | | | | | | | | | | | | | | | | | | | | |
|--|-----------------|--|--|-----------------------------------|----------------------------------|---------------------------------|---------------|---------------------|----------------------------|---------------------------|--------------------------------|----------------------------------|---------------------------|---------------------------------------|--------------------------------|-----------------------------------|------------------------------|-----------------------------------|------------------------------|--|-----------------------------------|----------------------------------|-----------------------------|
| USER INPUTS | | | | | | | CALCULATIONS | | | | | | | | | | | | | | | | |
| Corridor (From-To) | Distance (feet) | Period (AM, MD, PM, School PM or Weekend MD) | Average Peak Period Traffic Volume (vph) | # of hours in coordination (h:mm) | Travel Time Before Project (sec) | Travel Time After Project (sec) | Distance (mi) | Annual Affected VMT | Speed Before Project (mph) | Speed After Project (mph) | Speed Increase (percent diff.) | Travel Time Before Project (hrs) | Travel Time Savings (hrs) | Fuel Consumption Before Project (gal) | Fuel Consumption Savings (gal) | ROG Emission Before Project (lbs) | ROG Emission Reduction (lbs) | NOx Emission Before Project (lbs) | NOx Emission Reduction (lbs) | PM2.5 Ex Emission Before Project (lbs) | PM2.5 Ex Emission Reduction (lbs) | CO Emission Before Project (lbs) | CO Emission Reduction (lbs) |
| Mt Diablo Boulevard Eastbound (from Dolores Drive to Brown Avenue) | 3,326 | AM | 910 | 2:00 | 169 | 150 | 0.63 | 11,942 | 13 | 15 | 15% | 10680 | 1,201 | 1,109 | 116 | 6 | 1.1 | 11.0 | 0.5 | 0.2 | 0.1 | 96.0 | 6.0 |
| | 1,161 | Midday | 1,152 | 3:15 | 105 | 32 | 0.22 | 8,576 | 8 | 25 | 213% | 8400 | 5,840 | 1,046 | 567 | 6 | 4.3 | 9.1 | 2.6 | 0.2 | 0.2 | 82.0 | 31.4 |
| | 5,121 | School PM | 1,335 | 1:00 | 341 | 231 | 0.97 | 9,711 | 10 | 15 | 50% | 22762 | 7,343 | 1,043 | 235 | 6 | 1.9 | 9.6 | 1.1 | 0.2 | 0.1 | 85.6 | 12.4 |
| | 5,121 | PM | 1,320 | 3:00 | 356 | 190 | 0.97 | 40,008 | 10 | 18 | 80% | 32633 | 15,217 | 4,297 | 1,356 | 25 | 10.6 | 39.7 | 6.2 | 0.9 | 0.4 | 352.5 | 74.0 |
| Mt Diablo Boulevard Westbound (from Brown Avenue to Dolores Drive) | 3,326 | Weekend | 1,145 | 5:30 | 218 | 147 | 0.63 | 17,190 | 10 | 15 | 50% | 7211 | 2,349 | 1,846 | 416 | 11 | 3.4 | 17.0 | 1.9 | 0.4 | 0.1 | 151.5 | 22.0 |
| | 3,326 | AM | 845 | 2:00 | 201 | 141 | 0.63 | 11,089 | 11 | 16 | 45% | 11795 | 3,521 | 1,137 | 250 | 6 | 2.0 | 10.7 | 1.2 | 0.2 | 0.1 | 95.0 | 13.7 |
| | 1,161 | Midday | 968 | 3:15 | 101 | 36 | 0.22 | 7,206 | 8 | 22 | 175% | 6789 | 4,369 | 879 | 428 | 5 | 3.3 | 7.6 | 2.1 | 0.2 | 0.1 | 68.9 | 23.3 |
| | 5,121 | School PM | 974 | 1:00 | 386 | 243 | 0.97 | 7,085 | 9 | 14 | 56% | 18798 | 6,964 | 813 | 189 | 5 | 1.6 | 7.3 | 0.9 | 0.2 | 0.0 | 65.1 | 10.0 |
| Moraga Road Northbound (St. Mary's Road-Herman Drive - Mt Diablo Boulevard) | 5,121 | PM | 974 | 3:00 | 382 | 238 | 0.97 | 29,521 | 9 | 15 | 67% | 25838 | 9,740 | 3,386 | 930 | 20 | 7.8 | 30.6 | 4.6 | 0.7 | 0.3 | 271.2 | 48.8 |
| | 3,326 | Weekend | 1,093 | 5:30 | 242 | 213 | 0.63 | 16,409 | 9 | 11 | 22% | 7641 | 916 | 1,882 | 200 | 11 | 1.8 | 17.0 | 1.1 | 0.4 | 0.0 | 150.7 | 10.1 |
| | 2,260 | AM | 1,249 | 1:30 | 174 | 101 | 0.43 | 8,353 | 9 | 15 | 67% | 15092 | 6,332 | 958 | 263 | 6 | 2.2 | 8.6 | 1.3 | 0.2 | 0.1 | 76.7 | 13.8 |
| | 2,260 | Midday | 983 | 3:15 | 174 | 77 | 0.43 | 14,244 | 9 | 20 | 122% | 11878 | 6,622 | 1,634 | 679 | 10 | 5.3 | 14.7 | 3.5 | 0.3 | 0.2 | 130.8 | 37.0 |
| Moraga Road Southbound (Mt Diablo Boulevard - St. Mary's Road-Herman Drive) | 2,260 | School PM | 1,259 | 1:00 | 182 | 128 | 0.43 | 4,042 | 8 | 12 | 50% | 11457 | 3,399 | 493 | 98 | 3 | 0.9 | 4.3 | 0.4 | 0.1 | 0.0 | 38.6 | 5.1 |
| | 2,260 | PM | 1,092 | 3:00 | 112 | 119 | 0.43 | 14,607 | 14 | 13 | -7% | 8493 | -531 | 1,285 | -72 | 7 | -0.6 | 13.2 | -0.3 | 0.3 | 0.0 | 113.6 | -3.9 |
| | 2,260 | Weekend | 1,057 | 5:30 | 142 | 125 | 0.43 | 10,783 | 11 | 12 | 9% | 4336 | 519 | 1,105 | 52 | 6 | 0.5 | 10.5 | 0.2 | 0.2 | 0.0 | 92.4 | 2.9 |
| | 2,260 | AM | 912 | 1:30 | 88 | 75 | 0.43 | 6,099 | 18 | 21 | 17% | 5573 | 823 | 448 | 53 | 2 | 0.3 | 5.1 | 0.3 | 0.1 | 0.0 | 42.5 | 3.1 |
| Moraga Road Southbound (Mt Diablo Boulevard - St. Mary's Road-Herman Drive) | 2,260 | Midday | 932 | 3:15 | 88 | 61 | 0.43 | 13,505 | 18 | 25 | 39% | 5696 | 1,748 | 993 | 238 | 5 | 1.5 | 11.3 | 1.2 | 0.2 | 0.1 | 94.0 | 14.3 |
| | 2,260 | School PM | 1,080 | 1:00 | 190 | 76 | 0.43 | 3,467 | 8 | 20 | 150% | 10260 | 6,156 | 423 | 191 | 3 | 1.5 | 3.7 | 0.9 | 0.1 | 0.0 | 33.1 | 10.3 |
| | 2,260 | PM | 1,172 | 3:00 | 99 | 88 | 0.43 | 15,677 | 16 | 18 | 13% | 8058 | 895 | 1,254 | 102 | 6 | 0.7 | 13.5 | 0.3 | 0.2 | 0.0 | 115.0 | 5.9 |
| | 2,260 | Weekend | 931 | 5:30 | 75 | 70 | 0.43 | 9,497 | 21 | 22 | 5% | 2017 | 134 | 615 | 21 | 3 | 0.2 | 7.5 | 0.2 | 0.1 | 0.0 | 61.3 | 1.3 |
| TOTAL | | | | | | | | | | | | 235,408 | 83,556 | 26,647 | 6,312 | 152 | 50.2 | 252.1 | 30.2 | 5.5 | 1.7 | 2,216.4 | 341.4 |
| Total with Occupancy (Person hours travelled) | | | | | | | | | | | | 263,186 | 93,416 | | | | | | | | | | |