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# TCM Workshop

September 30, 2003



**METROPOLITAN  
TRANSPORTATION  
COMMISSION**

## TCM Definition:

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“...any strategy to reduce vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, or traffic congestion for the purpose of reducing motor vehicle emissions.”

## Not a TCM

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- Smog check/I&M
- Alternative fuel vehicles (school buses, fleets, etc.)
- Engine replacement for heavy duty vehicles
- Old vehicle scrappage
- Older vehicle tune-ups
- Vehicle idling controls

# Other TCMs in the SIP

TCMs	1982 Plan	1990 Contingency TCMs	2001 Plan
Transit			
• Expansion/New Service	X	X	X
• Productivity	X		
• Incentives		X	
• Express Bus			X
• Coordination		X	
Park and Ride Lots	X		
Signal Timing		X	
Incident Management		X	X
Ridesharing Services	X		
HOV Lanes	X	X	
Bikes/Non-motorized			X
Employer Trip Reduction	X	X	
Financial Incentives (commuter check)		X	
Pricing			
• Gas Tax		X	
• Bridge Tolls		X	
Land Use (TLC & HIP)			X
Local TSM		X	

# Further Study Measures (FSMs) in The 2001 Ozone Attainment Plan

- Eleven (11) measures in all
- Investigate to determine if suitable for SIP commitment
- MTC focused on five measures:
  - **FSM 1:** Study benefits of particulate trap retrofit program  
*(Advanced through MTC funding; also NOx reductions)*
  - **FSM 2:** Update HOV Lane Master Plan  
*(Completed, funding for some new HOV lanes in TIP)*
  - **FSM 3:** Study Effects of High Speed Freeway Travel  
*(Advanced as part of Spare the Air program)*
  - **FSM 4:** Parking Management Incentive Program (municipal spaces)  
*(Results do not show significant potential)*
  - **FSM 5:** Enhanced Housing Incentive/Station Access Program  
*(Under consideration as new TCM)*

# Related Air Quality Information Items

- Smart Growth adopted by ABAG and will be used in Transportation 2030
- Transportation 2030 Plan: Proposed new goal of "Clean Air"
- MTC approved funds for retrofit of 1700 urban buses to reduce NOx and PM (FSM 1)
- Phase II of TransLink® approved
- SB 916 (Bridge toll bill) would:
  - Provide both capital and operating funds for transit
  - Funds ferries, rail, express bus, enhanced bus
  - Real-time transit information
  - Safe Routes to transit
  - City Carshare
  - Transit benefits promotion
- New Spare the Air activities
  - LAVTA free transit demonstration project
  - Observe the speed limit message
  - Older vehicle owner survey

# A Sampling of Public TCM Suggestions

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## Transit

- Shuttles to transit and in downtowns
- Enhanced/Rapid bus projects
- Car sharing at transit stations
- Safe routes to transit/ more bike parking
- New ridership targets and funding
- Develop new rail and transit hubs
- Dedicated lanes for express buses
- Real time arrival information

## Transit *(continued)*

- Signal pre-emption capability on major routes
- More frequent service with smaller and cleaner buses and vans
- Student bus pass program
- Re-establish bus programs at individual schools

## Traffic Flow

- Install roundabouts
- Real time traffic information to avoid congestion
- Traffic calming measures

# A Sampling of Public TCM Suggestions *(continued)*

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## Smart Growth

- Commit percentage of MTC funds to incentives
- Require cities to implement Smart Growth before they can receive transportation funds
- Developers required to implement trip reduction strategies
- Regional transportation impact fee on sprawl development
- Incentives for encouraging transit oriented development

## Employers

- Provide incentives for employers to develop Commute Alternative programs
- Alternative work schedules

## Parking

- Regional parking policy manual for reduced parking ratios for new development
- Air pollution charges for severe work attraction zones

# A Sampling of Public TCM Suggestions *(continued)*

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## Spare the Air

- Encourage telecommuting
- Automate speed enforcement
- Free public transit
- Higher bridge tolls to pay for transit

## Legislative

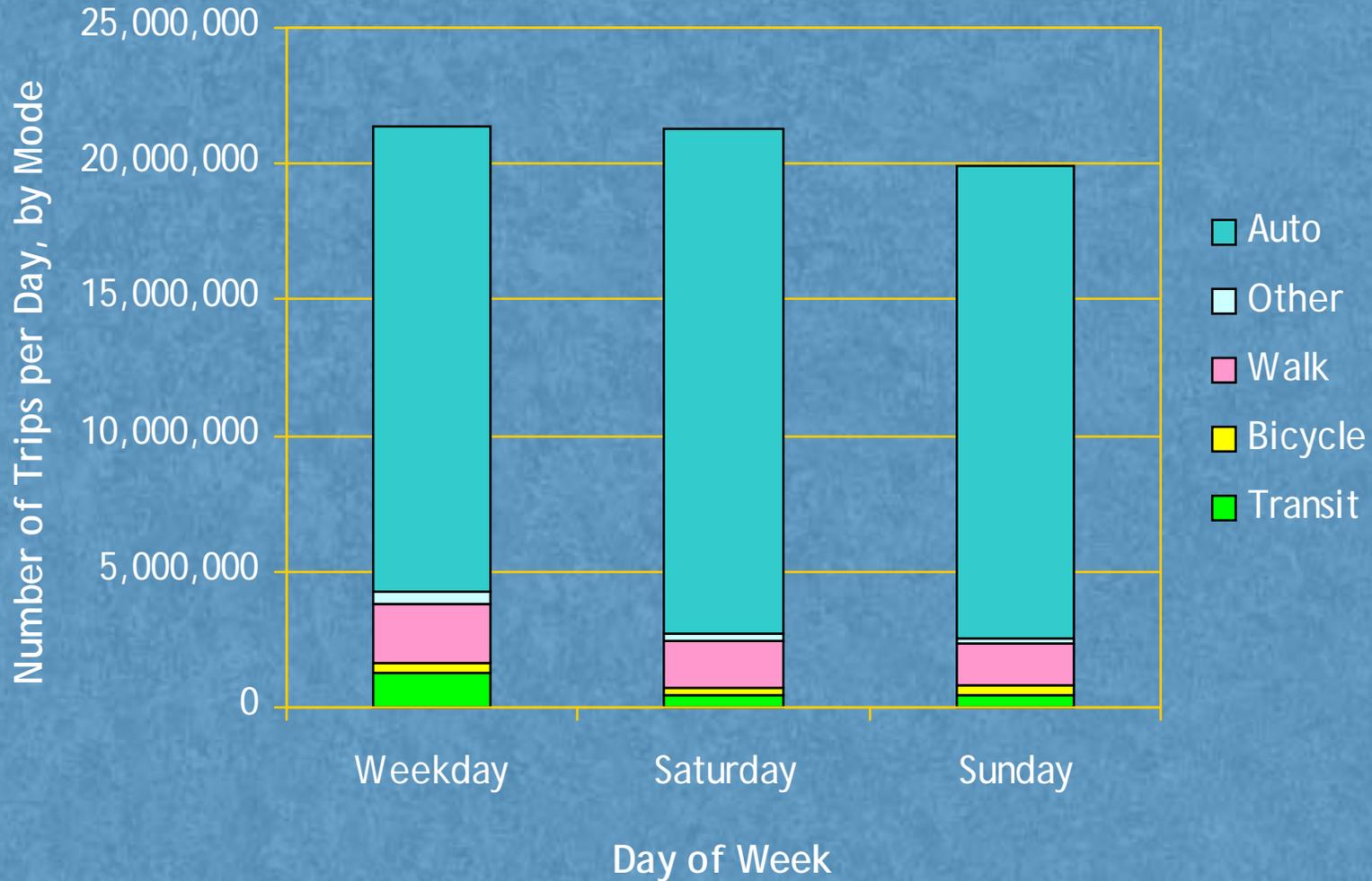
- Re-establish trip reduction requirements for employers
- Auto insurance charged at the pump
- Increase state gasoline tax

## Legislative *(continued)*

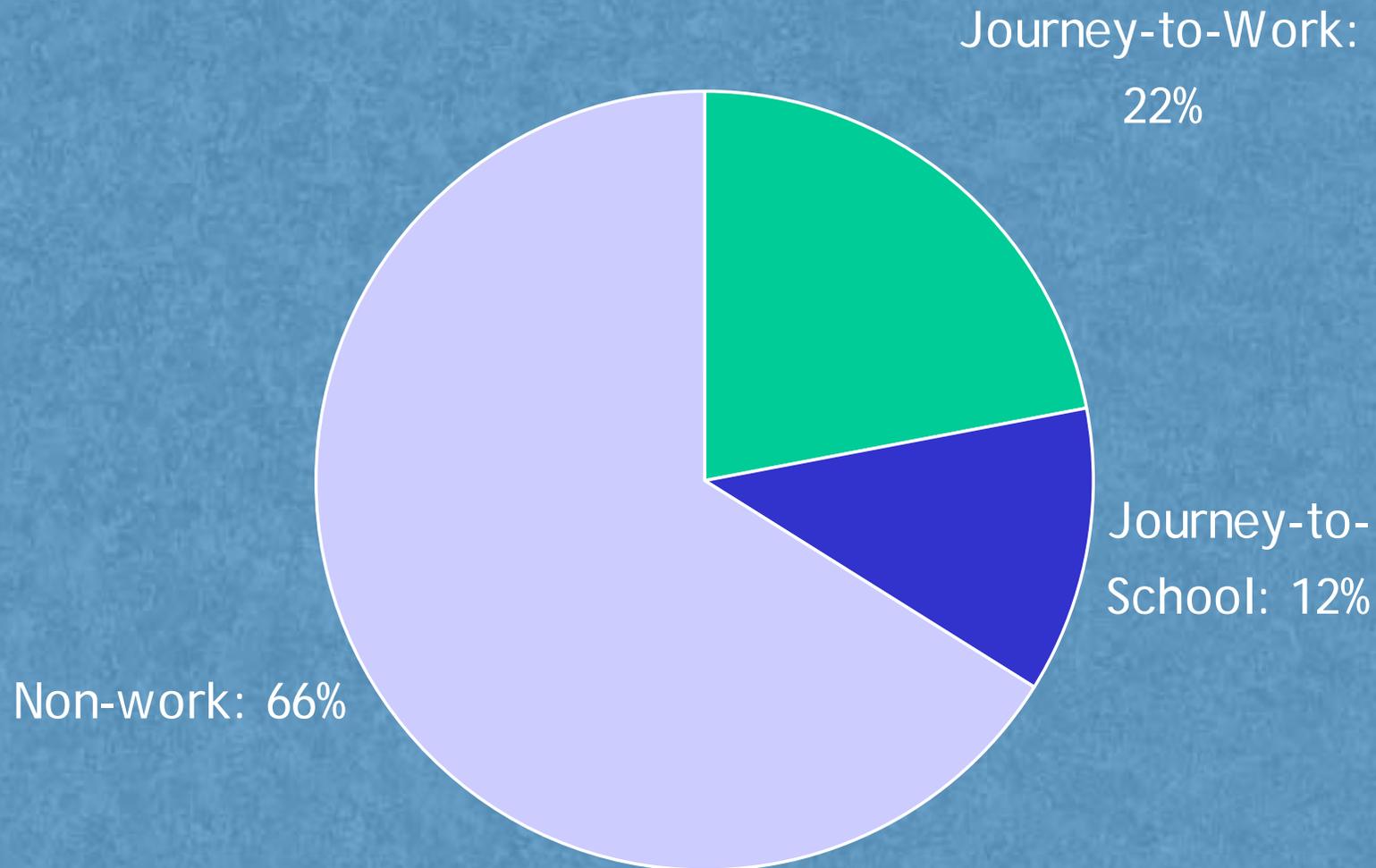
- Extend the parking cash out law to employer owned parking
- Emission based vehicle registration fees
- Congestion pricing on bridges and other roads
- Gasoline surcharge during ozone season
- Establishment of a High Occupancy Toll network

# Bay Area Average Daily Trips: 2000

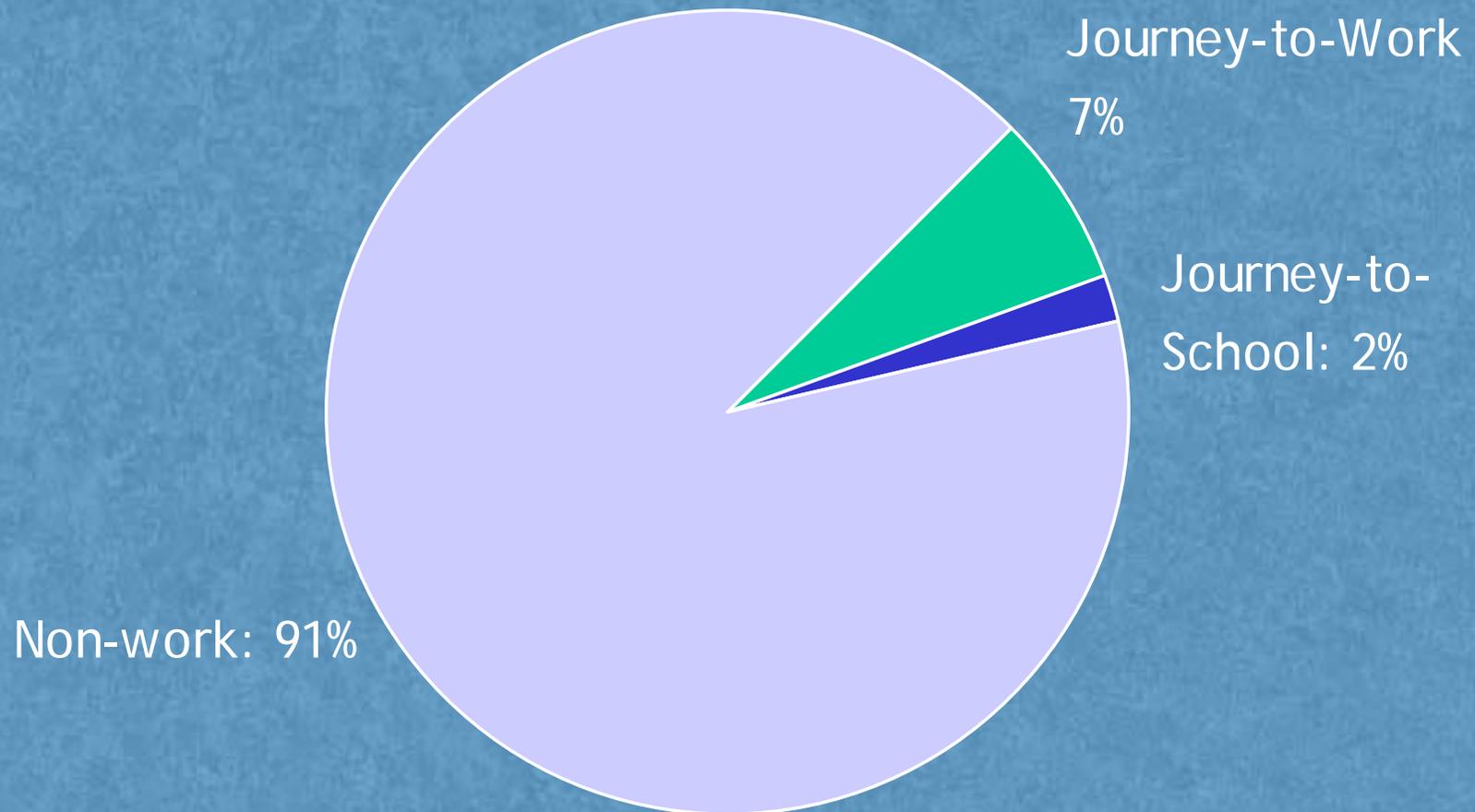
Average Daily Trips, 2000  
San Francisco Bay Area



# Bay Area Average Weekday Trips By Trip Purpose: 2000

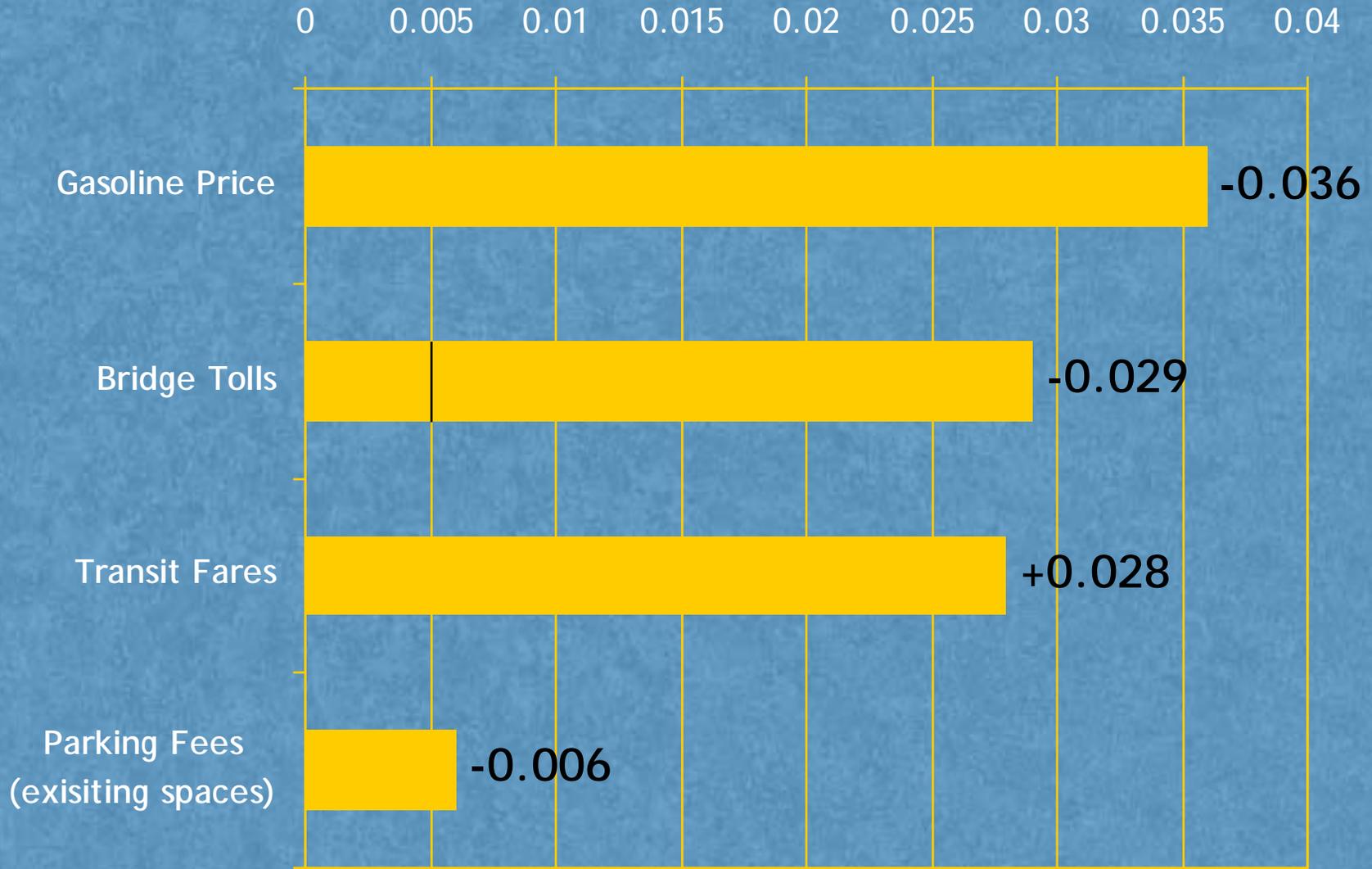


# Bay Area Average Weekend Trips By Trip Purpose: 2000



# Vehicle Trip Elasticities

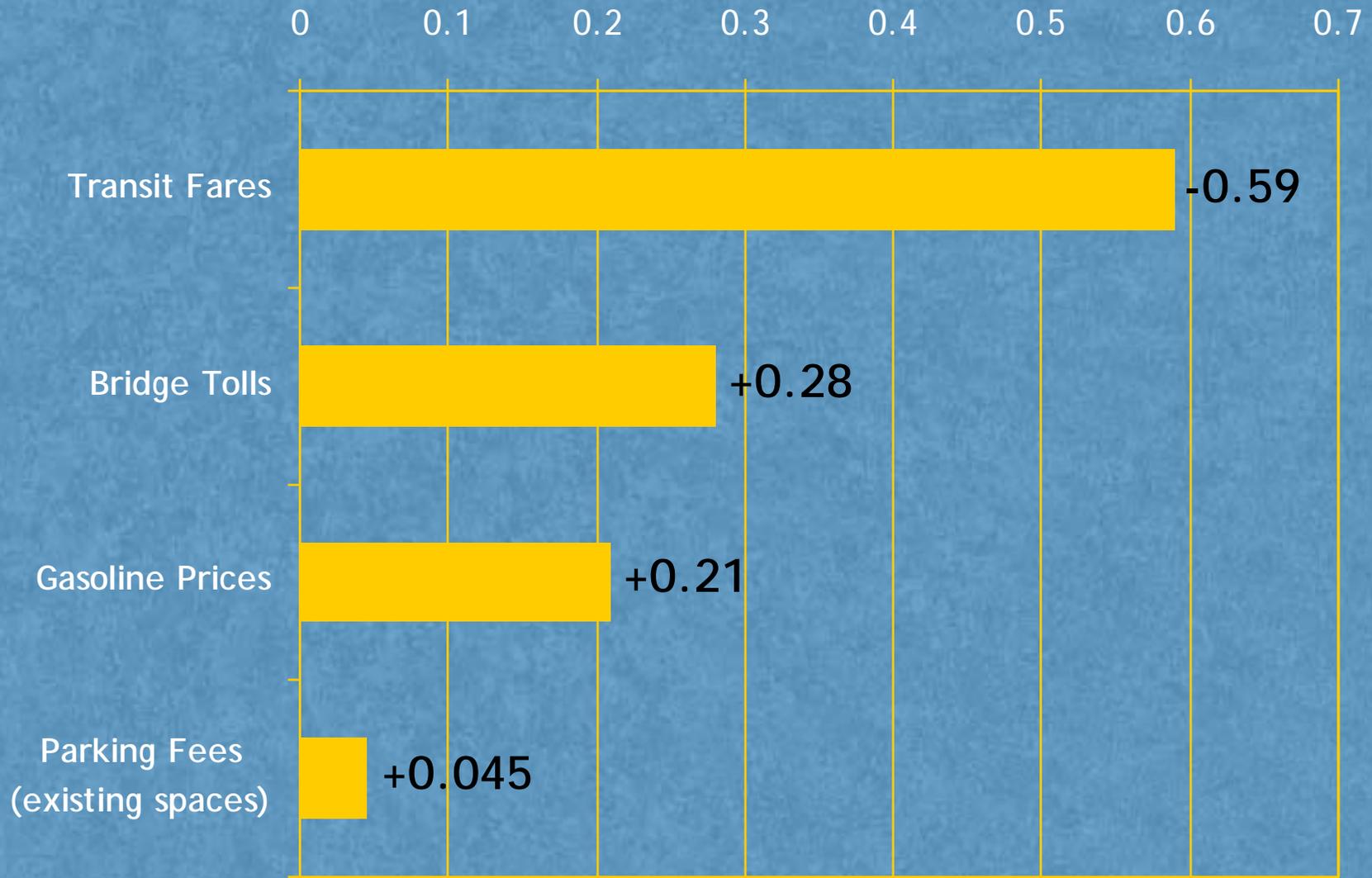
(Total Regional Vehicle Trips)



Elasticity: Percent change in vehicle trips given 1% change in cost

# Transit Use Elasticities

(Total Regional Transit Trips)



Elasticity: Percent change in transit use given 1% change in cost

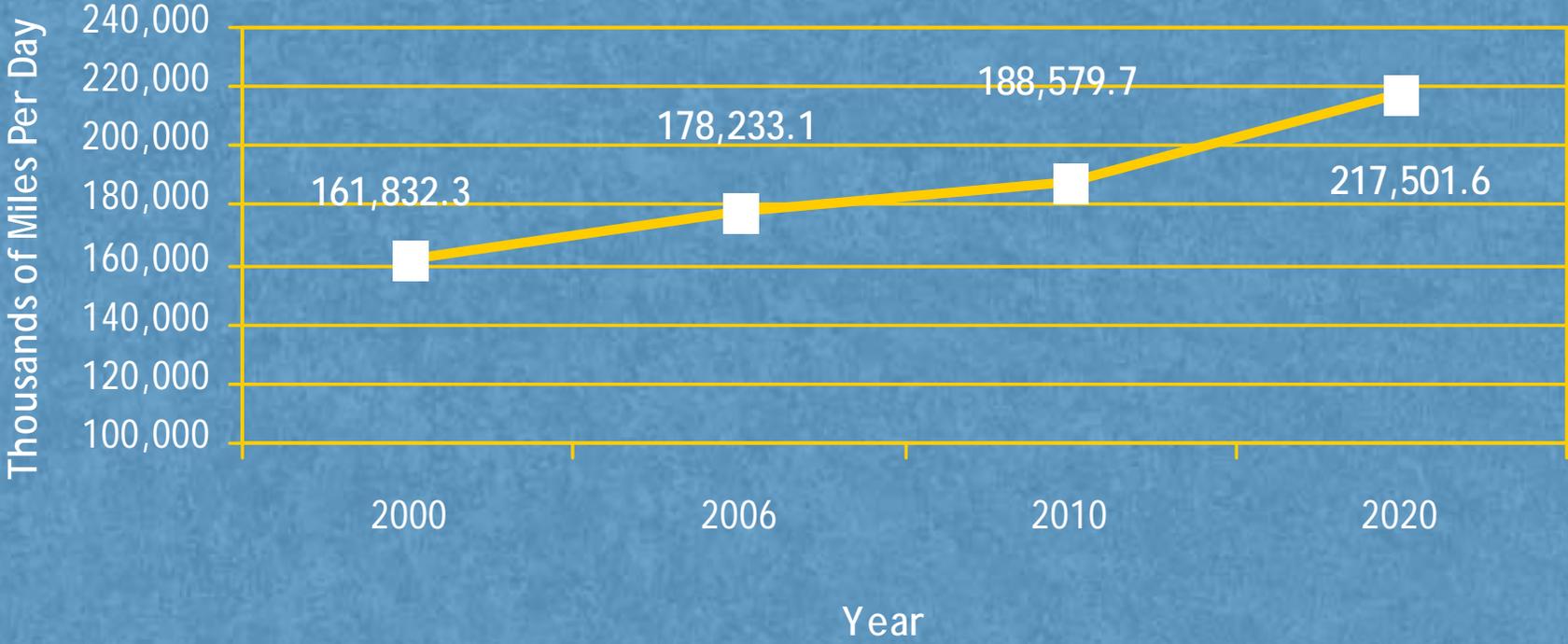
# Blueprint Parking Sensitivity Test

(Assumed an additional \$2.60/day parking charge for work trips)

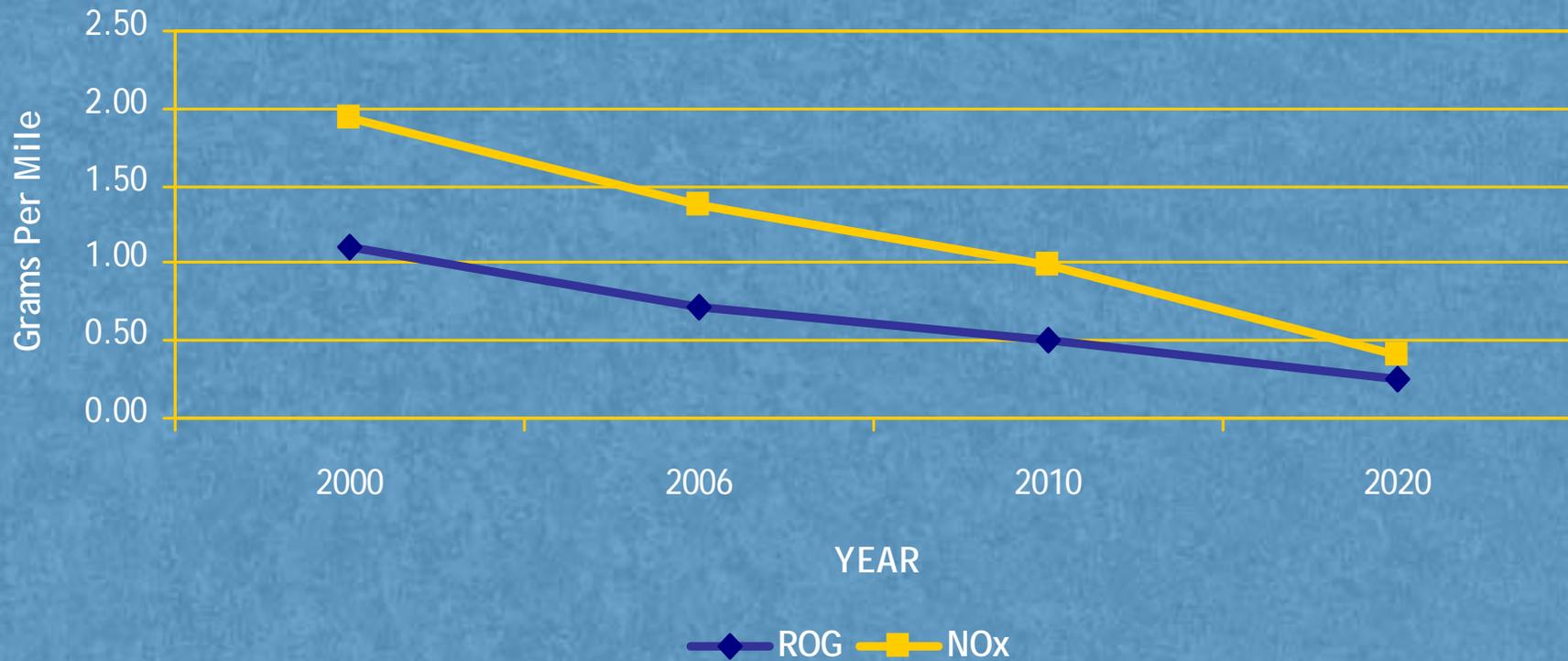
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- 0.7% **Decrease** in Regional Vehicle Trips
- 2.6% **Increase** in Regional Transit Trips

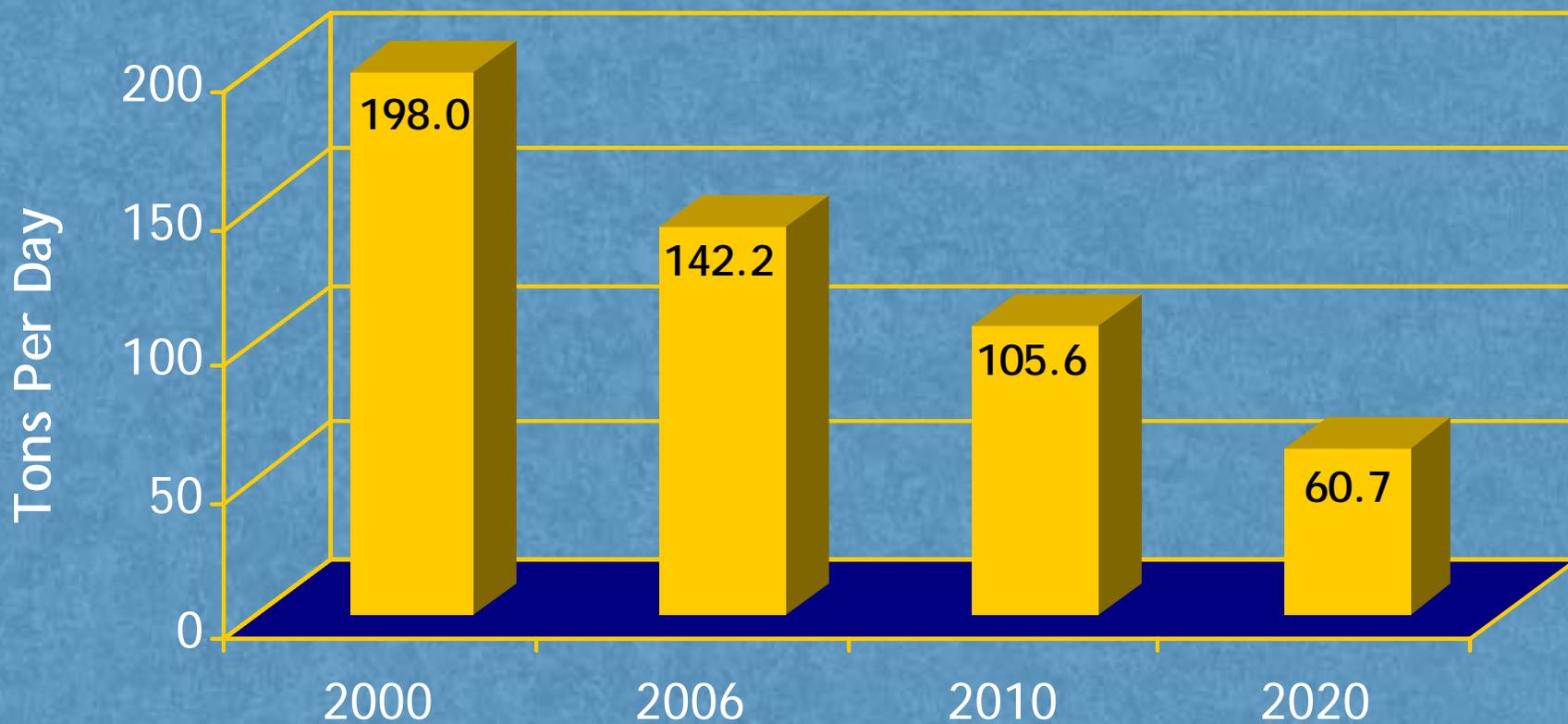
# Bay Area Vehicle Miles Traveled



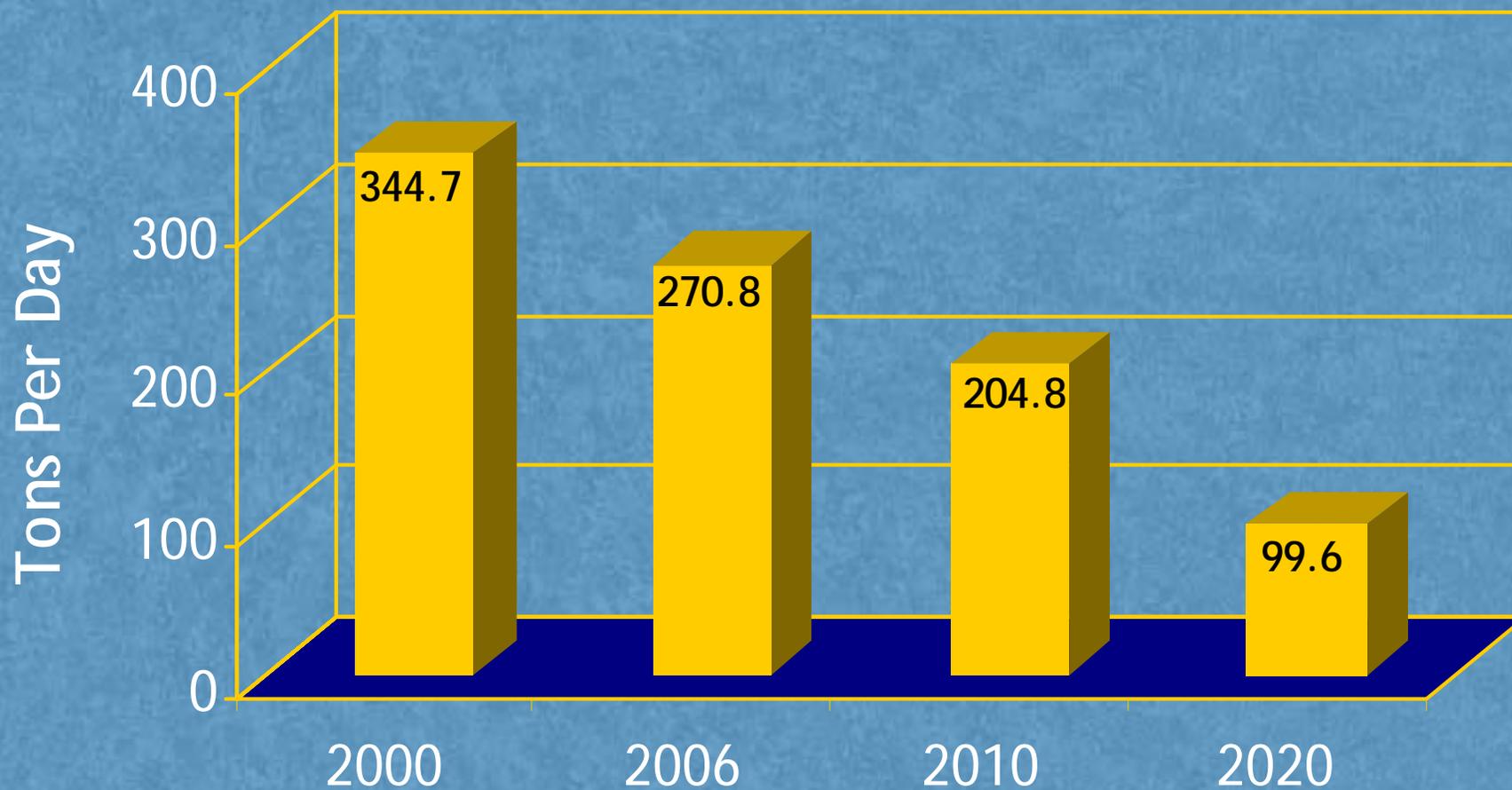
# Bay Area Vehicle Emission Rates



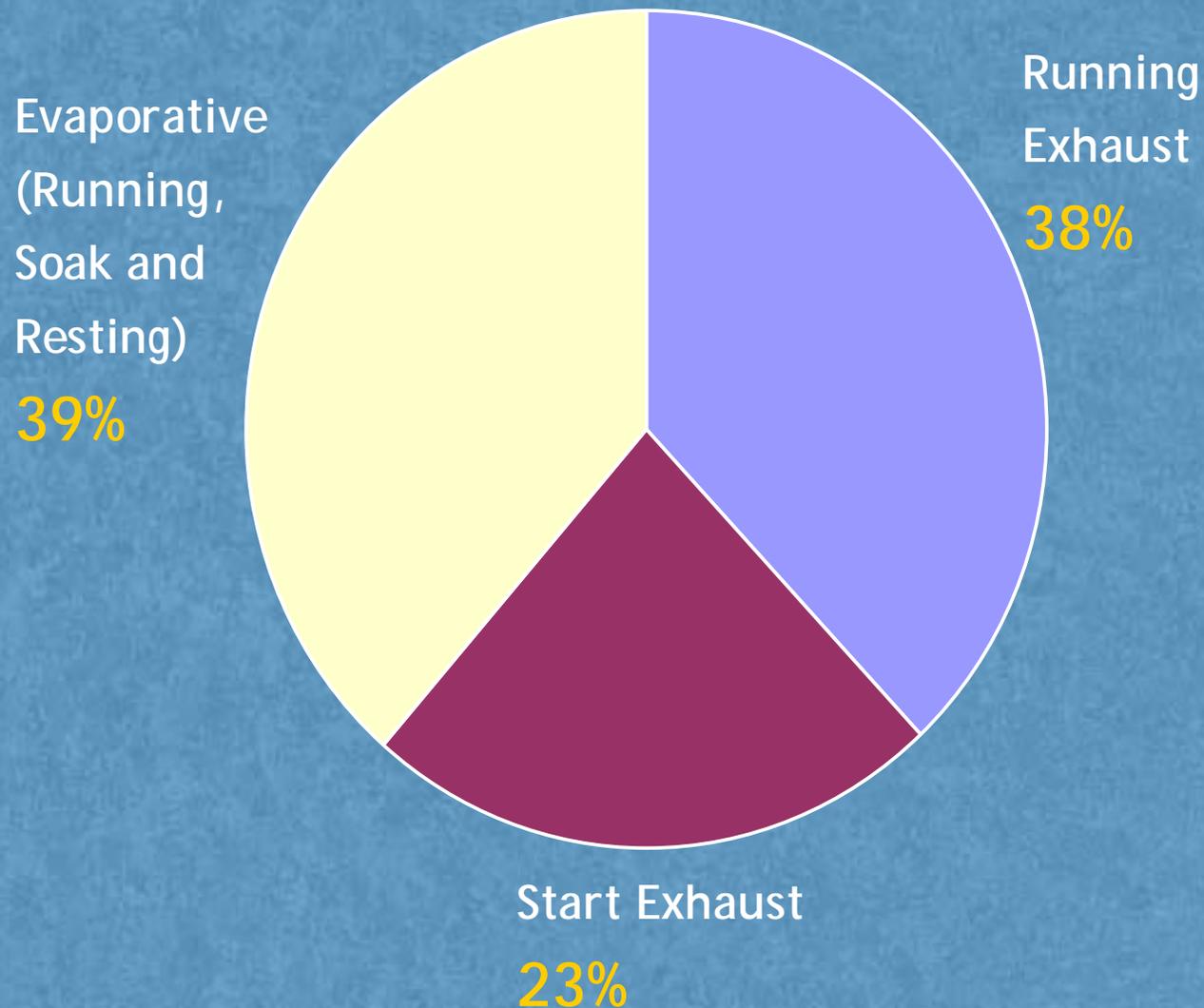
# Bay Area On-Road ROG Mobile Source Emissions



# Bay Area On-Road NOx Mobile Source Emissions

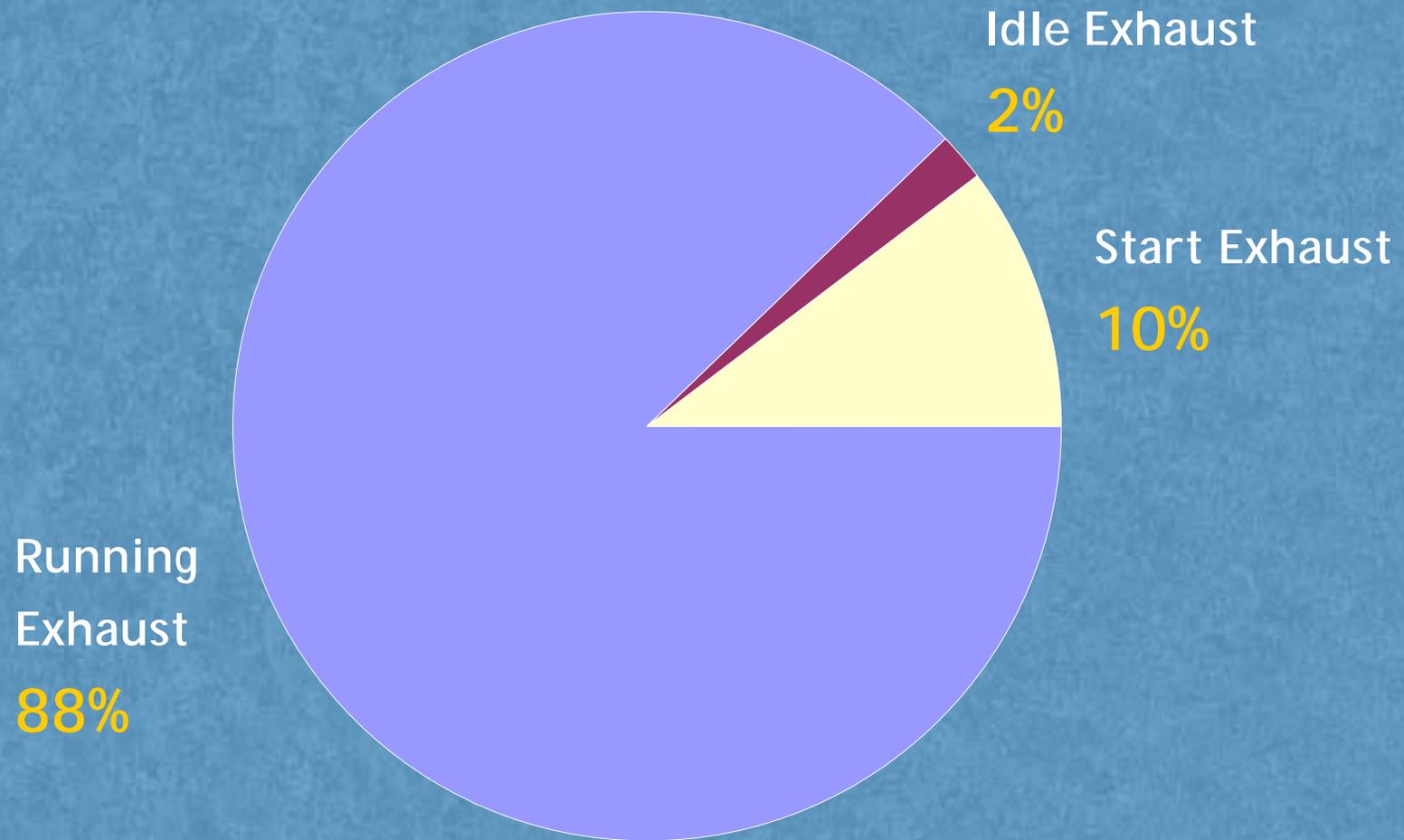


# ROG Emission Components: Year 2006

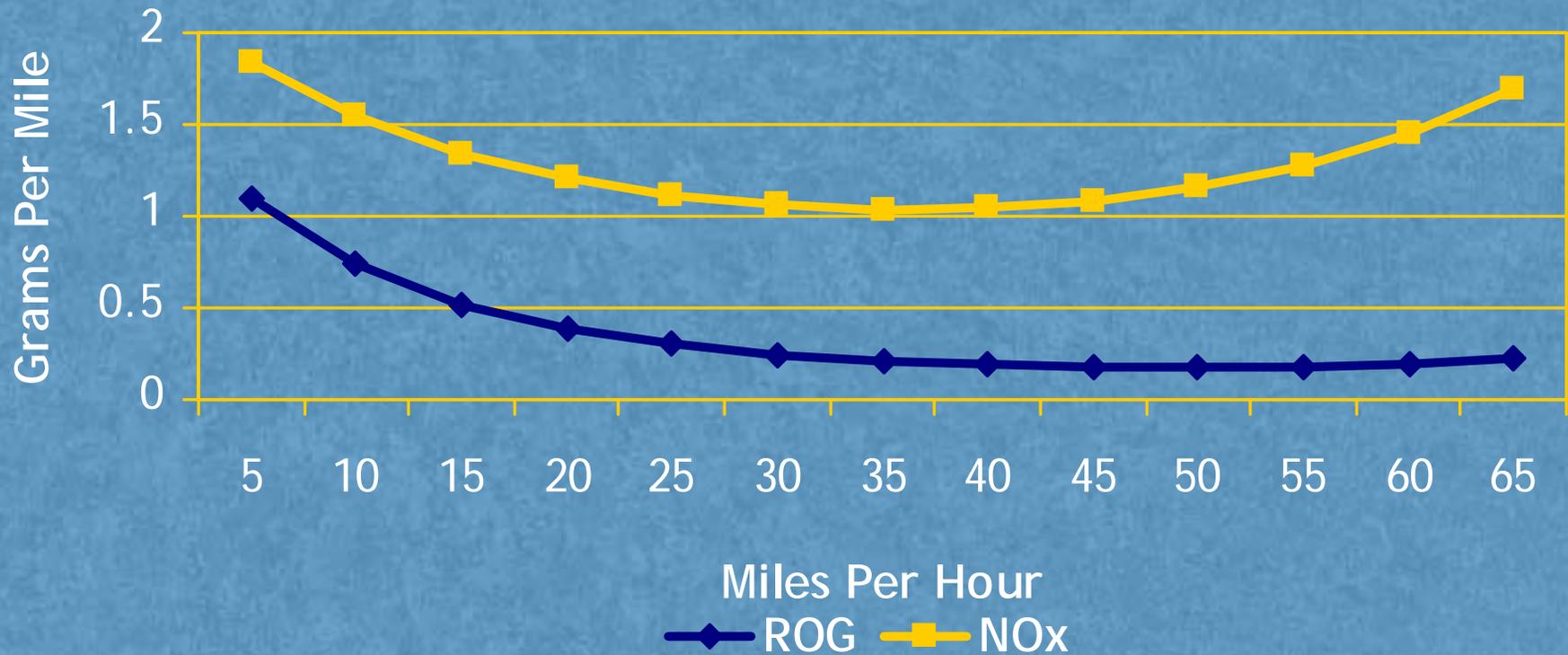


# NOx Emission Components: Year 2006

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# ROG/NOx Emission Rates By Speed



# Distribution of TCMs by Emission Reductions (VOC)

Tons Per Day Reduced	1997 State Plan	1990 MTC Contingency	MTC 2001 OAP	Total
0-0.1	14	6	4	24
0.1-0.2	1	4	1	6
0.2-0.4		3		3
0.4-0.6	1	1		2
0.6-0.8	1			1
0.8-1.0				
>1.0	1	1		2

# Relative Ranking of Selected TCMs

Tons Per Day Reduced	Examples of TCMs	
>2.0	<ul style="list-style-type: none"> <li>• Aggressive pricing</li> </ul>	
>1.0	<ul style="list-style-type: none"> <li>• Expanded signal timing</li> </ul>	
0.6-1.0		
0.3-0.6	<ul style="list-style-type: none"> <li>• Incident management on freeways</li> <li>• Increase state gas tax by 9¢</li> </ul>	
0.1-0.3	<ul style="list-style-type: none"> <li>• Regional express bus</li> <li>• Raise bridge tolls to \$2</li> <li>• Upgrade Caltrain service</li> </ul>	<ul style="list-style-type: none"> <li>• HOV expansion</li> <li>• Freeway Service Patrol</li> </ul>
<0.1	<ul style="list-style-type: none"> <li>• Bart to Colma</li> <li>• Increased Capitols</li> <li>• Regional transit coordination</li> </ul>	<ul style="list-style-type: none"> <li>• Local TSM guidance</li> <li>• Bike/pedestrian</li> <li>• TLC</li> </ul>

# Cost Effectiveness of TCMs vs. Other Mobile Source Measures

Cost Per Ton Reduced (thousands of dollars)	TCMs	Other Mobile Source Measures
<\$10	22%	64%
\$10-20	12%	8%
\$20-30	11%	8%
\$30-40	5%	11%
\$40-50	3%	4%
\$50-60	3%	3%
\$60-70	4%	-
\$70-100	8%	2%
\$100-250	14%	-
>\$250	18%	-
	<b>100%</b>	<b>100%</b>

Source: *The CMAQ Program-Assessing 10 Years of Experience*, TRB, 2002

# General TCM Issues

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1. Estimated reductions for federal and state plans not known
  - 1 hour standard still being achieved for federal plan
2. Vehicle technology continues to drive emissions downward
3. 2006 implementation date for any new measures (federal plan)
4. Finding new measures with significant emission reductions
5. Funding tradeoffs:  
VOC focus vs. NOx and PM
  - VOC for Bay Area
  - NOx for Central Valley
  - PM for public health
6. Continuing implementation issues with new measures:
  - incentives vs. conditions
7. Episodic vs. continuous measures

# Sample TCM Calculations (Preliminary, tons/day)

- Enhanced Bus (*4 AC routes*)
  - Emission reductions: 0.068 TPD
  - Cost Effectiveness: \$501,000/ton
- Bus Rapid Transit (*4 AC Routes*)
  - Emission reductions: 0.023 TPD
  - Cost Effectiveness: \$5 million/ton
- Bus Signal Pre-emption (*7 Muni routes*)
  - Emission reductions: 0.01-0.05 TPD\*
  - Cost effectiveness: \$53,000/ton (minimum)
- Real Time Transit Information (*7 Muni routes*)
  - Emission reductions: 0.01-0.05 TPD\*
  - Cost effectiveness: \$53,000/ton (minimum)
- Regional Vanpool Program (*870 vans*)
  - Emission reductions: 0.20 TPD
  - Cost effectiveness: \$233,000/ton
- Start up School Bus Service in Livermore
  - Emission reductions: 0.006 TPD

\* limited empirical data

# Sample TCM Calculations (Preliminary, tons/day) *(continued)*

- Bike Storage at BART stations
  - Emission reductions: 0.09 TPD
  - Cost effectiveness: \$12,600/ton
- Bridge Tolls to \$3
  - Emission reductions: 0.06 TPD
- Regional Gas Tax of \$0.10 per gallon
  - Emission reductions: 0.54 TPD
- New Ferry Routes *(6 new routes)*
  - Emission reductions (vehicle trips only): 0.08 TPD
- Signal Timing *(Coordinate 1300 new signals)*
  - Emission reductions: 0.51 TPD
  - Cost effectiveness: \$2,500/ton