Appendix C: Technical Analysis Methods and Findings

Sub-Appendices:

1. Round 1 Analysis: Portfolio of Pathways
2. Round 1 Analysis: Technical Documentation of Performance Indicators
3. Round 1 Analysis: Visualizations of Performance Indicators
4. Round 2 Analysis: Portfolio of Pathways
5. Round 2 Analysis: Technical Documentation of Performance Indicators
6. Round 2 Analysis: Visualizations of Performance Indicators

Next Generation Freeways

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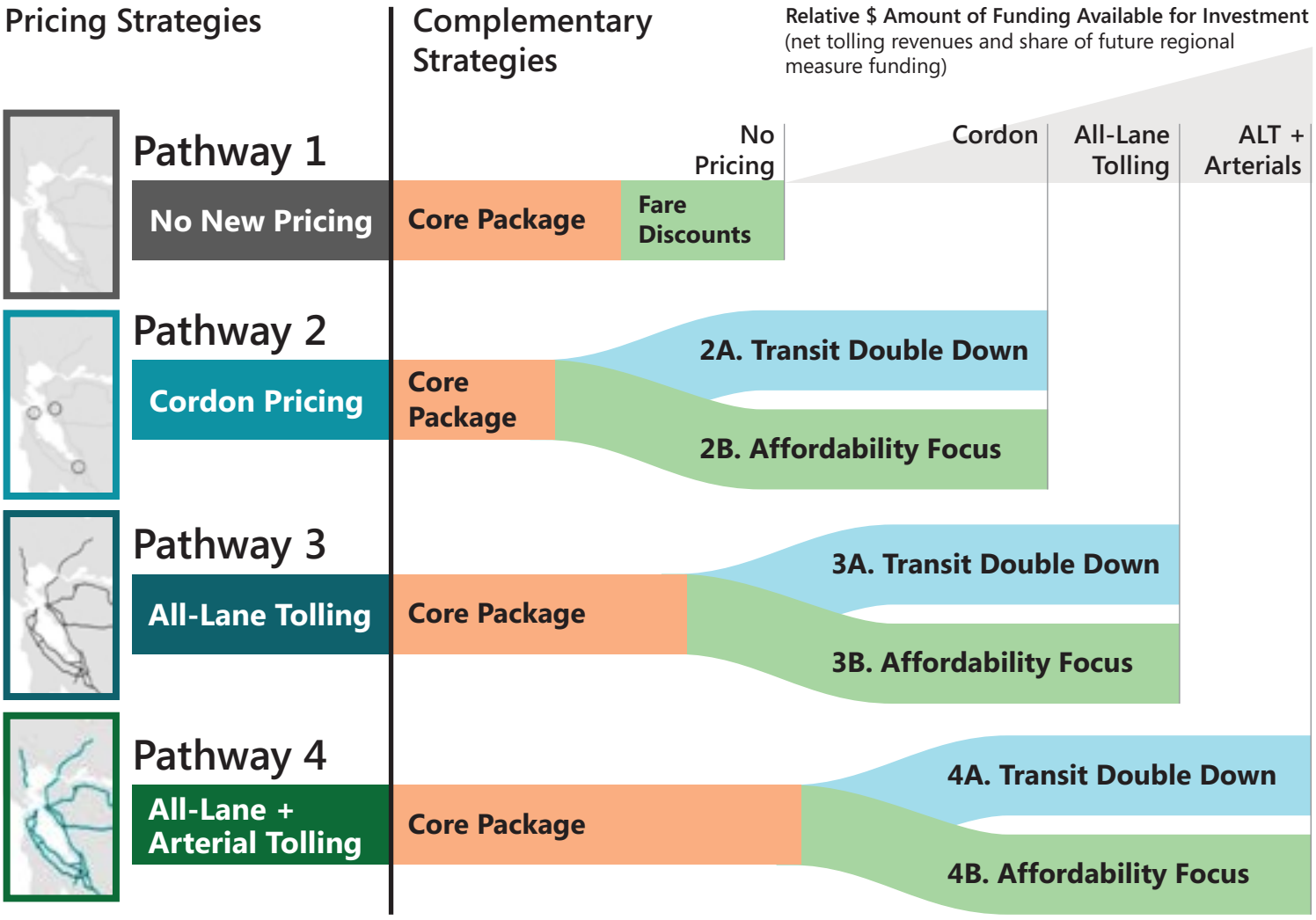
Next Generation Bay Area Freeways Study
Portfolio of Pathways for Round 1 Analysis

What is a "pathway"? Pathways are combinations of a road pricing strategy and complementary strategies that are designed to advance the vision of Next Generation Freeways. Complementary strategies would be funded by tolling revenues and alignment of existing or future resources, such as a regional transportation measure.

What pathways are being studied? An initial portfolio of seven pathways has been developed for the study's first round of analysis in spring and summer 2023. Three pricing strategies form the basis of six pathways, each with a different set of complementary strategies. A seventh pathway will also be evaluated to determine whether goals can be realized without new road pricing initiatives. These pathways would be narrowed down and refined and over the course of the study with learnings from technical analysis and community and stakeholder engagement. A second round of analysis is planned for fall 2023.

How do pathways align with available revenue? The amount of tolling revenues available for reinvestment in complementary strategies would differ based on the pricing strategy. Revenue estimates will be developed during the analysis and would inform the scale of complementary strategies.

Summary of Proposed Pathways



Note: Toll levels for pricing strategies have not been developed as part of the pathway definitions. Appropriate toll levels that may be necessary to achieve goals will be informed by the analysis.

Pathway 1
No "New" Pricing Initiatives

- Express lanes remain on highways.

Relative scale of funding for reinvestment in complementary strategies:

Tolling Revenue	None
Future Funding	$ $ $

$ indicates potential scale of funding relative to other pathways

Complementary Strategies

Core Package

80% OF NET REVENUE

Transit-First

Trunkline Transit Frequency Boosts
10-min headways on rail, express buses, and major local buses

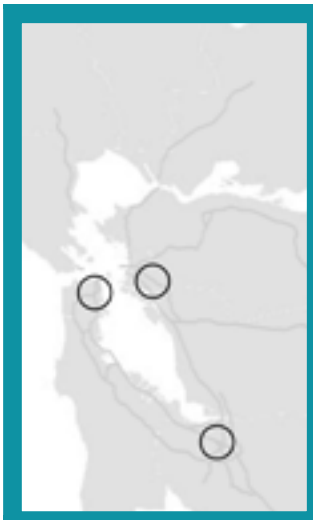
Freeway Carpool/ Bus-Priority Lanes
Contiguous network including direct connectors that prioritizes buses

Local Street Enhancements to Improve Transit Access
Speed limit reductions through safety design elements and bike lane/sidewalk investments

20% OF NET REVENUE

Minimum Discounts

Transit Fare Discount 25%
Very low-income users, and persons with disabilities



Pathway 2
Cordon Pricing Around Urban Centers

- Vehicles entering the downtowns of the region's three largest cities—Oakland, San Francisco and San Jose—are tolled.
- Express lanes remain on highways.

Relative scale of funding for reinvestment in complementary strategies:

Tolling Revenue	$
Future Funding	$ $ $

$ indicates potential scale of funding relative to other pathways

Complementary Strategies

Core Package

40% OF NET REVENUE

Transit-First

Trunkline Transit Frequency Boosts
10-min headways on rail, express buses, and major local buses

Local Transit Frequency Boosts
10-min or less headways on major routes ending in or passing through downtowns

Local Street Enhancements to improve Transit Access
Speed limit reductions through safety design elements and bike lane/sidewalk investments

20% OF NET REVENUE

Reparative Investments

Highway Pedestrian Crossing Improvements

Urban Greening in Freeway-Adjacent Communities

Investment Focus: Version A

40% OF NET REVENUE

Transit Double-Down

New Express Bus Service
~5-10 missing markets

Local Feeder Bus Frequency Boosts
10-min headways

Extended Transit Service Hours
Evenings for major routes

Transit Priority on Local Streets
Bus-only lanes, signal priority

Investment Focus: Version B

40% OF NET REVENUE

Affordability

Transit Fare Discount 50%
Low-income users

Toll Discount 50%
Very low-income users

Toll Caps/Rebates
For specific industry groups

Toll Credits for Transit Riders
Rewarding frequent transit use

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Pathway 3
All-Lane Highway Tolling

- All lanes of highways in corridors with existing or planned frequent regional rail or express bus service are tolled.
- Carpool lanes are for HOV3+ vehicles only, with 50% discounted tolls.
- Tolls vary by place and time-of-day.

Relative scale of funding for reinvestment in complementary strategies:

Tolling Revenue	$ $ $ $
Future Funding	$ $ $

$ indicates potential scale of funding relative to other pathways

Complementary Strategies

Core Package

40% OF NET REVENUE

Transit-First

Trunkline Transit Frequency Boosts 10-min headways on rail, express buses, and major local buses

Highway Carpool/ Bus-Priority Lanes
Contiguous network including direct connectors that prioritizes buses

Local Street Enhancements to Improve Transit Access
Speed limit reductions through safety design elements and bike lane/sidewalk investments

10% OF NET REVENUE

Minimum Discounts

Transit Fare Discount 25%
Very low-income users, and persons with disabilities

Toll Discount 50%
Persons with disabilities

10% OF NET REVENUE

Reparative Investments

Highway Pedestrian Crossing Improvements

Urban Greening in Freeway-Adjacent Communities

Investment Focus: Version A

40% OF NET REVENUE

Transit Double-Down

New Express Bus Service
~5-10 missing markets

Local Feeder Bus Frequency Boosts
10-min headways

Extended Transit Service Hours
Evenings for major routes

Transit Priority on Local Streets
Bus-only lanes, signal priority

Investment Focus: Version B

40% OF NET REVENUE

Affordability

Transit Fare Discount 50%
Low-income users

Toll Discount 50%
Very low-income users

Toll Caps/Rebates
For specific industry groups

Toll Credits for Transit Riders
Rewarding frequent transit use

Next Gen Freeways

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Pathway 4

All-Lane Highway and Arterial Tolling in Transit-Rich Corridors

- All lanes of highways in corridors with existing or planned frequent regional rail or express bus service are tolled.
- Carpool lanes are for HOV3+ vehicles only, with 50% discounted tolls.
- Major arterials that run parallel to highways are tolled to limit diversion of vehicles into local streets.
- Tolls vary by place and time-of-day.

Relative scale of funding for reinvestment in complementary strategies:

Tolling Revenue	$ $ $ $ $
Future Funding	$ $ $

$ indicates potential scale of funding relative to other pathways

Complementary Strategies

Core Package

40% OF NET REVENUE

Transit-First

Trunkline Transit Frequency Boosts
10-min headways on rail, express buses, and major local buses

Highway Carpool/ Bus-Priority Lanes
Contiguous network including direct connectors that prioritizes buses

Local Street Enhancements to Improve Transit Access
Speed limit reductions through safety design elements and bike lane/sidewalk investments

10% OF NET REVENUE

Minimum Discounts

Transit Fare Discount 25%
Very low-income users, and persons with disabilities

Toll Discount 50%
Persons with disabilities

10% OF NET REVENUE

Reparative Investments

Highway Pedestrian Crossing Improvements

Urban Greening in Freeway-Adjacent Communities

Investment Focus: Version A

40% OF NET REVENUE

Transit Double-Down

New Express Bus Service
~5-10 missing markets

Local Feeder Bus Frequency Boosts
10-min headways

Extended Transit Service Hours
Evenings for major routes

Transit Priority on Local Streets
Bus-only lanes, signal priority

Investment Focus: Version B

40% OF NET REVENUE

Affordability

Transit Fare Discount 50%
Low-income users

Toll Discount 50%
Very low-income users

Toll Caps/Rebates
For specific industry groups

Toll Credits for Transit Riders
Rewarding frequent transit use

METROPOLITAN TRANSPORTATION COMMISSION

ROUND 1 ANALYSIS TECHNICAL DOCUMENTATION: PERFORMANCE AND EQUITY OUTCOMES

August 2023

Organized by the five Next Generation Bay Area Freeways goals, ten performance indicators help answer whether pathways developed for Round 1 Analysis achieve two desired outcomes (rephrased as questions in this document) per Goal. Outcomes of pricing pathways (Pathways 2A/B, 3A/B, 4A/B) are measured relative to the No New Pricing pathway (Pathway 1), which is considered the "baseline" for analysis. The performance indicators are forecasted for the year 2035 – the year by which the pricing pathways assume implementation of pricing strategies. The indicators highlight impacts on underserved populations where feasible.

Outcomes by Goals: Measuring Performance and Equity Impacts

Goals	Desired Outcomes	Performance/Equity Indicators (forecasted for year 2035)
Affordable	1. Affordable travel options for those with limited means.	**Transportation costs** as a share of household income, by different income groups
	2. Travel time savings that are worth incremental travel costs.	**Monetary value of travel time savings vs. toll costs** by different income groups
Efficient	3. Transit alternatives that are time-competitive with driving.	**Travel time by transit vs. auto** in region and EPCs
	4. Greater use of multimodal alternatives to driving.	**Mode share** Transit, walk and bike vs. auto
Reliable	5. Reduced travel times on freeways without adverse impacts on parallel local roads.	**Travel time on freeways and parallel local streets** in region and EPCs, for people and goods
	6. Improved reliability of travel time throughout the day.	**Travel time during peak hours vs. non-peak hours on freeways** for people and goods
Reparative	7. Investments that reverse health, safety, connectivity and aesthetic issues caused by freeways in adjacent communities.	**Absolute dollar amount of new revenues reinvested in freeway adjacent communities**
	8. Incremental costs that are not regressive to those with limited means.	**Benefits received vs. costs paid by low-income population**
Safe	9. Fewer fatalities on and off freeways.	**Fatalities on freeways and local streets** in region and EPCs
	10. Reduced climate emissions.	**Vehicle miles travelled on freeway and local streets** in region and EPCs

KEY DEFINITIONS IN PERFORMANCE INDICATORS

Income Quantiles and Focused Populations

- **Q1** refers to households with an annual income of less than $55,000 in 2023 dollars, also referred to as **Very Low-Income Households**.
- **Q2** refers to households with an annual income of greater than $55,000 and less than $110,000 in 2023 dollars, also referred to as **Low-Income Households**.
- **Q3** refers to households with an annual income of greater than $110,000 and less than $190,000 in 2023 dollars, also referred to as **Moderate-Income Households**.
- **Q4** refers to households with an annual income of greater than $190,000 in 2023 dollars, also referred to as **High-Income Households**.
- **Equity Priority Communities (EPCs)** refers to Census tracts with a significant concentration of underserved populations, including people of color and households with low incomes, last updated as part of Plan Bay Area 2050 (2021).

Pathways

- **Pathway 1 – No New Pricing –** refers to simulated 2035 outcomes if population and job growth continue according to the Plan Bay Area 2050 Regional Growth Forecast and strategies for local street safety improvements and speed reductions, bike lane and sidewalk improvements, and 50% transit fare discounts for Q1 are implemented.
- **Pathway 2 – Cordon Pricing –** refers to simulated 2035 pathway outcomes if the cordon pricing strategy is implemented. In addition to the core package of investments included in Pathway 1, net revenues from pricing fund complementary strategies in either Focus A (Transit Double-Down) or Focus B (Affordability Focus).
- **Pathway 3 – All-Lane Tolling –** refers to simulated 2035 pathway outcomes if all-lane tolling on freeways is implemented. In addition to the core package of investments included in Pathway 1, net revenues from pricing fund complementary strategies in either Focus A (Transit Double-Down) or Focus B (Affordability Focus).
- **Pathway 4 – All-Lane + Arterial Tolling –** refers to simulated 2035 pathway outcomes if all-lane tolling on freeways and arterials is implemented. In addition to the core package of investments included in Pathway 1, net revenues from pricing fund complementary strategies in either Focus A (Transit Double-Down) or Focus B (Affordability Focus).
- **Version A – Transit Double-Down –** refers to a package of complementary strategies that includes new express bus service, local feeder bus frequency boosts, extended transit service hours, and transit priority on local streets, funded by net pricing revenues with the objective of improving transit experience.
- **Version B – Affordability Focus –** refers to a package of complementary strategies that includes 50% transit fare discounts for Q1 and Q2, 50% toll discounts for Q1, toll caps/rebates, and toll credits for transit riders, funded by net pricing revenues with the objective of improving affordability for Bay Area travelers.

For detailed definitions of pathways, please refer to Attachment D. For details on the scale of investment in complementary strategies, please refer to Attachment A.

Study Corridors

For the purposes of the first round of analysis of the all-lane tolling pathways (Pathways 3A, 3B 4A, 4B), the network of tolled corridors was split into 19 segments or **study corridors** based on county lines, major interchanges, travel patterns, and availability of parallel transit. Each study corridor may span multiple freeways. The study corridors, shown below

(detailed in Table 25 in the appendix of this document) and named in short for convenience, are flexible and could be altered for the second round of analysis.

- San Francisco County:
  - San Francisco
- San Francisco/San Mateo County:
  - Northern San Mateo US-101
  - Northern San Mateo I-280
- San Mateo County:
  - Southern San Mateo US-101
  - Southern San Mateo I-280
- Santa Clara County:
  - Northern Santa Clara Corridors
  - Central Santa Clara North-South Corridors
  - Central Santa Clara East-West Corridors
  - Southern Santa Clara US-101
- Alameda County:
  - Alameda I-880
  - Eastern Alameda I-580
  - Central Alameda I-580
  - Northern Alameda I-580
  - Bay Bridge Approach
- Contra Costa/Alameda County:
  - Contra Costa/Alameda I-680/SR-24/I-980
- Contra Costa County:
  - Contra Costa SR-4
  - Contra Costa I-80
- Solano County:
  - Solano I-80
- Marin/Sonoma County:
  - Marin/Sonoma US-101

Parallel Arterials

For the purposes of the first round of analysis, **Parallel Arterials** refers to major local streets that are run parallel to the tolled freeways and meet a set of "parallel" criteria. For details on the parallel arterials, please refer to Attachment B.

Goods Movement Routes

For the purposes of the first round of analysis, three **goods movement routes** with the highest goods volumes were considered for analysis.

- Solano/Yolo I-80 to the Port of Oakland
- Santa Clara/San Benito US-101 to the Port of Oakland
- Alameda/San Joaquin I580 to the Port of Oakland

Key Representative Origin-Destination Pairs

For the purposes of the first round of analysis, ten **key origin-destination (O-D) pairs** that are representative of the geographical diversity in the region and connect major housing and job centers were selected to analyze two performance indicators: Travel time by transit vs. auto (Efficient performance indicator #1) as well as travel time during peak hours vs. off-peak hours on freeways (Reliable performance indicator #2).

- Antioch to Central/West Oakland
- Central San Jose to San Francisco Downtown Area
- Central/West Oakland to Central San Jose
- Central/West Oakland to Palo Alto
- Central/West Oakland to San Francisco Downtown Area
- Danville, San Ramon, Dublin, and Pleasanton to San Francisco Downtown Area
- Fairfield and Vacaville to Richmond
- Livermore to Central San Jose
- Santa Rosa to San Francisco Downtown Area
- Vallejo to San Francisco Downtown Area

Other relevant terms used in specific indicators are further defined under each indicator.

PERFORMANCE AND EQUITY OUTCOMES BY GOAL

Goal: Ensure everyone has affordable and cost-effective travel options.

Key Question 1: Will there be affordable travel options for those with limited means?

Performance Indicator: Transportation costs as a share of household income, by different income groups

Performance Indicator Definition

Annual transportation costs for the average household as a share of the annual income of the average household, determined by the four income quantiles.

Methodology

Transportation costs include annual expenditures on transit fares; out-of-pocket operating costs of driving trips including auto ownership/financing, insurance, registration/taxes, fuel, maintenance, parking, and tolls; applicable toll discounts; and taxi or TNC fares. These costs are forecasted by Travel Model 1.5, based on simulated travel behavior and assumptions on the cost of fuel, tolls, parking fees, and transit fares. The costs are aggregated across all households within a given income quantile and divided by the aggregate income of that income quantile to arrive at the share of household income spent on transportation.

Key terms used under this performance indicator are: Driving only defined as households that only drive on an average weekday; transit only defined as households that only travel using transit on an average weekday; driving + transit defined as households that both drive and use transit on an average weekday; other defined as households whose travel behavior does not fall into the categories above; and toll cost defined as the total combined cost incurred from Express Lanes, cordons and all-lane tolling.

How to Interpret the Results

The percentages shown in Table 1 and Table 2 indicates the share of an average household's income that is spent on overall transportation costs, including new toll costs in the pricing pathways. A low percentage is favorable as this would indicate that a low share of a household's income is spent on transportation-related costs. The toll costs alone as a share of income are also shown separately, in Table 3 and Table 4.

Table 1: Transportation Costs as a Share of Income for All Households

Travel Mode	1	2a	2b	3a	3b	4a	4b
Driving Only	24%	24%	24%	24%	24%	24%	24%
Transit Only	11%	10%	10%	10%	11%	10%	11%
Driving + Transit	23%	24%	23%	24%	24%	24%	24%
Other	17%	15%	17%	15%	17%	15%	17%

Table 2: Transportation Costs as a Share of Income for Very Low-Income Households

Travel Mode	1	2a	2b	3a	3b	4a	4b
Driving Only	47%	47%	47%	47%	47%	47%	47%
Transit Only	13%	17%	17%	17%	13%	17%	13%
Driving + Transit	47%	47%	47%	47%	47%	47%	47%
Other	23%	18%	23%	18%	23%	18%	23%

Table 3: Toll Costs as a Share of Income for All Households

Travel Mode	1	2a	2b	3a	3b	4a	4b
Driving Only	0.0%	0.1%	0.1%	0.2%	0.2%	0.3%	0.2%
Transit Only	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Driving + Transit	0.0%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%
Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 4: Toll Costs as a Share of Income for Very Low-Income Households

Travel Mode	1	2a	2b	3a	3b	4a	4b
Driving Only	0.0%	0.2%	0.1%	0.3%	0.2%	0.3%	0.2%
Transit Only	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Driving + Transit	0.0%	0.3%	0.2%	0.2%	0.1%	0.3%	0.2%
Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Key Question 2: Will travel time savings be worth incremental toll costs?

Performance Indicator: Monetary value of travel time savings vs. toll costs by different income groups

Performance Indicator Definition

The monetized value of auto travel time savings for the auto driver is divided by auto tolls paid (minus any discounts, credits, and rebates). The monetary value of time savings differs for personal auto vs. business/commercial travelers.

Methodology

Average travel times, to traverse study corridors using general-purpose lanes, and toll values for the AM period are sourced from the output networks of the travel model. The average travel time to traverse a study corridor is compared between two runs to determine the "time savings". To translate this to a dollar value, the time savings are multiplied by a constant[1] recommended by the USDOT (0.5 for all personal travel, including commuting to and from work, and 1.54 for "on-the-clock" business travel such as transportation and material moving occupations) as well as a relevant wage rate[2] sourced from the U.S. Bureau of Labor Statistics ($15.33 for Q1, $30.05 for Q2, $53.90 for Q3, $114.96 for Q4, $40.53 for construction workers, $31.75 for heavy truck operators, and $36.09 for sales workers in 2023 $ per person-hour). This value serves as the numerator. The denominator is the toll value for the entire study corridor. The calculation only considers travel times on freeways and does not account for travel on local streets or roads to access the freeway.

Key terms used under this performance indicator are: Household drivers, defined as private vehicle drivers and business/commercial drivers defined as drivers driving on business expense or paid commercial drivers.

How to Interpret the Results

A ratio of 1 indicates that the monetary value derived from the travel time savings experienced is equal to the toll amount paid. The monetary value of travel time savings represents the perceived benefits received by drivers and does not account for societal benefits obtained through the implementation of road pricing (e.g., emissions reduction, safety, and reparative investments, transit discounts, and improvements for the non-driving population). Ratios that are similar across income groups and approach a value of 1 are favorable as these would indicate that the perceived benefits of road pricing are equitable across income classes, but striving for a ratio of 1 is not necessary as it would discount the before-mentioned societal benefits.

[1] U.S. Department of Transportation. (2016, September 27). The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2016 Update). https://www.transportation.gov/sites/dot.gov/files/docs/2016%20Revised%20Value%20of%20Travel%20Time%20Guidance.pdf

[2] U.S. Bureau of Labor Statistics. (2022, May). Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates San Francisco-Oakland-Hayward, CA. https://www.bls.gov/oes/current/oes_41860.htm

Table 5: Ratio of Auto Travel Time Savings (Monetary Value) to Incremental Toll Costs for Household Drivers

Income Quantile	1	2a	2b	3a	3b	4a	4b
Q1	NA	0.0	0.0	0.1	0.3	0.1	0.2
Q2	NA	0.0	0.0	0.3	0.3	0.2	0.2
Q3	NA	0.0	0.0	0.5	0.5	0.4	0.4
Q4	NA	0.0	0.0	1.1	1.0	0.8	0.8

Note: "NA" indicates that there are no incremental toll costs

Table 6: Ratio of Auto Travel Time Savings (Monetary Value) to Incremental Toll Costs for Business/Commercial Drivers

Roadway Users	1	2a	2b	3a	3b	4a	4b
Heavy Truck Operators	NA	0.0	0.0	0.9	0.9	0.7	0.7
Sales Workers	NA	0.0	0.0	1.0	1.0	0.8	0.8
Construction Workers	NA	0.0	0.0	1.2	1.1	0.9	0.9

Note: "NA" indicates that there are no incremental toll costs

Goal: Maximize capacity of existing infrastructure by improving multimodal alternatives to driving.

Key Question 1: Will transit alternatives be time-competitive with driving?

Performance Indicator: Travel time by transit vs. auto in the region and EPCs

Performance Indicator Definition

Transit travel time (including walking access to transit, waiting time, and in-vehicle travel time) divided by auto travel time (including drive time and parking time) for ten representative origin-destination pairs across the region.

Methodology

Travel times are sourced from the output networks of the travel model, for the AM period between representative origin-destination pairs. A simple average of the ratios across the ten representative O-D pairs is used to depict a regional aggregate metric.

Key terms used under this performance indicator are: 3 big cities (San Francisco, San Jose, and Oakland) and zones defined as regional travel analysis zones for use in MTC planning studies. These travel analysis zones (TAZs) are typically small area neighborhoods or communities that serve as the smallest geographic basis for travel demand model forecasting systems.

How to Interpret the Results

A ratio of 1 indicates that the travel time by transit is equal to that by auto. A decrease in the ratio is favorable as this would indicate transit travel time is improving relative to auto travel time.

Table 7: Ratio of Travel Time by Transit Vs. Auto during the AM Peak Period

Origin-Destination Pairs	1	2a	2b	3a	3b	4a	4b
Antioch to Central/West Oakland	1.1	1.1	1.1	1.4	1.4	1.4	1.4
Central San Jose to San Francisco Downtown Area	1.2	1.2	1.2	1.3	1.3	1.3	1.3
Central/West Oakland to Central San Jose	1.3	1.2	1.2	1.5	1.5	1.4	1.5
Central/West Oakland to Palo Alto	1.4	1.3	1.4	1.3	1.5	1.3	1.5
Central/West Oakland to San Francisco Downtown Area	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Danville, San Ramon, Dublin, and Pleasanton to San Francisco Downtown Area	0.8	0.9	0.9	0.9	0.9	0.9	0.9
Fairfield and Vacaville to Richmond	1.6	1.6	1.6	1.6	1.7	1.6	1.6
Livermore to Central San Jose	1.3	1.3	1.3	1.1	1.1	1.2	1.1
Santa Rosa to San Francisco Downtown Area	1.6	1.6	1.6	1.5	1.5	1.5	1.5
Vallejo to San Francisco Downtown Area	1.0	0.9	1.0	1.0	1.2	1.0	1.1
Average Across 10 Origin-Destination Pairs	**1.3**	**1.2**	**1.3**	**1.2**	**1.3**	**1.3**	**1.3**
All Zones to San Francisco Downtown Area	1.3	1.3	1.3	0.9	1.0	1.3	1.3
All Zones to Central San Jose	2.5	2.3	2.3	2.0	2.1	2.3	2.5
All Zones to Central/West Oakland	1.8	1.7	1.7	1.3	1.4	1.8	1.9
Average of All Zones to 3 Big Cities	**2.2**	**2.1**	**2.1**	**2.0**	**2.1**	**2.0**	**2.1**
All EPCs to San Francisco Downtown Area	1.3	1.3	1.3	0.8	0.9	0.8	0.9
All EPCs to Central San Jose	2.9	2.6	2.7	2.5	2.6	1.8	1.9
All EPCs to Central/West Oakland	2.2	2.0	2.1	1.7	1.8	1.5	1.6
Average of All EPCs to 3 Big Cities	**2.4**	**2.2**	**2.3**	**2.2**	**2.3**	**2.2**	**2.2**

Key Question 2: Will there be greater use of multimodal alternatives to driving?

Performance Indicator: Commute Tour Mode Share

Performance Indicator Definition

Share of commute trips with the primary mode of travel being transit, telecommuting, SOV, HOV, walking, and biking.

Methodology

This indicator is calculated as the number of trips completed with a given travel mode divided by the total number of trips for commute trips during peak hours.

Key terms used under this performance indicator are: SOV defined as single-occupancy vehicles; HOV defined as high-occupancy vehicles; transit which includes local bus, light rail, ferry, express bus, heavy rail, and commuter rail; and TNC defined as transportation network companies or ride-hailing services.

How to Interpret the Results

The percentage indicates the share of the total number of commute trips that are completed by means of the primary mode listed. Decreases in SOV and other driving mode shares are favorable as such shifts are generally associated with decreases in VMT and greenhouse gas (GHG) emissions.

Table 8: Mode Share of Commute Tours during the Peak Hours

Travel Mode	1	2a	2b	3a	3b	4a	4b
SOV	36.6%	36.2%	36.3%	35.8%	36.0%	35.7%	36.0%
HOV	17.9%	17.9%	17.9%	18.1%	18.1%	18.1%	18.1%
Taxi/TNC	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%
Transit	18.0%	18.3%	18.3%	18.7%	18.6%	18.8%	18.7%
Bike	7.1%	7.2%	7.1%	7.1%	6.9%	7.1%	6.9%
Walk	2.4%	2.5%	2.4%	2.4%	2.4%	2.5%	2.4%
Telecommute	17.2%	17.3%	17.2%	17.1%	17.1%	17.1%	17.1%
Total Auto	**55.3%**	**54.9%**	**55.0%**	**54.7%**	**54.9%**	**54.6%**	**54.9%**
Total Non-Auto	**44.7%**	**45.3%**	**45.0%**	**45.3%**	**45.0%**	**45.5%**	**45.1%**

Goal: Reduce traffic congestion and improve reliability for people and goods.

Key Question 1: Will travel times be reduced on freeways without adversely impacting parallel local roads?

Performance Indicator: Travel time on freeways and parallel local streets in region and EPCs, for people and goods

Performance Indicator Definition

Percentage change in average travel time during peak hours, defined as 6 AM to 10 AM and 3 PM to 7 PM, by study corridor.

Methodology

Average travel times to traverse study corridors are sourced from the output networks of the travel model, for the AM and PM periods. These travel times are compared between runs by calculating the difference between the baseline run and subsequent model runs. A simple average of the percentage change in travel time across the study corridors is used to depict a regional aggregate metric. The calculation is done separately for freeway study corridors and parallel arterial streets.

How to Interpret the Results

The percentage indicates the change in travel time on the specified facility type. A low percentage (negative value) is favorable as it would indicate a decrease in the average travel time across the facilities, equivalent to an increase in the average speed.

Table 9: Change in Peak Hour Travel Time on Freeway Corridors

Corridor	1	2a	2b	3a	3b	4a	4b
San Francisco	0%	4%	4%	-14%	-13%	-12%	-13%
Northern San Mateo US-101	0%	-2%	-2%	-8%	-8%	-7%	-7%
Northern San Mateo I-280	0%	-1%	-1%	-2%	-2%	-1%	-1%
Southern San Mateo US-101	0%	0%	0%	-23%	-23%	-20%	-18%
Southern San Mateo I-280	0%	0%	0%	-3%	-2%	-1%	0%
Northern Santa Clara Corridors	0%	-2%	-1%	-22%	-22%	-18%	-16%
Central Santa Clara North-South Corridors	0%	-1%	0%	7%	8%	13%	14%
Central Santa Clara East-West Corridors	0%	0%	0%	-9%	-9%	-7%	-6%
Southern Santa Clara US-101	0%	0%	0%	0%	0%	0%	0%
Alameda I-880	0%	0%	0%	-22%	-22%	-19%	-19%
Eastern Alameda I-580	0%	0%	0%	15%	14%	14%	14%
Central Alameda I-580	0%	-2%	-2%	-13%	-11%	-14%	-12%
Northern Alameda I-580	0%	0%	0%	9%	9%	10%	10%
Bay Bridge Approach	0%	-2%	-2%	-13%	-14%	-12%	-12%
Contra Costa/Alameda I-680/SR-24/I-980	0%	-1%	-1%	-22%	-22%	-21%	-21%
Contra Costa SR-4	0%	1%	1%	-19%	-19%	-16%	-16%
Contra Costa I-80	0%	-1%	-1%	-22%	-22%	-20%	-20%
Solano I-80	0%	0%	0%	2%	2%	1%	1%
Marin/Sonoma US-101	0%	0%	0%	0%	0%	0%	0%
Average Across 19 Study Corridors	**0%**	**0%**	**0%**	**-10%**	**-10%**	**-8%**	**-8%**

Table 10: Change in Peak Hour Travel Time on Arterials Parallel to Freeway Corridors

Corridor	1	2a	2b	3a	3b	4a	4b
San Francisco	0%	0%	0%	1%	1%	0%	0%
Northern San Mateo US-101	0%	-1%	1%	-1%	-1%	-2%	-2%
Northern San Mateo I-280	0%	0%	0%	0%	0%	1%	1%
Southern San Mateo US-101	0%	0%	0%	9%	8%	-1%	-1%
Southern San Mateo I-280	0%	0%	0%	29%	27%	-1%	-1%
Northern Santa Clara Corridors	0%	0%	0%	12%	12%	-2%	-1%
Central Santa Clara North-South Corridors	0%	0%	0%	5%	5%	0%	0%
Central Santa Clara East-West Corridors	0%	0%	0%	6%	6%	-1%	0%
Southern Santa Clara US-101	0%	0%	0%	0%	0%	0%	0%
Alameda I-880	0%	0%	0%	14%	13%	-1%	-1%
Eastern Alameda I-580	0%	0%	0%	0%	0%	1%	0%
Central Alameda I-580	0%	0%	0%	6%	6%	-3%	-3%
Northern Alameda I-580	0%	0%	0%	2%	2%	2%	2%
Bay Bridge Approach	0%	0%	0%	5%	4%	-1%	-1%
Contra Costa/Alameda I-680/SR-24/I-980	0%	0%	0%	7%	7%	0%	0%
Contra Costa SR-4	0%	0%	0%	15%	14%	2%	2%
Contra Costa I-80	0%	0%	0%	21%	18%	0%	0%
Solano I-80	0%	0%	0%	0%	0%	0%	0%
Marin/Sonoma US-101	0%	0%	0%	0%	0%	0%	0%
Average Across 19 Study Corridors	**0%**	**0%**	**0%**	**8%**	**7%**	**0%**	**0%**

Table 11: Change in Peak Hour Travel Time on Arterials Parallel to Freeway Corridors within EPCs

Corridor	1	2a	2b	3a	3b	4a	4b
San Francisco	0%	0%	0%	1%	1%	1%	1%
Northern San Mateo US-101	0%	0%	0%	0%	0%	0%	0%
Northern San Mateo I-280	0%	0%	0%	0%	0%	3%	3%
Southern San Mateo US-101	0%	0%	0%	4%	4%	0%	0%
Southern San Mateo I-280	NA	NA	NA	NA	NA	NA	NA
Northern Santa Clara Corridors	0%	0%	0%	7%	7%	-1%	-1%
Central Santa Clara North-South Corridors	0%	0%	0%	4%	4%	0%	0%
Central Santa Clara East-West Corridors	0%	0%	0%	1%	1%	0%	0%
Southern Santa Clara US-101	0%	0%	0%	0%	0%	0%	0%
Alameda I-880	0%	1%	0%	15%	14%	-2%	-1%
Eastern Alameda I-580	NA	NA	NA	NA	NA	NA	NA
Central Alameda I-580	0%	0%	0%	9%	6%	-7%	-7%
Northern Alameda I-580	0%	0%	0%	2%	2%	3%	3%
Bay Bridge Approach	0%	0%	0%	4%	3%	-1%	-1%
Contra Costa/Alameda I-680/SR-24/I-980	0%	0%	0%	3%	3%	-1%	-1%
Contra Costa SR-4	0%	0%	0%	16%	15%	2%	2%
Contra Costa I-80	0%	0%	0%	17%	15%	0%	0%
Solano I-80	0%	0%	0%	0%	0%	0%	0%
Marin/Sonoma US-101	0%	0%	0%	0%	0%	0%	0%
Average Across 19 Study Corridors	**0%**	**0%**	**0%**	**6%**	**5%**	**0%**	**0%**

Note: "NA" indicates that there were no tolled arterials in the EPCs on the specified corridor

Table 12: Change in Peak Hour Travel Time on Goods Movement Routes

Corridor	1	2a	2b	3a	3b	4a	4b
Solano/Yolo I-80 to the Port of Oakland	0%	0%	0%	-8%	-8%	-7%	-7%
Santa Clara/San Benito US-101 to the Port of Oakland	0%	-1%	0%	-8%	-8%	-7%	-6%
Alameda/San Joaquin I580 to the Port of Oakland	0%	-1%	-1%	-2%	-1%	-2%	-1%
Average Across 3 Goods Movement Routes	**0%**	**-1%**	**-1%**	**-7%**	**-6%**	**-6%**	**-5%**

Key Question 2: Will travel time reliability improve throughout the day?

Performance Indicator: Travel time during peak hours vs. off-peak hours on freeways for people and goods

Performance Indicator Definition

Average travel time during peak hours, defined as 6 AM to 10 AM and 3 PM to 7 PM, divided by travel time during off-peak hours, defined as 10 AM to 3 PM, for ten representative origin-destination pairs across the region.

Methodology

Average travel times between each representative origin-destination pair are sourced from the output networks of the travel model, for peak and non-peak periods. A simple average of the ratios across the ten representative O-D pairs is used to depict a regional aggregate metric.

How to Interpret the Results

A ratio of 1 indicates that the travel time by auto during peak hours is equal to that during off-peak hours. A decrease in the ratio is favorable as this would indicate peak hour travel time is improving relative to off-peak hour travel time, thereby curbing unreliability caused due to recurring freeway congestion. The results do not capture the impacts of nonrecurring traffic congestion caused by collisions or other incidents on the road as the travel model cannot provide insights into day-to-day travel time variability.

Table 13: Ratio of Auto Travel Time During Peak vs Off-Peak Hours for 10 Key Origin-Destination Pairs

Origin-Destination Pairs	1	2a	2b	3a	3b	4a	4b
Antioch to Central/West Oakland	1.3	1.3	1.3	1.2	1.2	1.1	1.1
Central San Jose to San Francisco Downtown Area	1.1	1.0	1.1	1.1	0.9	NA	NA
Central/West Oakland to Central San Jose	1.1	1.1	1.2	1.0	1.1	1.2	NA
Central/West Oakland to Palo Alto	1.4	1.3	1.4	1.3	1.3	1.3	1.3
Central/West Oakland to San Francisco Downtown Area	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Danville, San Ramon, Dublin, and Pleasanton to San Francisco Downtown Area	1.2	1.1	1.1	1.0	1.0	1.0	1.0
Fairfield and Vacaville to Richmond	1.1	1.2	1.1	1.2	1.2	1.2	1.2
Livermore to Central San Jose	1.2	1.3	1.2	1.4	1.4	1.3	1.3
Santa Rosa to San Francisco Downtown Area	1.0	1.0	0.9	1.0	1.0	1.0	1.0
Vallejo to San Francisco Downtown Area	1.1	1.1	1.1	1.0	1.0	1.0	1.0
Average Across 10 Key Origin-Destination Pairs	**1.2**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**

Note: "NA" indicates that values are missing due to insufficient data from the travel model; the methodology will be further investigated for Round 2 Analysis

Table 14: Ratio of Auto Travel Time During Peak vs Off-Peak Hours for Goods Movement Routes

Corridor	1	2a	2b	3a	3b	4a	4b
Solano/Yolo I-80 to the Port of Oakland	1.1	1.1	1.1	1.0	1.0	1.0	1.0
Santa Clara/San Benito US-101 to the Port of Oakland	1.1	1.1	1.1	1.0	1.0	1.0	1.0
Alameda/San Joaquin I580 to the Port of Oakland	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Average Across 3 Goods Movement Routes	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**

Goal: Support freeway-adjacent communities impacted by 20th-century transportation policy decisions.

Key Question 1: Will investments in communities adjacent to freeways reverse health, safety, connectivity, and aesthetic issues caused by freeways?

Performance Indicator: Absolute dollar amount of new revenues reinvested in freeway-adjacent communities

Performance Indicator Definition

The absolute dollar amount that is invested in neighborhood-oriented projects that reverse health, safety, connectivity, and aesthetic issues caused by freeways in adjacent communities within ½ mile of a freeway corridor.

Methodology

The amount of revenue that benefits freeway-adjacent communities is calculated in the following way for the different categories of complementary strategies:

- Local transit investments: Estimated based on the investment in the relevant complementary strategies multiplied by the share of area/length/total quantity of improvements that lie within half a mile of a freeway corridor.
- Safety investments: Estimated based on the investment in the relevant complementary strategies multiplied by the share of local roadways that lie within half a mile of a freeway corridor.
- Community-scale Investments: Assumed that all investments are in freeway-adjacent communities.

Key terms used under this performance indicator are: freeway-adjacent communities, defined as communities that fall within a ½ mile buffer around freeways. For details on the nature of investment in the complementary strategies, please refer to Attachment A.

How to Interpret the Results

The dollar amount indicates how much money is available for reinvestment in freeway-adjacent communities. Higher amounts are favorable as these would indicate that there are more new revenues reinvested in freeway-adjacent communities.

Table 15: Absolute Dollar Amount of New Revenues Generated that is Reinvested in Freeway Adjacent Communities (2023$ billions)

Reinvestment Category	1	2a	2b	3a	3b	4a	4b
Local Street Enhancements to Improve Transit Access	$1.3	$1.3	$1.3	$1.3	$1.3	$1.3	$1.3
Local Feeder Bus Frequency Boosts	$0.0	$0.0	$0.0	$2.9	$0.0	$2.9	$0.0
Transit Priority on Local Streets	$0.0	$0.9	$0.0	$0.5	$0.0	$0.5	$0.0
Highway Pedestrian Crossing Improvements	$0.0	$2.0	$2.0	$2.0	$2.0	$2.0	$2.0
Urban Greening in Freeway-Adjacent Communities	$0.0	$2.0	$2.0	$2.0	$2.0	$2.0	$2.0
All	**$1.3**	**$6.3**	**$5.4**	**$8.7**	**$5.4**	**$8.7**	**$5.4**

Key Question 2: Will there be incremental costs that are not regressive to those with limited means?

Performance Indicator: Benefits received vs. costs paid by very low-income populations

Performance Indicator Definition

The dollar amount reinvested in the form of subsidies or investments that benefit very low-income populations is divided by the incremental costs borne by very low-income populations. Incremental costs include newly incurred toll costs and an estimated share of contribution to other funding sources that enable complementary strategies.

Methodology

The volume of very low-income, toll-paying drivers and relevant toll values are sourced from the output networks of the travel model. These values are multiplied to calculate the incremental toll costs. The share of contribution to other funding sources was assumed to be 10%, based on research indicating such contribution levels to sales tax measures. The benefits are calculated in the following way for the different categories of complementary strategies revenues reinvested; credits and rebates that are not accounted for by the model are subtracted from the revenue total manually, and the revenue total is then divided by an amount that benefits very low-income populations calculated in the following way for the four categories of complementary strategies:

- Cost offsets: The sum of toll and transit fare discounts and the value of toll credits that benefit very low-income households.
- Transit investments: Estimated based on the investment in the relevant complementary strategies multiplied by the share of very low-income ridership.
- Roadway bike/ped: Estimated based on the share of investments in EPCs multiplied by the share of very low-income households within the EPCs.
- Community Investments: Estimated based on the share of investments in EPCs multiplied by the share of very low-income households within the EPCs.

For details on the nature of investment in the complementary strategies, please refer to Attachment A.

How to Interpret the Results

A ratio greater than 1 is favorable as this would indicate that the revenues reinvested toward the very low-income population group exceeds the costs borne by the very low-income population group as a whole, notwithstanding impacts at the individual level.

Table 16: The Dollar Amount Reinvested in the Form of Subsidies or Investments That Benefit Very Low-Income Populations (2023$ billions)

Reinvestment Category	1	2a	2b	3a	3b	4a	4b
Trunkline Transit Frequency Boosts	$1.0	$0.5	$0.5	$1.0	$1.0	$1.0	$1.0
Local Street Enhancements to Improve Transit Access	$1.0	$1.0	$1.0	$1.0	$1.0	$1.0	$1.0
Transit Fare 25% Discounts	$8.8	$0.0	NA	$4.4	NA	$4.4	NA
New Express Bus Service	$0.0	$2.3	$0.0	$2.3	$0.0	$2.3	$0.0
Local Feeder Bus Frequency Boosts	$0.0	$4.8	$4.8	$4.0	$0.0	$4.0	$0.0
Transit Priority on Local Streets	$0.0	$1.3	$0.0	$0.6	$0.0	$0.6	$0.0
Extended Transit Service Hours	$0.0	$0.1	$0.0	$0.1	$0.0	$0.1	$0.0
Transit Fare 50% Discounts	$0.0	$0.0	$3.1	$0.0	$8.8	$0.0	$8.8
Toll 50% Discounts	$0.0	$0.0	$0.7	$0.0	$0.7	$0.0	$0.7
Toll Credits for Transit Riders	$0.0	$0.0	$0.2	$0.0	$0.2	$0.0	$0.2
Highway Pedestrian Crossing Improvements	$0.0	$0.6	$0.6	$0.6	$0.6	$0.6	$0.6
Urban Greening in Freeway-Adjacent Communities	$0.0	$0.6	$0.6	$0.6	$0.6	$0.6	$0.6
Total Benefits	**$10.7**	**$11.2**	**$11.5**	**$14.6**	**$12.9**	**$14.6**	**$12.9**

Note: "NA" indicates that the reinvestment strategy was accounted for in a different row

Table 17: Incremental Costs Borne by Very Low-Income Populations (2023$ billions)

Cost	1	2a	2b	3a	3b	4a	4b
Incremental Toll Costs	$0.0	$1.4	$0.9	$1.4	$1.0	$1.7	$1.0
Estimated Contribution to Other Funding Sources	$2.5	$2.5	$2.5	$2.5	$2.5	$2.5	$2.5
Total Incremental Cost	**$2.5**	**$3.8**	**$3.4**	**$3.9**	**$3.5**	**$4.2**	**$3.4**

Table 18: Ratio of Revenues Reinvested Toward Very Low-Income Populations to Incremental Costs Paid by Very Low-Income Populations

Ratio of Revenues Reinvested to Incremental Costs Paid for Very Low-Income Populations	1	2a	2b	3a	3b	4a	4b
Ratio	4.4	2.9	3.4	3.8	3.7	3.5	3.7

Goal: Promote safer travel by all modes and on all facilities, while also improving environmental health.

Key Question 1: Will there be fewer fatalities on and off freeways?

Safe Performance Indicator: Fatalities on freeways and local streets in region and EPCs

Performance Indicator Definition

The number indicates the forecasted annual motorist, pedestrian, and bike fatalities due to vehicle collisions in the year 2035.

Methodology

The number of fatalities is estimated by multiplying the VMT sourced from the output networks of the travel model by a collision-factor coefficient. The coefficient is a constant that varies by area type (e.g., regional core, central business district, urban business, urban, suburban, and rural), facility type (freeways, arterials), and number of lanes. The estimates are adjusted to reflect changes in speeds on the road network using exponents[3] for a revised power model based on researched methodology[4] and then normalized by a ratio of observed to modeled values.

How to Interpret the Results

The values indicate the estimated annual fatalities by travel mode. Lower numbers of estimated fatalities are favorable.

Table 19: Estimated Annual Number of Fatalities in the Region

Travel Mode	1	2a	2b	3a	3b	4a	4b
Motorist	219	222	241	260	260	256	254
Pedestrian	94	94	94	98	98	100	100
Bike	21	21	21	22	22	22	22
All	**334**	**337**	**356**	**380**	**380**	**379**	**377**

[3] Institute of Transport Economics. (2009). The Power Model of the relationship between speed and road safety. https://www.toi.no/getfile.php?mmfileid=13206

[4] Federal Highway Administration. (2018, January). Self-Enforcing Roadways: A Guidance Report. https://www.fhwa.dot.gov/publications/research/safety/17098/003.cfm

Table 20: Estimated Annual Number of Fatalities on Freeways

Travel Mode	1	2a	2b	3a	3b	4a	4b
Motorist	92	95	114	129	129	123	122
Pedestrian	0	0	0	0	0	0	0
Bike	0	0	0	0	0	0	0
All	**92**	**95**	**114**	**129**	**129**	**123**	**122**

Table 21: Estimated Annual Number of Fatalities on Local Streets

Travel Mode	1	2a	2b	3a	3b	4a	4b
Motorist	127	127	127	131	131	133	133
Pedestrian	94	94	94	98	98	100	100
Bike	21	21	21	22	22	22	22
All	**242**	**242**	**242**	**251**	**251**	**255**	**255**

Table 22: Estimated Annual Number of Fatalities on Local Streets within EPCs

Travel Mode	1	2a	2b	3a	3b	4a	4b
Motorist	24	24	24	25	25	25	25
Pedestrian	23	23	23	24	24	25	25
Bike	5	5	5	5	5	5	5
All	**52**	**52**	**52**	**54**	**54**	**55**	**55**

Key Question 2: Will climate emissions be reduced?

Performance Indicator: Vehicle miles traveled on freeways and local streets in the region and EPCs

Performance Indicator Definition

The total number of daily vehicle miles traveled (VMT) on freeways and local streets. VMT is used as a proxy for climate emissions.

Methodology

The VMT is calculated by multiplying the road volumes and lengths for all roads sourced from the output networks of the travel model, then summing the values for both freeway and non-freeway facilities.

How to Interpret the Results

The percentage indicates the change in vehicle miles traveled on the specified facility type. A negative value is favorable as it would indicate a decrease in the vehicle miles traveled across the facilities.

Table 23: Change in Vehicle Miles Travelled on Freeways and Local Streets in the Region

Source	1	2a	2b	3a	3b	4a	4b
Freeway	0.0%	-0.6%	-0.5%	-8.7%	-8.5%	-8.4%	-7.9%
Local Streets	0.0%	-0.5%	-0.5%	6.6%	6.6%	3.9%	4.1%
All	**0.0%**	**-0.6%**	**-0.5%**	**-1.9%**	**-1.8%**	**-2.9%**	**-2.6%**

Table 24: Change in Vehicle Miles Travelled on Local Streets within EPCs

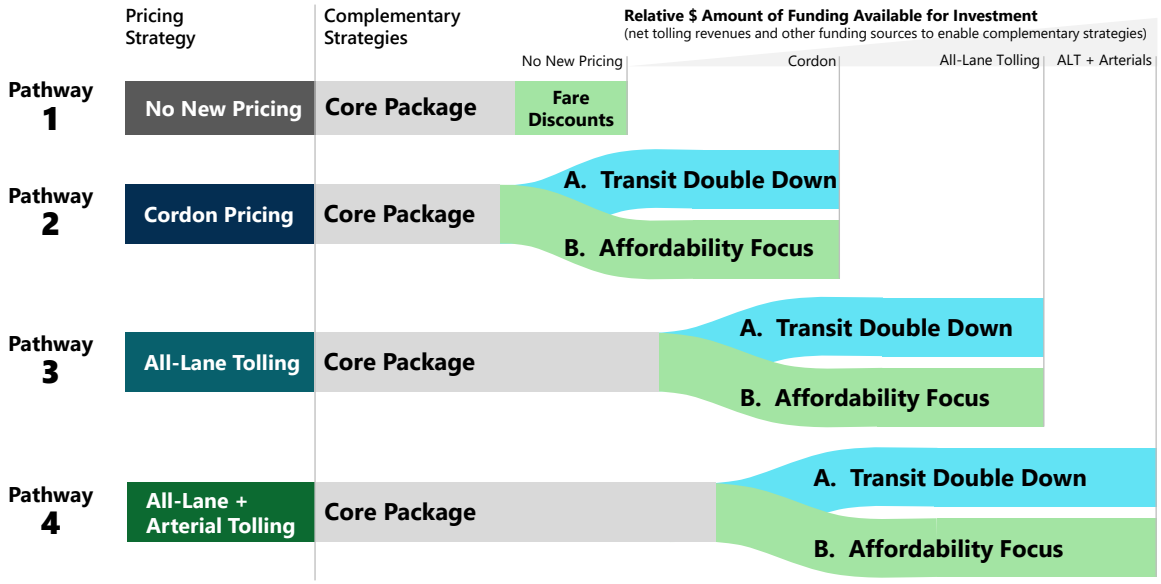
Source	1	2a	2b	3a	3b	4a	4b
EPC (local streets only)	0.0%	-1.1%	-1.1%	7.6%	7.4%	3.7%	3.8%

APPENDIX 1: ALL-LANE TOLLING STUDY CORRIDORS

Table 25: Extents of the 19 Study Corridors

County	#	Study Corridor Short Name	Extents
San Francisco	1	San Francisco	I-80 (US-101 interchange to Bay Bridge) US-101 (I-280 interchange to US-101 interchange) I-280 (US-101 interchange to Brannan St)
San Francisco / San Mateo	2	Northern San Mateo US-101	US-101 (I-380 interchange to I-280 interchange)
	3	Northern San Mateo I-280	I-280 (SR-35 San Bruno to US-101 interchange)
San Mateo	4	Southern San Mateo US-101	US-101 (Santa Clara County line to I-380 interchange)
	5	Southern San Mateo I-280	I-280 (Santa Clara County line to SR-35 San Bruno)
Santa Clara	6	Northern Santa Clara Corridors	US-101 (I-880 interchange to San Mateo County line) I-880 (US-101 interchange to Alameda County line) SR-237 (SR-85 interchange to I-880 interchange)
	7	Central Santa Clara North-South Corridors	US-101 (SR-85 interchange to I-880 interchange) SR-87 (SR-85 interchange to US-101 interchange) SR-17 (SR-85 interchange to I-280 interchange) I-880 (I-280 interchange to US-101 interchange)
	8	Central Santa Clara East-West Corridors	I-280 (I-680 to San Mateo County line) I-680 (I-280 to Alameda County line)
	9	Southern Santa Clara US-101	US-101 (Gilroy to SR-85 interchange)
Alameda	10	Alameda I-880	I-880 (Santa Clara County line to Oakland 98th Ave) I-680 (Santa Clara County line to Auto Mall Pkwy)
	11	Eastern Alameda I-580	I-580 (I-680 interchange to San Joaquin County line)
	12	Central Alameda I-580	I-580 (I-238 interchange to I-680 interchange) I-238 (I-880 interchange to I-580 interchange)
	13	Northern Alameda I-580	I-580 (SR-24 interchange to I-238 interchange)
	14	Bay Bridge Approach	I-880 (98th Ave to I-80 interchange) I-580 (I-80 interchange to SR-24 interchange) I-80 (Contra Costa County line to Bay Bridge Toll Plaza)
Contra Costa / Alameda	15	Contra Costa/Alameda I-680/SR-24/I-980	I-680 (SR-24 interchange to SR-4 interchange) SR-242 (I-680 interchange to SR-4 interchange) SR-24 (I-580 interchange to I-680 interchange) I-980 (I-880 interchange to I-580 interchange)
Contra Costa	16	Contra Costa SR-4	SR-4 (Brentwood to I-680 interchange)
	17	Contra Costa I-80	I-80 (Alameda County line to Carquinez Bridge)
Solano	18	Solano I-80	I-80 (Carquinez Bridge to Vacaville)
Marin/Sonoma	19	Marin/Sonoma US-101	US-101 (Santa Rosa Airport Blvd to San Rafael)

Round 1 Analysis:
Six pathways were evaluated against Pathway 1 (No New Pricing)



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Pathway 2 Cordon Pricing Inputs:
Pricing Strategy

Initially Defined by Advisory Group

- Location of tolls: Downtown cores of San Francisco, Oakland, and San Jose
- Tolls would vary by location and time-of-day
- No carpool discount; no bridge-toll discount; axle surcharge; ride-hail surcharge

Further Refined in Round 1 Analysis

- Timing: During peak hours, for inbound trips only; weekdays only
- Toll rates (2023$):
  - San Francisco: $6.50 (aligned with SFCTA Downtown Congestion Pricing Study)
  - Oakland and San Jose: $3.25
  - Freeway pass-through trips are not tolled
- Cordon boundaries:
  - San Francisco: Downtown area + Mission Bay + Northeast neighborhoods (second option in SFCTA Downtown Congestion Pricing Study)
  - Oakland: Downtown area, bounded by I-980, Grand Ave, Harrison St and I-880
  - San Jose: Downtown area, bounded by Barack Obama Blvd, Julian St & E Santa Clara, S 10th St and I-280 (Diridon station included within bounds)

2

2

Pathway 3/4: Highway All Lane Tolling Pricing Strategy

Initially Defined by Advisory Group

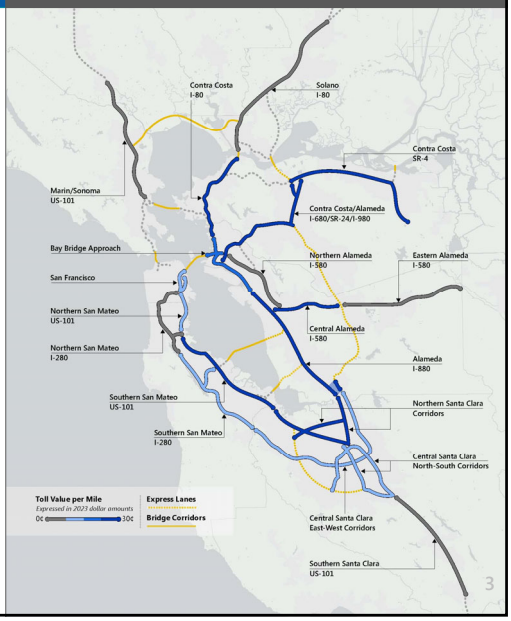
- Location of tolls: Corridors with existing or planned frequent rail or express bus service (<15 min headways)
- Preset tolls that would vary by location and time-of-day (no dynamic tolling); 50% discount for HOV3+ vehicles

Further Refined in Round 1 Analysis

- Corridors: Tolled highway network was divided into 19 study corridors, based on county lines and travel patterns
- Toll rates (2023$) (weekdays only):
  - Fixed per-mile rates set at 0, 10, 20 or 30 cents per mile
  - Rate for each corridor, direction of travel and time period determined through iterative process to achieve 40-50mph speeds on all lanes

    → Results in a 0-cent toll rate on a few corridors in peak periods, and most corridors in off-peak periods or off-peak travel direction
  - Pathway 4 Arterial Tolls: Set at 10% of toll on parallel highway

Study Corridors and Input Toll Rates
(in peak hour, peak direction)
For Pathway 3A (All-Lane Tolling)



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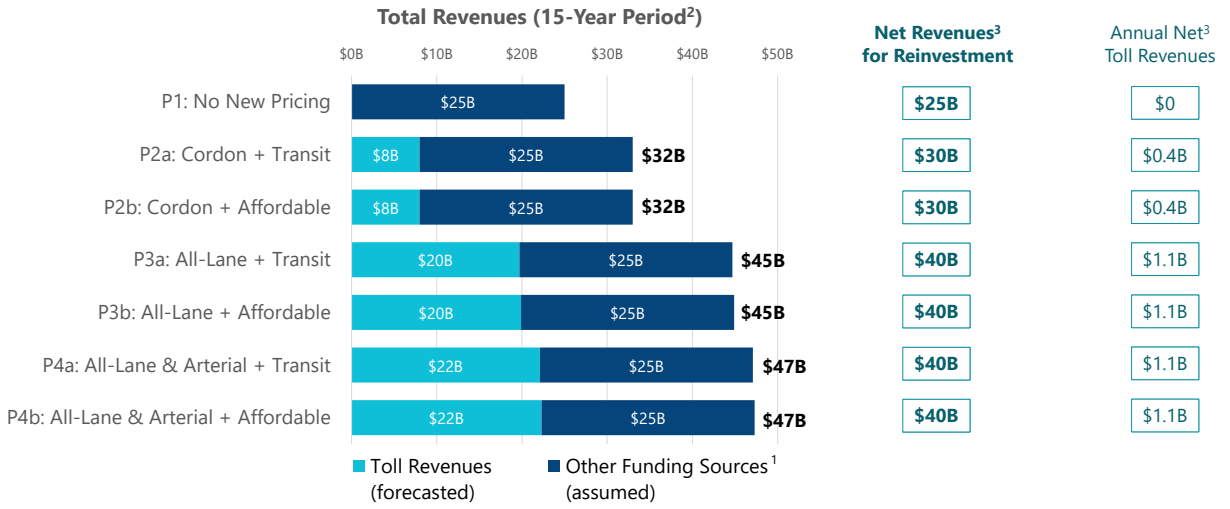
Revenues for Reinvestment in Complementary Strategies

(forecasted) Pricing Strategy Toll Revenues + (assumed) Other Funding Sources[1]



1. For the first round of analysis, funding sources such as regional revenue measures, local revenues and federal/state grants to advance pricing policy were assumed to be available to implement some complementary strategies such as transit improvements, transit fare discounts and safety improvements
2. Calculated based on a 15-year revenue stream from 2035-2050; values in Year of Expenditure (YOE) $
3. Net revenues calculated based on assumptions of $1-1.5B initial capital investment and operating costs at ~20-25% of revenues (higher end of range is for P4 due to arterial tolling)

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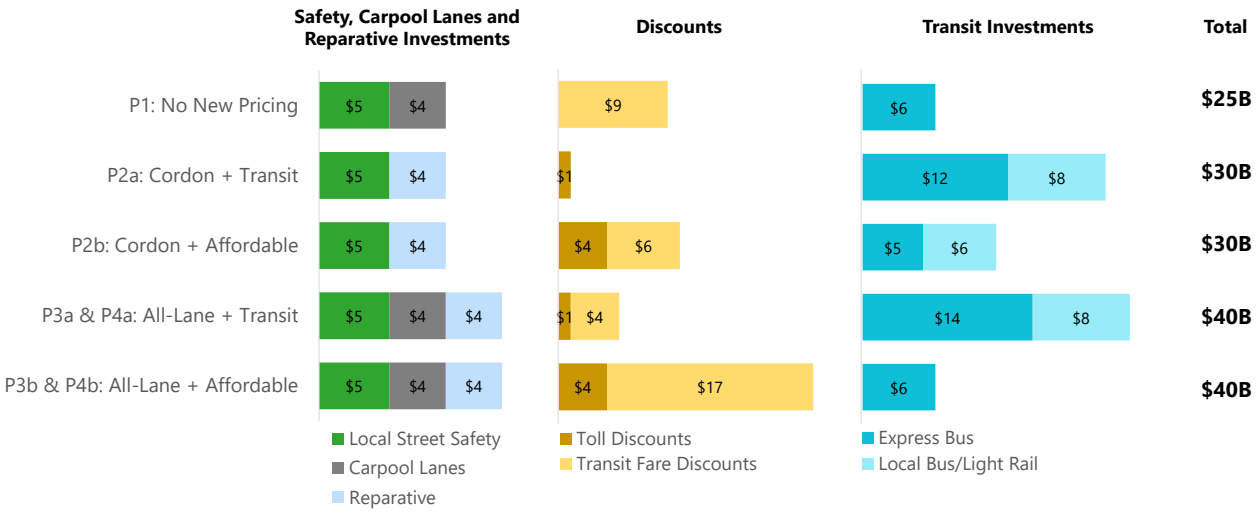
Revenue Reinvestment in Complementary Strategies



Details of investments provided in Attachment A

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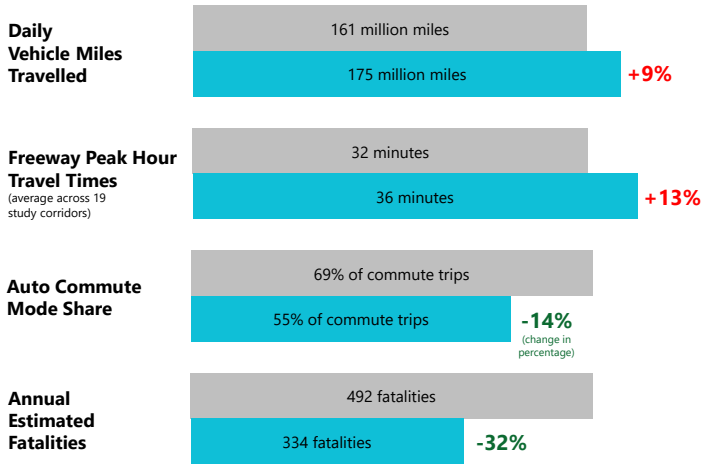
Understanding the "Baseline" Pathway 1 No New Pricing

2019 Pre-Pandemic vs. 2035 "Baseline" Pathway 1



What's in Pathway 1?

- **Near-term PBA50 strategies**, such as:
  - Increased allowable densities
  - Increased telecommuting
  - Major transit projects such as BART to Silicon Valley Ph. 2 and Caltrain Portal
- **Express lanes remain on freeways**
- **Assumed funding sources that would enable**:
  - Trunkline transit frequency boosts
  - Contiguous network of carpool lanes
  - Local street safety enhancements
  - Transit fare discounts (50% for very low-income users <25% median income)

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Key outcomes of All-Lane Tolling "Pricing Pathways"

To be discussed next

Reliable

Efficient

Affordable

Reparative

Safe

1. **Regional VMT reduction of ~2-3%** relative to No Pricing in 2035, equivalent to all near-term Plan Bay Area 2050 transit investments combined
2. **Meaningful congestion relief on busiest freeways** with over 20% travel time reductions in peak hours; diversion to arterials needs further mitigation
3. **Low modal shift** of <1% to non-auto modes; limited effectiveness of significant express bus investments across pathways
4. **Tolls burden a small share of population**, increasing the transportation cost burden by over 1% for less than 7% of households; opportunity for targeted cost burden relief
5. **Significant benefits accrued to freeway-adjacent communities and low-income populations**; benefits accrued to the very low-income population group exceed costs borne by the group by a factor of 3
6. **Safety improvements reduce estimated fatalities significantly**, but speed improvements dampen benefits; some diversion to arterials may be unavoidable

7

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Key outcomes of Cordon "Pricing Pathways"

Limited impact at the regional-scale, but positive impacts at the local-scale

To be discussed next

Reliable

Efficient

Affordable

Reparative

Safe

1. Meaningful regional VMT reduction of ~0.5%, but significantly lesser than all-lane tolling pathways
2. No major impact on freeway congestion; some improvements (~2%) in local street travel times
3. Significant modal shift of 3-5% for trips ending in cordons, but limited shift at a regional-scale
4. Tolls burden a small share of population, increasing the transportation cost burden by over 1% for less than 5% of households; opportunity for targeted cost burden relief
5. Significant benefits accrued to freeway-adjacent communities and low-income populations
6. Reduction in VMT for trips within and to/from cordons by 6-12%, accompanied by fewer estimated fatalities

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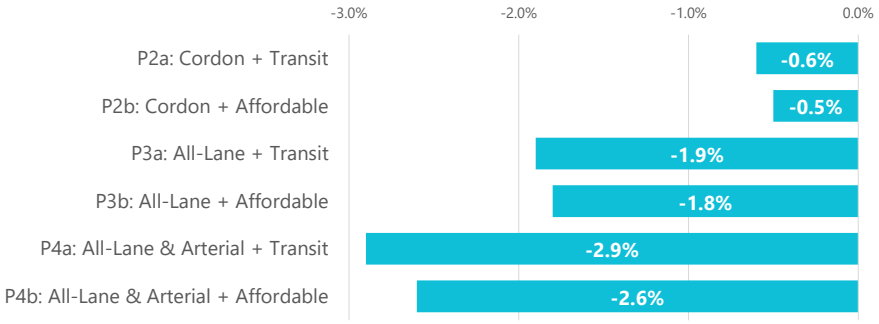
The all-lane tolling pathways lead to a ~2-3% reduction in vehicle miles traveled; cordon pathways have a smaller but meaningful effect

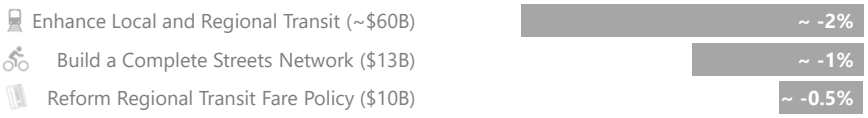
Change in VMT, relative to the No New Pricing Pathway (year 2035)



What is a 2% reduction in VMT equivalent to?

- 150,000 fewer commute trips in a day, or
- 150,000 commuters deciding to carpool, or
- 2x Caltrain's daily boardings pre-pandemic, or
- 2,500 express buses operating at 80% capacity

Comparison to VMT Impact of Plan Bay Area 2050 Investments



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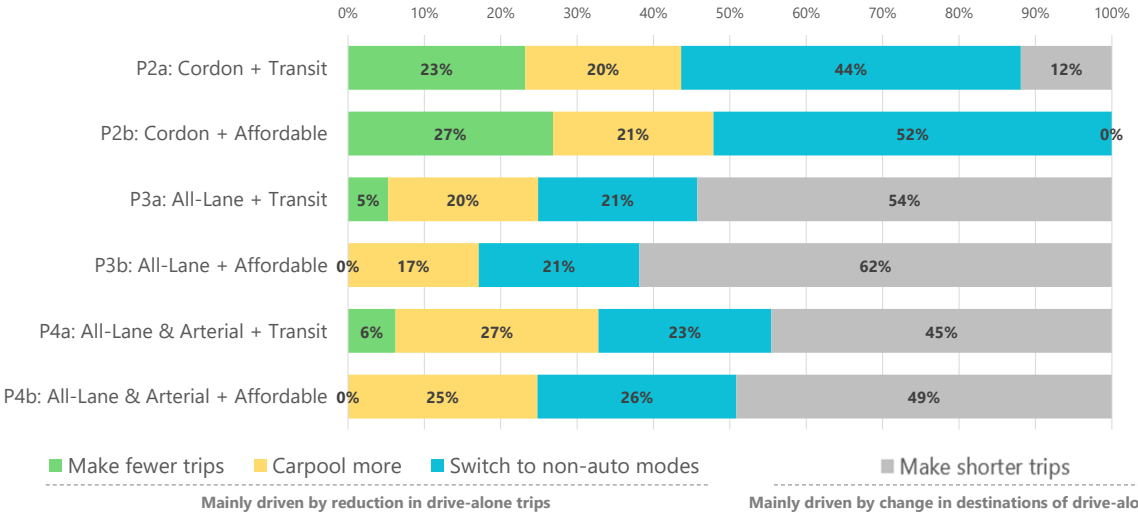
Underlying the VMT reduction, a few behavioral effects are at play

Change in VMT by Underlying Reasons, relative to the No New Pricing Pathway for Household Trips



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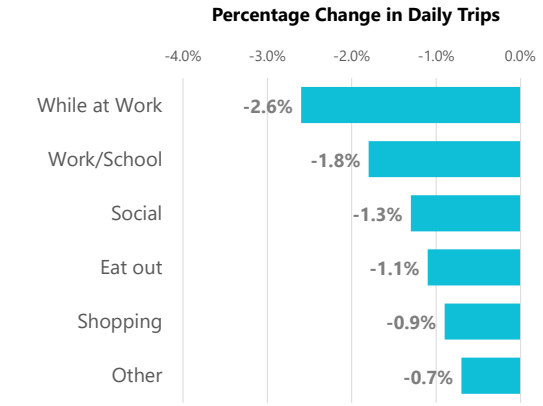
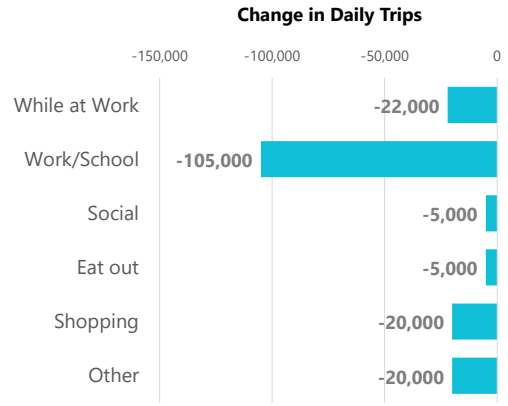
Example shown for Pathway 3A: All-Lane Tolling + Transit Double Down, relative to P1: No New Pricing

Reductions in Drive-Alone Trips: Trips to work/school and trips while-at-work see greatest reductions

Drive-Alone Trips by Trip Purpose
~12.8 million trips daily
Net Change: -180,000 trips (-1.4%)





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VMT and Travel Time Reductions on Freeways: Significant shifts

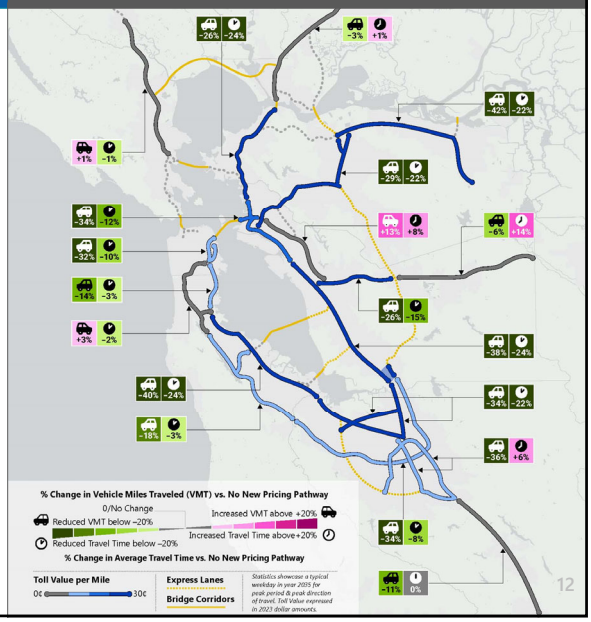
VMT change (peak period, peak direction)

- Up to 40% VMT reduction in some corridors
- VMT increases on some corridors with minimum toll rates due to diversion from corridors with higher tolls
  - ➢ Points at opportunity to refine toll rates in Round 2

Travel time change (peak period, peak direction)

- Greater than 20% reductions on the busiest freeways, where tolls were set to the highest levels
- Up to 14% increases in travel times in some corridors due to diversion and/or underutilization of HOV3 lanes

Example Map from Pathway 3A (All-Lane Tolling)
Percentage change in VMT and Travel Time, relative to Pathway 1 No New Pricing (peak period, peak direction)



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Outcomes by Goals: Measuring Performance and Equity Impacts

Goals	Desired Outcomes	Performance/Equity Indicators (forecasted for year 2035)
Affordable	1. Affordable travel options for those with limited means.	**Transportation costs** as a share of household income, by different income groups
	2. Travel time savings that are worth incremental travel costs.	**Monetary value of travel time savings vs. toll costs** by different income groups
Efficient	3. Transit alternatives that are time-competitive with driving.	**Travel time by transit vs. auto** in region and EPCs
	4. Greater use of multimodal alternatives to driving.	**Mode share** Transit, walk and bike vs. auto
Reliable	5. Reduced travel times on freeways without adverse impacts on parallel local roads.	**Travel time on freeways and parallel local streets** in region and EPCs, for people and goods
	6. Improved reliability of travel time throughout the day.	**Travel time during peak hours vs. non-peak hours on freeways** for people and goods
Reparative	7. Investments that reverse health, safety, connectivity and aesthetic issues caused by freeways in adjacent communities.	**Absolute dollar amount of new revenues reinvested in freeway adjacent communities**
	8. Incremental costs that are not regressive to those with limited means.	**Benefits received vs. costs paid by low-income population**
Safe	9. Fewer fatalities on and off freeways.	**Fatalities on freeways and local streets** in region and EPCs
	10. Reduced climate emissions.	**Vehicle miles travelled on freeway and local streets** in region and EPCs

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Pathway Outcomes: Reliable

Goals	Desired Outcomes	Performance/Equity Indicators (forecasted for year 2035)
Affordable	1. Affordable travel options for those with limited means.	**Transportation costs** as a share of household income, by different income groups
	2. Travel time savings that are worth incremental travel costs.	**Monetary value of travel time savings vs. toll costs** by different income groups
Efficient	3. Transit alternatives that are time-competitive with driving.	**Travel time by transit vs. auto** in region and EPCs
	4. Greater use of multimodal alternatives to driving.	**Mode share** Transit, walk and bike vs. auto
Reliable	5. Reduced travel times on freeways without adverse impacts on parallel local roads.	**Travel time on freeways and parallel local streets** in region and EPCs, for people and goods
	6. Improved reliability of travel time throughout the day.	**Travel time during peak hours vs. non-peak hours on freeways** for people and goods
Reparative	7. Investments that reverse health, safety, connectivity and aesthetic issues caused by freeways in adjacent communities.	**Absolute dollar amount of new revenues reinvested in freeway adjacent communities**
	8. Incremental costs that are not regressive to those with limited means.	**Benefits received vs. costs paid by low-income population**
Safe	9. Fewer fatalities on and off freeways.	**Fatalities on freeways and local streets** in region and EPCs
	10. Reduced climate emissions.	**Vehicle miles travelled on freeway and local streets** in region and EPCs

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Reliable

Key Findings

Cordon Pathways

No major impact to freeway congestion

Some improvement in local street travel times

All-Lane Tolling Pathways

Meaningful congestion relief on busiest freeways

- All-lane tolling pathways provide significant congestion relief and improve reliability in peak periods on some of the region's busiest freeways, for people and goods.

Diversion to arterials needs further mitigation

- While lowered speed limits helped contain diversion, tolling freeways does adversely impact parallel arterial travel times, highlighting a tradeoff.
- Tolling arterials mitigates this adverse impact.

Additional Insights

Careful and strategic setting of tolls to effectively manage traffic flow is key.

»»» Next Gen Freeways

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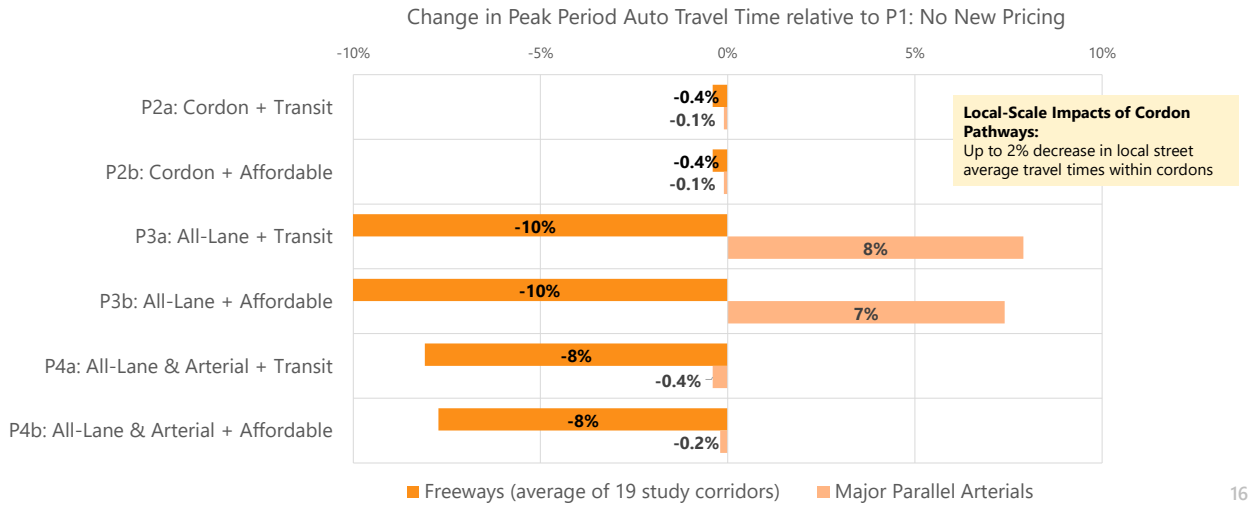
Reliable 1

Desired Outcome: Reduced travel times on freeways without adverse impacts on parallel local roads

Regional freeway travel times reduce significantly in all-lane tolling pathways; parallel arterial times can be mitigated by tolling or potentially other strategies

Pathway Comparison

Regional Overview: Average Result Across All 19 Study Corridors



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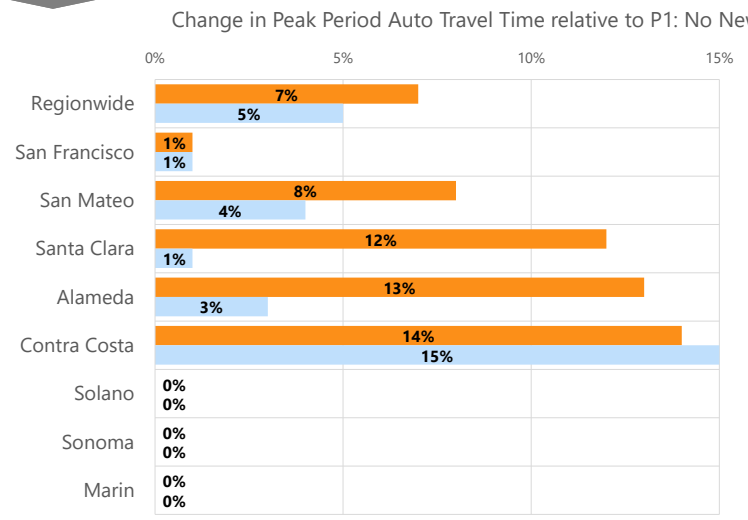
Reliable 1

Desired Outcome: Reduced travel times on freeways without adverse impacts on parallel local roads

Example from Pathway 3A: Adverse impacts on local road travel times are lower in Equity Priority Communities (EPC), except in Contra Costa County

Equity Focus

Pathway 3A Focus: Parallel Arterial Travel Times, Region vs. EPCs by County



Note: Napa County not shown since none of the19 study corridor is in the county.

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Reliable 1

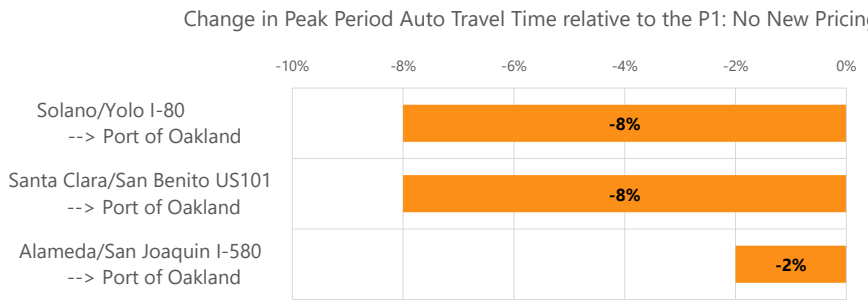
Desired Outcome: Reduced travel times on freeways without adverse impacts on parallel local roads

Example from Pathway 3A: Major goods routes experience considerable improvement in travel times under all-lane tolling pathways

Goods Movement Focus

Goods Movement Routes: Travel Time Change in Pathway 3A (All-Lane Tolling)

(findings are similar across Pathways 3B/4A/4B)



Further optimization of toll rates could yield higher time savings in this corridor

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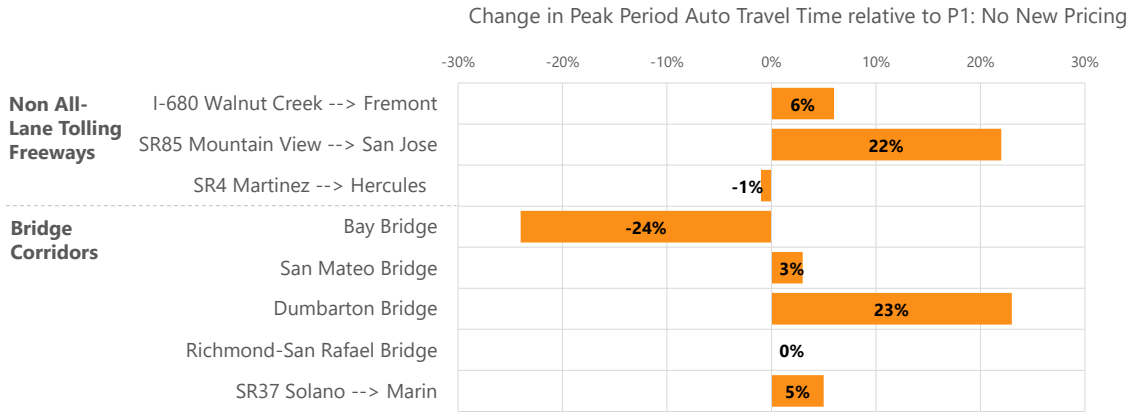
Reliable 1

Desired Outcome: Reduced travel times on freeways without adverse impacts on parallel local roads

All-lane tolling also has significant impacts on travel times on some untolled freeway corridors and bridge corridors

Background

Travel Time Change in Pathway 3A (All-Lane Tolling)
(findings are similar across Pathways 3B/4A/4B)



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Reliable 2

Desired Outcome: Improved reliability of travel time throughout the day

A reliable system is one that provide consistent and predictable travel times

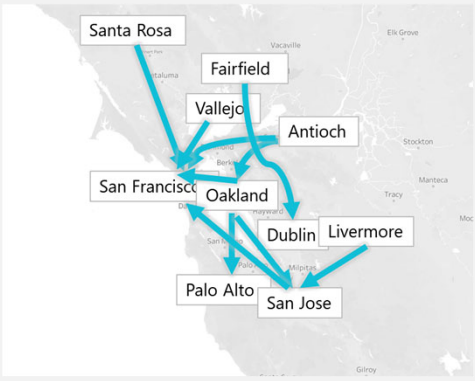
Background

Sources of Un-Reliability

- **"Non-Recurring":** Driven by collisions or other incidents on the road
  - → **While we can estimate number of collisions off-model, we cannot forecast impact on travel times with our model**
- **"Recurring":** Driven by increased traffic or congestion
  - → **The focus of this performance indicator**

What this performance indicator measures

Ratio of auto travel time during
peak vs off-peak
for 10 key origin-destination pairs



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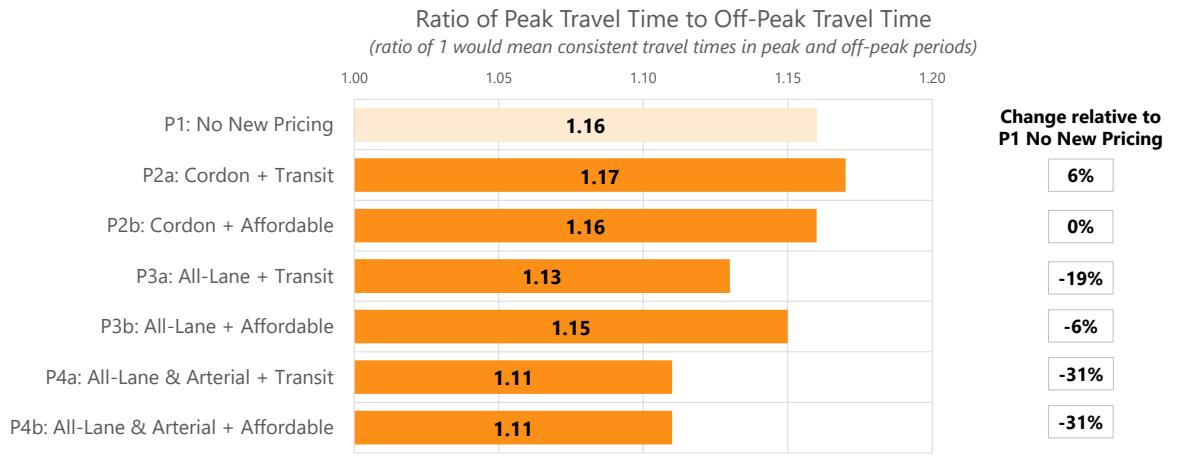
Reliable 2 — Desired Outcome: Improved reliability of travel time throughout the day

All-lane tolling pathways decrease the variability of freeway travel time between peak and off-peak periods, improving congestion-driven "recurring" unreliability

Pathway Comparison

Regional Overview: Average Result Across 10 Key Origin-Destination Pairs



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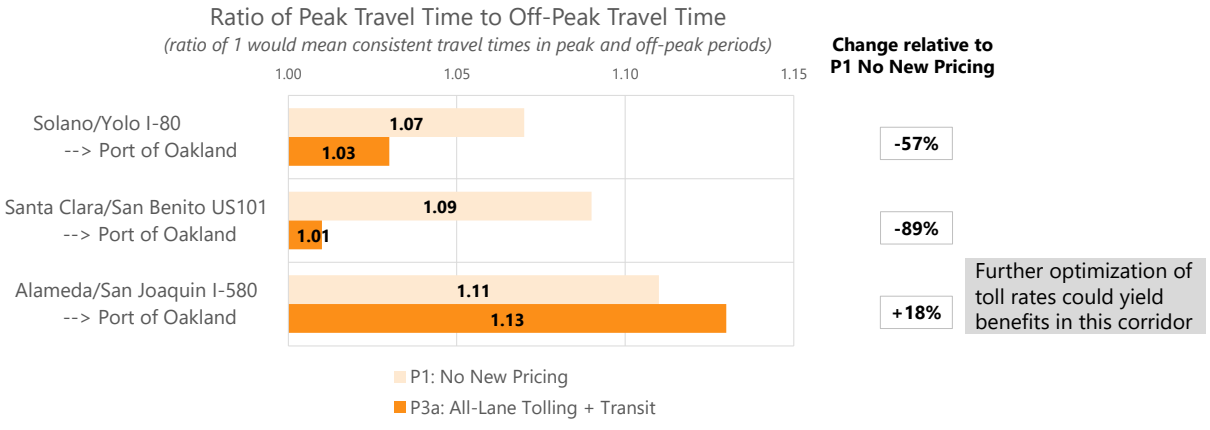
Reliable 2 — Desired Outcome: Improved reliability of travel time throughout the day

Example from Pathway 3A: The major goods routes benefit from the improvement in reliability in all-lane tolling pathways

Goods Movement Focus

Goods Movement Routes in Pathway 3A (All-Lane Tolling)

(findings are similar across Pathways 3B/4A/4B)



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Pathway Outcomes: Efficient

Goals	Desired Outcomes	Performance/Equity Indicators (forecasted for year 2035)
Affordable	1. Affordable travel options for those with limited means.	**Transportation costs** as a share of household income, by different income groups
	2. Travel time savings that are worth incremental travel costs.	**Monetary value of travel time savings vs. toll costs** by different income groups
Efficient	3. Transit alternatives that are time-competitive with driving.	**Travel time by transit vs. auto** in region and EPCs
	4. Greater use of multimodal alternatives to driving.	**Mode share** Transit, walk and bike vs. auto
Reliable	5. Reduced travel times on freeways without adverse impacts on parallel local roads.	**Travel time on freeways and parallel local streets** in region and EPCs, for people and goods
	6. Improved reliability of travel time throughout the day.	**Travel time during peak hours vs. non-peak hours on freeways** for people and goods
Reparative	7. Investments that reverse health, safety, connectivity and aesthetic issues caused by freeways in adjacent communities.	**Absolute dollar amount of new revenues reinvested in freeway adjacent communities**
	8. Incremental costs that are not regressive to those with limited means.	**Benefits received vs. costs paid by low-income population**
Safe	9. Fewer fatalities on and off freeways.	**Fatalities on freeways and local streets** in region and EPCs
	10. Reduced climate emissions.	**Vehicle miles travelled on freeway and local streets** in region and EPCs

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Efficient

Key Findings

Cordon Pathways

Significant modal shift for trips entering cordons
Limited modal shift on regional scale

All-Lane Tolling Pathways

Limited modal shift on regional scale

- Shift to non-auto modes is modest and similar across pathways, questioning the effectiveness of reinvested revenues.

Limited effectiveness of significant express bus investments

- Transit travel becomes faster, especially in Version A of pathways with express and local bus frequency improvements.
- However, as auto travel times improve, transit travel is not getting faster relative to auto.

Additional Insights

Strategic use of revenues is key to optimize mode shift.

Next Gen Freeways

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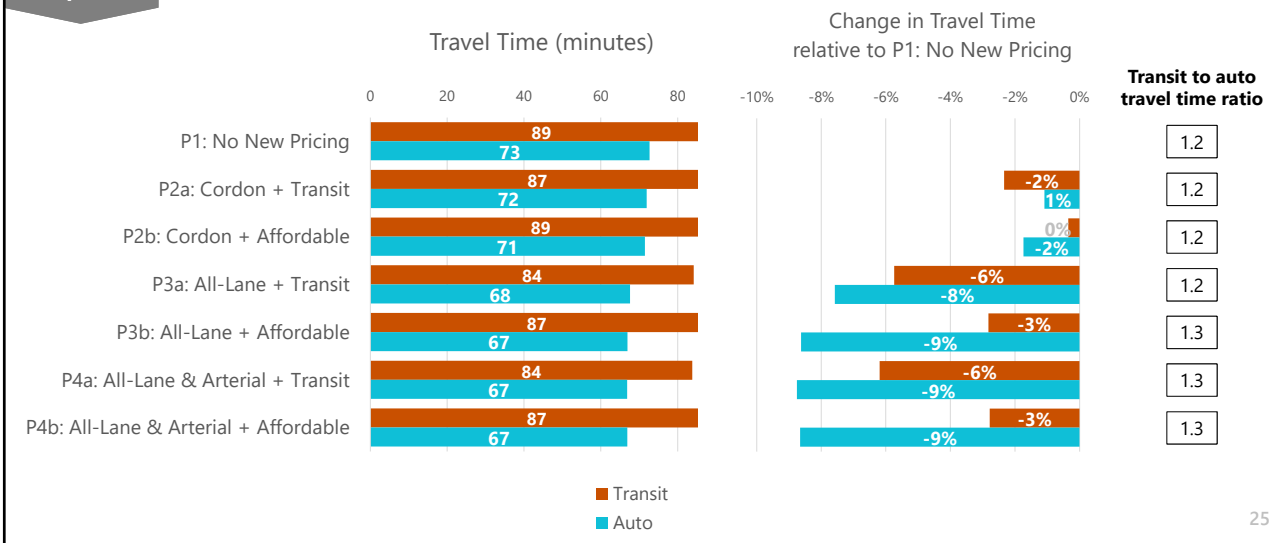
Efficient 1 Desired Outcome: Transit alternatives that are time-competitive with driving.

Transit sees travel time reductions in all-lane tolling pathways, but auto sees even greater time savings

Pathway Comparison

Average Results for 10 Key Origin-Destination Pairs



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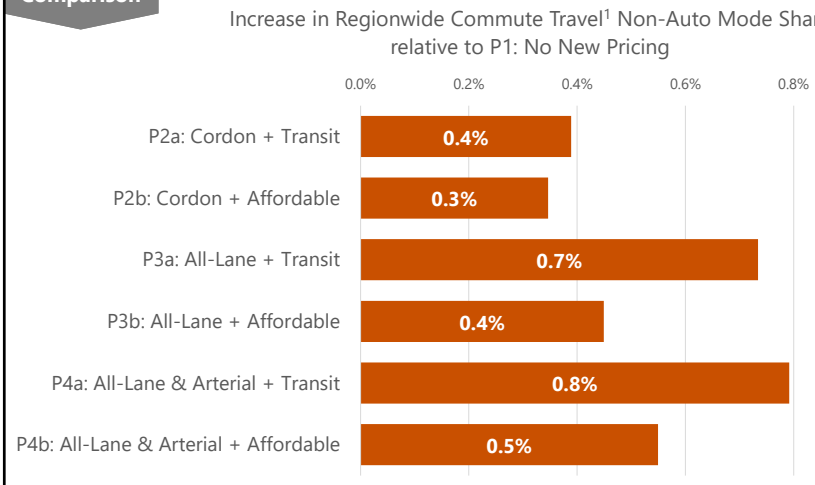
Efficient 2 Desired Outcome: Greater use of multimodal alternatives to driving

Mode shift of commute travel to non-auto modes is modest, despite considerable transit investment in Transit Double-Down (Version A) pathways

Pathway Comparison



Local-Scale Impacts of Cordon Pathways:
3-5% increase in non-auto mode share for trips into cordons

1. The increases in non-auto mode share for all trips are similarly modest

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Efficient 2 Desired Outcome: Greater use of multimodal alternatives to driving

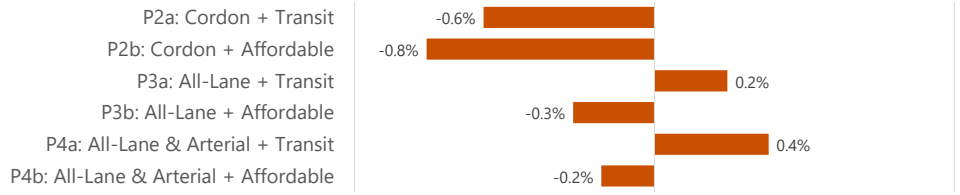
While mode shift is observed across all income groups, low-income tolling discounts in Version B have the unintended consequence of discouraging mode shift

Equity Focus

Change in Non-Auto Mode Share, relative to the No New Pricing Pathway

For Households with Annual Income > $55K

For Very Low-Income Households with Annual Income <$55K



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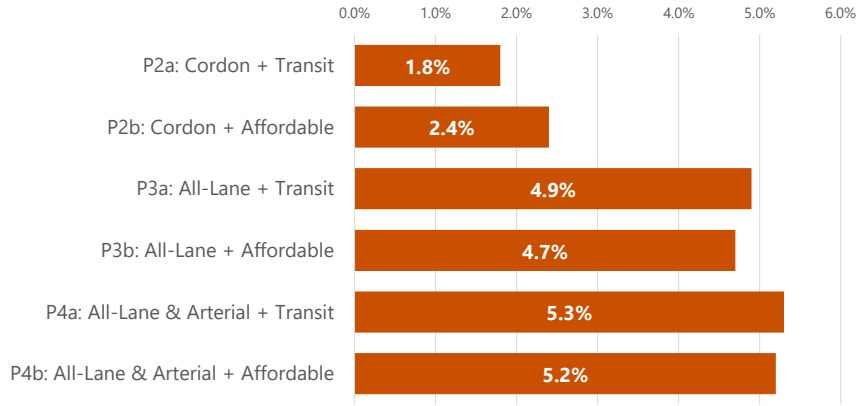
Efficient 2 Desired Outcome: Greater use of multimodal alternatives to driving

All-lane tolling pathways, regardless of version A or B, result in a ~5% increase in transit boardings

Pathway Comparison

Increase in Regionwide Transit Boardings
relative to the No New Pricing Pathway



Transit boardings is not significantly higher in "Transit Double Down" version A despite the substantial transit investment.

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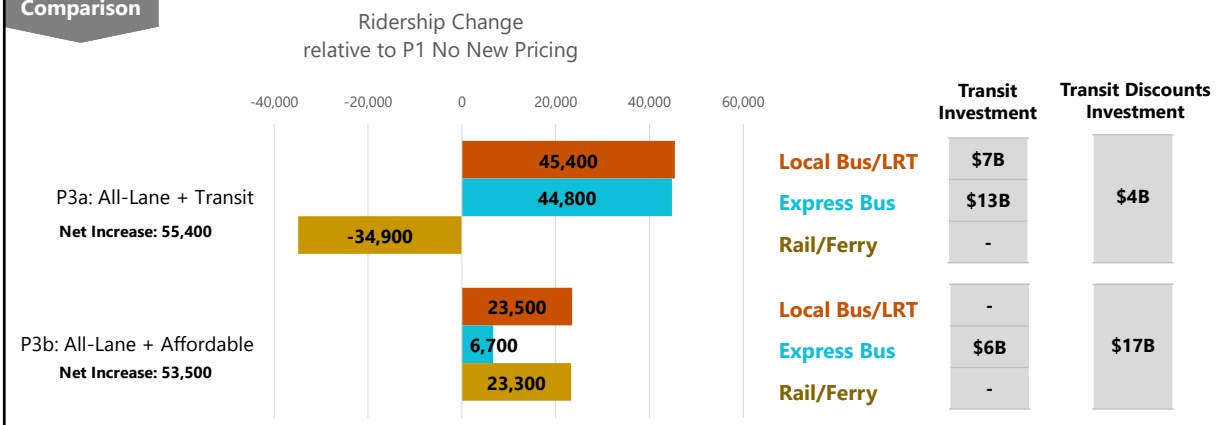
Efficient 2 Desired Outcome: Greater use of multimodal alternatives to driving

Local bus/light rail investments may be more effective use of revenues; Express bus investments divert ridership from rail and ferry

Pathway Comparison



	Transit Investment	Transit Discounts Investment
Local Bus/LRT	$7B	$4B
Express Bus	$13B	
Rail/Ferry	-	
Local Bus/LRT	-	$17B
Express Bus	$6B	
Rail/Ferry	-	

More investment in local bus/light rail improvements may also help alleviate adverse impacts of traffic diversion to arterials

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Pathway Outcomes: Affordable

Goals	Desired Outcomes	Performance/Equity Indicators (forecasted for year 2035)
Affordable	1. Affordable travel options for those with limited means.	**Transportation costs** as a share of household income, by different income groups
	2. Travel time savings that are worth incremental travel costs.	**Monetary value of travel time savings vs. toll costs** by different income groups
Efficient	3. Transit alternatives that are time-competitive with driving.	**Travel time by transit vs. auto** in region and EPCs
	4. Greater use of multimodal alternatives to driving.	**Mode share** Transit, walk and bike vs. auto
Reliable	5. Reduced travel times on freeways without adverse impacts on parallel local roads.	**Travel time on freeways and parallel local streets** in region and EPCs, for people and goods
	6. Improved reliability of travel time throughout the day.	**Travel time during peak hours vs. non-peak hours on freeways** for people and goods
Reparative	7. Investments that reverse health, safety, connectivity and aesthetic issues caused by freeways in adjacent communities.	**Absolute dollar amount of new revenues reinvested in freeway adjacent communities**
	8. Incremental costs that are not regressive to those with limited means.	**Benefits received vs. costs paid by low-income population**
Safe	9. Fewer fatalities on and off freeways.	**Fatalities on freeways and local streets** in region and EPCs
	10. Reduced climate emissions.	**Vehicle miles travelled on freeway and local streets** in region and EPCs

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Affordable

Key Findings

All Pricing Pathways

Tolls burden a small share of population

- Over half of households do not use tolled facilities under any pathway on any given average weekday; i.e., the increase in cost burden from tolling is negligible for the median household.
- The transportation cost burden increases by over 1% for less than 7% of households under all-lane tolling pathways (relative to a 24% cost burden in the absence of new pricing initiatives).
- Under current toll rates, low- and middle- income drivers may not perceive the toll to be "worth" the time savings, but high-income, business/commercial travelers and some carpoolers would.

Additional Insights

Opportunity for targeted cost burden relief

Pathways could reconsider how to minimize the burden on low- and middle-income drivers facing a high cost burden, while also balancing perceived benefits across driver groups.

Next Gen Freeways

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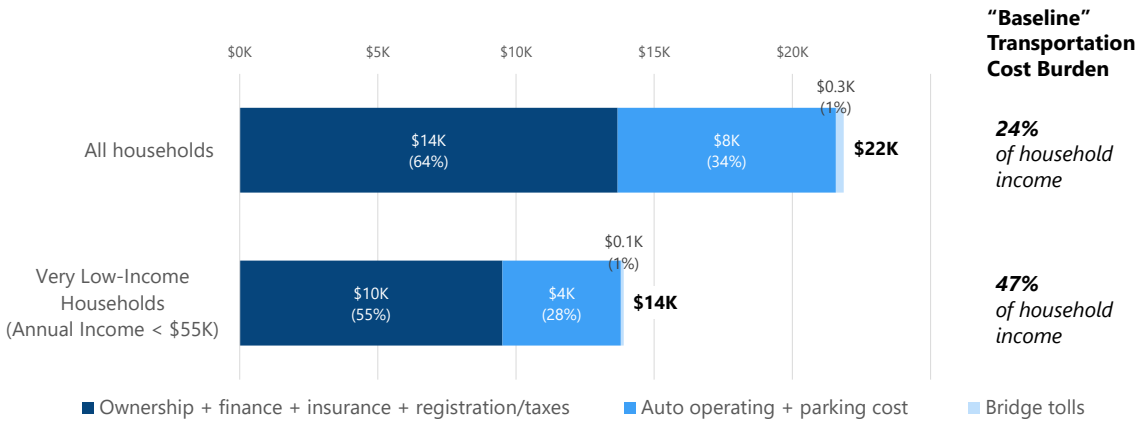
Affordable 1 Desired Outcome: Affordable travel options for those with limited means

Auto-dependent households spend ~24% of their income on transportation costs

Background

2035 Estimated Annual Transportation Costs (2023$) for a Typical Household that is Auto-Dependent



"Baseline" Transportation Cost Burden

24% *of household income*

47% *of household income*

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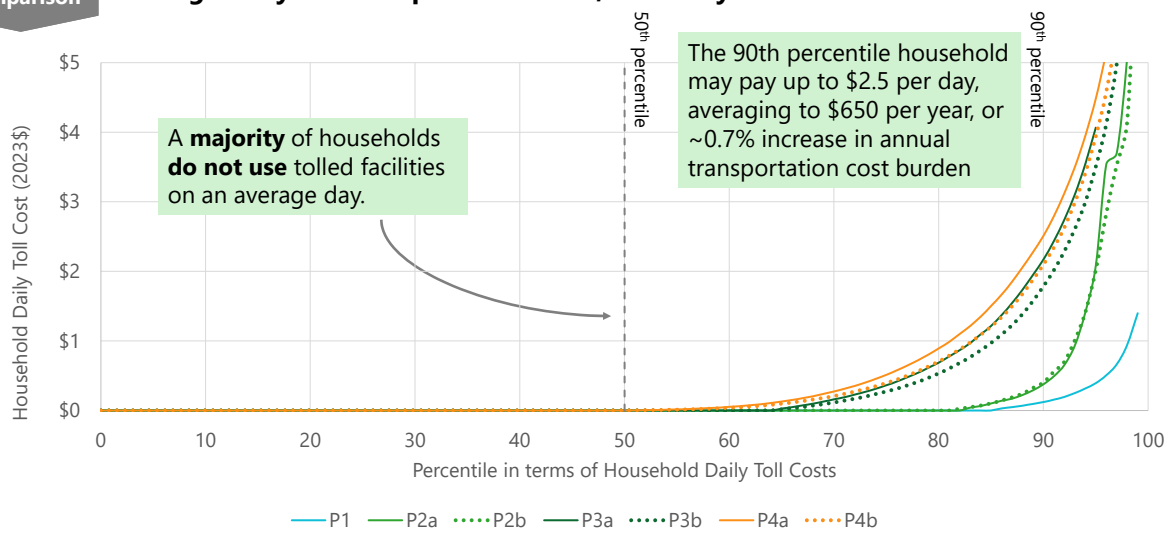
Affordable 1 Desired Outcome: Affordable travel options for those with limited means

On an average weekday under the pricing pathways, less than half of all households use tolled facilities across pathways

Pathway Comparison

Average Daily Toll Cost per Household, shown by Percentiles



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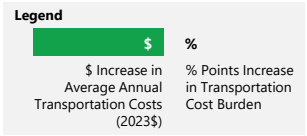
Affordable 1 Desired Outcome: Affordable travel options for those with limited means

The increase in transportation cost burden from tolls is significant only for a small share of households

Equity Focus

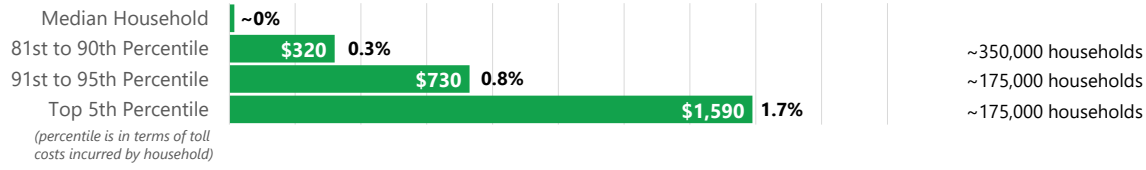
$ Increase in Average Annual Transportation Costs and % Points Increase in Transportation Cost Burden

(shown for Pathway 3A, which does not include low-income discounts)



For All Households
(% points increase is additive to baseline 24% cost burden)

Total Number: 3,500,000 households



(percentile is in terms of toll costs incurred by household)

For Very Low-Income Households with Annual Income <$55K
(% points increase is additive to baseline 47% cost burden)

Total Number: 860,000 households

(percentile is in terms of toll costs incurred by household)

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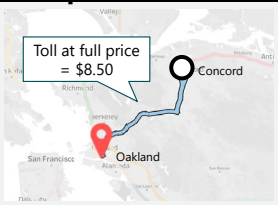
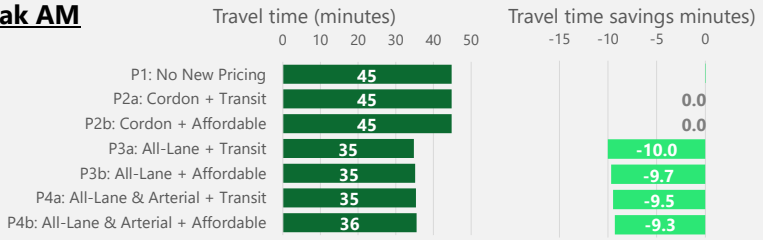
Affordable 2 Desired Outcome: Travel time savings that are worth incremental travel costs

Cost effectiveness of tolls, as perceived by drivers, varies by travelers' value of time and their discount eligibility

Background

Example Corridor in Peak AM





Ratio of Monetary Value of Time Savings vs Toll Cost for different types of drivers

Assumed value of time = 50% of hourly wage

Landscape Laborer
Earns $20 an hour;
Pays the discounted price of $4.25 in P2b, P3b and P4b due to *low-income discount*

Teacher
Earns $40 an hour;
Pays a discounted price of $4.25 due to *carpooling discount*

Lawyer
Earns $120 an hour;
Pays the *full price* of $8.50

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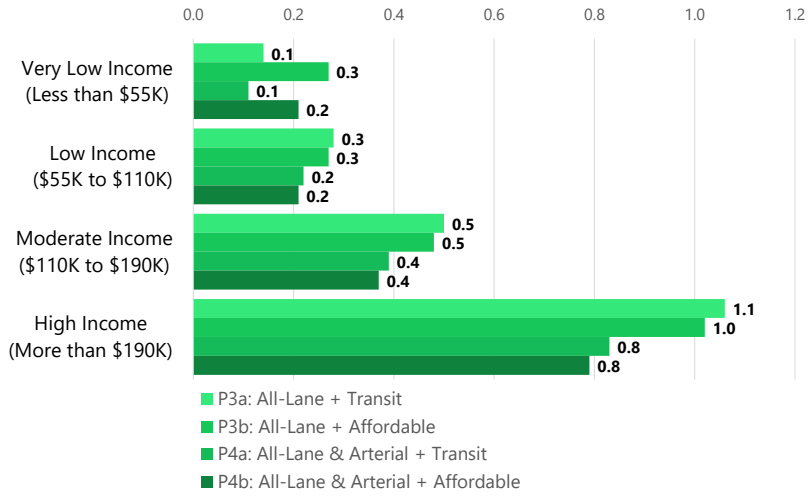
Affordable 2 Desired Outcome: Travel time savings that are worth incremental travel costs

Among those driving on the tolled corridors under all-lane tolling, low- and middle-income drivers may not perceive the toll as "worth" their time savings at current toll levels

Equity Focus

Ratio of Monetary Value of Time Savings to Toll Cost (Average across 19 study corridors for single-occupancy vehicles)



A ratio of 1 is not necessarily the objective: striving for 1 would discount the societal benefits (e.g. emissions reduction, safety and reparative investments, transit discounts and improvements for non-driving population).

But strategies are needed to "equalize" perceived benefits across income classes and approach a value of 1.

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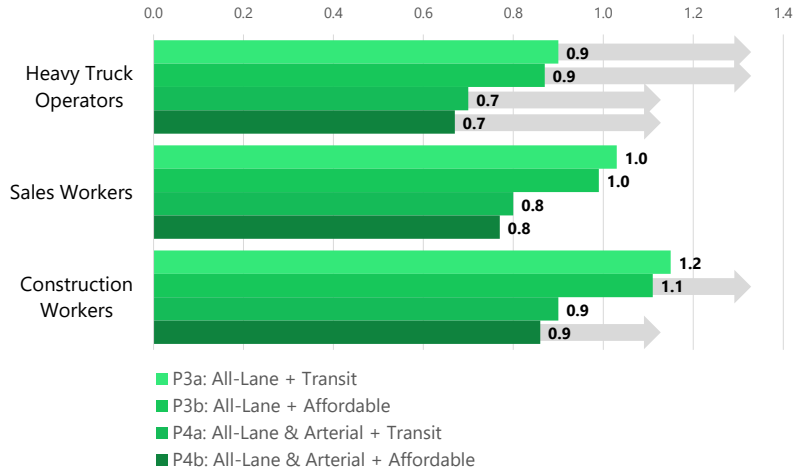
Affordable 2 Desired Outcome: Travel time savings that are worth incremental travel costs

Companies with commercial vehicles and people travelling on business would perceive a higher value of time savings

Pathway Comparison

Ratio of Monetary Value of Time Savings to Toll Cost
(Average across 19 study corridors for single-occupancy vehicles)



Beyond operator perspective, shippers stand to benefit from additional value of time savings, depending on the type of freight being transported.

Toll caps for certain occupations, included in the "B" version of pathways (but not modeled due to model limitations), would further increase this ratio.

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Pathway Outcomes: Reparative

Goals	Desired Outcomes	Performance/Equity Indicators (forecasted for year 2035)
Affordable	1. Affordable travel options for those with limited means.	**Transportation costs** as a share of household income, by different income groups
	2. Travel time savings that are worth incremental travel costs.	**Monetary value of travel time savings vs. toll costs** by different income groups
Efficient	3. Transit alternatives that are time-competitive with driving.	**Travel time by transit vs. auto** in region and EPCs
	4. Greater use of multimodal alternatives to driving.	**Mode share** Transit, walk and bike vs. auto
Reliable	5. Reduced travel times on freeways without adverse impacts on parallel local roads.	**Travel time on freeways and parallel local streets** in region and EPCs, for people and goods
	6. Improved reliability of travel time throughout the day.	**Travel time during peak hours vs. non-peak hours on freeways** for people and goods
Reparative	7. Investments that reverse health, safety, connectivity and aesthetic issues caused by freeways in adjacent communities.	**Absolute dollar amount of new revenues reinvested in freeway adjacent communities**
	8. Incremental costs that are not regressive to those with limited means.	**Benefits received vs. costs paid by low-income population**
Safe	9. Fewer fatalities on and off freeways.	**Fatalities on freeways and local streets** in region and EPCs
	10. Reduced climate emissions.	**Vehicle miles travelled on freeway and local streets** in region and EPCs

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Reparative

Key Findings

All Pricing Pathways

Significant benefits accrued to freeway-adjacent communities and low-income populations

- Pricing pathways reinvest ~15-30% of revenues in freeway-adjacent communities, which could add over 500 acres or urban green space, ~40 new highway pedestrian crossings, and a range of safety and transit investments.
- Total benefits (including discounts, transit and safety improvements) accrued to the very low-income population group exceed costs borne by the group, notwithstanding impacts to individuals.

Additional Insights

- With funding appropriately advancing equity goals through pathway design, pathways can reconsider how to redistribute revenues (and costs) to mitigate adverse impacts seen across other goals while simultaneously advancing equity in freeway-adjacent and Equity Priority Communities.

»»» Next Gen Freeways

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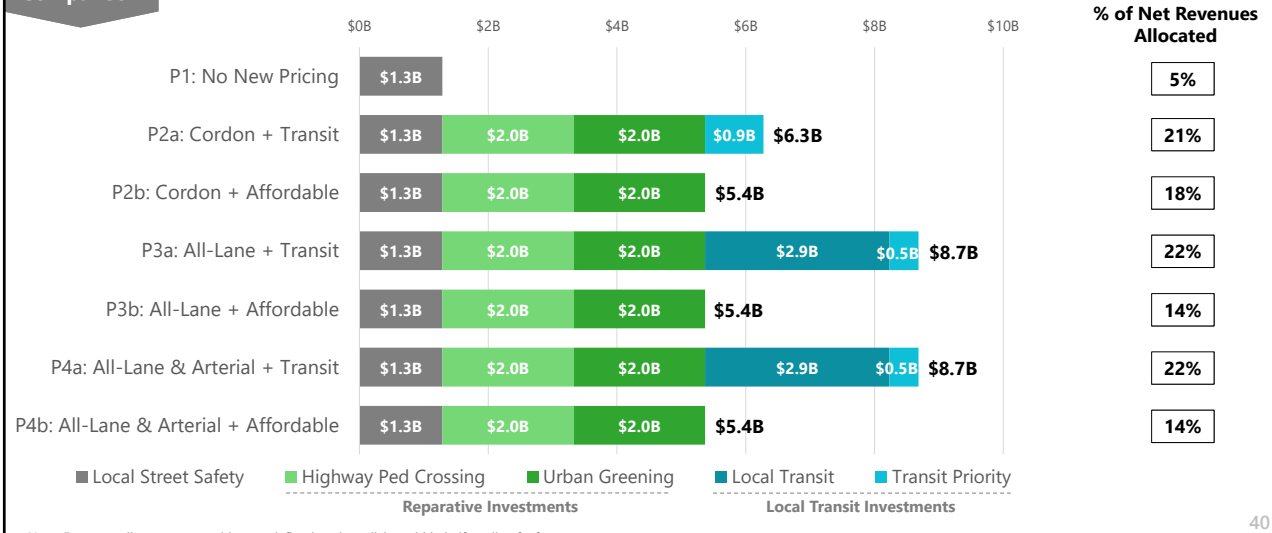
Reparative 1 Desired Outcome: Investments that reverse health, safety, connectivity and aesthetic issues caused by freeways in adjacent communities

All pricing pathways allocate significant investments towards freeway adjacent communities

Pathway Comparison

New Revenues Reinvested in Freeway Adjacent Communities (over 15-year period)



Note: Freeway adjacent communities are defined as those living within half a mile of a freeway.

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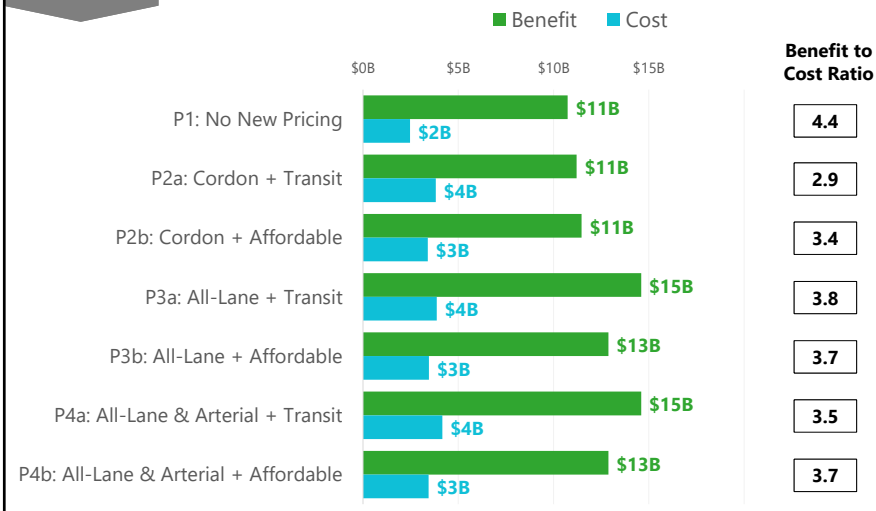
Reparative 2 Desired Outcome: Incremental costs that are not regressive to those with limited means

Under all pathways, the benefits accrued to the very low-income population group significantly exceed toll costs and assumed regional measure contributions

Pathway Comparison

Estimated Benefits vs. Costs accrued to Very Low-Income Population



"Benefits" to very low-income populations include:

- Transit investments
  (in proportion with very low-income share of ridership)
- Transit fare and toll discounts
- Safety investments
  (in proportion with share of very low-income population)
- Reparative investments
  (in proportion with share of very low-income population in freeway-adjacent communities)

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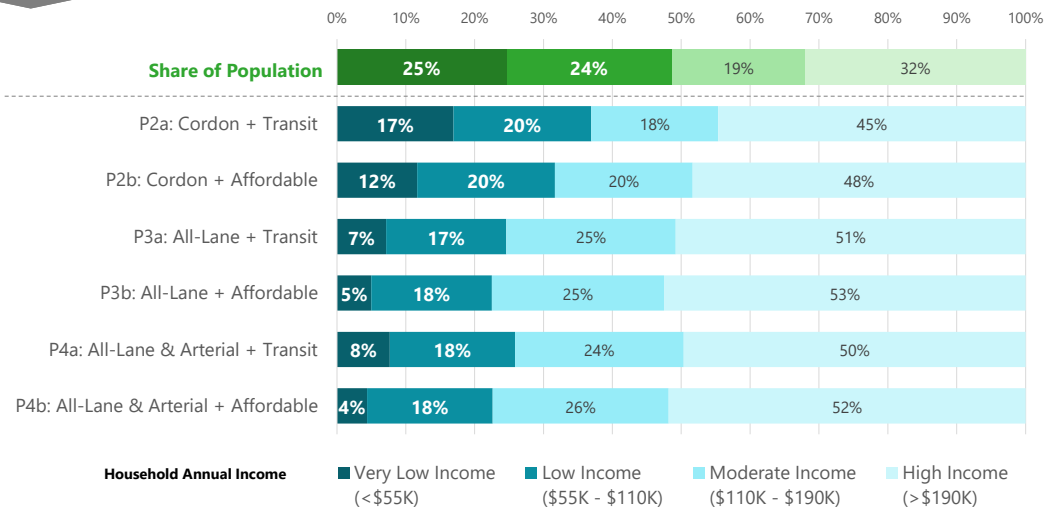
Reparative 2 Desired Outcome: Incremental costs that are not regressive to those with limited means

Under all pathways, the share of toll revenues paid by the low-income population is lower than their share of the population

Equity Focus

Share of Toll Revenues by Income Group, Relative to Share of Population



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Pathway Outcomes: Safe

Goals	Desired Outcomes	Performance/Equity Indicators (forecasted for year 2035)
Affordable	1. Affordable travel options for those with limited means.	**Transportation costs** as a share of household income, by different income groups
	2. Travel time savings that are worth incremental travel costs.	**Monetary value of travel time savings vs. toll costs** by different income groups
Efficient	3. Transit alternatives that are time-competitive with driving.	**Travel time by transit vs. auto** in region and EPCs
	4. Greater use of multimodal alternatives to driving.	**Mode share** Transit, walk and bike vs. auto
Reliable	5. Reduced travel times on freeways without adverse impacts on parallel local roads.	**Travel time on freeways and parallel local streets** in region and EPCs, for people and goods
	6. Improved reliability of travel time throughout the day.	**Travel time during peak hours vs. non-peak hours on freeways** for people and goods
Reparative	7. Investments that reverse health, safety, connectivity and aesthetic issues caused by freeways in adjacent communities.	**Absolute dollar amount of new revenues reinvested in freeway adjacent communities**
	8. Incremental costs that are not regressive to those with limited means.	**Benefits received vs. costs paid by low-income population**
Safe	9. Fewer fatalities on and off freeways.	**Fatalities on freeways and local streets** in region and EPCs
	10. Reduced climate emissions.	**Vehicle miles travelled on freeway and local streets** in region and EPCs

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Safe

Key Findings

Cordon Pathways

Reduction in VMT on local streets in cordons, accompanied by fewer estimated fatalities locally.

All-Lane Tolling Pathways

With safety improvements prioritized across all pathways, estimated fatalities decrease substantially relative to current rates

- However, speed increases from reduced traffic congestion in pricing pathways dampen this effect, mainly on freeways.

Some diversion to arterials may be unavoidable.

- While overall VMT decreases, there is a shift of VMT from freeways to local streets.

Additional Insights

Tradeoff to consider: Is there a level of VMT increase on some local streets that is acceptable, if there are no adverse impacts on local congestion and improvements to freeway congestion?

Next Gen Freeways

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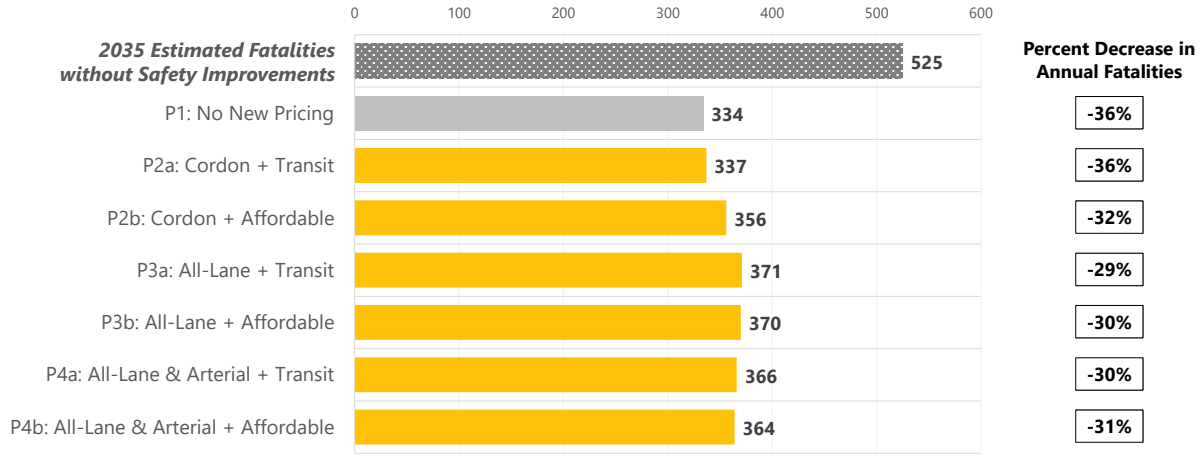
Safe 1

Desired Outcome: Fewer fatalities on and off freeways

With robust safety investments across all pathways, annual fatalities are estimated to decrease significantly; however, this benefit is slightly dampened in pricing pathways

Pathway Comparison

Estimated Annual Fatalities relative to P1 No New Pricing



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Safe 1

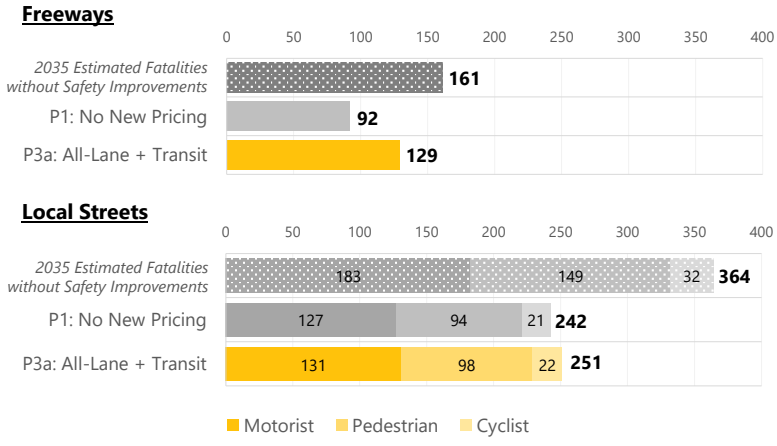
Desired Outcome: Fewer fatalities on and off freeways

The dampening of safety benefits in pricing pathways is mainly due to increased speeds on freeways that may result in more fatalities

Equity Focus

Annual Fatalities by Facility Type, relative to P1 No New Pricing in Pathway 3A (All-Lane Tolling)

(Trends are similar across Pathways 3B/4A/4B)



There are no disproportionate impacts of fatalities on local streets in Equity Priority Communities as a result of the pricing pathways.

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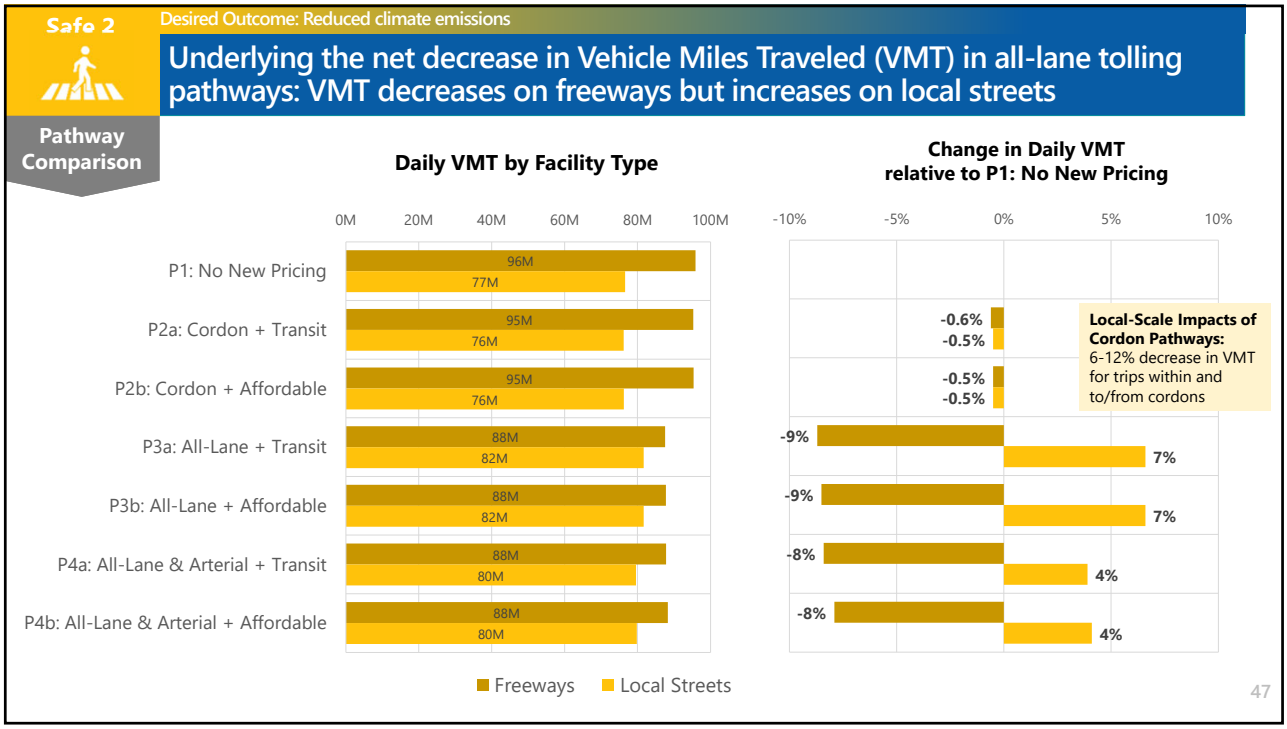
Safe 2
Desired Outcome: Reduced climate emissions
Underlying the net decrease in Vehicle Miles Traveled (VMT) in all-lane tolling pathways: VMT decreases on freeways but increases on local streets
Pathway Comparison
Daily VMT by Facility Type
0M 20M 40M 60M 80M 100M
P1: No New Pricing 96M 77M
P2a: Cordon + Transit 95M 76M
P2b: Cordon + Affordable 95M 76M
P3a: All-Lane + Transit 88M 82M
P3b: All-Lane + Affordable 88M 82M
P4a: All-Lane & Arterial + Transit 88M 80M
P4b: All-Lane & Arterial + Affordable 88M 80M
Freeways
Local Streets
Change in Daily VMT relative to P1: No New Pricing
-10% -5% 0% 5% 10%
-0.6% -0.5%
-0.5% -0.5%
-9% 7%
-9% 7%
-8% 4%
-8% 4%
Local-Scale Impacts of Cordon Pathways:
6-12% decrease in VMT for trips within and to/from cordons
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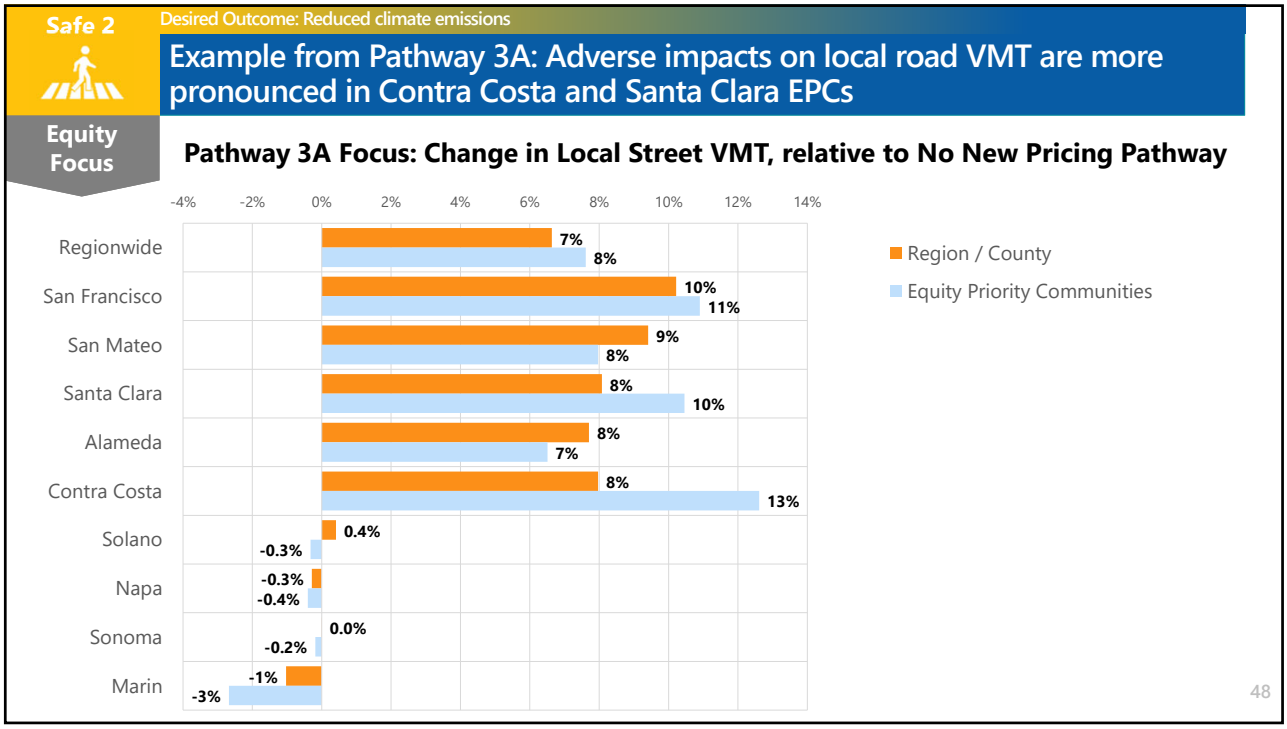
Safe 2
Desired Outcome: Reduced climate emissions
Example from Pathway 3A: Adverse impacts on local road VMT are more pronounced in Contra Costa and Santa Clara EPCs
Equity Focus
Pathway 3A Focus: Change in Local Street VMT, relative to No New Pricing Pathway
-4% -2% 0% 2% 4% 6% 8% 10% 12% 14%
Regionwide 7% 8%
San Francisco 10% 11%
San Mateo 9% 8%
Santa Clara 8% 10%
Alameda 8% 7%
Contra Costa 8% 13%
Solano 0.4% -0.3%
Napa -0.3% -0.4%
Sonoma 0.0% -0.2%
Marin -1% -3%
Region / County
Equity Priority Communities
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What pathways are being evaluated in Round 2 Analysis?

The study is evaluating the potential of three pathways with new road pricing strategies for advancing the Next Generation Freeways goals.

Pathway 1
Highway All-Lane Tolling

Where?
All major highways
Vehicles tolled at on/off ramps and at regional entry points;
Lane 1 reserved for HOV2+ or HOV3+ based on demand

When?
Weekday rush hours
6-10 a.m., 3-7 p.m.
No tolls during mid-day and night;
No tolls on weekends

How Much?
Preliminary rates

Minimum toll:	50¢
Congested highways:	30¢ per mile
Other highways:	10¢ per mile
HOV2+ discount:	50%

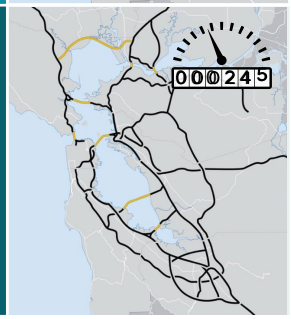
Pathway 2
Regionwide Mileage-Based User Fee

Where?
All roads
Fee based on miles driven on all Bay Area roads;
Existing express lanes remain

When?
All hours

How Much?
Preliminary rates
5¢ per-mile fee

Pathway 3
Regionwide Mileage-Based User Fee + Highway All-Lane Tolling



	Where?	When?	How Much?
All-Lane Highway Tolling	**Congested highways**	**Weekday rush hours**	**Preliminary rates** 30¢ per mile HOV 2+: 50% discount
Mileage-Based User Fee	**All roads**	**All hours**	**Preliminary rates** *5¢ per-mile fee*

Toll Affordability — **Income <200% FPL:** Monthly toll costs to not exceed $30 — **Income 200-300% FPL:** Monthly toll costs to not exceed $60

Complementary Strategies

All net revenues would be reinvested into the transportation system, prioritizing Equity Priority Communities

50% Transit

Frequency Boosts
- Major bus routes
- Feeder bus routes to rail/ferry

Improved First and Last Mile Connections
- Shuttle connections in Equity Priority Communities

35% Local Roads

Road Safety
- Safety design improvements
- Bike lane/sidewalk improvements
- Enforcement of unsafe driving

Transit-Friendly Streets
- Transit priority infrastructure
- Reallocation of roadway space

15% Reparative Infrastructure

Focused in Low-Income Freeway-Adjacent Communities
- Road pavement improvement
- Pedestrian crossing improvements
- Urban greening

Next Gen Freeways

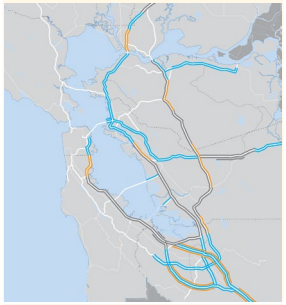
METROPOLITAN TRANSPORTATION COMMISSION

What pathways are being evaluated in Round 2 Analysis?

The study is also evaluating the relative performance of a regional express lane network. Pathway 4 is identical to the express lanes network included in Plan Bay Area 2050, while Pathways 5 and 6 are alternate versions, with the same Plan Bay Area 2050 geographic scope. Pathway 7 evaluates dual priced lanes on all highways.

Pathway 4

Regional Express Lane Network (PBA2050 Network Scope)
w/lane conversions and widening



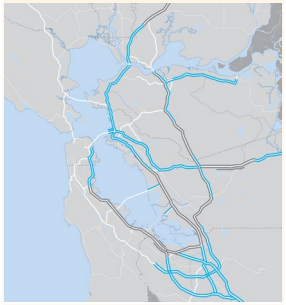
Where?
Most major highways
Full network: 670 directional miles
773 lane-miles
Future lane-miles: *514*
Lane Conversion: 374
Widening: 140

When?
Weekdays 5 a.m. to 8 p.m.

How Much?
Dynamic toll rates to achieve 45 mph speeds
Minimum toll: 50¢
HOV 3+: Free
HOV 2: 50% discount

Pathway 5

Regional Express Lane Network (PBA2050 Network Scope)
w/lane conversions only



Where?
Most major highways
Full network: 670 directional miles
688 lane-miles
Future lane-miles: *428*
Lane Conversion: 428
Widening: 0

When?
Weekdays 5 a.m. to 8 p.m.

How Much?
Dynamic toll rates to achieve 45 mph speeds
Minimum toll: 50¢
HOV 3+: Free
HOV 2: 50% discount

Pathway 6

Regional Dual Express Lane Network (PBA2050 Network Scope)
w/lane conversions and widening

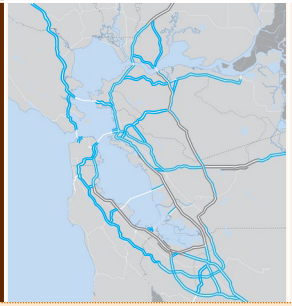
Where?
Most major highways
Full network: 670 directional miles
1,282 lane-miles
Future lane-miles: *1,022*
Lane Conversion: 882
Widening: 140

When?
Weekdays 5 a.m. to 8 p.m.

How Much?
Dynamic toll rates to achieve 45 mph speeds
Minimum toll: 50¢
HOV 3+: Free
HOV 2: 50% discount

Pathway 7

Dual Priced Lanes on All Highways
w/lane conversions only
(single priced lane if highway has three or fewer lanes)



Where?
All major highways
Full network: 1,140 directional miles
2,080 lane-miles
Future lane-miles: *1,820*
Lane Conversion: 1,820
Widening: 0

When?
Weekdays 5 a.m. to 8 p.m.

How Much?
Dynamic toll rates to achieve 45 mph speeds
Minimum toll: 50¢
HOV 3+: Free
HOV 2: 50% discount

Toll Affordability **Income <200% FPL:** 50% Discount

Complementary Strategies

Net revenues, if any, would be reinvested back into transit, prioritizing Equity Priority Communities.

What are the initial findings from Round 2 Analysis?

High-level outcomes in 2035 relative to the baseline "No New Pricing" scenario are shown below, along with sketch-level cost and net revenue estimates. *Note: Pathway 3 analysis was not completed due to resource constraints, Pathway 6 was deprioritized.*

	Pathway 1 **Highway All-Lane Tolling**	**Pathway 2** **Regionwide Mileage-Based User Fee**	**Pathway 4** **Regional Express Lane Network** w/lane conversions and widening	**Pathway 5** **Regional Express Lane Network** w/lane conversions only	**Pathway 7** **Dual Priced Lanes on All Highways** w/lane conversions only
Modeled Outcomes relative to 2035 Baseline[1]					
Vehicle Miles Travelled	Overall -4% Highways -16% Local Streets +11% EPC Local Streets +13%	Overall -2% Highways -3% Local Streets -2% EPC Local Streets -2%	Overall +0.5% Highways +0.8% Local Streets +0.0% EPC Local Streets +0.2%	Overall +0.4% Highways +0.5% Local Streets +0.3% EPC Local Streets +0.5%	Overall +0.4% Highways -0.8% Local Streets +2% EPC Local Streets +3%
GHG Emissions	SB375 -2% All Vehicles -3%	SB375 -2% All Vehicles -2%	SB375 +0.5% All Vehicles +0.5%	SB375 +0.3% All Vehicles +0.3%	SB375 +0.0% All Vehicles +0.2%
Peak-Period Travel Times (General Purpose Lanes)	Highways -14% Goods Routes -12% Major Arterials +15%	Highways -2% Goods Routes -2% Major Arterials +1%	Highways -1% Goods Routes -1% Major Arterials -0.2%	Highways +0.1% Goods Routes +0.4% Major Arterials +0.0%	Highways +6% Goods Routes +7% Major Arterials +0.4%
Commute Travel Mode Shift	SOV ↓ 1.1% HOV ↑ 0.8% Transit ↑ 0.3%	SOV ↓ 0.4% HOV ↓ 0.5% Transit ↑ 0.7%	SOV ↓ 0.3% HOV ↑ 0.4% Transit ↓ 0.2%	SOV ↓ 0.2% HOV ↑ 0.3% Transit ↓ 0.2%	SOV ↑ 0.3% HOV ↓ 0.1% Transit ↓ 0.2%
Annual Incremental Expenditure for Driving Households	All Households $320 Households w/Income <200%FPL $70	All Households $630 Households w/Income <200%FPL $300	n/a since driving on priced lanes is a choice		

(Continued...)

What are the initial findings from Round 2 Analysis? (continued)

High-level outcomes in 2035 relative to the baseline "No New Pricing" scenario are shown below, along with sketch-level cost and net revenue estimates. *Note: Pathway 3 analysis was not completed due to resource constraints, Pathway 6 was deprioritized.*

	Pathway 1 **Highway All-Lane Tolling**		**Pathway 2** **Regionwide Mileage-Based User Fee**		**Pathway 4** **Regional Express Lane Network** w/lane conversions and widening		**Pathway 5** **Regional Express Lane Network** w/lane conversions only		**Pathway 7** **Dual Priced Lanes on All Highways** w/lane conversions only	
Cost and Revenue Estimates (2023$)[2]										
Capital Cost to Implement		$2,400M		$0M		$3,700M		$2,100M		$4,400M
Annual Costs	O&M	$420M	O&M	$500M	O&M	$170M	O&M	$160M	O&M	$330M
	R&R	$160M	R&R	$0M	R&R	$150M	R&R	$130M	R&R	$280M
Gross Annual Revenue		$1,220M		$2,500M		$210M		$210M		$750M
Net Annual Revenue for Reinvestment		$630M		$2,000M		$0		$0		$140M

1. Outcomes are forecasted using MTC's Travel Model 1.6, an activity-based regional travel model that simulates activities of all Bay Area residents on a typical weekday, using external factors and land use projections for year 2035.

   GHG Emissions SB375: Greenhouse gas emissions from cars and light duty trucks excluding fuel efficiency gains, as per SB375 guidelines

   GHG Emissions All Vehicles: Emissions from all vehicles, including fuel efficiency gains

   Peak-Period: Time periods 6am-10am and 3pm-7pm; the four-hour extent of these periods is a modeling constraint.

   EPC: Equity Priority Communities

   SOV: Single-occupancy vehicles

   HOV: High-occupancy vehicles with 2+ persons

   FPL: Federal Poverty Level

2. Pathway 1 Highway All-Lane Tolling capital costs were estimated for pre-construction, infrastructure, toll system integration, signage, and data servers. Operations and Maintenance (O&M) costs were calculated based on number of tolled trips as well as other fixed costs, and estimated for system maintenance, trip building & manual image review, account management, payment processing (incl. inter-agency), HOV verification app fees, public information, performance management and enforcement. Rehabilitation and Replacement (R&R) costs are annualized and based on a 7-year lifecycle for tolling equipment and 30-year lifecycle for infrastructure components.

   Pathway 2 Regional Mileage-Based User Fee costs assume no capital investment; O&M costs are based on an administrative cost assumption of 20% of revenues.

   Pathway 4/5/7 capital and operating costs are based on estimates provided by project sponsors and per-mile cost averages of past express lane projects.

   Revenue estimates are based on modeled outcomes. Net annual revenues subtract out O&M and R&R costs from the annual gross revenues.

METROPOLITAN TRANSPORTATION COMMISSION

ROUND 2 ANALYSIS TECHNICAL DOCUMENTATION: PERFORMANCE AND EQUITY OUTCOMES

August 2024

Organized by the five Next Generation Bay Area Highways goals, ten performance indicators help answer whether pathways developed for Round 2 Analysis achieve two desired outcomes (rephrased as questions in this document) per Goal. Outcomes of pricing pathways (Pathways 1, 2, 4, 5 and 6) are measured relative to the No New Pricing Baseline. The performance indicators are forecasted for the year 2035 – the year by which the pricing pathways assume implementation of pricing strategies. The indicators highlight impacts on underserved populations where feasible.

Outcomes by Goals: Measuring Performance and Equity Impacts

Goals	Desired Outcomes	Performance/Equity Indicators (forecasted for year 2035)
Affordable	1. Affordable travel options for those with limited means.	**Transportation costs** as a share of household income, by different income groups
	2. Travel time savings that are worth incremental travel costs.	**Monetary value of travel time savings vs. toll costs** by different income groups
Efficient	3. Transit alternatives that are time-competitive with driving.	**Travel time by transit vs. auto** in region and EPCs
	4. Greater use of multimodal alternatives to driving.	**Mode share** Transit, walk and bike vs. auto
Reliable	5. Reduced travel times on freeways without adverse impacts on parallel local roads.	**Travel time on freeways and parallel local streets** in region and EPCs, for people and goods
	6. Improved reliability of travel time throughout the day.	**Travel time during peak hours vs. non-peak hours on freeways** for people and goods
Reparative	7. Investments that reverse health, safety, connectivity and aesthetic issues caused by freeways in adjacent communities.	**Absolute dollar amount of new revenues reinvested in freeway adjacent communities**
	8. Incremental costs that are not regressive to those with limited means.	**Benefits received vs. costs paid by low-income population**
Safe	9. Fewer fatalities on and off freeways.	**Fatalities on freeways and local streets** in region and EPCs
	10. Reduced climate emissions.	**Vehicle miles travelled on freeway and local streets** in region and EPCs

Note: The study team was unable to incorporate Pathway 7 (dual priced lanes on all highways), which was analyzed toward the end of Round 2 Analysis, into this sub-appendix due to resource constraints. This pathway however is discussed within Chapter 6 of the Study Report and performance indicators are highlighted within Chapter 7.

KEY DEFINITIONS IN PERFORMANCE INDICATORS

Income Quantiles and Focused Populations

- **Q1** refers to households with an annual income of less than $55,000 in 2023 dollars, also referred to as **Very Low-Income Households**.
- **Q2** refers to households with an annual income of greater than $55,000 and less than $110,000 in 2023 dollars, also referred to as **Low-Income Households**.
- **Q3** refers to households with an annual income of greater than $110,000 and less than $190,000 in 2023 dollars, also referred to as **Moderate-Income Households**.
- **Q4** refers to households with an annual income of greater than $190,000 in 2023 dollars, also referred to as **High-Income Households**.
- **<200% FPL** refers to households with an annual income less than $62,400 for a family of 4. Please see further details on the Federal Poverty Level guidelines. For the purposes of determining indicators, given model limitations, this group is equivalent to Q1 as defined above.
- **200-300% FPL** refers to households with an annual income greater than $62,400 and less than $93,600 for a family of 4. Please see further details on the Federal Poverty Level guidelines. For the purposes of determining indicators, given model limitations, this group is equivalent to the first half of Q2 as defined above.
- **Equity Priority Communities (EPCs)** refers to Census tracts with a significant concentration of underserved populations, including people of color and households with low incomes, last updated as part of Plan Bay Area 2050 (2021).

Pathways

- **Baseline – No New Pricing –** refers to simulated 2035 outcomes if population and job growth continue according to the Plan Bay Area 2050 Regional Growth Forecast and near-term housing, transit and road projects/strategies are implemented as in Plan Bay Area 2050. This also includes express lanes currently in operation and those under construction as of current day.
- **Pathway 1 – Highway All-Lane Tolling –** refers to simulated 2035 pathway outcomes if all-lane tolling on highways is implemented. Tolling is on all highways in AM/PM peak period only on weekdays, with toll levels of 30c on congested corridors and 10c on all other corridors and a minimum toll of 50c. The pathway includes a 50% discount for HOV2+, and toll caps of $30/month for households with incomes <200% FPL and $60/month for households with incomes 200-300% FPL. Net revenues from pricing would fund complementary strategies.
- **Pathway 2 – Regional Mileage-Based User Fee (MBUF) –** refers to simulated 2035 pathway outcomes if a regional mileage-based user fee of 5c (2023$) is implemented at all times on all Bay Area roads. The pathway includes toll caps of $30/month for households with incomes <200% FPL and $60/month for households with incomes 200-300% FPL. Net revenues from pricing would fund complementary strategies.
- **Pathway 3 – Highway All-Lane Tolling + Regional Mileage-Based User Fee (MBUF) –** analysis pending due to resource constraints
- **Pathway 4 – Regional Express Lane Network (Plan Bay Area 2050 scope) –** refers to the regional express lane network that is included in Plan Bay Area 2050. The pathway includes a 50% toll discount for HOV2 vehicles and 100% toll discount for HOV3+ vehicles, and a 50% toll discount for households with incomes <200% FPL.
- **Pathway 5 – Regional Express Lane Network (Plan Bay Area 2050 geographic scope, conversions only) –** refers to the regional express lane network that is included in Plan Bay Area 2050, with any widening substituted by conversion of existing lanes. The pathway includes a 50% toll discount for HOV2 vehicles and 100% toll discount for HOV3+ vehicles, and a 50% toll discount for households with incomes <200% FPL.

- **Pathway 6 – Regional Dual Express Lane Network (Plan Bay Area 2050 geographic scope)** refers to the regional express lane network that is included in Plan Bay Area 2050, along with a conversion of an additional general purpose lane to form a dual express lane network. The pathway includes a 50% toll discount for HOV2 vehicles and 100% toll discount for HOV3+ vehicles, and a 50% toll discount for households with incomes <200% FPL.

Study Corridors

For the purposes of the second round of analysis of the Pathway 1 Highway All-Lane Tolling, the network of tolled corridors was split into 22 segments or **study corridors** based on county lines, major interchanges, travel patterns, and availability of parallel transit. Each study corridor may span multiple highways. The study corridors shown below are named in short for convenience and extents are detailed in Table 25 in the appendix of this document. A handful of other corridors that are part of the tolled network such as I-505, I-780 and SR-13, are not shown in this list. Regionwide performance indicators account for the impacts on such corridors, but corridor-scale indicators are not included due to resource limitations.

- San Francisco County:
  - San Francisco
- San Mateo County:
  - Northern San Mateo US-101
  - Northern San Mateo I-280
  - Southern San Mateo US-101
  - Southern San Mateo I-280
- Santa Clara County:
  - Northern Santa Clara Corridors
  - Central Santa Clara North-South Corridors
  - Central Santa Clara East-West Corridors
  - Southern Santa Clara US-101
  - Santa Clara SR-85
- Alameda County:
  - Alameda I-880
  - Eastern Alameda I-580
  - Central Alameda I-580
  - Northern Alameda I-580
  - Bay Bridge Approach
  - Alameda I-680
- Contra Costa/Alameda County:
  - Contra Costa/Alameda I-680/SR-24/I-980
- Contra Costa County:
  - Southern Contra Costa I-680
  - Contra Costa SR-4
  - Contra Costa I-80
- Solano County:
  - Solano I-80
- Marin/Sonoma County:
  - Marin/Sonoma US-101

Parallel Arterials

For the purposes of the analysis, **Parallel Arterials** refers to major local streets that are run parallel to the tolled highways and meet a set of "parallel" criteria. For details on the parallel arterials, please refer to Attachment B.

Goods Movement Routes

For the purposes of the second round of analysis, three **goods movement routes** with the highest goods volumes were considered for analysis.

- Solano/Yolo I-80 to the Port of Oakland
- Santa Clara/San Benito US-101 to the Port of Oakland
- Alameda/San Joaquin I-580 to the Port of Oakland

Key Representative Origin-Destination Pairs

For the purposes of the second round of analysis, ten **key origin-destination (O-D) pairs** that are representative of the geographical diversity in the region and connect major housing and job centers were selected to analyze two performance indicators: Travel time by transit vs. auto (Efficient performance indicator #1) as well as travel time during peak hours vs. off-peak hours on highways (Reliable performance indicator #2).

- Antioch to Central/West Oakland
- Central San Jose to San Francisco Downtown Area
- Central/West Oakland to Central San Jose
- Central/West Oakland to Palo Alto
- Central/West Oakland to San Francisco Downtown Area
- Danville, San Ramon, Dublin, and Pleasanton to San Francisco Downtown Area
- Fairfield and Vacaville to Richmond
- Livermore to Central San Jose
- Santa Rosa to San Francisco Downtown Area
- Vallejo to San Francisco Downtown Area

Other relevant terms used in specific indicators are further defined under each indicator.

PERFORMANCE AND EQUITY OUTCOMES BY GOAL

Goal: Ensure everyone has affordable and cost-effective travel options.

Key Question 1: Will there be affordable travel options for those with limited means?

Performance Indicator: Transportation costs as a share of household income, by different income groups

Performance Indicator Definition

Annual transportation costs for the average household as a share of the annual income of the average household, determined by the four income quantiles.

Methodology

Transportation costs include annual expenditures on transit fares; out-of-pocket operating costs of driving trips including auto ownership/financing, insurance, registration/taxes, fuel, maintenance, parking, and tolls; applicable toll discounts; and taxi or TNC fares. These costs are forecasted by Travel Model 1.5, based on simulated travel behavior and assumptions on the cost of fuel, tolls, parking fees, and transit fares. The costs are aggregated across all households within a given income quantile and divided by the aggregate income of that income quantile to arrive at the share of household income spent on transportation.

Key terms used under this performance indicator are: Driving only defined as households that only drive on an average weekday; transit only defined as households that only travel using transit on an average weekday; driving + transit defined as households that both drive and use transit on an average weekday; other defined as households whose travel behavior does not fall into the categories above; and toll cost defined as the total combined cost incurred from Express Lanes, cordons and all-lane tolling.

How to Interpret the Results

The percentages shown in Table 1 and Table 2 indicates the share of an average household's income that is spent on overall transportation costs, including new toll costs in the pricing pathways. A low percentage is favorable as this would indicate that a low share of a household's income is spent on transportation-related costs. The incremental toll costs alone as a share of income are also shown separately, in Table 3 and Table 4.

Table 1: Transportation Costs as a Share of Income for All Households

Travel Mode	Baseline	1	2	4	5	6
Driving Only	12%	12%	13%	12%	12%	12%
Transit Only	5%	5%	5%	5%	5%	5%
Driving + Transit	12%	12%	12%	12%	12%	12%
Other	8%	7%	7%	7%	7%	7%

Table 2: Transportation Costs as a Share of Income for Very Low-Income Households

Travel Mode	Baseline	1	2	4	5	6
Driving Only	48%	48%	49%	48%	48%	48%
Transit Only	14%	13%	13%	14%	14%	14%
Driving + Transit	41%	41%	42%	41%	42%	42%
Other	22%	21%	21%	22%	22%	22%

Table 3: Incremental Toll Costs as a Share of Income for All Households

Travel Mode	1	2	4	5	6
Driving Only	0.2%	0.3%	0.0%	0.0%	0.0%
Transit Only	0.0%	0.0%	0.0%	0.0%	0.0%
Driving + Transit	0.2%	0.3%	0.0%	0.0%	0.1%
Other	0.0%	0.0%	0.0%	0.0%	0.0%

Table 4: Incremental Toll Costs as a Share of Income for Very Low-Income Households

Travel Mode	1	2	4	5	6
Driving Only	0.2%	1.0%	0.1%	0.1%	0.2%
Transit Only	0.0%	0.0%	0.0%	0.0%	0.0%
Driving + Transit	0.1%	0.7%	0.0%	0.0%	0.2%
Other	0.0%	0.0%	0.0%	0.0%	0.0%

Key Question 2: Will travel time savings be worth incremental toll costs?

Performance Indicator: Monetary value of travel time savings vs. toll costs by different income groups

Performance Indicator Definition

The monetized value of auto travel time savings for the auto driver is divided by auto tolls paid. The monetary value of time savings differs for personal auto vs. business/commercial travelers.

Methodology

Monetized value of auto travel time savings (numerator of ratio): Travel times, to traverse roadways using general-purpose lanes, and toll values are sourced from the output networks of the travel model. The travel time is compared between the baseline and pathway runs to determine the "time savings". To translate this to a dollar value, the time savings are multiplied by a constant recommended by USDOT[1] (0.5 for all personal travel, including commuting to and from work, and 1.54 for "on-the-clock" business travel such as transportation and material moving occupations) as well as a relevant wage rate[2] sourced from the U.S. Bureau of Labor Statistics ($15.33 for Q1, $30.05 for Q2, $53.90 for Q3, $114.96 for Q4, $31.75 for heavy truck operators, $36.09 for sales workers and $40.53 for construction workers in 2023 $ per person-hour). The calculation only considers tolled roads, i.e., the calculation for P1 only considers travel times on highways in the AM/PM period, and the calculation for P2 considers all roads in all time periods.

Toll costs (denominator of ratio): The denominator is the toll cost. While toll costs are similarly experienced by people within the Q3 and Q4 quantile, they can vary for people within the Q1 and Q2 quantile due to the monthly toll caps in place. For drivers in these first two quantiles that use highways heavily during peak hours, toll costs are capped at $30/$60 per month, bringing down the average toll cost per trip and making the tolls more cost effective. The ratios are shown as a range for the first two quantiles.

The ratio shown in the tables is the weighted average of the ratio across all roadways, weighted by vehicle volume. This indicator is not determined for Pathways 4/5/6 since the tolls are only on particular lanes and driving in these lanes remains a choice.

Key terms used under this performance indicator are: Household drivers, defined as private vehicle drivers and business/commercial drivers defined as drivers driving on business expense or paid commercial drivers.

How to Interpret the Results

A ratio of 1 indicates that the monetary value derived from the travel time savings experienced is equal to the toll amount paid. The monetary value of travel time savings represents the perceived benefits received by drivers and does not account for societal benefits obtained through the implementation of road pricing (e.g., emissions reduction, safety, and reparative investments, transit discounts, and improvements for the non-driving population). Ratios that are similar across income groups and approach a value of 1 are favorable as these would indicate that the perceived benefits of road pricing are equitable across income classes, but striving for a ratio of 1 is not necessarily the objective as this would discount the aforementioned societal benefits.

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[1] U.S. Department of Transportation. (2016, September 27). The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2016 Update). https://www.transportation.gov/sites/dot.gov/files/docs/2016%20Revised%20Value%20of%20Travel%20Time%20Guidance.pdf

[2] U.S. Bureau of Labor Statistics. (2022, May). Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates San Francisco-Oakland-Hayward, CA. https://www.bls.gov/oes/current/oes_41860.htm

Table 5: Ratio of Auto Travel Time Savings (Monetary Value) to Incremental Toll Costs for Household Drivers

Income Quantile	1	2	4	5	6
Q1	0.1 to 0.7	0.0	NA	NA	NA
Q2	0.2 to 0.7	0.0	NA	NA	NA
Q3	0.3	0.1	NA	NA	NA
Q4	0.6	0.2	NA	NA	NA

Note: "NA" indicates that there are no incremental toll costs

Table 6: Ratio of Auto Travel Time Savings (Monetary Value) to Incremental Toll Costs for Business/Commercial Drivers

Roadway Users	1	2	4	5	6
Heavy Truck Operators	0.5	0.0	NA	NA	NA
Sales Workers	0.6	0.0	NA	NA	NA
Construction Workers	0.7	0.1	NA	NA	NA

Note: "NA" indicates that there are no incremental toll costs

Goal: Maximize capacity of existing infrastructure by improving multimodal alternatives to driving.

Key Question 1: Will transit alternatives be time-competitive with driving?

Performance Indicator: Travel time by transit vs. auto in the region and EPCs

Performance Indicator Definition

Transit travel time (including walking access to transit, waiting time, and in-vehicle travel time) divided by auto travel time (including drive time and parking time) for ten representative origin-destination pairs across the region.

Methodology

Travel times are sourced from the output networks of the travel model, for the AM period between representative origin-destination pairs. A simple average of the ratios across the ten representative O-D pairs is used to depict a regional aggregate metric.

Key terms used under this performance indicator are: 3 big cities (San Francisco, San Jose, and Oakland) and zones defined as regional travel analysis zones for use in MTC planning studies. These travel analysis zones (TAZs) are typically small area neighborhoods or communities that serve as the smallest geographic basis for travel demand model forecasting systems.

How to Interpret the Results

A ratio of 1 indicates that the travel time by transit is equal to that by auto. A decrease in the ratio is favorable as this would indicate transit travel time is improving relative to auto travel time.

Table 7: Ratio of Travel Time by Transit Vs. Auto during the AM Peak Period

Origin-Destination Pairs	Baseline	1	2	4	5	6
Antioch to Central/West Oakland	1.3	1.6	1.3	1.4	1.1	1.2
Central San Jose to San Francisco Downtown Area	1.5	1.4	1.4	1.5	1.5	1.5
Central/West Oakland to Central San Jose	1.3	1.6	1.3	1.3	1.3	1.4
Central/West Oakland to Palo Alto	1.6	1.3	1.4	1.6	1.6	1.7
Central/West Oakland to San Francisco Downtown Area	0.8	0.9	0.8	0.8	0.8	0.8
Danville, San Ramon, Dublin, and Pleasanton to San Francisco Downtown Area	0.9	1.0	0.9	0.9	0.9	0.8
Fairfield and Vacaville to Richmond	1.8	1.9	1.8	1.9	1.9	1.9
Livermore to Central San Jose	1.6	1.4	1.5	1.4	1.5	1.5
Santa Rosa to San Francisco Downtown Area	1.7	1.7	1.6	1.6	1.7	1.7
Vallejo to San Francisco Downtown Area	1.0	1.3	1.0	1.0	1.0	1.0
Average Across 10 Origin-Destination Pairs	**1.4**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**
All Zones to San Francisco Downtown Area	1.5	1.6	1.5	1.5	1.5	1.5
All Zones to Central San Jose	2.9	2.4	2.5	2.7	2.7	2.7
All Zones to Central/West Oakland	2.2	2.0	2.1	2.1	2.1	2.1
All EPCs to San Francisco Downtown Area	3.2	2.6	2.7	3.0	3.0	3.0
All EPCs to Central San Jose	2.6	2.3	2.4	2.5	2.4	2.4
All EPCs to Central/West Oakland	1.5	1.6	1.5	1.5	1.5	1.5

Key Question 2: Will there be greater use of multimodal alternatives to driving?

Performance Indicator: Commute Tour Mode Share

Performance Indicator Definition

Share of commute trips with the primary mode of travel being transit, work-from-home, SOV, HOV, walking, and biking.

Methodology

This indicator is calculated as the number of trips completed with a given travel mode divided by the total number of trips for commute trips during peak hours.

Key terms used under this performance indicator are: SOV defined as single-occupancy vehicles; HOV defined as high-occupancy vehicles; transit which includes local bus, light rail, ferry, express bus, heavy rail, and commuter rail; and TNC defined as transportation network companies or ride-hailing services.

How to Interpret the Results

The percentage indicates the share of the total number of commute trips that are completed by means of the primary mode listed. Decreases in SOV and other driving mode shares are favorable as such shifts are generally associated with decreases in VMT and greenhouse gas (GHG) emissions.

Table 8: Mode Share of Commute Tours during the Peak Hours

Travel Mode	Baseline	1	2	4	5	6
SOV	38.0%	36.9%	37.6%	37.7%	37.8%	38.2%
HOV	18.7%	19.5%	18.2%	19.1%	19.1%	18.8%
Transit	9.5%	9.8%	10.2%	9.3%	9.3%	9.3%
Bike	5.1%	5.1%	5.2%	5.1%	5.1%	5.0%
Walk	2.7%	2.7%	2.8%	2.7%	2.8%	2.7%
Work-from-home	26.0%	25.9%	26.0%	26.0%	26.0%	26.0%
Total Auto	**56.7%**	**9.8%**	**10.2%**	**9.3%**	**9.3%**	**9.3%**
Total Non-Auto	**43.3%**	**43.6%**	**44.2%**	**43.1%**	**43.2%**	**43.1%**

Goal: Reduce traffic congestion and improve reliability for people and goods.

Key Question 1: Will travel times be reduced on highways without adversely impacting parallel local roads?

Performance Indicator: Travel time on highways and parallel local streets in region and EPCs, for people and goods

Performance Indicator Definition

Percentage change in average travel time during peak hours, defined as 6 AM to 10 AM and 3 PM to 7 PM, by study corridor.

Methodology

Average travel times to traverse study corridors are sourced from the output networks of the travel model, for the AM and PM periods. These travel times are compared between runs by calculating the difference between the baseline run and subsequent model runs. A simple average of the percentage change in travel time across the study corridors is used to depict a regional aggregate metric. The calculation is done separately for highway study corridors and parallel arterial streets.

How to Interpret the Results

The percentage indicates the change in travel time on the specified facility type. A low percentage (negative value) is favorable as it would indicate a decrease in the average travel time across the facilities, equivalent to an increase in the average speed.

Table 9: Change in Peak Hour Travel Time on Highway Corridors

Corridor	1	2	4	5	6
San Francisco	-11%	-2%	+3%	+1%	+3%
Northern San Mateo US-101	-14%	-3%	-7%	+5%	-3%
Northern San Mateo I-280	-6%	-2%	-2%	0%	-2%
Southern San Mateo US-101	-20%	-1%	+1%	0%	+4%
Southern San Mateo I-280	-7%	-2%	0%	0%	+1%
Northern Santa Clara Corridors	-21%	-2%	-5%	-2%	-5%
Central Santa Clara North-South Corridors	-15%	0%	-2%	-1%	-1%
Central Santa Clara East-West Corridors	-10%	-2%	0%	+1%	+4%
Southern Santa Clara US-101	-8%	-1%	-1%	-1%	0%
Santa Clara SR-85	-1%	0%	0%	0%	0%
Alameda I-880	-22%	-3%	+2%	+3%	+2%
Eastern Alameda I-580	-5%	-1%	+1%	+1%	+6%
Central Alameda I-580	-22%	-5%	0%	0%	+9%
Northern Alameda I-580	-3%	-1%	+3%	+3%	+8%
Bay Bridge Approach	-18%	-2%	0%	+1%	+3%
Alameda I-680	-19%	-5%	-2%	0%	+2%
Southern Contra Costa I-680	-11%	-2%	0%	0%	+3%
Contra Costa/Alameda I-680/SR-24/I-980	-16%	-3%	-1%	0%	+1%
Contra Costa SR-4	-20%	-1%	-2%	-1%	+1%
Contra Costa I-80	-32%	-2%	-8%	-10%	-6%
Solano I-80	0%	-1%	-1%	+4%	+5%
Marin/Sonoma US-101	-5%	-1%	-1%	0%	0%
Average Across 19 Study Corridors	**-14%**	**-2%**	**-1%**	**0%**	**+1%**

Table 10: Change in Peak Hour Travel Time on Arterials Parallel to Highway Corridors

Corridor	1	2	4	5	6
San Francisco	+4%	0%	0%	0%	0%
Northern San Mateo US-101	+37%	0%	0%	0%	0%
Northern San Mateo I-280	+7%	0%	0%	0%	0%
Southern San Mateo US-101	+22%	+1%	0%	0%	0%
Southern San Mateo I-280	+34%	-1%	0%	0%	0%
Northern Santa Clara Corridors	+23%	+2%	0%	0%	0%
Central Santa Clara North-South Corridors	+14%	+2%	0%	0%	0%
Central Santa Clara East-West Corridors	+14%	+1%	0%	0%	0%
Southern Santa Clara US-101	+2%	0%	0%	0%	0%
Santa Clara SR-85	+5%	+1%	0%	0%	0%
Alameda I-880	+21%	0%	0%	0%	0%
Eastern Alameda I-580	+7%	0%	0%	0%	0%
Central Alameda I-580	+8%	0%	0%	0%	0%
Northern Alameda I-580	+13%	+1%	0%	0%	0%
Bay Bridge Approach	+10%	-1%	0%	0%	0%
Alameda I-680	+14%	+8%	0%	0%	-1%
Southern Contra Costa I-680	+50%	+1%	0%	0%	0%
Contra Costa/Alameda I-680/SR-24/I-980	+10%	0%	0%	0%	0%
Contra Costa SR-4	+17%	0%	0%	0%	+1%
Contra Costa I-80	+14%	-1%	-2%	-2%	-1%
Solano I-80	+3%	0%	0%	0%	0%
Marin/Sonoma US-101	+8%	+2%	+1%	+1%	+1%
Average Across 19 Study Corridors	**+15%**	**+1%**	**0%**	**0%**	**0%**

Table 11: Change in Peak Hour Travel Time on Arterials Parallel to Highway Corridors within EPCs

Corridor	1	2	4	5	6
San Francisco	+5%	0%	0%	0%	0%
Northern San Mateo US-101	+23%	-1%	0%	0%	+1%
Northern San Mateo I-280	+32%	0%	0%	0%	0%
Southern San Mateo US-101	+7%	0%	0%	0%	0%
Southern San Mateo I-280	NA	NA	NA	NA	NA
Northern Santa Clara Corridors	+20%	+3%	+1%	0%	+1%
Central Santa Clara North-South Corridors	+13%	+2%	0%	0%	0%
Central Santa Clara East-West Corridors	+9%	+1%	0%	0%	0%
Southern Santa Clara US-101	+12%	+1%	0%	0%	0%
Santa Clara SR-85	+1%	+1%	0%	0%	0%
Alameda I-880	+20%	-1%	-1%	0%	-1%
Eastern Alameda I-580	NA	NA	NA	NA	NA
Central Alameda I-580	+6%	0%	0%	0%	0%
Northern Alameda I-580	+15%	+1%	0%	0%	0%
Bay Bridge Approach	+10%	0%	0%	0%	0%
Alameda I-680	NA	NA	NA	NA	NA
Southern Contra Costa I-680	NA	NA	NA	NA	NA
Contra Costa/Alameda I-680/SR-24/I-980	+5%	0%	0%	0%	0%
Contra Costa SR-4	+23%	0%	0%	0%	+1%
Contra Costa I-80	+9%	0%	0%	0%	+1%
Solano I-80	+3%	0%	-1%	+1%	0%
Marin/Sonoma US-101	+5%	-1%	0%	0%	0%
Average Across 19 Study Corridors	**+12%**	**0%**	**0%**	**0%**	**0%**

Note: "NA" indicates that there are no major parallel arterials within EPCs

Table 12: Change in Peak Hour Travel Time on Goods Movement Routes

Corridor	1	2	4	5	6
Solano/Yolo I-80 to the Port of Oakland	-12%	-1%	-3%	0%	-1%
Santa Clara/San Benito US-101 to the Port of Oakland	-10%	-1%	0%	+1%	+2%
Alameda/San Joaquin I580 to the Port of Oakland	-13%	-3%	+1%	+1%	+7%
Average Across 3 Goods Movement Routes	**-12%**	**-2%**	**-1%**	**0%**	**+2%**

Key Question 2: Will travel time reliability improve throughout the day?

Performance Indicator: Travel time during peak hours vs. off-peak hours on highways for people and goods

Performance Indicator Definition

Average travel time during peak hours, defined as 6 AM to 10 AM and 3 PM to 7 PM, divided by travel time during off-peak hours, defined as 10 AM to 3 PM, for ten representative origin-destination pairs across the region.

Methodology

Average travel times between each representative origin-destination pair are sourced from the output networks of the travel model, for peak and non-peak periods. A simple average of the ratios across the ten representative O-D pairs is used to depict a regional aggregate metric.

How to Interpret the Results

A ratio of 1 indicates that the travel time by auto during peak hours is equal to that during off-peak hours. A decrease in the ratio is favorable as this would indicate peak hour travel time is improving relative to off-peak hour travel time, thereby curbing unreliability caused due to recurring highway congestion. The results do not capture the impacts of nonrecurring traffic congestion caused by collisions or other incidents on the road as the travel model cannot provide insights into day-to-day travel time variability.

Table 13: Ratio of Auto Travel Time During Peak vs Off-Peak Hours for 10 Key Origin-Destination Pairs

Origin-Destination Pairs	Baseline	1	2	4	5	6
Antioch to Central/West Oakland	1.3	1.2	1.3	1.3	1.3	1.3
Central San Jose to San Francisco Downtown Area	1.1	1.1	1.0	1.1	1.1	1.1
Central/West Oakland to Central San Jose	1.1	1.0	1.0	1.1	1.1	1.1
Central/West Oakland to Palo Alto	1.2	1.4	1.3	1.3	1.3	1.3
Central/West Oakland to San Francisco Downtown Area	1.1	1.0	1.1	1.1	1.1	1.2
Danville, San Ramon, Dublin, and Pleasanton to San Francisco Downtown Area	1.2	1.1	1.2	1.3	1.3	1.3
Fairfield and Vacaville to Richmond	1.2	1.1	1.2	1.1	1.2	1.1
Livermore to Central San Jose	1.2	1.2	1.2	1.2	1.2	1.2
Santa Rosa to San Francisco Downtown Area	1.0	1.0	1.0	1.0	1.0	1.0
Vallejo to San Francisco Downtown Area	1.2	1.1	1.2	1.2	1.3	1.4
Average Across 10 Key Origin-Destination Pairs	**1.2**	**1.1**	**1.2**	**1.2**	**1.2**	**1.2**

Table 14: Ratio of Auto Travel Time During Peak vs Off-Peak Hours for Goods Movement Routes

Corridor	Baseline	1	2	4	5	6
Solano/Yolo I-80 to the Port of Oakland	1.1	1.0	1.1	1.1	1.1	1.1
Santa Clara/San Benito US-101 to the Port of Oakland	1.1	1.0	1.1	1.1	1.1	1.0
Alameda/San Joaquin I580 to the Port of Oakland	1.1	1.0	1.1	1.1	1.1	1.1
Average Across 3 Goods Movement Routes	**1.1**	**1.0**	**1.1**	**1.1**	**1.1**	**1.1**

Goal: Support highway-adjacent communities impacted by 20th-century transportation policy decisions.

Key Question 1: Will investments in communities adjacent to highways reverse health, safety, connectivity, and aesthetic issues caused by highways?

Performance Indicator: Absolute dollar amount of new revenues reinvested in highway-adjacent communities

Performance Indicator Definition

The absolute dollar amount that is invested in neighborhood-oriented projects that reverse health, safety, connectivity, and aesthetic issues caused by highways in adjacent communities within ½ mile of a highway corridor.

Methodology

The amount of revenue that benefits highway-adjacent communities is calculated in the following way for the different categories of complementary strategies:

- Transit investments: Estimated based on the investment in the relevant complementary strategies multiplied by the share of area/length/total quantity of improvements that lie within half a mile of a highway corridor.
- Local Street investments: Estimated based on the investment in the relevant complementary strategies multiplied by the share of local roadways that lie within half a mile of a highway corridor.
- Reparative investments: Assumed that all investments are in highway-adjacent communities.

Key terms used under this performance indicator are: highway-adjacent communities, defined as communities that fall within a ½ mile buffer around highways. For details on the nature of investment in the complementary strategies, please refer to Attachment A.

How to Interpret the Results

The dollar amount indicates how much money is available for reinvestment in highway-adjacent communities. Higher amounts are favorable as these would indicate that there are more new revenues reinvested in highway-adjacent communities.

Table 15: Absolute Dollar Amount of New Revenues Generated that is Reinvested in Highway-Adjacent Communities (YOE billions)

Reinvestment Category	1	2	4	5	6
Local Parallel Arterials Bus/LRT Frequency Boosts	$2.5	$6.0	$0.0	$0.0	$0.0
Local Feeder Bus Frequency Boosts	$2.1	$5.6	$0.0	$0.0	$0.0
Local EPC Shuttles	$1.2	$4.8	$0.0	$0.0	$0.0
Local Street Enhancements to Improve Transit Access	$1.4	$8.8	$0.0	$0.0	$0.0
Transit Priority on Local Streets	$1.2	$1.2	$0.0	$0.0	$0.0
Reparative Investments	$2.0	$7.8	$0.0	$0.0	$0.0
Total	**$10.3**	**$34.2**	**$0.0**	**$0.0**	**$0.0**

Key Question 2: Will there be incremental costs that are not regressive to those with limited means?

Performance Indicator: Benefits received vs. costs paid by very low-income populations

Performance Indicator Definition

The dollar amount reinvested in the form of investments that benefit very low-income populations is divided by the incremental costs borne by very low-income populations. Incremental costs include newly incurred toll costs.

Methodology

The volume of very low-income, toll-paying drivers and relevant toll values are sourced from the output networks of the travel model. These values are multiplied to calculate the incremental toll costs. The benefits are calculated in the following way for the different categories of complementary strategies revenues reinvested; credits and rebates that are not accounted for by the model are subtracted from the revenue total manually, and the revenue total is then divided by an amount that benefits very low-income populations calculated in the following way for the four categories of complementary strategies:

- Transit investments: Estimated based on the investment in the relevant complementary strategies multiplied by the share of very low-income ridership.
- Local Street investments: Estimated based on the share of investments in EPCs multiplied by the share of very low-income households within the EPCs.
- Reparative investments: Estimated based on the share of investments in EPCs multiplied by the share of very low-income households within the EPCs.

For details on the nature of investment in the complementary strategies, please refer to Attachment A.

How to Interpret the Results

A ratio greater than 1 is favorable as this would indicate that the revenues reinvested toward the very low-income population group exceeds the costs borne by the very low-income population group as a whole, notwithstanding impacts at the individual level.

Table 16: Dollar Amount Reinvested in the Form of Investments That Benefit Very Low-Income Populations (YOE billions)

Reinvestment Category	1	2	4	5	6
Local Parallel Arterials Bus/LRT Frequency Boosts	$1.9	$4.7	$0.0	$0.0	$0.0
Local Feeder Bus Frequency Boosts	$1.6	$4.3	$0.0	$0.0	$0.0
Local EPC Shuttles	$1.0	$3.7	$0.0	$0.0	$0.0
Express Bus Transit Frequency Boosts	$0.0	$1.3	$0.0	$0.0	$0.0
Local Street Enhancements to Improve Transit Access	$0.5	$3.4	$0.0	$0.0	$0.0
Transit Priority on Local Streets	$0.4	$0.4	$0.0	$0.0	$0.0
Reparative Investments	$0.6	$2.3	$0.0	$0.0	$0.0
Total Benefits	**$6.0**	**$20.1**	**$0.0**	**$0.0**	**$0.0**

Table 17: Incremental Costs Borne by Very Low-Income Populations (YOE billions)

Cost	1	2	4	5	6
Total Incremental Cost	**$1.5**	**$7.2**	**$0.3**	**$0.3**	**$0.8**

Table 18: Ratio of Revenues Reinvested Toward Very Low-Income Populations to Incremental Costs Paid by Very Low-Income Populations

Ratio of Revenues Reinvested to Incremental Costs Paid for Very Low-Income Populations	1	2	4	5	6
Ratio	**4.0**	**2.8**	**0.0**	**0.0**	**0.0**

Goal: Promote safer travel by all modes and on all facilities, while also improving environmental health.

Key Question 1: Will there be fewer fatalities on and off highways?

Safe Performance Indicator: Fatalities on highways and local streets in region and EPCs

Performance Indicator Definition

The number indicates the forecasted annual motorist, pedestrian, and bike fatalities due to vehicle collisions in the year 2035.

Methodology

The number of fatalities is estimated by multiplying the VMT sourced from the output networks of the travel model by a collision-factor coefficient. The coefficient is a constant that varies by area type (e.g., regional core, central business district, urban business, urban, suburban, and rural), facility type (highways, arterials), and number of lanes. The estimates are adjusted to reflect changes in speeds on the road network using exponents[3] for a revised power model based on researched methodology[4] and then normalized by a ratio of observed to modeled values.

How to Interpret the Results

The values indicate the estimated annual fatalities by travel mode. Lower numbers of estimated fatalities are favorable.

Table 19: Estimated Annual Number of Fatalities in the Region

Travel Mode	Baseline	1	2	4	5	6
Motorist	320	310	320	320	320	320
Pedestrian	140	150	140	140	140	140
Bike	30	30	30	30	30	30
All	**500**	**500**	**490**	**500**	**500**	**490**

[3] Institute of Transport Economics. (2009). The Power Model of the relationship between speed and road safety. https://www.toi.no/getfile.php?mmfileid=13206

[4] Federal Highway Administration. (2018, January). Self-Enforcing Roadways: A Guidance Report. https://www.fhwa.dot.gov/publications/research/safety/17098/003.cfm

Table 20: Estimated Annual Number of Fatalities on Highways

Travel Mode	Baseline	1	2	4	5	6
Motorist	150	130	150	150	150	140
Pedestrian	0	0	0	0	0	0
Bike	0	0	0	0	0	0
All	**150**	**130**	**150**	**150**	**150**	**140**

Table 21: Estimated Annual Number of Fatalities on Local Streets

Travel Mode	Baseline	1	2	4	5	6
Motorist	180	190	170	170	180	180
Pedestrian	140	150	140	140	140	140
Bike	30	30	30	30	30	30
All	**350**	**370**	**340**	**350**	**350**	**350**

Table 22: Estimated Annual Number of Fatalities on Local Streets within EPCs

Travel Mode	Baseline	1	2	4	5	6
Motorist	30	40	30	30	30	30
Pedestrian	30	40	30	30	30	30
Bike	10	10	10	10	10	10
All	**70**	**80**	**70**	**70**	**70**	**70**

Key Question 2: Will climate emissions be reduced?

Performance Indicator: Vehicle miles traveled on highways and local streets in the region and EPCs, and greenhouse gas emissions

Performance Indicator Definition

The change in total number of daily vehicle miles traveled (VMT) on highways and local streets, and change in greenhouse gas emissions.

Methodology

The VMT is calculated by multiplying the road volumes and lengths for all roads sourced from the output networks of the travel model, then summing the values for both highway and non-highway facilities. Greenhouse gas emissions are estimated using the California Air Resource Board's (CARB) EMFAC (Emissions Factors) model, which uses model outputs of VMT and speeds by vehicle type as inputs. Two different measures of emissions are reported. The first adheres to the guidelines established by SB 375 (Steinberg 2008), including only cars and light-duty trucks and excluding emissions reductions that come from vehicle fuel efficiency gains. Total CO2 emissions reductions are also reported, reflecting all vehicle types and the influence of assumptions around future electric vehicle adoption rates which differ from what is used for SB 375 reporting.

How to Interpret the Results

The percentage indicates the change. A negative value is favorable as it would indicate a decrease in the vehicle miles traveled or emissions.

Table 23: Change in Vehicle Miles Travelled on Highways and Local Streets in the Region

Source	1	2	4	5	6
Highway	-16%	-3%	0.8%	0.5%	0.6%
Local Streets	11%	-2%	0.0%	0.3%	0.9%
Local Streets - EPCs	13%	-2%	0.2%	0.5%	1.2%
All	**-4%**	**-2%**	**0.5%**	**0.4%**	**0.7%**

Table 24: Change in Greenhouse Gas Emissions in the Region

Source	1	2	4	5	6
Cars and Light-Duty Trucks (SB375)	-2%	-2%	0.5%	0.3%	0.6%
All Vehicles (including fuel efficiency gains)	-3%	-2%	0.5%	0.3%	0.7%

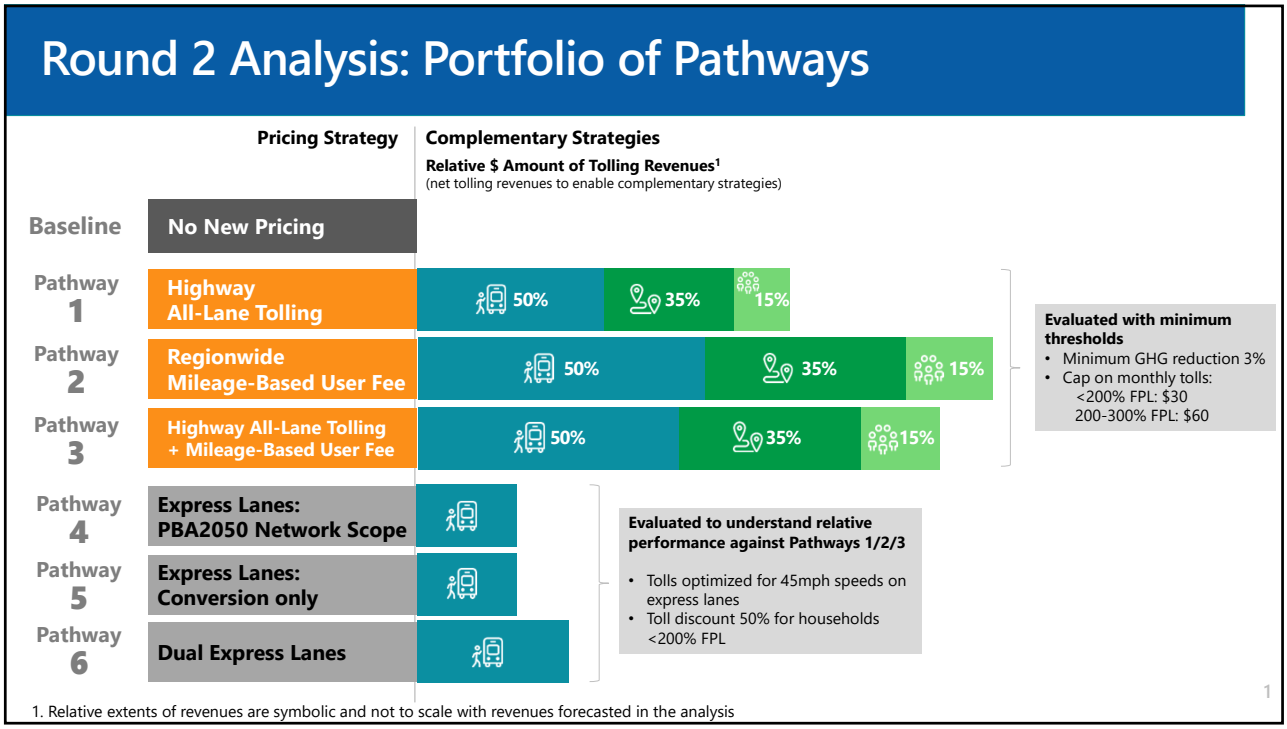
APPENDIX 1: STUDY CORRIDORS

Table 25: Extents of the 22 Study Corridors

County	#	Study Corridor Short Name	Extents
San Francisco	1	San Francisco	I-80 (US-101 interchange to Bay Bridge) US-101 (San Mateo County line to I-80 interchange) I-280 (San Mateo County line to Brannan St)
San Mateo	2	Northern San Mateo US-101	US-101 (I-380 interchange to San Francisco County line)
	3	Northern San Mateo I-280	I-280 (I-380 interchange to San Francisco County line)
	4	Southern San Mateo US-101	US-101 (Santa Clara County line to I-380 interchange)
	5	Southern San Mateo I-280	I-280 (Santa Clara County line to I-380 interchange)
Santa Clara	6	Northern Santa Clara Corridors	US-101 (I-880 interchange to San Mateo County line) I-880 (US-101 interchange to Alameda County line) SR-237 (SR-85 interchange to I-880 interchange)
	7	Central Santa Clara North-South Corridors	US-101 (SR-85 interchange to I-880 interchange) SR-87 (SR-85 interchange to US-101 interchange) SR-17 (SR-85 interchange to I-280 interchange) I-880 (I-280 interchange to US-101 interchange)
	8	Central Santa Clara East-West Corridors	I-280 (I-680 to San Mateo County line) I-680 (I-280 to Alameda County line)
	9	Southern Santa Clara US-101	US-101 (Gilroy to SR-85 interchange)
	10	Santa Clara SR-85	SR-85 (US-101 interchange to US-101 interchange)
Alameda	11	Alameda I-880	I-880 (Santa Clara County line to Oakland 98th Ave) I-680 (Santa Clara County line to Auto Mall Pkwy)
	12	Eastern Alameda I-580	I-580 (I-680 interchange to San Joaquin County line)
	13	Central Alameda I-580	I-580 (I-238 interchange to I-680 interchange) I-238 (I-880 interchange to I-580 interchange)
	14	Northern Alameda I-580	I-580 (SR-24 interchange to I-238 interchange)
	15	Bay Bridge Approach	I-880 (98th Ave to I-80 interchange) I-580 (I-80 interchange to SR-24 interchange) I-80 (Contra Costa County line to Bay Bridge Toll Plaza)
	16	Alameda I-680	I-680 (Santa Clara County line to Contra Costa County line)
Contra Costa / Alameda	17	Contra Costa/Alameda I-680/SR-24/I-980	I-680 (SR-24 interchange to SR-4 interchange) SR-242 (I-680 interchange to SR-4 interchange) SR-24 (I-580 interchange to I-680 interchange) I-980 (I-880 interchange to I-580 interchange)
Contra Costa	18	Southern Contra Costa I-680	I-680 (Alameda County line to SR-24 interchange)

	19	Contra Costa SR-4	SR-4 (Brentwood to I-680 interchange)
	20	Contra Costa I-80	I-80 (Alameda County line to Carquinez Bridge)
Solano	21	Solano I-80	I-80 (Carquinez Bridge to Yolo County line)
Marin/Sonoma	22	Marin/Sonoma US-101	US-101 (Golden Gate Bridge to Mendocino County line)

Note: The study team was unable to incorporate Pathway 7 (dual priced lanes on all highways), which was analyzed toward the end of Round 2 Analysis, into this sub-appendix due to resource constraints. This pathway however is discussed within Chapter 6 of the Study Report and performance indicators are highlighted within Chapter 7.



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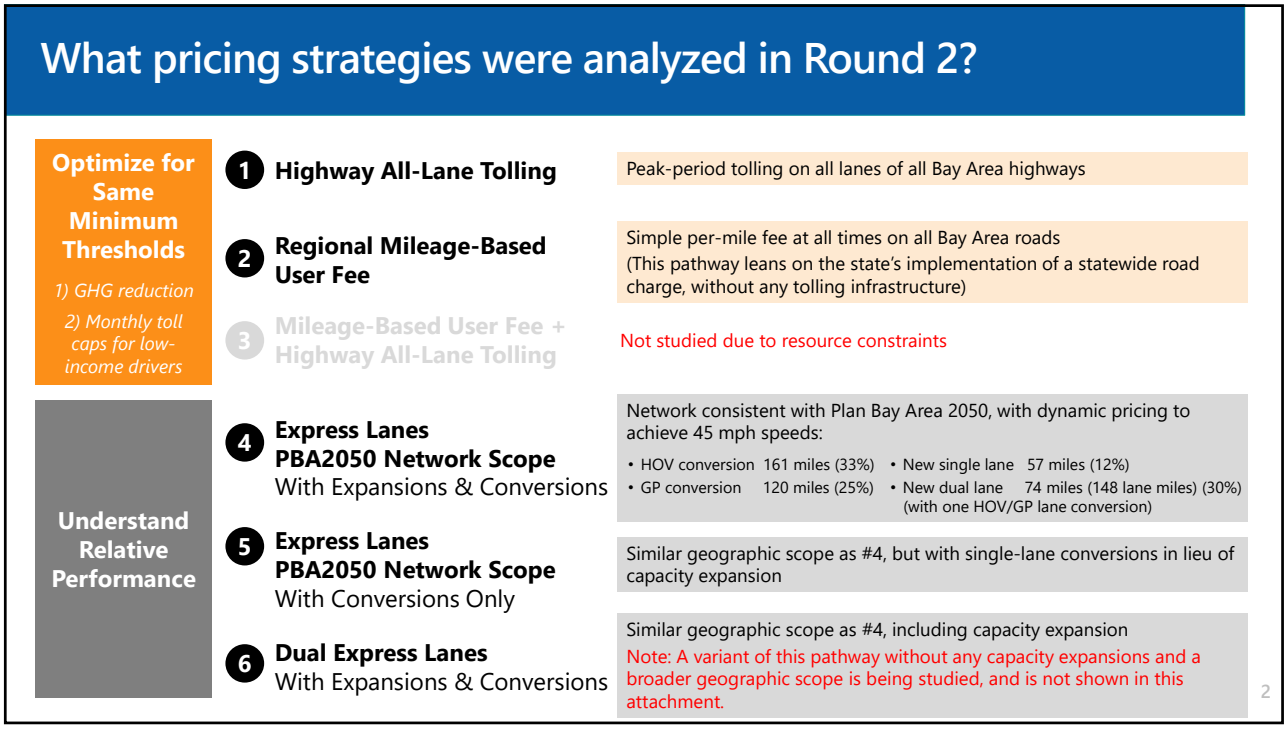


2

Pathway 1: All-Lane Highway Tolling

Where? Tolling on all highways in the region

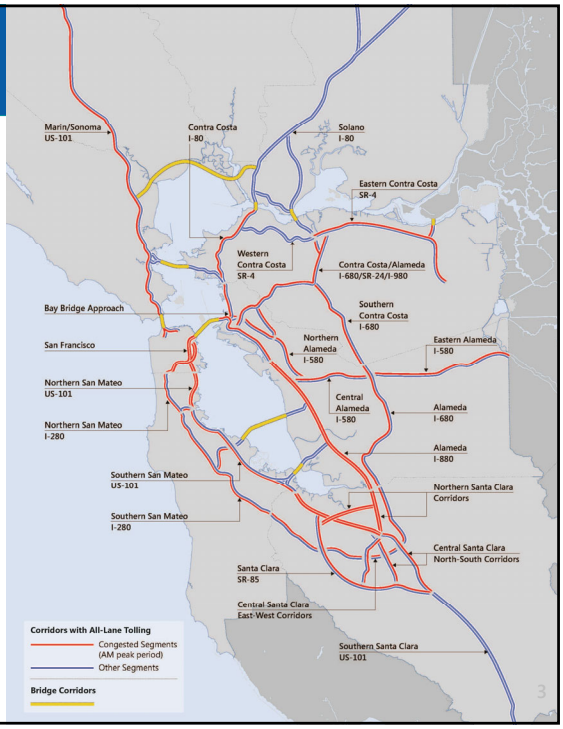
When? Only during peak hours (6am-10am, 3pm-7pm) to encourage more shift in driving to off-peak hours and provide more flexibility; **Weekdays only**

How much? Rates to achieve minimum 3% GHG reduction
Higher rate per mile on congested highways[1]
Minimum toll of 50¢ for operational feasibility

Carpooling incentives
- 50% HOV2+ discounts
- Maintain first lane as
  - HOV2+ lane for majority of corridors
  - HOV3+ for corridors with high 3+carpool rates

Cost burden mitigation
Monthly toll caps
- <200% FPL: $30
- 200-300% FPL: $60

1. Congested highways based on sustained level of congestion during peak hours in 2024 based on Google Maps traffic layer



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3

Pathway 2: Regional Mileage-Based User Fee (MBUF)

Where? Fee based on miles driven on all Bay Area roads

When? All hours, Everyday

How much? Rate to achieve minimum 3% GHG reduction

Carpooling incentives
- Maintain existing express/HOV lanes

Cost burden mitigation
Monthly toll caps
- <200% FPL: $30
- 200-300% FPL: $60

Note: Analysis of Pathway 3 (combination of Highway All-Lane Tolling and Mileage-Based User Fee) has not been completed due to resource constraints.

4

4

Rates to achieve the 3% GHG reduction threshold (relative to 2035 Baseline)

Pathway 1: All-Lane Tolling

Among various iterations attempted with different combinations of toll rates, ***the GHG emission reduction (calculated as per SB375 guidelines) peaked at ~2%.***

The following rate structure (2023$) was chosen for evaluating this pathway:

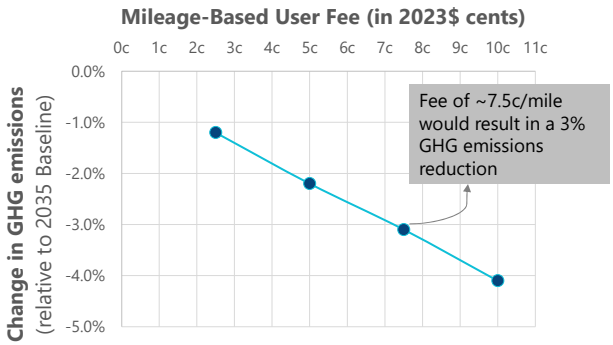
Congested highways	30¢ per mile
Other highways	10 ¢ per mile
Minimum toll	50¢

Underlying reason:

- Emission levels increase considerably at speeds below ~30mph and above ~55mph.
- Higher toll rates result in more diversion of traffic to local streets, which results in lower local road speeds (and a diminishing return on emissions reduction).

Pathway 2: Regional MBUF

The GHG emission reduction is closely correlated with the fee per mile.



To be able to make an apples-to-apples comparison of Pathway 1 and 2 outcomes, staff set the fee for Pathway 2 at 5 cents/mile, which achieves ~2% emission reduction.

5

5

Pathway 4/5/6: Express Lanes

Where? Highways with express lanes as in Plan Bay Area 2050

Incremental lane-miles of express lanes:

- Pathway 4: 514 (widening: 140)
- Pathway 5: 427[1] (widening: 0)
- Pathway 6: 1,022 (widening: 140)

When? 5am-8pm, Weekdays only

How much?

Dynamic toll rates to achieve 45mph speeds

Minimum toll 50¢

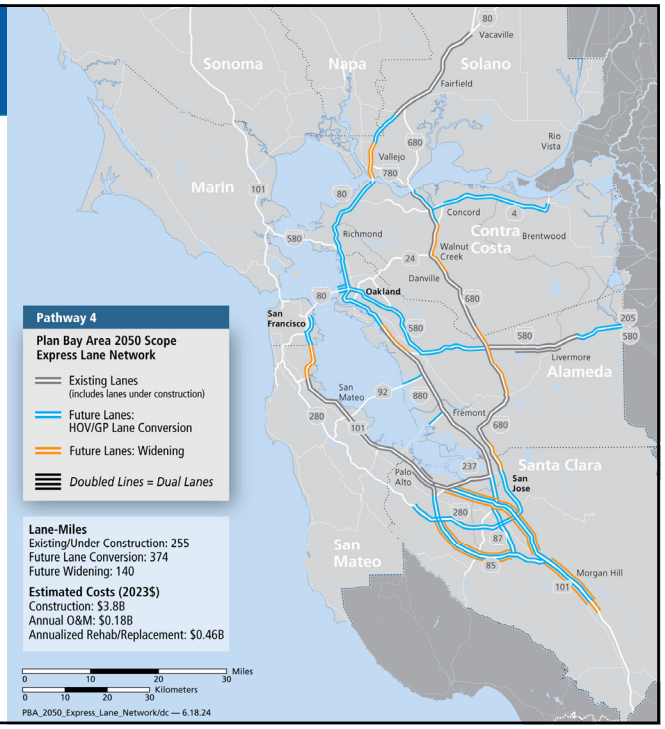
Carpooling incentives

- HOV3+: Free
- HOV2+: 50% discount

Cost burden mitigation

- <200% FPL: 50% discount

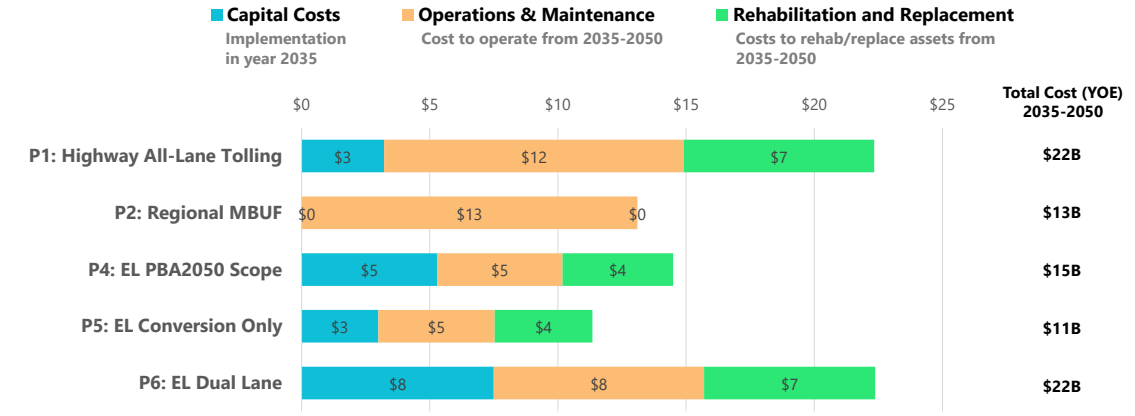
1. Lane-miles are lower than Pathway 4 since individual dual-lane projects that included widening were down-scoped to single-lane conversion only projects in Pathway 5, so as to not convert an addition general purpose lane



6

Costs of Pathways (over analysis period of 2035-2050)

Costs 2035-2050 (YOE $billion)



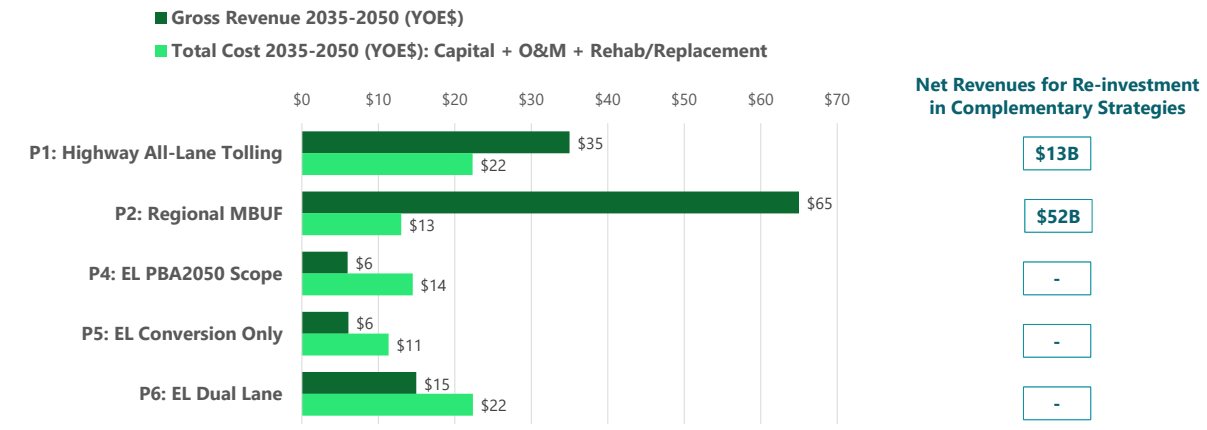
1. Assumes that capital costs are incurred in 2035, and O&M and R&R costs are incurred each year between 2035-2050, for consistency across pathways; Annual inflation rate 2.7% until 2035; 2.2% from 2035-2050
2. Pathway 1 Highway All-Lane Tolling costs are based on bottoms-up costing of ramp-based tolling across 570 centerline miles of highways and ~3M tolled trips per day
3. Pathway 2 Regional Mileage-Based User Fee costs are based on an administrative cost assumption of 20% of revenues
4. Pathway 4/5/6 Express Lane costs are based on sponsor-provided estimates for individual projects and further estimation based on cost averages across projects

7

7

Gross and Net Revenues of Pathways (over analysis period of 2035-2050)

Gross Revenues and Total Costs 2035-2050 (YOE $billion)



1. All revenues are based on year 2035 modeling forecasts, and an assumption of revenue escalation equivalent to inflation annually until 2050.
2. Pathway 1 Highway All-Lane Tolling key inputs: tolling on all highways in AM/PM peak period on weekdays, toll levels of 30c on congested corridors and 10c on all other corridors, minimum toll of 50c, 50% discount for HOV2+, toll caps of $30/month for households with incomes <200% FPL and $60/month for 200-300% FPL
3. Pathway 2 Regional Mileage-Based User Fee key inputs: Fee of 5c (2023$) on all miles traveled at all times of the day, toll caps of $30/month for <200% FPL and $60/month for 200-300% FPL
4. Pathway 4/5/6 Express Lane key inputs: Toll rates optimized for 45mph minimum speeds on express lanes from 5am-8pm on weekdays, minimum toll of 50c, 50% discount for <200% FPL

8

8

How were net revenues re-invested into complementary strategies?

Transit
50%

- Frequency Improvements for
  - Major Local Routes
  - Feeder Bus Routes
- First-Mile Shuttle Connections in Equity Priority Communities
- Frequency Improvements for Express Bus Routes *(only for Pathway 2 Regional MBUF)*

Local Roads
35%

- Transit-Friendly Arterials with Bus Priority Infrastructure
- Road Safety Design Elements

Reparative Infrastructure
15%

Investments in highway-adjacent low-income communities, such as:

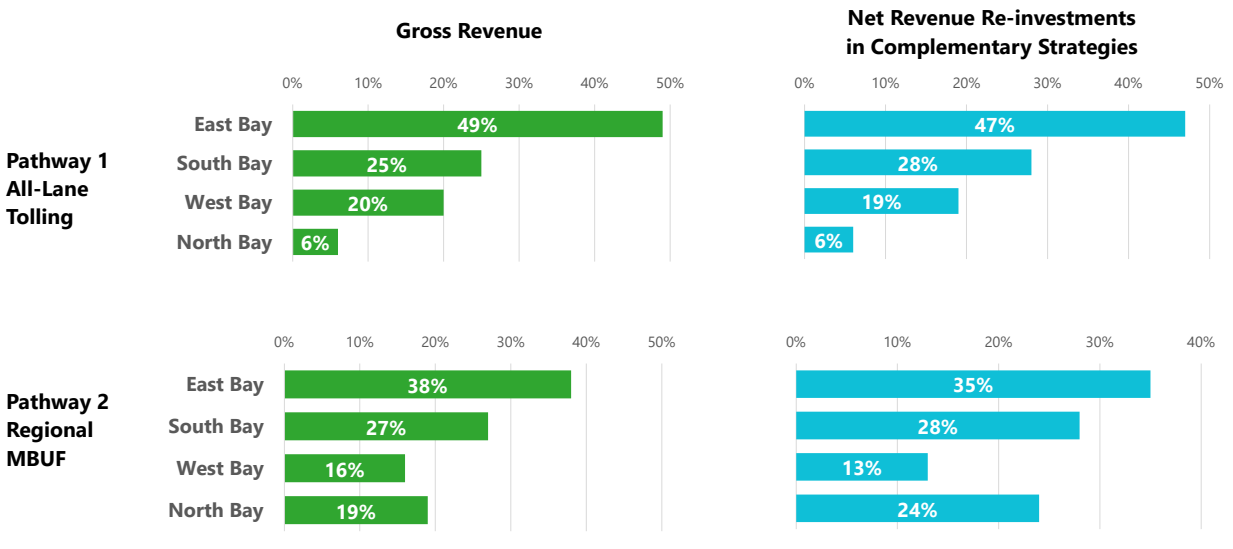
- Road Pavement Improvements
- Urban Greening
- Highway Pedestrian Crossings

(Not explicitly modeled)

9

9

Revenue re-investments in complementary strategies were closely aligned with forecasted revenues by county



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10

Focus main challenges rose to the top during Round 1 Analysis

Challenges with Highway All-Lane Tolling in Round 1 Analysis	Key Question
1. Optimizing Tolls with Climate Lens **Round 1 finding:** 2% net decrease in regional VMT	**Given ever-more-challenging climate goals, can we make even greater headway in helping meet SB375 targets?**
2. Limiting Diversion to Local Streets **Round 1 finding:** Diversion resulted in a 7% VMT increase on local streets	**Tolling parallel arterials was found to mitigate this increase; can other strategies can mimic this effect?**
3. Increasing Regional Mode Shift **Round 1 finding:** 5% increase in transit ridership; <1% overall regional mode shift	**Can revenues be better allocated to increase transit ridership & carpooling?**
4. Enhancing Affordability **Round 1 finding:** Low-income high-frequency users of highways were most burdened	**Can affordability be improved for high-frequency, low-income drivers?**

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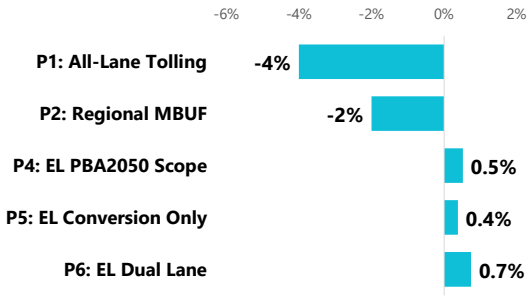
11

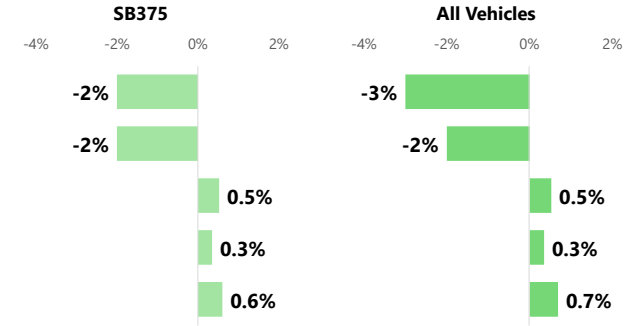
Challenge 1: Optimizing Tolls with Climate Lens

Change in VMT / GHG

Change in VMT
(relative to Baseline in year 2035)



Change in GHG Emissions
(relative to Baseline in year 2035)



P1 All-Lane Tolling: Despite greater VMT reductions (-4%) than in Round 1 analysis (-2%), GHG emissions reduction is estimated at 2% (lower than the 3% desired threshold)

P2 Regional MBUF: Greater VMT/GHG emissions reductions are possible with higher fee rates, but the level of reduction is matched to P1 levels of 2% to be able to make an apples-to-apples comparison of all other performance indicators.

P4/5/6 Express Lanes: All pathways increase VMT and GHG emissions as they induce more auto travel by increasing roadway capacity.

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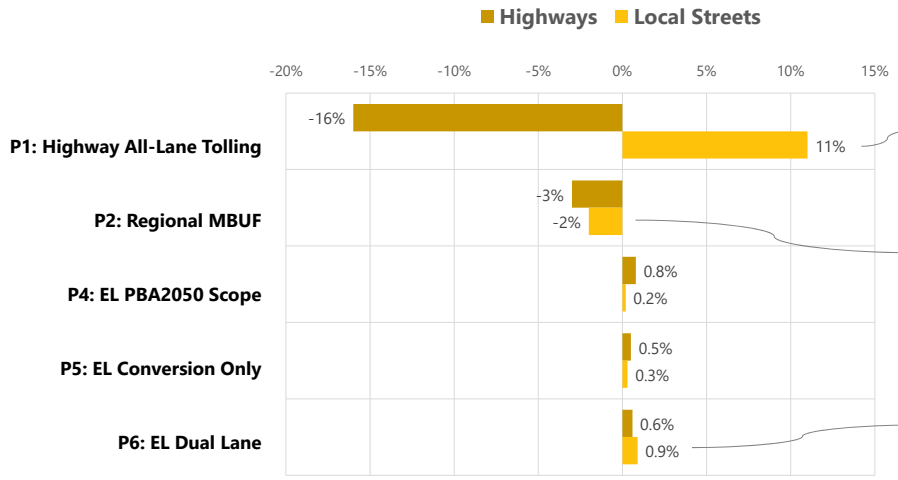
Challenge 2: Limiting Diversion to Local Streets

Diversion to local streets persists with all-lane tolling

Change in Highway vs. Local Street VMT
(relative to Baseline in year 2035)



Reducing speed limits on local streets has the potential to limit this diversion to ~4%, but lowered speed limits have an adverse impact on GHG emissions.

Regional MBUF curtails VMT on both highways and local streets, without issue of diversion.

Pricing a second highway lane results in some diversion to local streets, but without the highway VMT reduction benefits of P1

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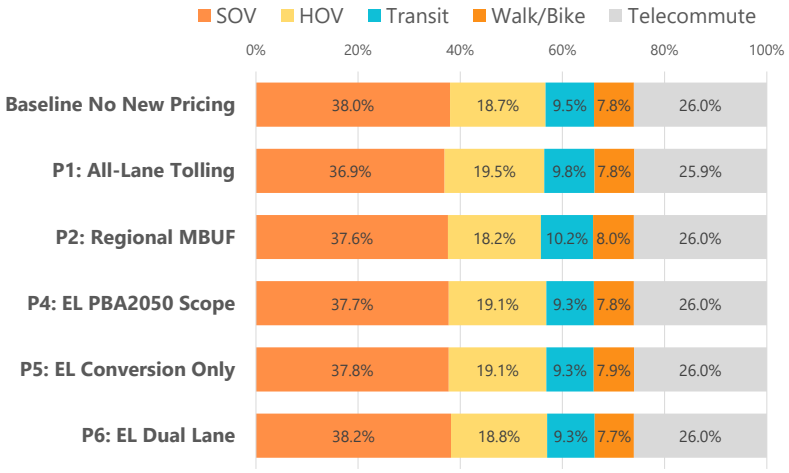
Challenge 3: Increasing Regional Mode Shift

Mode share: P1 results in more shift away from single-occupancy auto

Regionwide Commute Travel Mode Share
(relative to Baseline in year 2035)



Mode Shift from Baseline

	SOV	HOV	Transit	Walk/Bike
P1: All-Lane Tolling	-1.1%	+0.8%	+0.3%	-
P2: Regional MBUF	-0.4%	-0.5%	+0.7%	+0.2%
P4: EL PBA2050 Scope	-0.3%	+0.4%	-0.2%	-
P5: EL Conversion Only	-0.2%	+0.3%	-0.2%	+0.1%
P6: EL Dual Lane	+0.2%	+0.1%	-0.2%	-0.1%

Note: Numbers may not add up due to rounding

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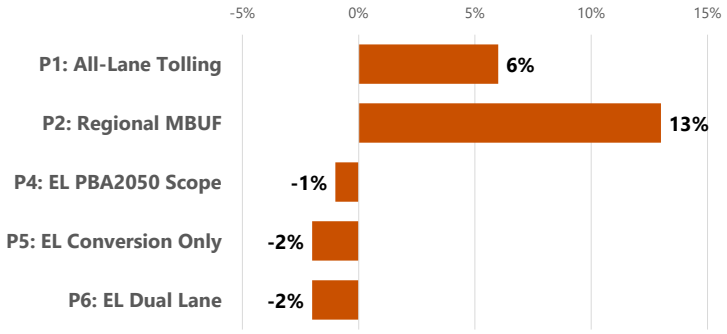
Challenge 3: Increasing Regional Mode Shift

Transit ridership increase is most significant in P2

Change in Regionwide Transit Boardings
relative to Baseline in year 2035



P1 All-Lane Tolling: Local transit investments have proven more effective, generating an increase in boardings similar to Round 1 levels, despite only a third of the investment level.

P2 Regional MBUF: Higher transit ridership (2x Pathway 1 levels) is driven by the significant revenue that is re-invested into transit (4x Pathway 1 levels), but there is relatively lower return on investment.

P4/5/6 Express Lanes: Without net revenues to reinvest into transit, all versions result in a net decrease in ridership.

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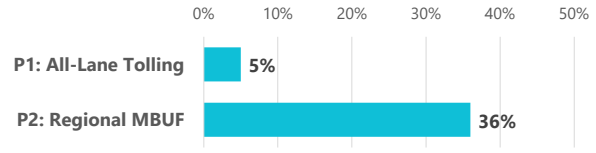
Challenge 4: Enhancing Affordability

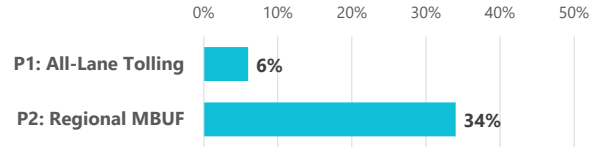
Toll caps limit expenditures for households with low incomes, but more households will meet the cap threshold with P2

Share of Low-Income Households that Meet Toll Cap Threshold

Households <200% FPL (<$60K annual income)
Tolls capped at $30/month



Households 200-300% FPL ($60-90K annual income)
Tolls capped at $60/month



P1 All-Lane Tolling impact on low-income households:

- Only 5-6% of low-income households would meet the toll cap threshold of $30/$60
- Costs are much lower for remainder households:
  - Over 50% of low-income households do not drive on tolled highways during peak hours on a regular basis and hence would not incur significant monthly costs
  - The 90th percentile household would incur monthly costs of $15 (<200% FPL) or $40 (200-300% FPL)

P2 Regional MBUF impact on low-income households:

- ~35% of low-income households would meet the toll cap threshold of $30/$60
- The remainder 65% of low-income households would incur monthly costs of anywhere between $0 -$30/$60 depending on miles driven

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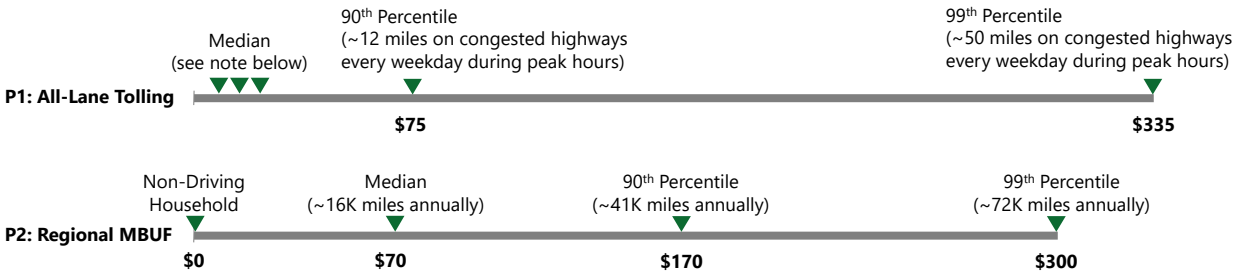
Challenge 4: Enhancing Affordability

For middle/high income households, the share of households that would incur substantial monthly costs is significantly higher with P2

Monthly Toll Expenditure per Household

Households >300% FPL (>$90K annual income)



Note on P1 All-Lane Tolling: "Median" monthly expenditure

The median monthly expenditure cannot be determined as it is challenging to ascertain the "median" level of travel on highways during peak periods across a full month.

However, knowing that nearly half of households in this income group do not use tolled highways on any one particular day, the median would be significantly lower, in the range of $10-$25.

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Key Performance Indicators

Goals			Round 1 Analysis All-Lane Tolling	Round 2 Analysis All-Lane Tolling	Round 2 Analysis Regional MBUF
Affordable	Average annual toll expenditure	Households<200% FPL	$50 to $70*	$70	$320
		All Households	$150 to $200*	$320	$630
			* Results with All-Lane Highway + Parallel Arterial Tolling		
Efficient	Change in SOV commute mode share		-0.9%	-1.1%	-0.4%
	Change in transit ridership		+5%	+6%	+13%
Reliable	Average change in freeway peak travel times		-8%* to -10%	-14%	-2%
	Average change in major parallel arterial peak travel times		0%* to 8%	+15%	+1%
			* Results with All-Lane Highway + Parallel Arterial Tolling		
Reparative	Share of toll revenues from <200% FPL population (~25% of population)		6%	4%	11%
	Ratio of benefits to costs for <200% FPL population		3.7	4.0	2.8
Safe	Change in estimated collisions		+4%	+2%	-2%
	Change in GHG emissions		-0.4% to -3%*	-2%	-2%
	Change in VMT		-2% to -3%*	-4%	-2%
			* Results with All-Lane Highway + Parallel Arterial Tolling		

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Equity: Considering four equity-centered outcomes

	P1: Highway All-Lane Tolling	P2: Regional Mileage-Based User Fee
Are there affordable travel options for those with limited means?	+ + • Toll caps limit expenditures • Travel during off-peak hours remains "free" • Local roads remain "free"	+ • Toll caps limit expenditures, but costs are relatively higher • Fewer transit alternatives relative to highways
Are travel time savings worth incremental travel costs for low-income drivers?	+ • Toll caps equalize the perceived cost-effectiveness of tolls for low-income highway users with that for high-income drivers	- • More likely perceived as a burden rather than cost-effective without a tangible direct benefit of time savings
Are local streets in Equity Priority Communities disproportionately burdened?	+ • No disproportionate burden as travel times on local streets parallel to highways increase by 12% in Equity Priority Communities vs. 15% regionwide	+ + + • No unintended consequence of diversion to local streets
Are incremental costs regressive to those with limited means?	+ + • Not regressive at an overall level as benefits to low-income population exceed costs (ratio is 4.0) • Relatively lower share of revenues is paid for by lower income households	+ • Not regressive at an overall level as benefits to low-income population exceed costs (ratio is 2.8) • Drivers in areas with low potential for transit access may perceive this fee as more regressive

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Translating Pricing into Real-Life Stories

Pathway	ALEXA • Lives in **Concord** and commutes to **Downtown Oakland** • Travels via **highways [~20 miles each way]** at **peak periods 3x a week** • **Drives 16K miles/year**	BELLA • Lives in **San Jose** and primarily works from home, with medical appointments at **Stanford** 3x a week • Travels via **highways [~20 miles each way]** at **midday** • **Drives 8K miles/year**	CARLOS • Lives in **West Oakland** and works in **Emeryville Bay Street Mall** • Travels via **local roads** at **peak periods [~3 miles each way]** • **Drives 12K miles/year**	DEVON • Drives for small jobs from **Tracy** to all over Bay Area • Travels via **highways [~60 miles]** spanning **all periods of the day everyday** • **Drives 40K miles/year**
Pathway 1 All-Lane Tolling	18% reduction in travel time +$150 in monthly costs *(or switch to using BART)*	No change in travel time ~$0 monthly costs	3% increase in travel time ~$0 monthly costs	8% reduction in travel time +$200 in monthly costs
Pathway 2 Regional Mileage-Based Fee	3% reduction in travel time +$70 in monthly costs	No change in travel time +$35 in monthly costs	No change in travel time +$50 in monthly costs	1% reduction in travel time +$170 in monthly costs

Note: Assumes all of these individuals are middle-income and thus ineligible for toll cap program

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Reliable

Goal: Reduce traffic congestion and improve reliability for people and goods

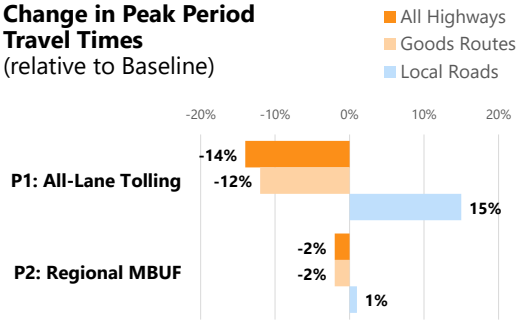
P1 All-Lane Tolling

- Most effective at reducing travel times on highways, for both people and goods by 14% and 12% respectively, relative to the baseline
- Diversion to local streets increases travel times by 15%
- Peak-period highway travel times drop from 19% to 13% relative to off-peak travel times

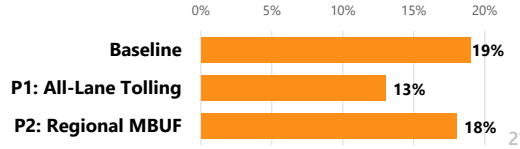
P2 Regional MBUF

- No major improvement in travel times: 2% reduction on highways and negligible change on local streets

Change in Peak Period Travel Times
(relative to Baseline)



Ratio of Peak to Off-Peak Highway Travel Times



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Efficient

Goal: Maximize capacity of existing infrastructure by improving multimodal alternatives to driving

P1 All-Lane Tolling

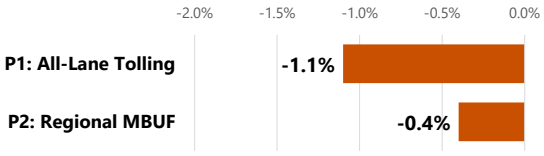
- Higher shift away from single-occupancy auto for commute travel, incentivized by peak period-focused pricing

P2 Regional MBUF

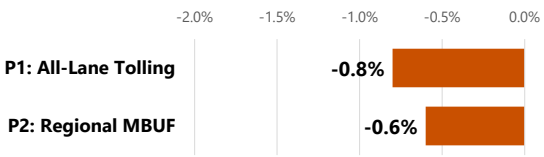
- Similar shift away from single-occupancy auto for all travel, incentivized by pricing at all times of the day

Shift in Mode Share of Single-Occupancy Auto

Peak Hour Commute Travel



All Travel



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Affordable

Goal: Ensure everyone has affordable and cost-effective travel options

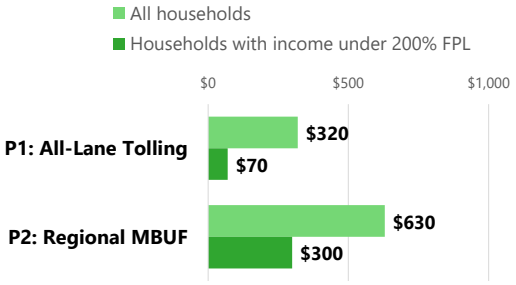
P1 All-Lane Tolling

- More affordable on average, with average annual toll expenditure for auto-oriented households at $320
- These expenditures come with time savings that are most cost-effective for people driving for their job, and low-income drivers who use freeways heavily
- Driving in off-peak hours remains a "free" alternative, along with weekends

P2 Regional MBUF

- Less affordable on average, with the average auto-oriented household spending $630 annually
- The difference in affordability from P1 is starker for lower income households
- With little travel time savings to account for, these costs are more likely perceived as a burden rather than cost-effective

Average Annual Household Toll Costs for Auto-Oriented Households



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Reparative

Goal: Support highway-adjacent communities impacted by 20th-century transportation policy decisions.

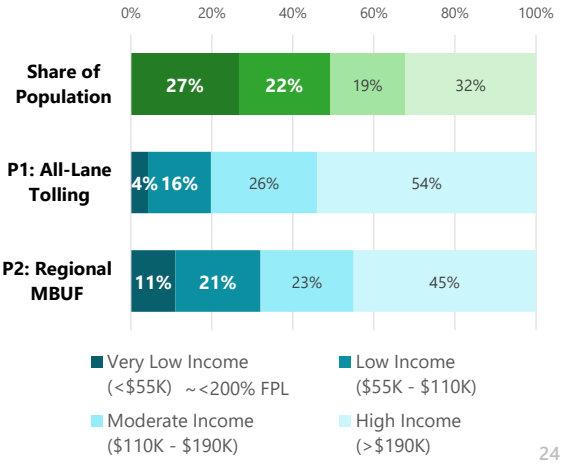
P1 All-Lane Tolling

- Net revenues set aside for reparative investments can support $2B of reparative investments in highway-adjacent communities, in addition to $8B of transit and road re-investments benefiting these communities
- With 4% ($1.5B from 2035-2050) of revenues being paid for by very low-income population, and $6B in re-investments benefiting this population group, the costs are not regressive overall

P2 Regional MBUF

- Significantly higher net revenues (four times higher than P1) can support much higher levels of investments in highway-adjacent communities
- However, while still not regressive, a larger share of revenues (11%) are paid for by very low-income populations
- Drivers in areas with low potential for transit access (e.g. rural areas) may perceive this fee as more regressive than a highway-based toll

Share of Toll Revenues by Income Group, Relative to Share of Population



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Goal: Promote safer travel by all modes and on all facilities, while also improving environmental health.

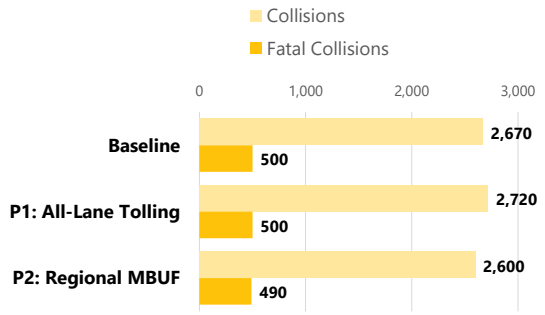
P1 All-Lane Tolling

- Increased VMT on local streets could lead to a marginal increase in collisions relative to the baseline
- Particulate pollution is bound to increase on local streets, while overall GHG emissions decrease by 2%

P2 Regional MBUF

- With a 2% overall reduction in VMT, collisions drop by a commensurate margin
- Higher fees could deliver a greater VMT and emissions reduction, but would have a more adverse impact on affordability

Estimated Annual Number of Collisions



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