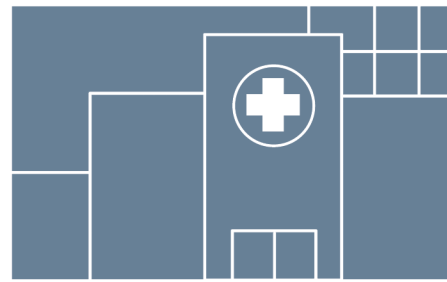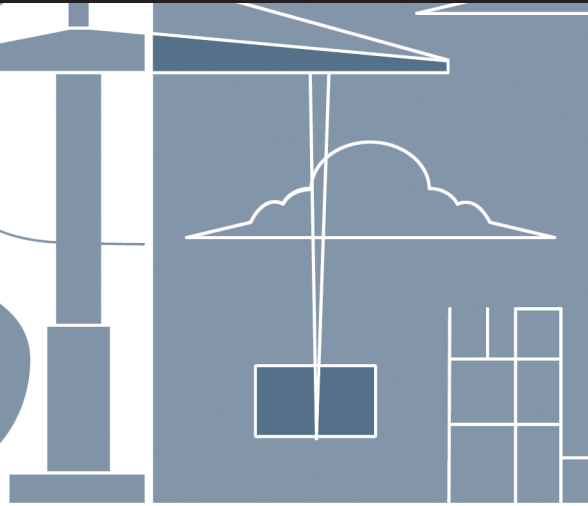**LOCAL STREETS AND ROADS, BRIDGES AND STATE HIGHWAY NEEDS ASSESSMENT**

# Plan BayArea 2040

**FINAL SUPPLEMENTAL REPORT**

Metropolitan Transportation Commission

Association of Bay Area Governments

JULY 2017

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Plan Bay Area 2040:
Final Local Streets and Roads, Bridges,
and State Highway Needs Assessment

July 2017

**METROPOLITAN
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## Project Staff

**Anne Richman**
Director, Programming and Allocations

**Theresa Romell**
Assistant Director, Programming and Allocations

**Sui Tan**
StreetSaver Program Manager

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# Executive Summary

For Plan Bay Area 2040 (PBA2040), MTC estimated the funding needed to operate and maintain the existing local street and road (LSR) system, including bridges on the locally-owned system, over the 24-year plan period from FY2016-17 to FY2039-40.  The cost of needed capital maintenance of the seven state-owned toll bridges (does not include the Golden Gate Bridge) over the same time period was developed and provided by the Bay Area Toll Authority (BATA).  MTC also used information developed by the California Department of Transportation (Caltrans) in conjunction with a pavement needs assessment conducted by MTC using the StreetSaver℗ pavement management system software, to estimate the cost of capital maintenance of the state highway system within the nine-county Bay Area over the PBA2040 time frame.

On the cost side, this analysis has two components for local streets and roads: (a) the cost of maintaining the local street and road network at its current condition level, and (b) the cost of improving the network and maintaining it in a state of good repair.  For bridges and state highways, information available allowed only for the estimation of cost needed to reach and maintain a state of good repair.  On the revenue side, the analysis includes revenues that are committed to operating and capital costs by law or local policy, as well as discretionary funds that are allocated to transit operating or capital needs by MTC.

As shown in Table 1 below, to reach a state of good repair in addition of our roads and bridges, the region will need to spend an estimated total of $85 billion over the next 24 years.  PBA2040 revenue estimated to be available for the operation and maintenance of the existing system totals $65.6 billion, leaving a remaining need of approximately $21.5 billion.

| Mode | PBA2040 Revenue | Need (State of Good Repair) | Need (Maintain Conditions) | Remaining Need (State of Good Repair) | Remaining Need (Maintain Conditions) |
|---|---|---|---|---|---|
| Local Streets and Roads | $35,298 | $48,926 | $42,951 | $13,628 | $7,653 |
| State Highways | $13,751 | $19,966 | $19,966 | $6,215 | $6,215 |
| Local Bridges | $923 | $2,187 | $2,187 | $1,264 | $1,264 |
| Regional Bridges | $15,660 | $16,064 | $16,064 | $404 | $404 |
| Total | $65,632 | $87,143 | $81,168 | $21,511 | $15,536 |

Table 1:  PBA2040 Local Road, Bridges, and State Highways Needs and Revenue Summary (In Millions)

# Local Streets and Roads

The Bay Area's local street and road (LSR) network, in addition to over 42,000 lane miles of roadway used by cars, buses, trucks and bicycles, also includes miles of curbs and gutters, sidewalks, storm drains, traffic signs, signals and lights.  These "non-pavement" items are necessary for a functioning street and road network.  The LSR system provides the foundation for all modes of travel, and is vital to the safety, livability and economic health of the Bay Area.

The average condition of the Bay Area's LSR network, rated on a scale of 0 to 100, is currently at 66.  This pavement condition index (PCI) places the region's roadway network in the "fair" category.  The classifications used to rate LSR pavements are shown in the table below.

| | |
|---|---|
| **Very Good-Excellent**<br><br>(PCI = 80-100) | Pavements are newly constructed or resurfaced and have few if any signs of distress |
| **Good**<br><br>(PCI = 70-79) | Pavements require mostly preventive maintenance and have only low levels of distress, such as minor cracks or spalling, which occurs when the top layer of asphalt begins to peel or flake off as a result of water permeation. |
| Fair<br><br>(PCI = 60-69) | Pavements at the low end of this range have significant levels of distress and may require a combination of rehabilitation and preventive maintenance to keep them from deteriorating rapidly. |
| **At Risk**<br><br>(PCI = 50-59) | Pavements are deteriorated and require immediate attention including rehabilitative work.  Ride quality is significantly inferior to better pavement categories. |
| **Poor**<br><br>(PCI = 25-49) | Pavements have extensive amounts of distress and require major rehabilitation or reconstruction. Pavements in this category affect the speed and flow of traffic significantly. |
| **Failed**<br><br>(PCI = 0-24) | Pavements need reconstruction and are extremely rough and difficult to drive on. |

**Table 2:  Pavement Condition Index Rating Scale**

While the region's average pavement condition is considered fair, it is important to note that the deterioration curve of a typical pavement is exponential, and not linear.  As shown in Figure 1 below, a new pavement will deteriorate slowly for the first 15 years of its standard 20-year life span. Once it reaches a PCI of 60, it will begin to deteriorate rapidly.  Without any intervention, the pavement can drop from the fair category to the "failed" category in as little as five years.  This deterioration holds serious implications for the cost of system preservation.  Pavements that are still in good condition (a PCI of 70 or above) can be preventively maintained at a low cost, whereas pavements that need significant rehabilitation or reconstruction require five to 15 times the amount of funding.  Once pavements fall below a PCI of 60, users of the roadways begin to experience increasing vehicle operating costs associated with wear and tear damage to their vehicles and additional fuel costs.
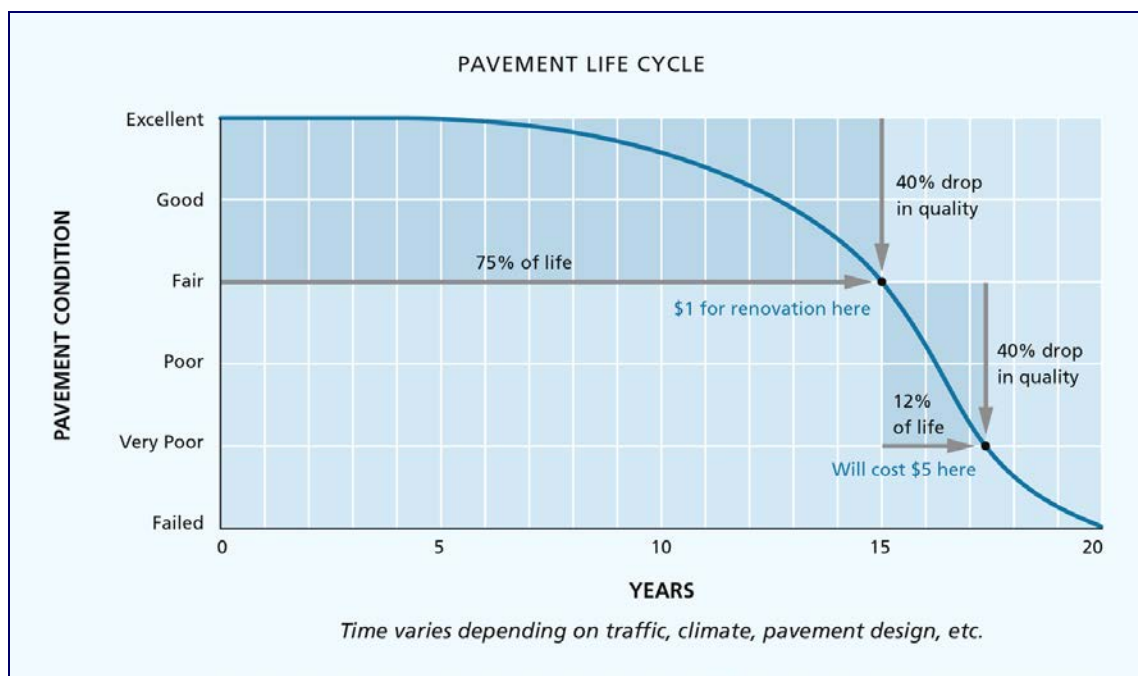
Figure 1: Pavement Life Cycle

## Assessment Methodology

The needs assessment for the region's local street and road system benefits from the biennial survey conducted as part of the California Local Streets and Roads Needs Assessment.  The survey conducted in 2014 provided information on Bay Area unit costs for pavement maintenance treatments, estimates of non-pavement asset inventories and replacement costs, and information on local jurisdiction revenues available for roadway operations and capital maintenance.  This survey data, for which information was provided by all 109 Bay Area jurisdictions, is used in conjunction with MTC's StreetSaver® Pavement Management system—an analysis tool that estimates the cost to maintain pavements at a specified condition level—to estimate the needs of the local street and road system.

Pavement needs are estimated by using the street inventory, conditions, and projected lifecycle information contained in local jurisdictions' StreetSaver® databases.  Pavement maintenance unit costs, a key input into the StreetSaver® model, were estimated by county, using information submitted by local jurisdictions to the 2014 California Local Street and Road Needs Assessment survey.  The StreetSaver® model then estimates the long-term maintenance needs of each jurisdiction's street network, assuming the most cost-effective maintenance strategies are applied.

Non-Pavement capital maintenance needs consist of the cost to maintain other local street and road assets that are required for a functioning street and road system.  These include assets such as storm drains, sidewalks, curbs and gutters, street lights, signs, and signals.  To estimate the Non-Pavement needs on the local road system, MTC used a prediction model developed by Nichols Consulting Engineers (NCE) that uses information provided by local jurisdictions on non-pavement asset inventory and useful life to estimate long-term costs to maintain non-pavement assets. Replacement costs are predicted based on the inventory of two non-pavement assets - curbs and gutters and streetlights.  The total non-pavement asset replacement cost is then divided by the average useful life for each of the major non-pavement asset

groups in order to estimate an annual preservation cost.  The prediction model was updated with asset inventory and replacement cost information provided by local jurisdictions in responses to the 2014 California Local Street and Road Needs Assessment survey.

Information derived from the 2014 California Local Street and Roads Needs Assessment survey was used to determine revenues for Bay Area LSR maintenance derived from local and county sources, as well as to determine the categorical split between capital maintenance and operations and new construction, by which jurisdictions expend revenues available for local streets and roads. Revenues for LSR maintenance and operations comes primarily from local and state sources. State taxes on gasoline, distributed by formula, provide a significant portion of these revenues.  Local sources consist of countywide or city transportation sales taxes, general funds, and other fees.  The PBA2040 investment strategy also contributes a significant amount of discretionary revenue to LSR capital maintenance.  Locally-generated revenue sources were assumed to keep pace with inflation, and were grown at the 2.2% annual rate consistent with the PBA2040 inflation assumption.   Projections of revenue from state sources were prepared by MTC and escalated in a manner consistent with the PBA2040 assumptions for fuel-price growth and consumption.  Discretionary revenue was assumed to be distributed for LSR to counties based on current funding distribution shares under the One Bay Area Grant program.

## Summary Results

Capital maintenance needs consist of activities that extend the useful life of the roadway asset by five or more years. This category can be further broken down into preservation for pavements and non-pavement assets (sidewalks, storm drains, traffic signals, curbs and gutters, etc.).

The system preservation needs were calculated for two different condition level scenarios:

1. **Maintain Existing PCI** – Local jurisdictions maintain the existing pavement condition index (PCI), while deferred maintenance costs are allowed to grow.
2. **State of Good Repair** – The LSR system reaches the optimal PCI (the point at which the system is most cost effective to maintain), within the first 10 years and is maintained at this level for the duration of the Plan period.

Operational costs consist of routine maintenance such as pothole filling, street sweeping and striping, as well as overhead expenses.  Operations costs were assumed to have first call on projected LSR revenue, and were projected to total $12.7 billion for the region over the Plan period.

Projected LSR capital and operating needs by county are summarized in Table 3 below.  The total cost includes needs for pavement and non-pavement maintenance, as well as operations costs.   As a region, funding identified for LSR covers approximately 72% of the total needed to meet a state of good repair, and about 82% of the amount need to maintain conditions at existing service levels.

| County | Total Cost (State of Good Repair) | Total 24-Year Revenue from Committed Sources | Total 24-Year Revenue from Discretionary Sources | Total Revenue | Remaining Need (State of Good Repair) |
|---|---|---|---|---|---|
| Alameda | $8,649 | $5,033 | $1,546 | $6,579 | $2,070 |
| Contra Costa | $6,116 | $3,338 | $1,133 | $4,470 | $1,646 |
| Marin | $1,722 | $831 | $221 | $1,052 | $670 |
| Napa | $1,473 | $969 | $168 | $1,138 | $335 |
| San Francisco | $7,903 | $5,988 | $966 | $6,955 | $949 |
| San Mateo | $3,935 | $2,012 | $657 | $2,669 | $1,266 |
| Santa Clara | $11,320 | $6,892 | $2,097 | $8,989 | $2,332 |
| Solano | $2,963 | $782 | $429 | $1,211 | $1,752 |
| Sonoma | $4,846 | $1,672 | $564 | $2,236 | $2,610 |
| REGION TOTAL | $48,926 | $27,518 | $7,780 | $35,298 | $13,628 |

**Table 3: PBA2040 LSR Projected Expense and Revenue (In Millions)**

# State Highways

The needs assessment for the state highway system relies on information provided by Caltrans in its 2015 State Highway Operations and Protection Program (SHOPP) Plan, and analysis of the District 4 (Bay Area) highway road conditions and projected needs using the StreetSaver model.   Future adjustments to the state highway needs assessment may be made to account for specific Bay Area operational needs over and above the assumed Bay Area population share of these needs as incorporated in the SHOPP forecast, and additional input that may be provided by Caltrans staff.

Every two years, Caltrans produces a 10-year estimate of needs to preserve and maintain the state highway system and its supporting infrastructure.  The 2015 SHOPP Plan contains a "Goal Constrained Needs Plan" that is an estimate of costs to meet defined performance goals over a 10-year period for the following major categories:

- Major Damage Restoration
- Collision Reduction
- Mandates
- Mobility Improvement
- Minor Program
- Bridge, Roadway and Roadside Preservation;
- Facility Improvement

The 2015 SHOPP Plan also contains a "Financially Constrained Needs Plan" that is constrained by the amount of funds expected to be available for expenditure on preservation needs in the same categories as listed above.

To estimate the needs, MTC staff escalated the Goal Constrained funding needs to 2017 dollars, using a 2.2 percent inflation rate, and projected these needs out for ten years to FY 2026-27. For FY 2027-28 through FY 2039-40, staff used estimates contained in the Financially Constrained Needs Plan, escalated to nominal dollars.  This shift to a lower needs level after year 10 is based on the assumption that the funding levels assumed for the first 10 years of the forecast are sufficient to bring the state highway system to a state of good repair, after which ongoing maintenance costs would be lower.  This assumption is consistent with the assumption made in the local street and road and transit capital maintenance needs assessments.  To estimate the Bay Area's share of the state highway needs, staff applied the Bay Area's population share, relative to the state, to the statewide 24-year total.  In addition, staff substituted the estimated roadway preservation needs for the StreetSaver⊘ generated estimate, as described below.

MTC used information on state highway lane mileage and pavement conditions, coupled with information provided by Caltrans on pavement maintenance treatment costs and practices, to develop a StreetSaver⊘ database for the state highways in the region.  In consultation with Caltrans staff, the model was then used to project the long-term pavement capital maintenance needs to meet and maintain a state of good repair. The state of good repair model results were then substituted for the roadway maintenance cost estimated using the region's population share of the statewide need based on the SHOPP Plan, as described above.

| Total Cost | Revenue from Committed Sources | Remaining Need |
|---|---|---|
| $19,966 | $13,751 | $6,215 |

**Table 4:  PBA2040 State Highway Projected Expense and Revenue (In Millions)**

# Local and Regional Bridges

## Local Bridges

The nearly 2,000 locally-owned bridges in the San Francisco Bay Area are essential links that help connect the state's communities, provide mobility for travelers, support efficient movement of freight, and relieve traffic congestion.

All of the region's bridges require some level of investment over time to remain in service.  Like a car or a house, a bridge requires regular maintenance.  Even if it is well-maintained, it is eventually necessary to rehabilitate or replace a bridge due to deterioration of its components.  Further, many bridges are improved or replaced for functional reasons, such as having been designed to carry lighter loads, less traffic or smaller vehicles than they now carry.  Deferring maintenance on a bridge may save money in the short term, but can force more costly repairs to be required sooner, ultimately increasing costs in the long term.

The Federal Highway Administration's National Bridge Investment Analysis System (NBIAS) system was used to develop the projections of capital maintenance need for our region's locally-owned bridges.  NBIAS has a modeling approach similar to that of the Pontis Bridge Management System (BMS) which is used by Caltrans for managing its bridges.  However, NBIAS requires only publically-available National Bridge Inventory (NBI) data to run, in contrast to Pontis, which requires detailed element data that are not part of the NBI.

Though NBIAS is populated with default costs, deterioration models and other parameters, these were calibrated to regional costs and conditions in order to provide as realistic a projection as possible of the cost to maintain Bay Area bridges.  Further, seismic retrofit needs, which are not modeled by NBIAS, were calculated and applied to the results.

The results obtained from NBIAS provide a projection of bridge investment needs over time for different budget assumptions.  Investment needs are funds that should be invested to minimize bridge costs over time and to address economically-justified functional improvements.  To the extent that projected funds are insufficient for addressing all needs, the system simulates what investments will occur with an objective of maximizing benefits given an available budget.  The system also predicts what new needs may arise considering deterioration and traffic growth, and projects a range of different physical measures of bridge condition.

Revenues available for investment in locally-owned bridges were projected based on the region's historical share of state funding for bridge maintenance projects.  Table 5 below summarizes the locally-owned bridge capital maintenance needs and projected revenue by county.

| County | Total Cost | Total Revenue | Remaining Need |
|---|---|---|---|
| Alameda | $396 | $167 | $229 |
| Contra Costa | $199 | $84 | $115 |
| Marin | $20 | $9 | $12 |
| Napa | $224 | $94 | $129 |
| San Francisco | $211 | $89 | $122 |
| San Mateo | $251 | $106 | $145 |
| Santa Clara | $510 | $215 | $294 |
| Solano | $130 | $55 | $75 |
| Sonoma | $246 | $104 | $142 |
| **TOTAL** | **$2,187** | **$923** | **$1,264** |

**Table 5: PBA2040 Local Bridge Projected Capital Maintenance Expense and Revenue (In Millions)**


## Regional Toll Bridges

There are seven state-owned toll bridges that span San Francisco Bay include the Antioch, Benicia, Carquinez, Dumbarton, Richmond/San Rafael, San Mateo/Hayward, and San Francisco-Oakland Bay bridges. The Golden Gate Bridge is not state-owned, but still spans the Bay and is considered a regional bridge for the purposes of this needs assessment.

To determine the capital maintenance needs of the state-owned bridges, MTC worked with BATA staff. BATA maintains detailed 20-year cost projections and budget schedules in order to plan and deliver bridge maintenance projects over the long-term. Planned and anticipated maintenance and rehabilitation projects for each bridge are categorized into the following categories:

- Category 1 – Structural Elements Rehab
- Category 2 – Deck Rehab
- Category 3 – Base System
- Category 4 – Structural Steel Painting
- Category 5 – Bridge and Pavement Approaches
- Category 6 – Electrical/Mechanical
- Category 7 – Facilities

A five percent cost escalation rate was applied to each of the cost categories over a 20-year period. The To estimate the additional four years of capital maintenance costs needed for the 24-year period of PBA2040, staff calculated the average annual real cost over the 20-year period and applied the five percent growth rate to that figure for the four remaining years. In addition to the projected future capital maintenance costs, BATA projected the cost of on-going debt-financing for capital maintenance and rehabilitation/replacement projects already performed or underway on the state-owned bridges in order to determine the total regional bridge-related expense over the PBA2040 period.

Commited funding for the state-owned bridge maintenance consists of projected revenue from existing bridge tolls. Discretionary revenue is assumed to come from future (not yet enacted) tolls.

The Golden Gate Bridge Highway and Transit District is responsible for the capital maintenance of the Golden Gate Bridge, and for ensuring sufficient revenue is generated to meet those needs. The Golden Gate Bridge capital maintenance needs are assumed to be equivalent to the total Golden Gate Bridge

toll revenue forecasted to be collected over the 24-year PBA2040 period, less toll funds set aside for transit operations.  Total toll revenue for the Golden Gate Bridge capital maintenance needs over the 24-year PBA 2040 period is approximately $2 billion.

The projected expenses and revenues for the region's eight regional toll bridges are summarized in Table 6 below.

| Total Cost | Revenue from Committed  Sources | Revenue from Discretionary Sources | Total Revenue | Remaining Need |
|---|---|---|---|---|
| $16,064 | $15,410 | $250 | $15,660 | $404 |

**Table 6:  PBA2040 Regional Bridge Projected Expense and Revenue (In Millions)**