CALIFORNIA LOCAL BRIDGE NEEDS ASSESSMENT REPORT 2020

for the

CALIFORNIA STATEWIDE LOCAL STREETS AND ROADS NEEDS ASSESSMENT

Final Report
August 2021

Prepared by

QUINCY ENGINEERING

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Rural Counties Task Force
Regional Transportation Planning Agencies

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FOR THE CALIFORNIA STATEWIDE LOCAL STREETS AND ROADS NEEDS ASSESSMENT 2020

Prepared for:

Nichols Consulting Engineers,
California State Association of Counties,
County Engineers Association of California,
League of California Cities,
Regional Transportation Planning Agencies,
Rural Counties Task Force, and
State of California Department of Transportation
Local Highway Bridge Program Advisory Committee

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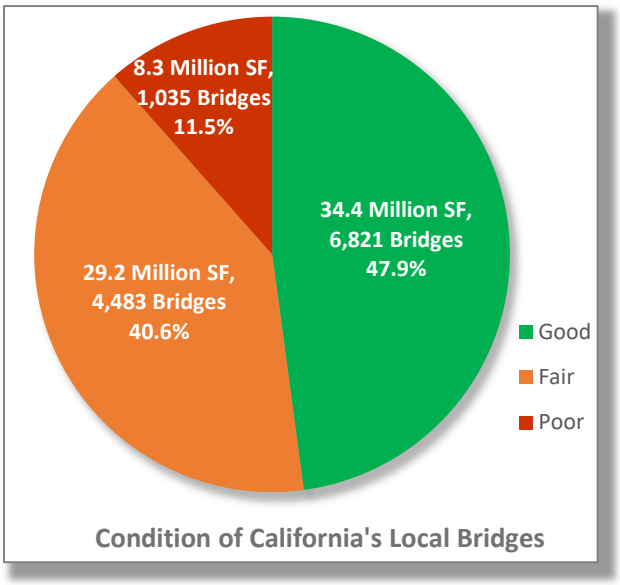
1 Executive Summary

Local Bridge Needs

Bridges are lifelines connecting our towns, cities, and counties to the state's economy. They establish safe routes over rivers, creeks, railroads, highways, and other roads. They provide access to schools, grocery stores, offices, retail shops, farms, and factories. In many communities, local bridges provide the only means of access for first responders. When bridges fail or close, local residents and economies are immediately affected.

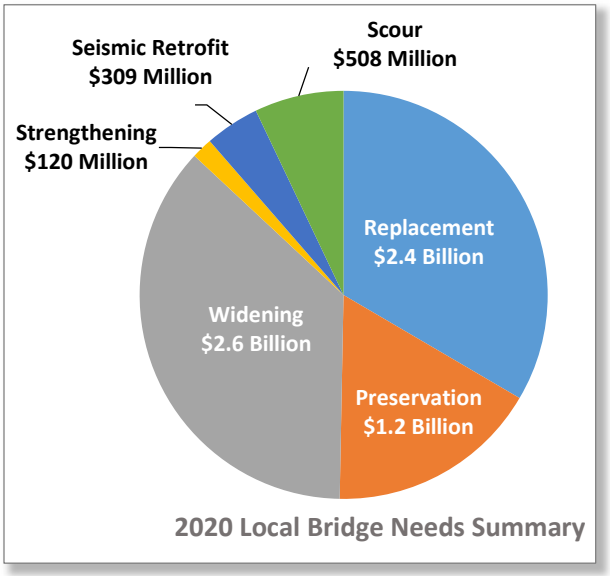


California's local bridges are an integral part of our transportation network, but they are deteriorating and aging faster than they can be repaired or replaced. Dedicated funding to fix local bridges has been stagnant for many years. This report presents the status of California's aging inventory of local bridges and provides policymakers with a reliable estimate of funding needed to maintain and improve this vital component of our transportation system.

How many local bridges are there in California?

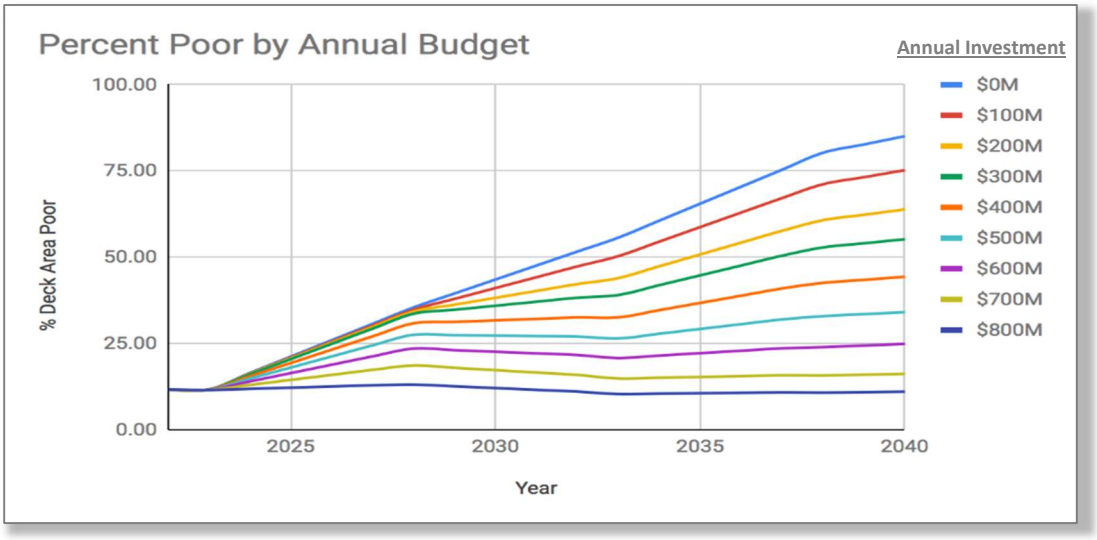
Cities and counties own and maintain about half of the state's bridges (12,339). The average age for these bridges is over 50 years – 10 years older than the national average. Almost one-fifth of these bridges are at least 80 years old, which is of significant concern, since most bridges were designed for a 75-to-100-year lifespan. The chart, to the right, indicates that more than half (52.1 percent of total deck area) of our local bridges are in "Fair" to "Poor" condition. Over 7 million vehicle trips are made across "Poor" local bridges every day. As bridges age, the rate of deterioration also increases due to increasing traffic volumes and accumulated wear and tear.

Cities and Counties own more than 12,000 bridges, and over half are more than 50 years old.



How much will it cost to make essential repairs?

It will require $7.2 billion in today's dollars to make important safety, strengthening, and widening improvements to keep pace with California's modern mobility needs. Just to maintain our current state of disrepair, it would require nearly $800 million annually.



How much do we have allocated to make repairs?

The primary funding source for local bridge projects has traditionally been through the Highway Bridge Program (HBP). This funding source has been stagnant over the past 10 years; at less than $300 million dollars annually. At this investment level, **the percentage of local bridges in poor condition will climb above 50% within the next 20 years**.

To put it another way, approximately 250 bridges need to be repaired or replaced annually. In California today, less than 40 bridge repairs are completed every year.

Summary

The needs for California's local bridges are increasing every year as they age. At the same time, the cost of bridge repairs continues to increase due to an increase in project complexity - based on design features, traffic widths, modern traffic loads, environmental regulations and permitting, and other project requirements. Today, bridge project construction costs are considerably higher and take more time to complete than they did at the time of their original construction.

California's local bridges need $800 million a year just to maintain current conditions.

The current rate of bridge replacement and major rehabilitation projects is not keeping up with the bridges that are reaching the end of their expected service lives. At the same time, maintenance needs within the aging population are also increasing. In conclusion, funding must be increased to $800 million annually just to maintain the current condition of California's local bridge inventory. And to improve the overall condition of our bridges as a key component in our local transportation network, the annual investment must be even higher.

2 California's Local Agency Bridge Inventory Population

As of 2020, there are roughly 25,499 vehicular bridges in the California public transportation system. Roughly half of these bridges (13,160) are owned and maintained by Caltrans as part of the State Highway System. The remainder of these bridges (12,339) are local agency bridges that are owned, maintained, and operated by cities, counties, and other municipalities. Local bridges are an integral part of the local street and road transportation network that help connect California communities, provide mobility for travelers, and support movement of economic goods and services. While the State Highway System is a critical mobility corridor, nearly all vehicle trips start and end their journeys on local roads and many by crossing local bridges. The focus of this report is the condition of California's local agency bridge inventory and the cost to maintain and improve that system.

2.1 National Bridge Inventory Overview

It is easy for the traveling public and everyday motorist to recognize a bridge within our local transportation network at first sight. However, it is important to understand that there is a specific legal definition for the term "bridge" contained with the Code of Federal Regulations Title 23 Part 605.305:

> ***Bridge.*** *A structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.*

This definition is important because it triggers federal law and policies specific to bridge structures including eligibility for the federal funding commonly used by local agencies to maintain, rehabilitate, and replace structures within their jurisdiction. Federal law also directs the upkeep of a database of information for all bridges in the country located on public roads known as the National Bridge Inventory (NBI) database. The data is collected by Caltrans on behalf of local agencies in California through a biennial bridge inspection cycle and provided to the Federal Highway Administration (FHWA) to be compiled into the NBI database annually. The NBI database contains detailed bridge information such as geometry, year built, and various condition ratings of the components of each bridge.

The NBI data used in this report is based on the NBI database received on June 30th, 2020, with data current through June 15th, 2020. The detailed bridge information is based on a snapshot in time of the recorded bridge inspection most up to date at the time the data was taken from the database. The data tracks a variety of metrics related to the age, type, condition, and function of the bridge. Generally, the NBI data used for this report include condition for Deck, Superstructure, Substructure, Structural Evaluation, Deck Geometry, Bridge Posting and Scour. Geometrical information and bridge age determined using Year Built were also taken from the NBI data.

The distribution of the local agency NBI bridges in California is shown in Figure 2.1. The bar chart represents a breakdown of the number of local bridges by county, including city owned bridges within their corresponding county. Most counties have a few hundred bridges, averaging about 200 bridges per county. Larger populated counties typically have a higher number of bridges compared to lower populated counties.

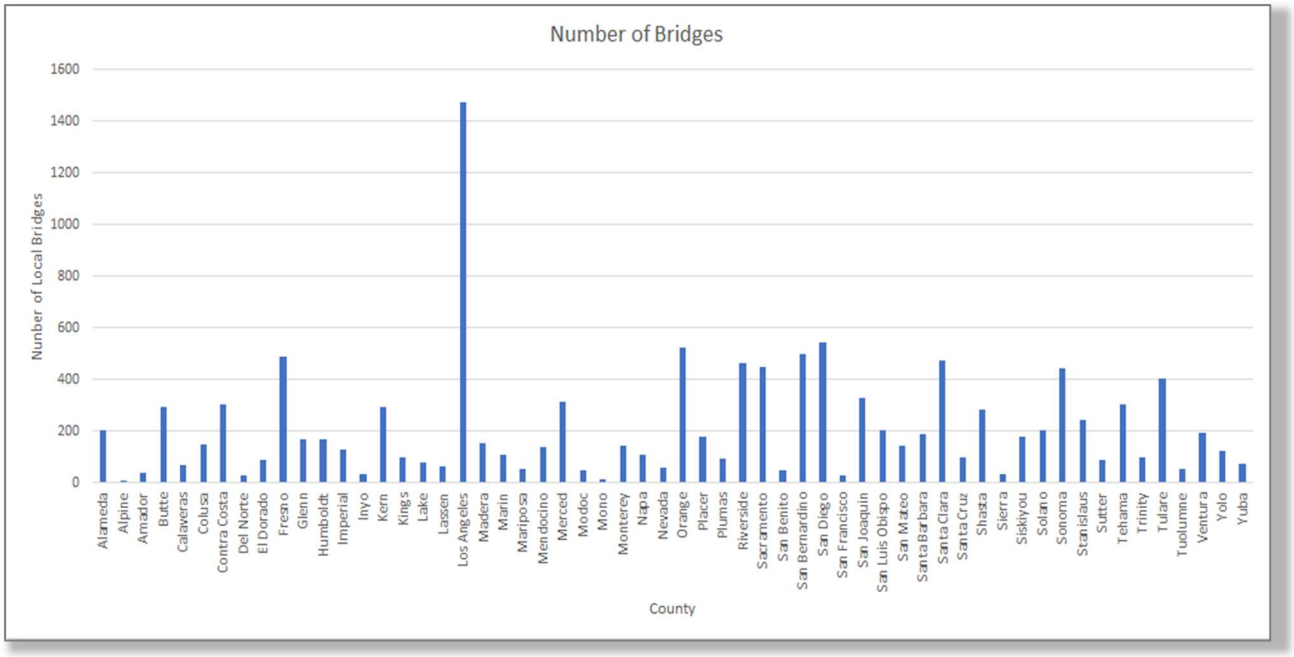


Figure 2.1 – Geographic Distribution of California's Local NBI Bridges, by County

2.2 Non-NBI Bridge Overview

Short span bridges (less than 20 feet in length) are not included in the NBI even if they carry vehicular traffic on public roads. These structures include short bridges, box culverts, and larger diameter pipe culverts. Although smaller than their larger siblings, these transportation structures are numerous on the local transportation network. They also provide the same level transportation connectivity on any given road or street. The failure of a 15-foot-long bridge can be just as disruptive to a roadway network as the failure of a 150-foot-long bridge. To evaluate the condition and needs of non-NBI bridges, a statewide survey was conducted of all 539 city and 58 county local agencies to gather data on these structures. Non-NBI bridge needs, determined through the survey, are covered separately in Section 5, and not included in the present bridge needs identified for this report.

Figure 2.2 – Cressey Way Structure at Livingston Canal in Merced County. This structure does not meet the federal definition of a Bridge, though it performs the same function for it's respective road network.

2.3 Bridge Metrics: Condition and Sufficiency Rating

Based on definitions from the FHWA, bridge condition and performance are categorized as "Good", "Fair", or "Poor". These labels are based on condition ratings of the bridge's Superstructure, Substructure, and Deck components on a scale of 0 through 9 which are evaluated and assigned every 2 years during the biennial bridge inspection process. Below is a summary of the general condition rating codes stored and assigned in the NBI database for bridge components.

Code	Component Inspection Description	Bridge Condition
N	Not Applicable	"Good"
9	Excellent Condition	
8	Very Good Condition – no problems noted	
7	Good Condition – some minor problems	
6	Satisfactory Condition – structural elements show some minor deterioration	"Fair"
5	Fair Condition – all primary structural elements are sound but have minor section loss, cracking	
4	Poor Condition – advanced section loss, deterioration	"Poor"
3	Serious Condition – loss of section or deterioration have seriously affected primary structural components. Local failures are possible.	
2	Critical Condition – advanced deterioration of primary structural elements. Unless closely monitored it may be necessary to close the structure until corrective action is taken.	
1	"Imminent" Failure Condition – major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Structure is closed to traffic, but corrective action may put it back in light service.	
0	Failed Condition – out of service – beyond corrective action	

Figure 2.3 – General Condition Code Ratings for the NBI Database

In general, components with condition values of 4 and below are considered "Poor", components with condition values of 5 and 6 are considered "Fair", and components with condition values of 7 and above are considered "Good". The lowest condition assigned for an individual component of a bridge is used to categorize the condition of the entire structure.

Figure 2.4 - Poor Superstructure and Substructure Condition Rating example
Verde School Road over East Highline Canal in Imperial County, CA

Figure 2.5 - Poor Deck and Superstructure Condition Rating example Bello Street Bridge over Pismo Creek in the City of Pismo Beach

Figure 2.6– Bridge Deck in poor Condition,
Morgan Territory Road, Contra Costa County

Figure 2.7 – Bridge Deck in Good Condition
Morgan Territory Road, Contra Costa County

Sufficiency Rating is another method of evaluating a bridge by calculating a score based on multiple factors to obtain a numeric value indicative of the bridge's sufficiency to remain in service. The result is a percentage in which 100% would represent an entirely sufficient bridge and 0% percent would represent an entirely insufficient or deficient bridge. Sufficiency Rating is essentially an overall rating of a bridge's fitness for the duty it performs based on factors derived from multiple NBI data fields, including fields that describe its structural evaluation (load carrying capacity), functional obsolescence (traffic width and volumes), and its essentiality to the public (required detour if closed). A low Sufficiency Rating may be due to structural defects, narrow lanes, low vertical clearance, or any of many possible issues.

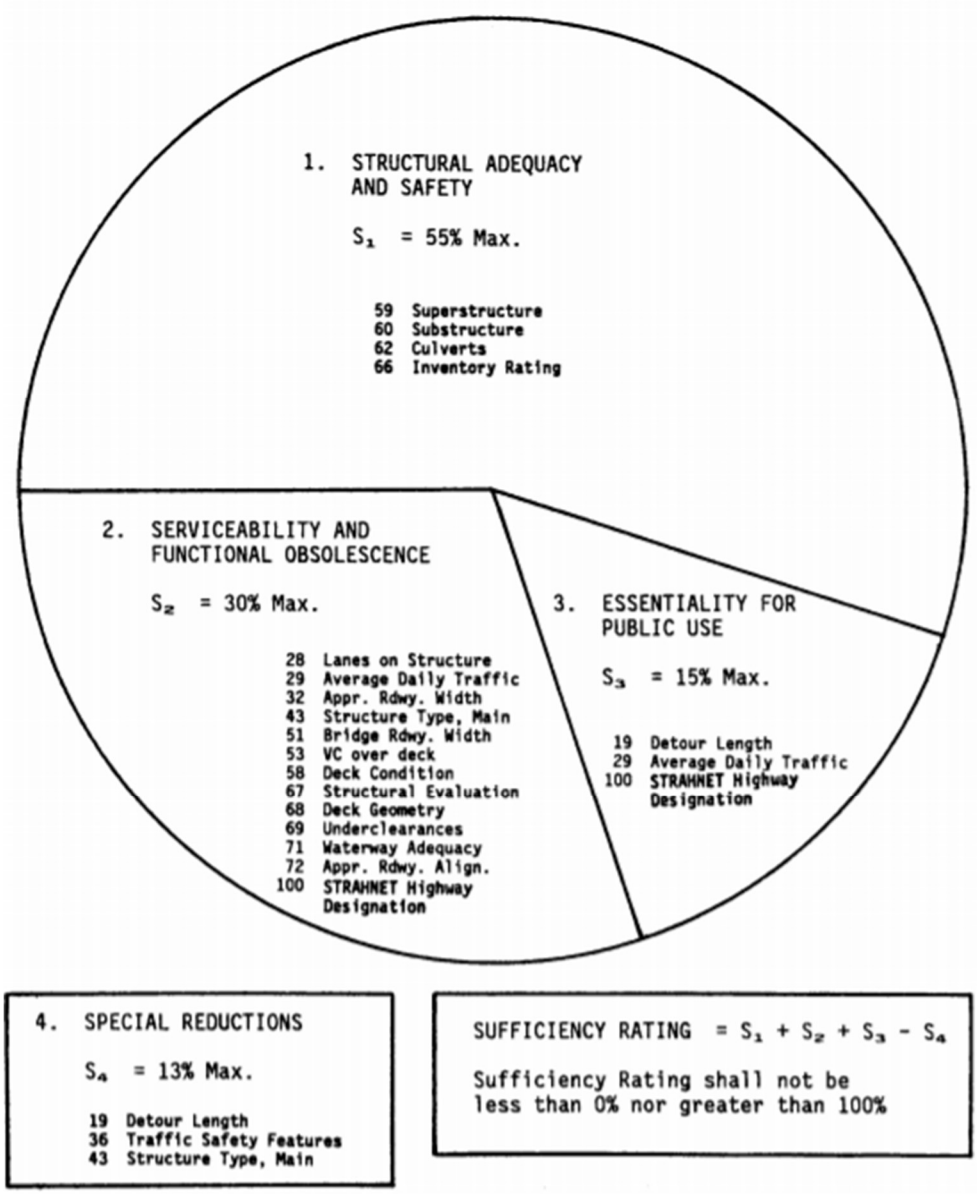


Figure 2.8 – A summary of Sufficiency Rating Factors from US Dept. of Transportation – Federal Highway Administration *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*

3 California's Local Bridge Inventory Condition and Age

3.1 Bridge Condition

In its report *Bridging the Gap*, the American Association of State Highway and Transportation Officials (AASHTO) describes age and deterioration as one of the top challenges facing bridges in our nation. All bridges experience deterioration throughout their service lives, requiring maintenance, repair, and ultimately replacement. The condition of a bridge inventory determines both the magnitude and timeline of maintenance needs and remaining service life. Common measures for evaluating the condition are:

1. The percentage of bridges in Good condition – weighted by deck area
2. The percentages of bridges in Poor condition – weighted by deck area

Because individual bridges vary significantly in size, both length and width, a commonly accepted approach to evaluate a bridge inventory is analyze the bridge conditions as a percentage of total inventory bridge deck area. This accounts for the fact that larger bridges generally require more effort and cost to maintain and repair than smaller bridges. Consider a group of bridges consisting of one large bridge and two small bridges. If two of these bridges are in Good condition and one is in Poor condition, it is more desirable for the larger bridge to be one of the structures in Good condition. It would take fewer resources to remediate one of the smaller bridges.

The chart below shows the condition of all California's NBI local bridges as a percentage of total NBI local bridge deck area. The deck area in Poor condition is 11.5% which represents 8,293,385 square feet of deck area distributed among 1,035 individual local bridges. By contrast, the State Highway System has only 3.3% of its bridges in Poor condition as a percentage of total deck area. Nearly three-quarters of the State Highway System bridge deck area is in Good condition whereas less than one half of the local agency bridge deck area in is Good condition.

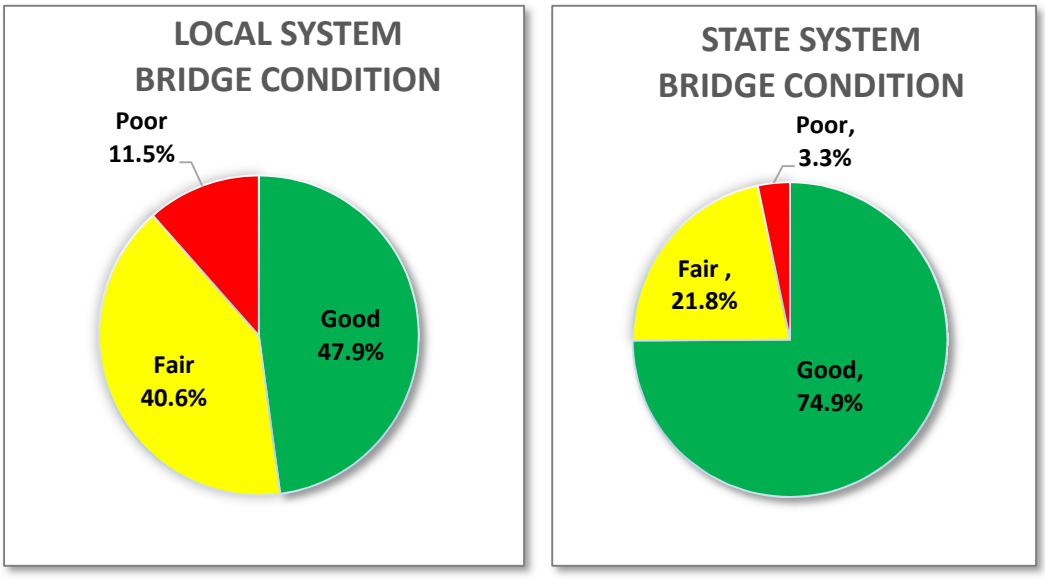


Figure 3.1– Local System Bridge Condition State vs. State Highway System Bridge Condition

Techniques for managing bridge infrastructure inventories across the nation are moving towards a method known as Transportation Asset Management. FHWA currently requires every state to develop a Transportation Asset Management Plan for various features on the National Highway System within each state including pavements and bridges. Starting in 2018, the State of California began carrying this approach forward to assets including pavements, bridges, and drainage on its State Highway System. A major feature element of this management approach involves setting performance targets on specific time intervals. FHWA mandates a minimum target of no more than 10% Poor deck area for National Highway System bridges. The State of California has set an additional target of no more than 1.5% Poor by deck area for the State Highway System as a 10-year target ending in 2028.

To achieve parity with either of these targets on the local bridge system, or even just the current 3.3% Poor currently achieved by the State Highway System, would require an unprecedented effort to replace, rehabilitate, and repair local bridges. With the existing current federal funding mechanisms, bridge construction projects to replace or significantly rehabilitate bridges within the local system has typically completed a rate of approximately 50 bridges per year over the past decade. Projecting this rate on the volume of Poor bridges in the local inventory today; it would take more than 30 years for the local system to meet a performance target matching the State's current goal. In reality, the bridges that are currently Good and Fair would also continue to deteriorate over that replacement period, which would further delay the goal.

Table 3.1 – Years Needed to Meet Performance Target at Current Replacement Rate

Performance Target for All Locally Owned Bridges	Source of Target	Deck Area Requiring Remediation*	Number of Local Bridges to Remediate**	Years to Meet Goal at Current Rate of Replacement ***
<10% Poor	FHWA	1,098,866 sq. ft	189 bridges	4.7 years
<3.3% Poor	Current level of poor condition bridges on State Highway System	5,919,194 sq. ft.	1016 bridges	25.4 years
<1.5% Poor	State of California 2028 Target	7,214,207 sq. ft.	1237 bridges	30.9 years

*Remediation is any form of project to correct poor condition.
**Based on an average 5,830 square-foot deck size for all local agency bridges in the California system.
***Based on static condition; no deterioration of Fair/Good bridges to Poor during replacement period.

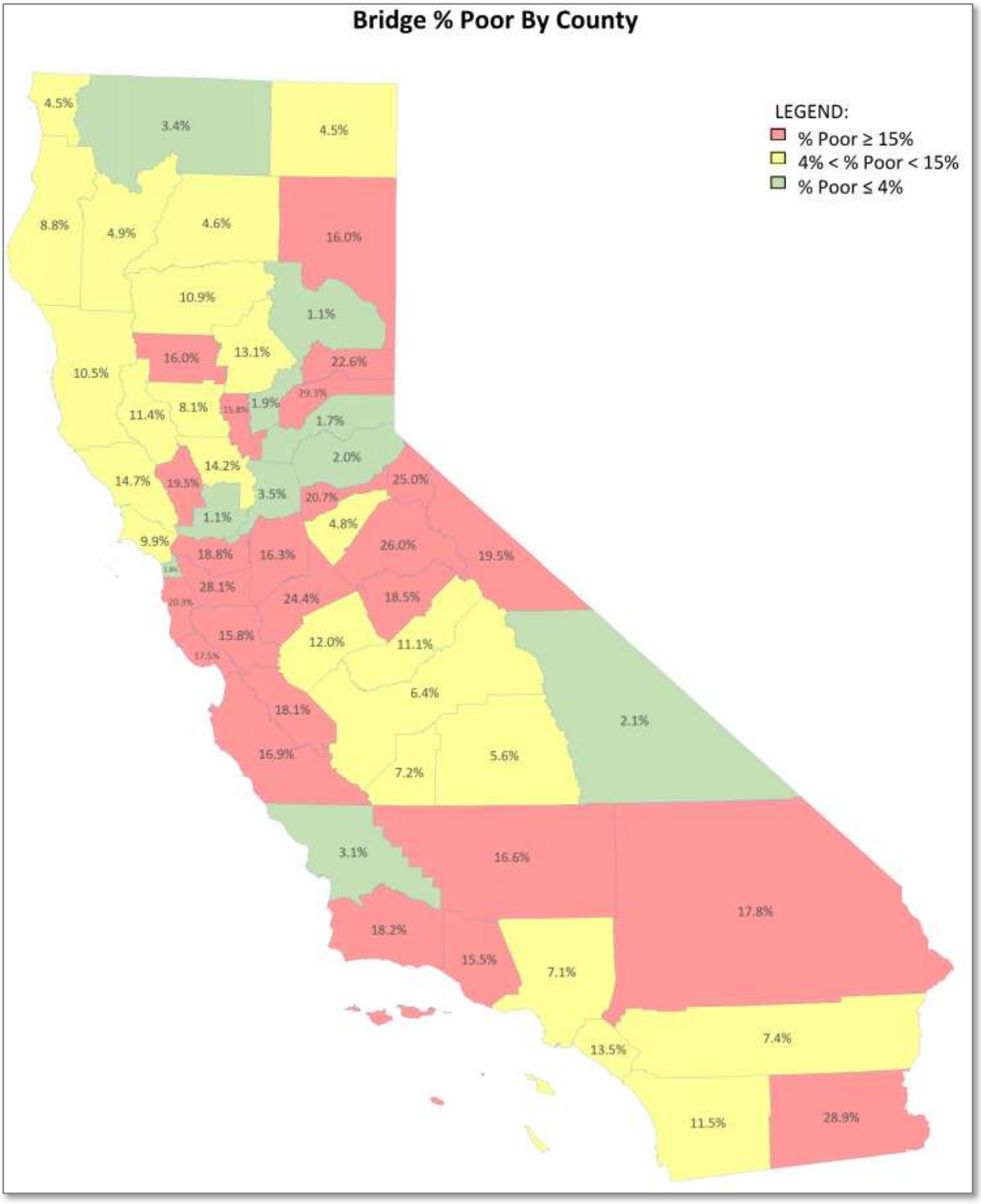


Figure 3.2 – Percent of Local Agency Bridges in Poor Condition, by County Deck Area

Local Agency Bridge Condition

County Name	Number of Bridges	Condition Rating (Bridge Count)			County Name	Number of Bridges	Condition Rating (Bridge Count)		
		Good	Fair	Poor			Good	Fair	Poor
Alameda	206	109	66	31	Orange	526	372	120	34
Alpine	10	2	6	2	Placer	181	100	76	5
Amador	41	15	16	10	Plumas	92	12	76	4
Butte	295	89	182	24	Riverside	462	301	134	27
Calaveras	69	31	31	7	Sacramento	448	340	94	14
Colusa	149	68	61	20	San Benito	47	24	18	5
Contra Costa	305	195	77	33	San Bernardino	499	256	184	59
Del Norte	27	15	9	3	San Diego	542	354	157	31
El Dorado	89	36	46	7	San Francisco	27	16	10	1
Fresno	489	204	257	28	San Joaquin	330	197	104	29
Glenn	171	91	68	12	San Luis Obispo	202	122	71	9
Humboldt	168	60	88	20	San Mateo	144	72	51	21
Imperial	131	32	72	27	Santa Barbara	190	109	66	15
Inyo	34	16	16	2	Santa Clara	475	281	149	45
Kern	295	195	69	31	Santa Cruz	101	37	37	27
Kings	99	51	44	4	Shasta	284	166	103	15
Lake	80	28	41	11	Sierra	32	5	19	8
Lassen	65	18	37	10	Siskiyou	177	97	67	13
Los Angeles	1,474	1,087	316	71	Solano	205	139	62	4
Madera	156	68	61	27	Sonoma	443	207	196	40
Marin	111	69	30	12	Stanislaus	245	75	142	28
Mariposa	53	27	15	11	Sutter	90	37	38	15
Mendocino	137	49	73	15	Tehama	304	131	146	27
Merced	314	118	153	43	Trinity	98	44	44	10
Modoc	50	36	11	3	Tulare	406	209	171	26
Mono	13	7	4	2	Tuolumne	55	20	33	2
Monterey	144	60	72	12	Ventura	192	146	38	8
Napa	107	53	44	10	Yolo	126	74	43	9
Nevada	58	18	27	13	Yuba	76	31	42	3

Table 3.2 – Local Agency Bridge Condition

3.2 Existing Structural Vulnerabilities

Modern bridges are designed and constructed with the intent of a 75-year lifespan, at a minimum. With minor maintenance along the way, an expectation of a 100-year lifespan is not unreasonable for most newly constructed bridges. As with all technology, the practice of bridge design and construction is continually evolving, and more recent improvements have not been in place in the field long enough to be tested for their predicted lifespans. While it is certain that some bridges may fall short of this lifespan target, it is likely that most new bridges will meet or even exceed the current service life goal.

However, as a group, older bridges should not be expected to achieve these service life spans. Older bridges were designed and constructed to less stringent performance criteria compared to their modern counterparts. In particular, bridges over 50 years old were designed with different transportation expectations and without recent advances in scientific understanding.

- **Lower Design loads.** The design capacity for bridges has increased in response to vehicle weights, in particular heavy highway trucks. The first truck weight limits were established by various states in 1913 and limited truck weights from 18,000 pounds to 28,000 pounds. By 1974, the Federal-Aid Highway Act capped ever growing truck weights to 80,000 pounds. Older bridges, properly designed to the load carrying requirements of their day, have been behind the weight escalation curve and experience greater loads than they were ever intended to be subjected to.

- **Increasing Traffic Volumes.** Fifty years ago, the population of California was approximately 20.3 million. That number has nearly doubled almost 40 million based on US Census data. Increased population has led to increased traffic volumes and increased number of daily vehicle trips. This also increases the rate of accumulated wear and tear on older bridges as they age in place and traffic demands grow up around them.

- **Seismic Risks.** California seismic design standards and construction practices have been greatly shaped by lessons learned from three significant events: the 1971 San Fernando earthquake, the 1989 Loma Prieta earthquake, and the 1994 Northridge earthquake. Each of these earthquakes ushered changes in design philosophies and uncovered built-in vulnerabilities in older bridges. Although a tremendous number of local agency bridges have been seismically retrofitted, there are still outstanding projects to complete.

Figure 3.3 – Bridge damage from the 1994 Northridge earthquake event

- **Code Development and Materials Science.** Application of materials science in the construction of bridges has advanced tremendously in the past 50 years. The steel fatigue design concepts

fundamentally used today were only introduced in the 1974 national bridge code, with significant refinements occurring well in the 1990s. Similarly, the understanding structural concrete has advanced in the areas of aggregate selection, cementitious materials chemistry, and prestressing technology. Older bridges do not benefit from this improved technology, which often focused on increasing structural durability.

Figure 3.4– Fracture of main steel truss member on the Delaware River Bridge in 2017. Investigation determined the cause was due to welding repair practices at the time of construction in 1956.

- **Scour and Degradation.** Scour is the removal of supporting earth materials from around bridge foundations caused by swiftly moving water. In milder forms, scour can lead to extensive and costly foundation repairs over the lifetime of a bridge. In the worst case, scour can lead to partial or complete bridge collapse during large flow events. Scour can be difficult to detect as it is often masked by the large flows themselves. Older bridge foundations were not designed and constructed with the level of hydrology data and hydraulics modeling available to modern designers.

Figure 3.5 – Scour Damage to the Round Valley Bridge in Inyo County in 2017

Aside from specific deficiencies, bridge age is an important predictor of the general health of a bridge and California's local bridge inventory. While there are always outliers to any data set, there is a general trend

of bridge condition decreasing with age. For any given climate, traffic level, or other unique site condition; an older bridge generally exhibits more wear and tear than a younger bridge. An analysis of California's local bridge 2020 NBI data shows:

1. The percentage of "Poor" bridges increases with older age cohorts.
2. Sufficiency Rating decreases over time as bridge ages increases.

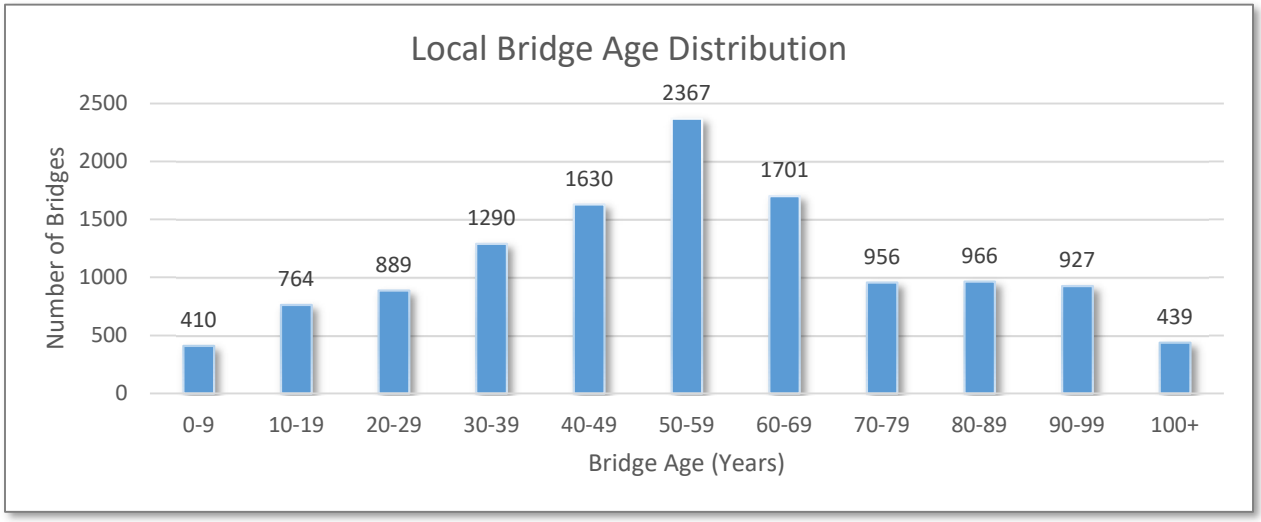


Figure 3.6 – Distribution of Local Bridge Ages

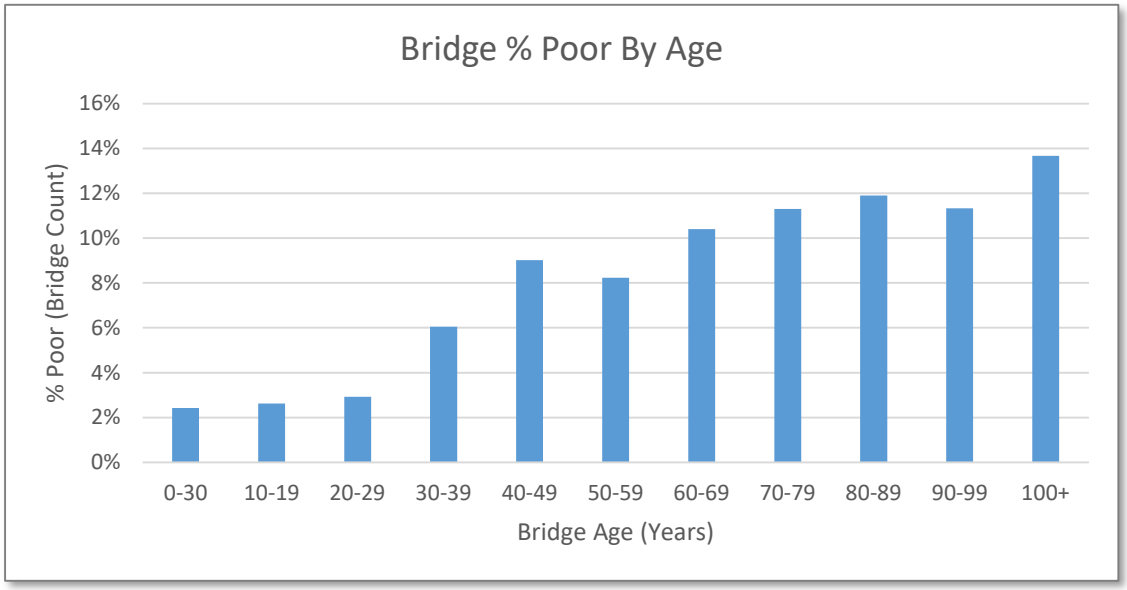


Figure 3.7 – Percent of Local Bridges in Poor Condition by Bridge Age

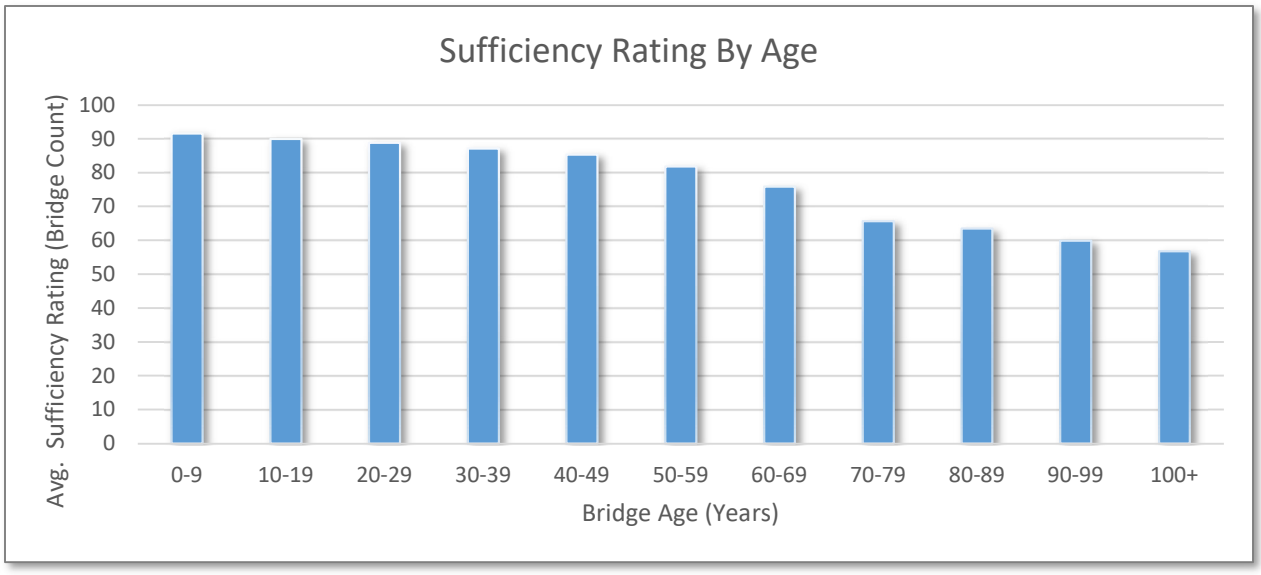


Figure 3.8 –Local Bridge Sufficiency Rating by Bridge Age

3.3 Aging Bridges and Required Replacement Rates

The age distribution of California's local bridge inventory corresponds to the historical development of the state and its transportation network. Like many parts of the country, California experienced a boom in transportation infrastructure construction during Interstate Highway System construction era from the mid-1950s through the mid-1970s. The local transportation system grew to connect rural areas, towns, and cities to the national system. Nearly half (5698 of 12,399 or 46%) of the state's local bridges were constructed during a 30-year period and are currently between 40 to 70 years old. The greatest concentration of bridges is in the 50- to 59-year-old group with 2,367 bridges. This indicates that in the decade prior to 1970, local bridges were being built at an average rate of over 230 per year. The average age for a local agency bridge in California is 54.3 years old, based on the total number of bridges, while the average for all bridges nationwide is approximately 44 years old. In total, there are now 2332 local bridges that are over 80 years old in California.

Since the 1980s, bridge construction has increasingly shifted focus from constructing new bridges for network expansion to rehabilitating and replacing the existing bridge inventory. The average rate of local bridge project delivery has been approximately 50 bridge projects per year over the past 20 years. At this rate of replacement, the inventory will continue to age and correspondingly its condition will worsen over this time. If the replacement rate stays at the approximately 50 bridges per year rate, the local inventory will accumulate over 16 years of average age over next 20 years period. This means that in 2040 the average bridge age will be over 70 years old. Correspondingly, to keep the average bridge age at a constant level, the replacement rate of local bridges would have to be more than 6 times the current rate, or 250 bridges per year. As the bridge inventory ages, the amount of funds that must be dedicated exclusively to maintenance increases disproportionally over time.

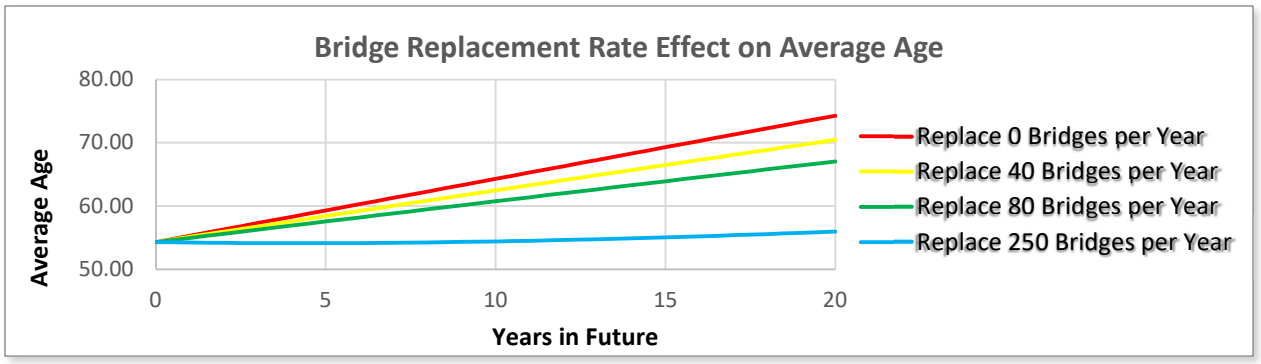


Figure 3.9 – Effect of Replacement Rate on Average Bridge Age

When the replacement rate of bridges does not keep pace with the original construction rate of bridges, the structures tend to age beyond their reasonably expected lifespans. Concurrently, the condition of the aging bridges declines, possibly requiring measures such as load restrictions or outright closure. The age distribution within the current bridge population will exacerbate the situation. Essentially there is a "wave" of aging bridges moving through our local bridge system, as shown in Figure 3.10. This graph represents a series of snapshots in time at 5-year intervals showing respective bridge age distribution. Looking back to the 2000 snapshot, the peak, or mode, has shifted approximately 20 years forward to the 2020 snapshot. This shows that the current replacement rate is unable to significantly slow or even change the shape of the peak of the aging wave. Since the reasonable serviceable life of a bridge is typically 75 to 100 years, the wave of bridges will be approaching the end their respective life spans in approximately 20 years. As noted previously, bridge age is an indicator of overall bridge condition; not only can bridge condition be expected to worsen, but it will also do so at an increased rate and magnitude.

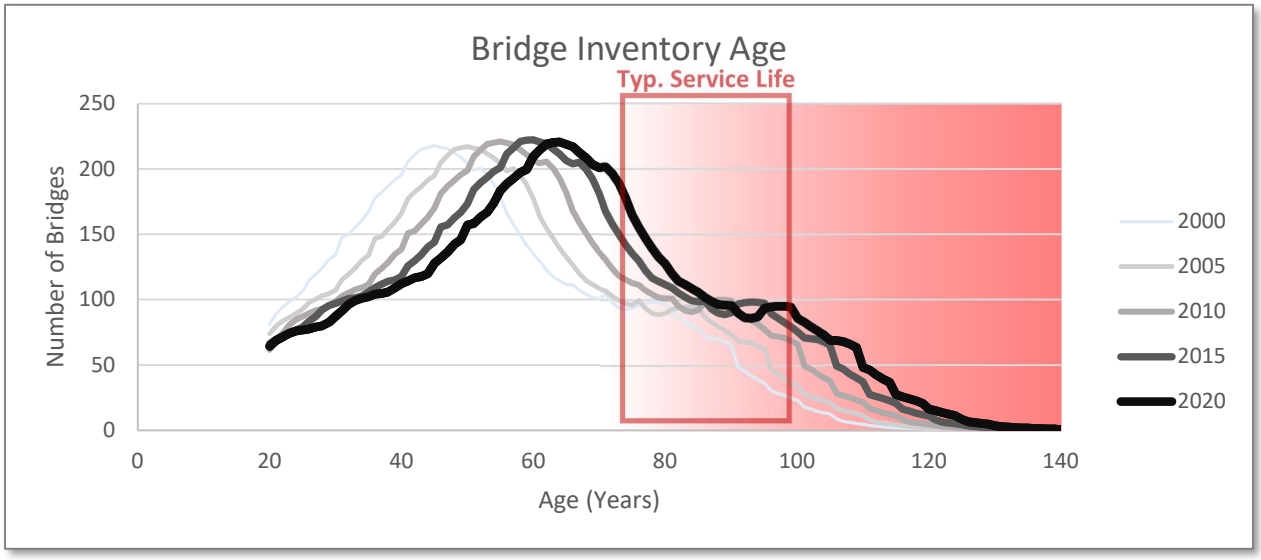


Figure 3.10 - Bridge Replacement Rate Effect on Average Age

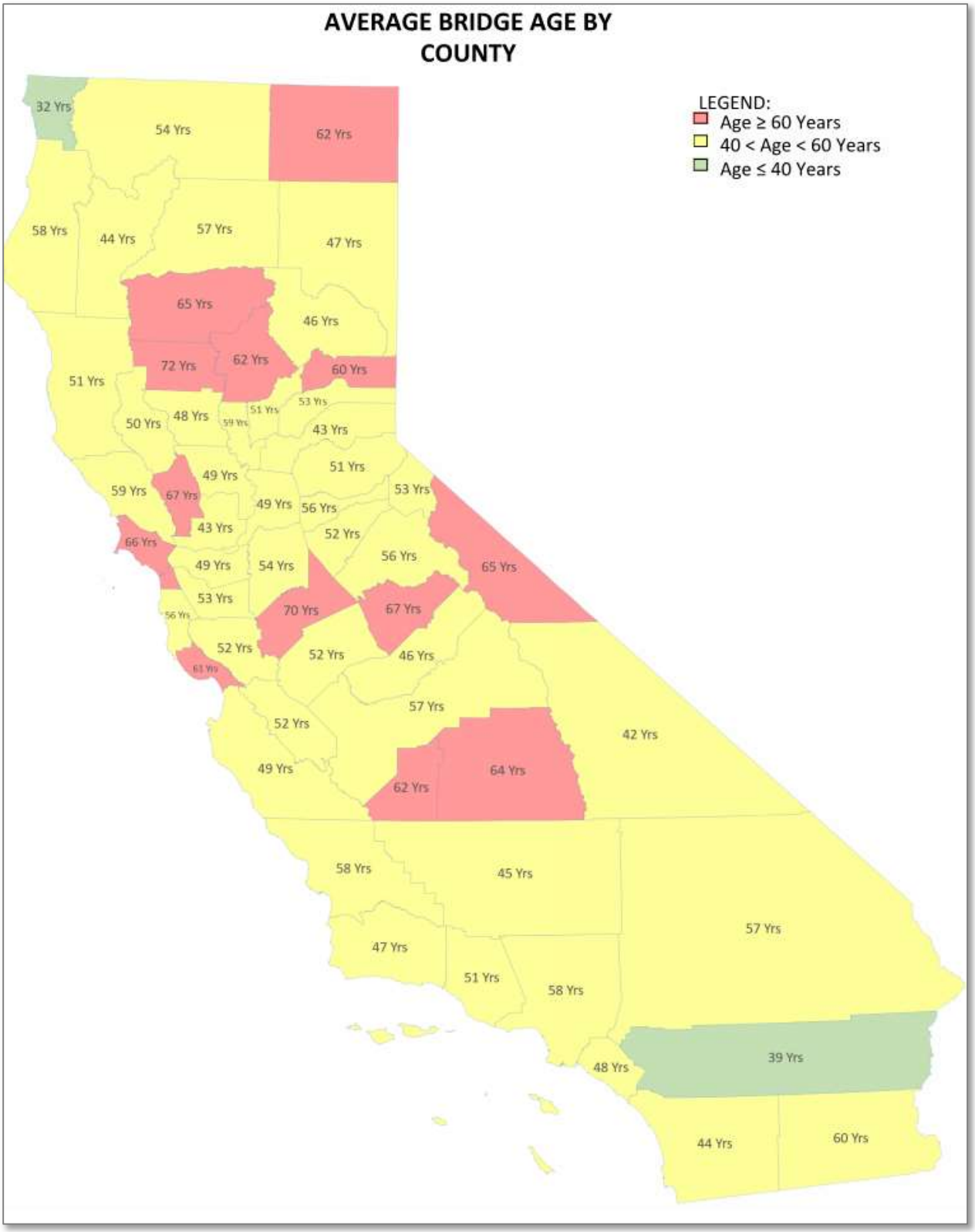


Figure 3.11 – Average Age of Local Agency Bridges, by County

4 Current Local Bridge Needs

An aggregate assessment of local bridge needs was made to estimate the current dollar amount of needs within California's local agency bridge system. Condition data from the NBI was used to evaluate what type of work every bridge in the inventory might require. Seismic needs were not included in the NBI data, and the needs were derived from current programmed projects. The following work types were considered:

- Bridge Replacement
- Bridge Rehabilitation (Deck Replacement)
- Bridge Deck Preservation
    - Methacrylate Sealing
    - Polyester Concrete Overlays
- Bridge Painting
- Scour Mitigation (Replacement)
- Bridge Widening
- Structural Strengthening

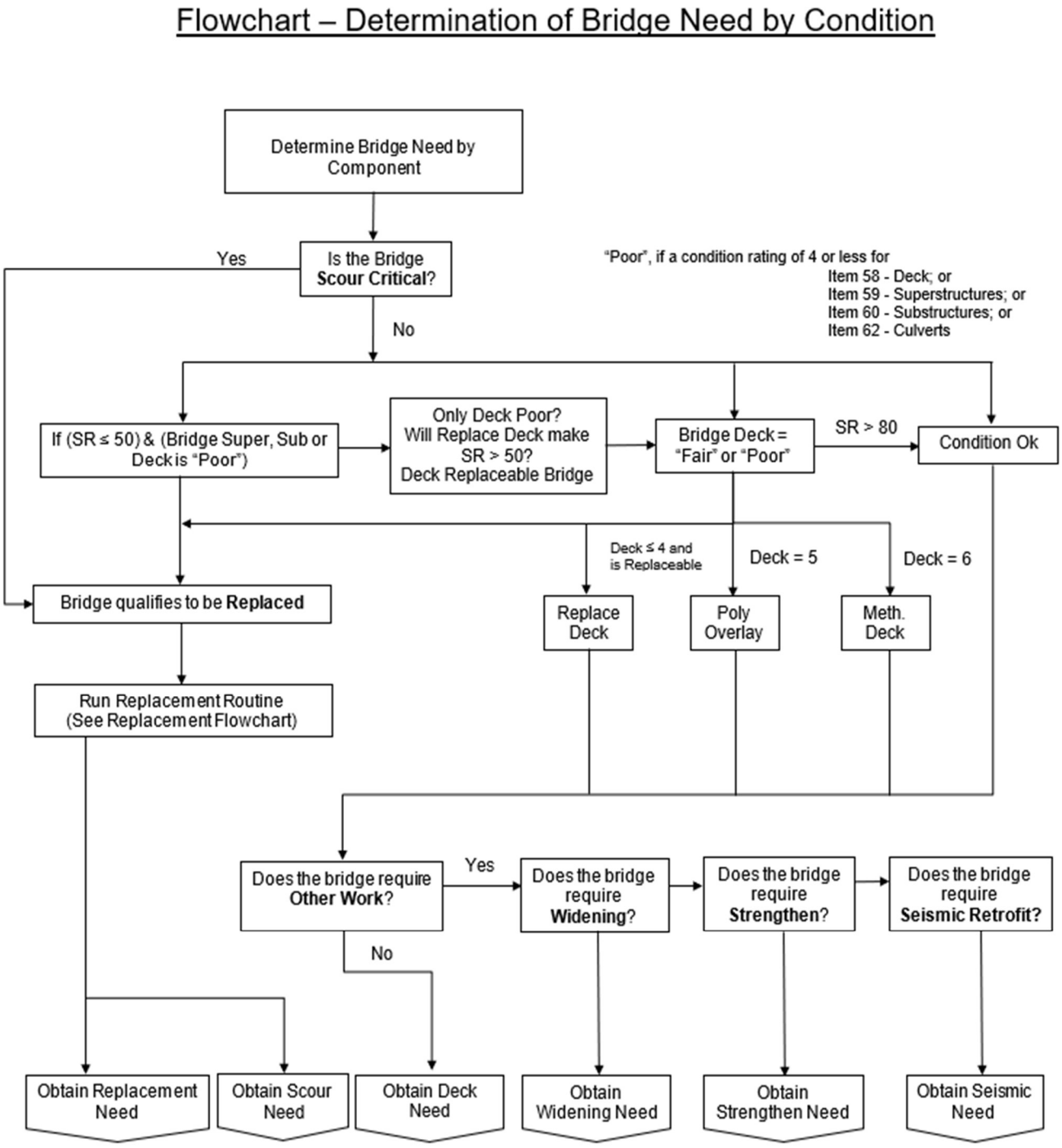
A priority was placed on preservation, if that approach was sufficient to raise the bridge condition adequately to remove replacement criteria, considering current best management practices. For example, Poor condition bridges that were considered candidates for replacement were checked to see if replacing only the deck would sufficiently improve the bridge's condition to remove the bridge from full-replacement candidacy.

The flowchart shown on Figure 4.1 illustrates the methodology used to determine bridge needs; additional flow charts used in the analysis can be found in Appendix A. Of the 12,339 local agency bridges, the aggregate data analysis showed:

- 451 (4%) bridges need replacement based on poor condition,
- 1,912 (15.4%) bridges need preservation maintenance based on deteriorating conditions,
- 1,953 (15.8%) bridges need widening based on current traffic volumes and safety standards,
- 185 (1.5%) bridges need strengthening based on load posting restrictions,
- 309 (2.5%) bridges need scour mitigation (replacement) as a public safety precaution,
- 42 (0.3%) bridges still require seismic retrofit based on lessons learned from previous earthquakes.

Then unit costs were applied to each type of work for each bridge to develop construction costs. Cross checks were made to ensure conflicting work items were not doubled counted. For example, if the condition of a bridge warranted replacement and the condition of the bridge's paint warranted repainting, only replacement costs were tabulated. All work activity costs were then summed to arrive at a total present needs cost. The intent was to encompass local agency bridge needs independent of current funding obligations or demands.

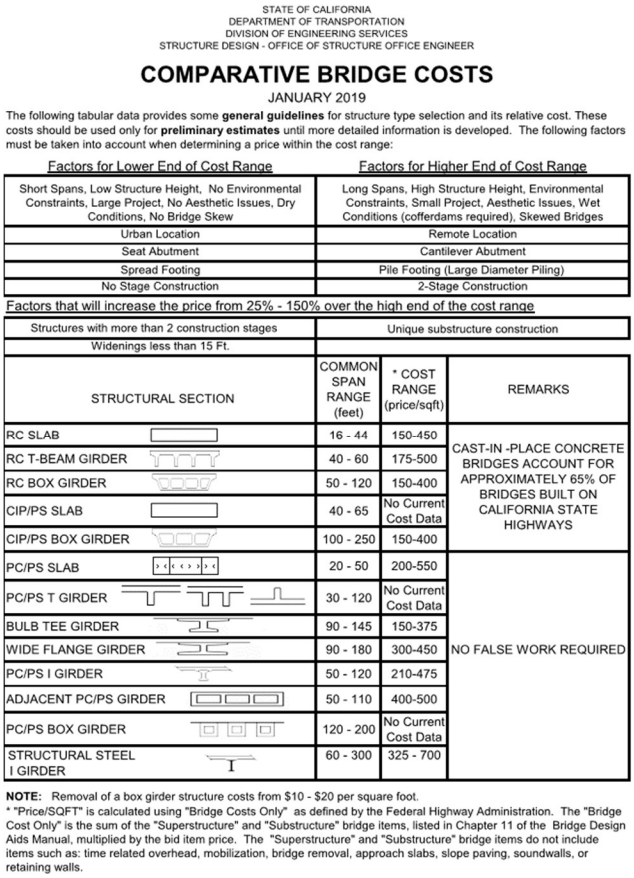
Figure 4.1 - Determination of Individual Bridge Needs



4.1 Total Project Costs Evaluation

Total project costs are composed of both construction costs and "soft costs" not directly spent on construction but required to execute the project. Construction costs for bridge projects include many items beyond the bridge work items including possible road alignments, right-of-way acquisition, and utility relocation. Several cost data sources were used to develop bridge item unit costs including Caltrans Comparative Bridge Cost Information, Caltrans Construction Cost Index tabulations, and historical bid information from local agency bridge projects.

Soft costs include project support, such as engineering, environmental studies and mitigation, construction permits, and construction inspection and contract management costs. These combined costs represent the true, full cost of replacing or rehabilitating a bridge. These costs were taken as a percentage of the construction cost, incorporating previous data from a regression analysis of historical HBP bridge replacement costs and current programming estimate guidelines.



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN - OFFICE OF STRUCTURE OFFICE ENGINEER

COMPARATIVE BRIDGE COSTS

JANUARY 2019

The following tabular data provides some **general guidelines** for structure type selection and its relative cost. These costs should be used only for **preliminary estimates** until more detailed information is developed. The following factors must be taken into account when determining a price within the cost range:

Factors for Lower End of Cost Range	Factors for Higher End of Cost Range
Short Spans, Low Structure Height, No Environmental Constraints, Large Project, No Aesthetic Issues, Dry Conditions, No Bridge Skew	Long Spans, High Structure Height, Environmental Constraints, Small Project, Aesthetic Issues, Wet Conditions (cofferdams required), Skewed Bridges
Urban Location	Remote Location
Seat Abutment	Cantilever Abutment
Spread Footing	Pile Footing (Large Diameter Piling)
No Stage Construction	2-Stage Construction

Factors that will increase the price from 25% - 150% over the high end of the cost range

Structures with more than 2 construction stages	Unique substructure construction
Widenings less than 15 Ft.	

STRUCTURAL SECTION	COMMON SPAN RANGE (feet)	* COST RANGE (price/sqft)	REMARKS
RC SLAB	16 - 44	150-450	CAST-IN -PLACE CONCRETE BRIDGES ACCOUNT FOR APPROXIMATELY 65% OF BRIDGES BUILT ON CALIFORNIA STATE HIGHWAYS
RC T-BEAM GIRDER	40 - 60	175-500	
RC BOX GIRDER	50 - 120	150-400	
CIP/PS SLAB	40 - 65	No Current Cost Data	
CIP/PS BOX GIRDER	100 - 250	150-400	
PC/PS SLAB	20 - 50	200-550	NO FALSE WORK REQUIRED
PC/PS T GIRDER	30 - 120	No Current Cost Data	
BULB TEE GIRDER	90 - 145	150-375	
WIDE FLANGE GIRDER	90 - 180	300-450	
PC/PS I GIRDER	50 - 120	210-475	
ADJACENT PC/PS GIRDER	50 - 110	400-500	
PC/PS BOX GIRDER	120 - 200	No Current Cost Data	
STRUCTURAL STEEL I GIRDER	60 - 300	325 - 700	

NOTE: Removal of a box girder structure costs from $10 - $20 per square foot.
* "Price/SQFT" is calculated using "Bridge Costs Only" as defined by the Federal Highway Administration. The "Bridge Cost Only" is the sum of the "Superstructure" and "Substructure" bridge items, listed in Chapter 11 of the Bridge Design Aids Manual, multiplied by the bid item price. The "Superstructure" and "Substructure" bridge items do not include items such as: time related overhead, mobilization, bridge removal, approach slabs, slope paving, soundwalls, or retaining walls.

Figure 4.2 Caltrans State System Cost Estimate Info

- Engineering & Environmental –
  - Construction cost up to $10 million
    - 25% of bridge construction cost
  - Construction cost beyond $10,000,000
    - $2.5 million + 7% of additional bridge construction cost
- Right of Way
  - 10% of bridge construction cost (rural)
  - 15% of bridge construction cost (urban)
- Approach Roadway
  - 55% of bridge construction cost
- Construction Mobilization
  - 10% of bridge construction Cost
- Construction Contingency
  - 15% of bridge construction cost
- Construction Management
  - 15% of construction cost

4.2 Replacement Needs Summary

A bridge is considered as a Replacement Need if it is in Poor condition and has a Sufficiency Rating below 50. An additional filter is used to sort qualifying bridges that, if deck preventative maintenance or rehabilitation is performed prior to replacement, no longer qualify for replacement due to the improvement. This is a more cost-effective approach to maintaining the existing bridge inventory. If a bridge meets the replacement requirements, even with an improved deck, then it qualifies for replacement. Replacement needs incorporate multiple aspects beyond just the bridge construction, but include:

- Project Development
- Environmental Process
- Preliminary Engineering
- Right of Way
- Utility Coordination / Relocation
- Permitting
- Environmental Mitigation
- Plans, Specifications, and Estimate
- Bridge Construction
- Existing Bridge Removal
- Approach Roadway Construction
- Construction Management
- Stage Construction

More details on this part of the assessment are provided in Appendix A.

Bridge replacement costs account for a significant portion of the overall inventory needs since the cost of a full bridge replacement is relatively high on a per project basis. The current estimated value of bridge replacement needs is $2.4 billion alone, accounting for the replacement of 451 bridges.

The estimated unit cost for each bridge type varies based on multiple factors. Each site is unique, with different materials that would be best suited to the specific span length. For example, geographic location impacts the overall cost of the project. Remote rural locations tend to be the most expensive, while more congested urban locations see the middle range of cost, and rural locations that are not remote, see the lowest construction costs. A bridge may cost more to construct at a remote site compared to the non-remote site that is close to concrete batch plant. Hence, the unit price for a given bridge type varies based on the site location. Figure 4.3 below shows the average bridge replacement construction unit cost (in dollars per square foot) of all the bridges that were considered for replacement. The “Historical/Special” category captures specialized bridges, such as historic trusses, arches, and movable bridges, whose types are selected based on existing bridge type. The “PC PS Box” category captures both precast-prestressed box girders and precast-prestressed girders.

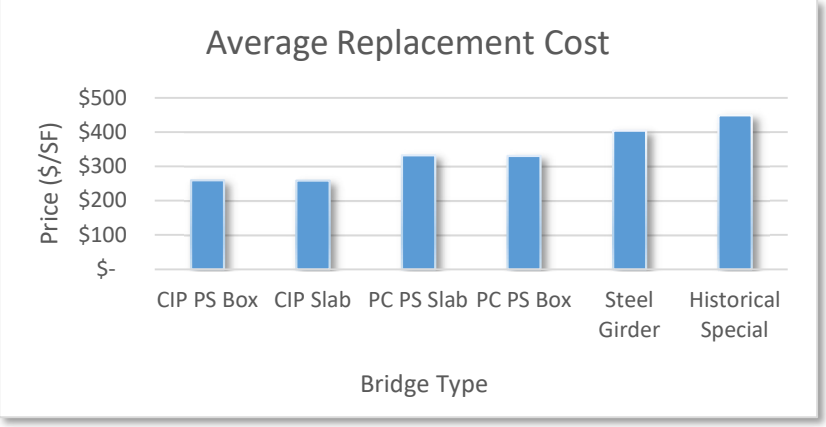


Figure 4.3 - Average Bridge Replacement Unit Cost

Figure 4.4 below shows the breakdown of bridge replacement types. Cast-in-Place (CIP) slab makes up the majority of new bridge replacement type. Following the slab replacement type, CIP prestressed box girders and Precast slabs account for approximately 44% of the new bridge types. Precast box girders, steel girders and Historical-Special (including movable bridges) types make up the remainder.

New bridge replacement type was determined using the NBI data from the existing bridge. Each situation is unique, but a process was developed to project a bridge type for a given location. Relevant data, such as existing span lengths, existing bridge type, historical significance, and bridge access requirements, such as navigable waterway or railroad were used to predict the likely type of the replacement bridge. Additional details on this analysis can be found in Appendix A.

It is important to note that the analysis is intended to be a predictor of aggregate needs. The process cannot be expected predict the most suitable bridge type for every single individual candidate. Bridges are very site specific. Selection of the most appropriate type is highly dependent on-site constraints such as waterway hydraulics, traffic handling and staging considerations, alignment constraints, site geology, environmental resource constraints, and availability of local materials. In aggregate, the predictive model matches some important historical trends in California bridge construction:

- Over 90% of the bridges in California are concrete and approximately two thirds of all new bridges built in California use cast-in-place concrete methodology. The model closely matches this trend with 91% concrete bridge types and 54% cast-in-place concrete bridge types.

- Historically, 7% of the bridges in California have been steel. The model predicts a smaller percentage of steel, perhaps slightly underestimating future use of this type. Historically, steel bridge types are reserved for longer spans requirements due to a premium for this material type. Older steel bridges are sometimes replacement by new technology concrete bridges, when feasible.

- The model predicts a higher than historic use of precast bridge types. Precast bridges are a newer construction methodology that was not available when many existing bridges were originally constructed. It is reasonable to expect them to represent a higher percentage of the bridge population, especially as a solution to increasing traffic and environmental constraints.

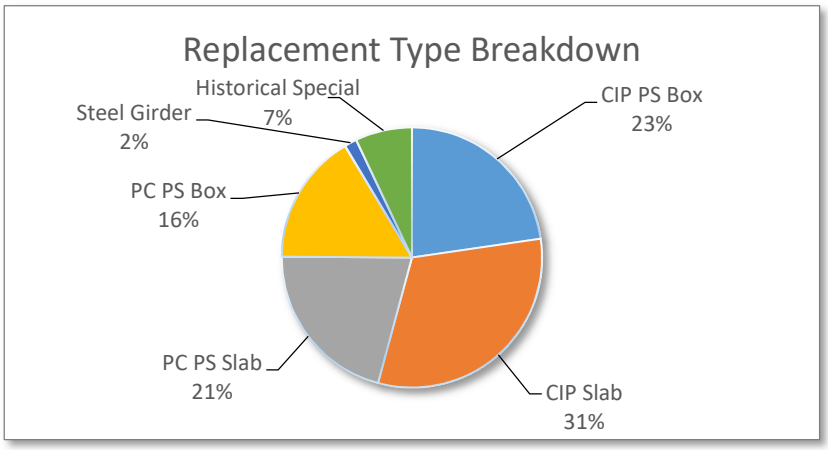


Figure 4.4 - Bridge Type Replacement Breakdown for Locally Owned Bridges

Figure 4.5 illustrates the replacement cost breakdown for each bridge replacement type. However, the quantity of a specific replacement type does not directly correlate to cost. Various factors account for this, including square footage of replacement and unit cost. Even though CIP slabs represent a large percentage of total bridge replacements, they are typically the smallest projects by square footage. Similarly, steel girder bridges and precast prestressed box girder bridges contribute to higher percentage of the cost even though a smaller amount of those bridge types are included in replacements. This is due to large span lengths and higher square footage unit costs.

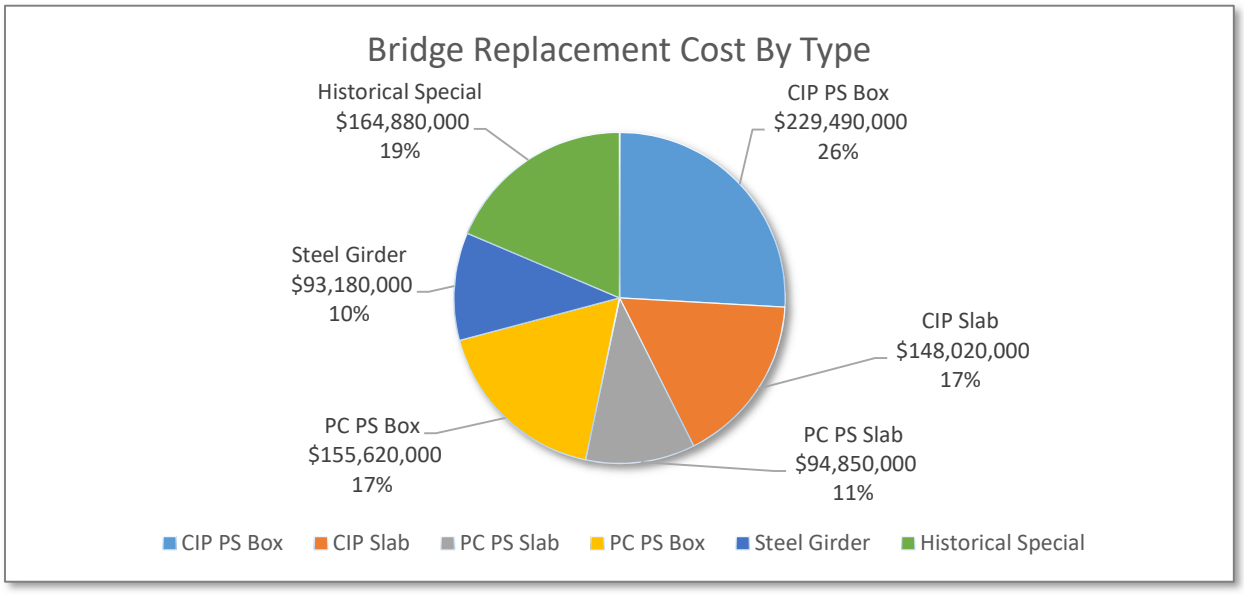


Figure 4.5 - Bridge Replacement Cost Breakdown by Type (Bridge Construction only)

In addition to the hard construction of bridge replacement project, there are other various "soft costs" including engineering, right-of-way, design engineering, environmental clearance, construction contingency, and construction inspection and management. A summary of the different associated cost needed to replace the bridges is shown in Figure 4.6 below.

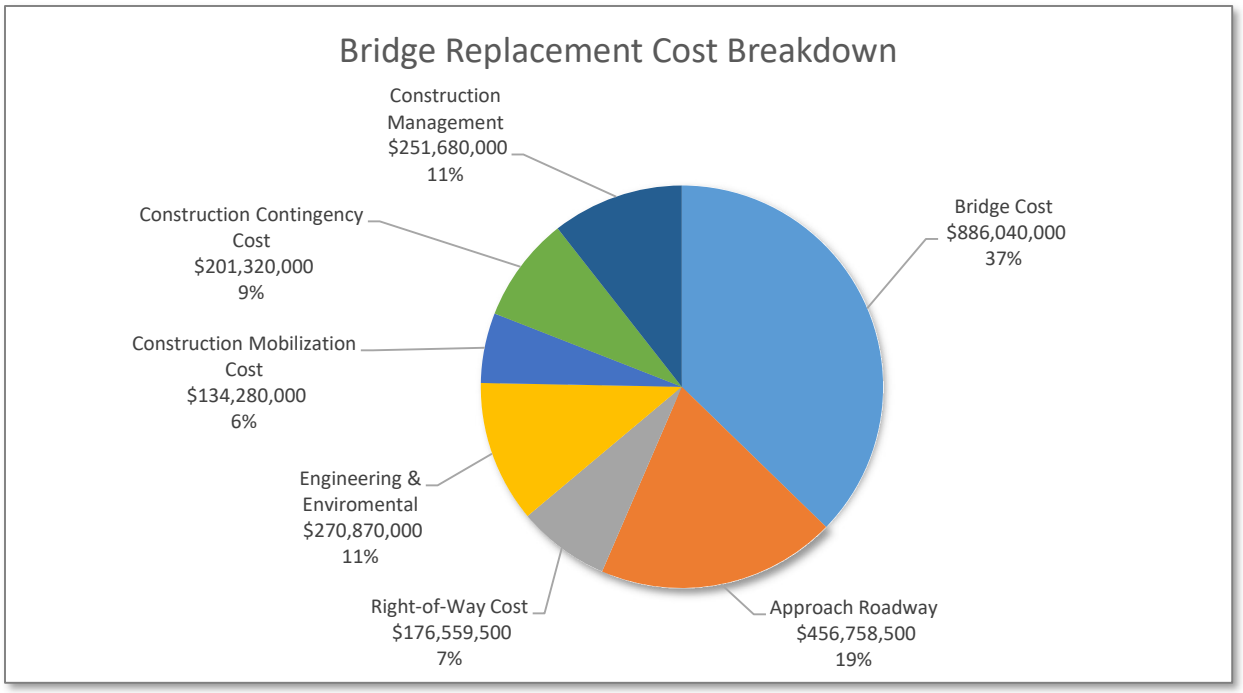


Figure 4.6 - Total Bridge Replacement Associated Costs

4.3 Bridge Rehabilitation and Preservation Needs

Bridge rehabilitation and preservation is an effective way to improve the condition of the current bridge inventory. It can be considered as a maintenance function for the bridge inventory, providing much needed servicing to prevent a replacement requirement in the near future. For bridges that do not qualify for replacement, a series of filters was used to determine rehabilitation and preservation requirements. These filters examined the condition rating of each individual qualifying bridge and used that condition rating to determine the appropriate rehabilitation or preservation needs. Additional details on the methodology can be found in the appendix of this report.

Based on an analysis of the local bridge inventory data; the total of rehabilitation and preservation activities for local agency bridges constitute a significant cost need at a total $1.2 billion dollar distributed over an estimated 1,912 bridges.

Bridge deck rehabilitation needs results are shown below. Figure 4.7 below shows the breakdown of the total bridge deck improvement costs including an estimate of ancillary costs. Comparing the bridge deck improvement total cost breakdown to the bridge replacement total cost break down, the actual cost of the deck improvement construction contributes to most of the total rehabilitation cost. This is consistent with expectations because the associated project component costs are lower for deck improvement compared to a bridge replacement. For instance, the associated road cost does not include roadway realignment, but only traffic handling. Engineering design and construction management costs are also significantly lower for a deck improvement project due to the lower level of effort in design and construction management. The results of this study indicate that the system wide **bridge deck improvement needs are approximately $1.2 billion dollars**.

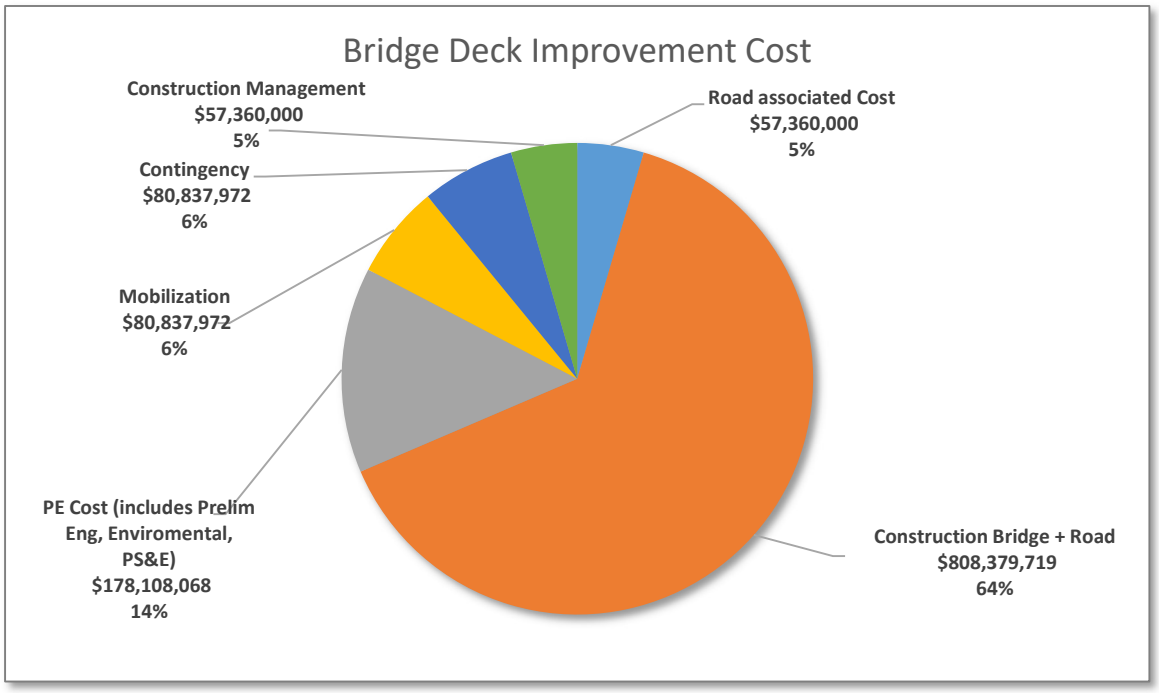


Figure 4.7 - Total Bridge Deck Improvement Associated Cost

4.3.1 Major Deck Rehabilitation (Deck Replacement)

Bridge decks are the most visible bridge component to the traveling public, and therefore, they the element with the most noticeable condition needs. The most structurally sound bridge with a poor riding deck surface will be remembered and perceived as a poor bridge by most users. This perception can be influenced by AC surfacing in poor condition over the bridge deck, which is not considered here, or can be a symptom of a much larger issue. Damage and deterioration to a bridge's deck surfaces also has the greatest impact to wear and tear on passenger vehicles and commercial trucks.

Major bridge deck rehabilitation accounts for a minor portion of the overall current bridge needs cost estimate. This is because full deck replacement is not practical or cost-effective on several common bridge types. A bridge was considered as a Deck Replacement Need if it:

- Was in Poor condition due to Deck only (Superstructure and Substructure otherwise ok).
- Was a bridge type where it was feasible and practical to replace the deck only
    - For example, it is not practical to replace the deck of a cast-in-place box girder bridge

Cost estimates for bridge replacement needs include additional amounts intended to represent ancillary items required when a deck is replaced including replacement of bridge deck joint seals and replacement of new bridge barriers required to meet current crash safety standards.

- Existing decks that are considered ineligible for Major deck rehabilitation are located on wood or timber frames, concrete slab and concrete box beams or girders.

4.3.2 Bridge Deck Preservation (Methacrylate and Polyester Overlay)

Bridge deck preservation is a common type of bridge rehabilitation. Deck treatments are a common and cost-effective means to address substandard decks and extend deck service life for fair decks among California's local bridge inventory. Common deck preservation activities include:

1. Application of high-molecular weight methacrylate sealers. These treatments penetrate and fill existing cracks in concrete, bond cracked portions of concrete, and prevent infiltration of water and corrosion agents into bridge decks.

2. Overlays of polyester concrete. These overlays perform a similar sealing function as methacrylate treatments in addition to providing an additional thickness of wearing surface to bridge decks to extend deck life from abrasion wear due to traffic.

4.3.3 Other Rehabilitation Work - Painting

In addition to the deck rehabilitation and preservation work, other main rehabilitation needs were considered to estimate total local bridge rehabilitation needs. The largest source of these is bridge painting. Bridge paint is subject to weather exposure, physical abrasion, and chemical attack from environmental pollutants. Just like a house or a car, time and exposure take a toll on the condition of bridge protective coating paint systems. Paint condition was evaluated based on condition data in the NBI database with estimates accounting to new bridge paint costs and removal and disposal of failing paint systems. While bridge painting project can be expensive on an individual basis, often due to the presence of hazardous materials in older coating systems, painting costs are not a significant contributor to the overall inventory need on an aggregate because most of the local agency bridges are concrete types that do not require routine painting like structural steel types. The total need for painting steel bridges accounts for approximately $250 million of the rehabilitation costs.

Figure 4.8 - Global Lead Containment System
Auburn Foresthill Bridge on Foresthill Road over the American River in Placer County, CA

Figure 4.9 - Bridge Deck Requiring Rehabilitation

Figure 4.10 - Bridge Deck Requiring Replacement

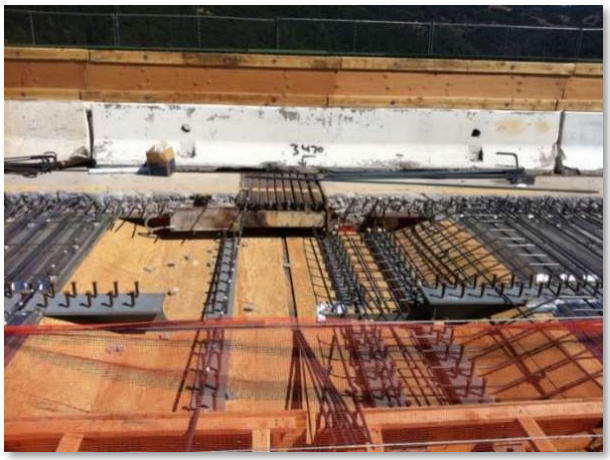


Figure 4.11 - Deck Replacement

4.4 Scour

Scour is the removal of supporting earth materials from around bridge foundations and supports caused by swiftly moving water. The effects of scour have become a critical focus in current bridge design and in evaluating maintenance needs in existing structures. While scour is something the travelling public may not see, it can cause sudden and extensive damage to bridges over a very short period, including possible full-scale collapse. Due to the large forces involved in swiftly moving water flows and the relatively high cost of bridge foundation work, scour is expensive and challenging to mitigate. A total of 309 bridges, or 2.5% of the local bridge inventory are considered scour critical, meaning the bridge's foundations have been determined to be unstable for the calculated scour condition or extensive scour is already occurring at the bridge's foundation creating an unstable support condition.

Figure 4.12 - Progression of Bridge Foundation Damage from Scour Over 2-year period at Robinson Creek Bridge in Mendocino County

Scour mitigation needs were tabulated as their own subcategory to highlight and account for the significant cost and safety impact scour damage represents to the local bridge inventory. In general, scour vulnerable bridges are usually most cost-effectively addressed through full replacement. Taking this into consideration, if a bridge was considered Scour Critical with NBI item 113 code of 2 or 3, then the full replacement cost of the bridge was considered. The replacement bridge type was determined using the same criteria used in the bridge replacement methodology. Using this methodology, the scour need assessment resulted in a replacement cost for 309 bridges, accounting for 1,450,269 square feet of total existing bridge area. The total Scour needs cost is approximately $500 million, accounting for approximately 7.1% of the total needs cost.

4.5 Bridge Widening

Geometric constraints are a real world need for California's local bridge inventory. The current bridge inventory is composed of thousands of bridges built over the past century and a half. Innovation and changes to modes of transportation over this time have affected the geometric needs of our roadways and bridges. As codes and standard for lane widths and shoulder widths have developed relatively to traffic volumes, the existing infrastructure has remained static except when actively widened to accommodate increased traffic. Geometric constraints include inadequate lane width, number of lanes, shoulders, and lack of sidewalks. These constraints effect everyday lives of the travelling public and may be one of the most noticeable needs by someone not familiar with a bridge's structural integrity. Bottlenecks and traffic all limit the functionality of not just the bridge, but the surrounding community. In addition, the lack of fully connected pedestrian and bicycle pathways reduces the safety of these alternative means of transportation.

The existing bridge inventory was analyzed to meet minimum AASHTO requirements based on existing lanes and ADT. If a bridge did not meet minimum width requirements in accordance with AASHTO standards and was noted to be geometrically deficient in the NBI database, widening was determined to be a need for the bridge. The new width for the existing bridge, after widening, incorporated the minimum AASHTO widths, existing number of lanes, and any existing sidewalks that indicated pedestrian access, to determine the final width of the bridge. For further detail regarding the widening criteria, see Appendix A.

Existing geometric deficiencies and changes to roadway minimum widths over time have led to widening becoming one of the largest needs of the current bridge inventory. It accounts for a total of $2.6 billion in need, encompassing a total of 1,953 bridges.

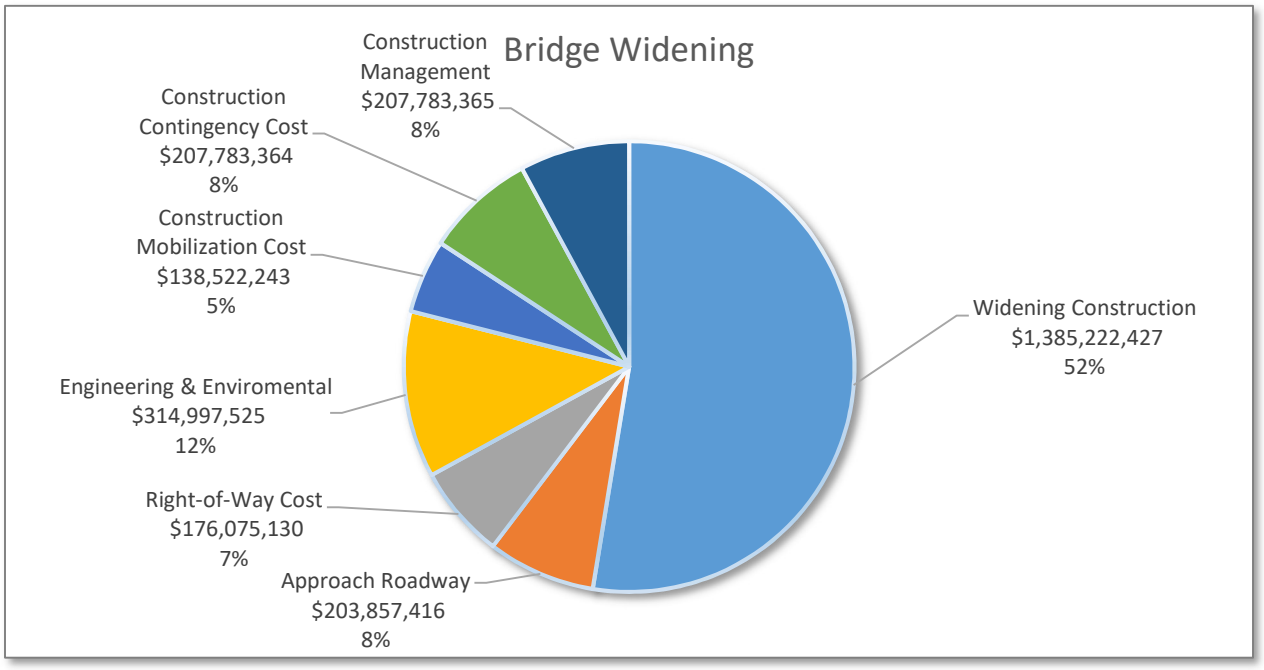


Figure 4.13 - Total Bridge Widening Associated Cost

4.6 Bridge Strengthening

Bridge strengthening may not be noticed by the travelling public but can have significant effects on shipping routes and transportation of commercial goods. Older bridges were not designed for modern equipment load such as commercial trucking. The NBI database uses NBI item 70 to track bridges that are load "posted" or are unable to carry various standardized vehicle loads. The degree to which the bridge is insufficient to carry these typical loads impacts the cost to improve the strength of the bridge. Based on an analysis considering any bridge less than the 100% required strength, per item 70 of the NBI, 185 bridges were determined to have Strengthening Needs. These 185 bridges requiring strengthening improvements accounted for $124 million in current needs, a small portion of the overall needs of the current bridge inventory. The following criteria were used to determine the strengthening cost as a function of the existing bridge replacement cost:

- Less than 10% required strength
  - 20% of bridge replacement cost
- 10%-20% below required strength
  - 30% of bridge replacement cost
- 20%-30% below required strength
  - 40% of bridge replacement cost
- 30%-40% below required strength
  - 80% of bridge replacement cost
- Greater than 40% below required strength
  - 100% of bridge replacement cost

Figure 4.14 - Temporary Timber Support Used to Increase Load Carrying Capacity. This Older Bridge is in Good Condition but Not Able to Carry Modern Vehicular Loads.

4.7 Seismic Retrofit Needs

California has a considerable number of bridges in the local inventory located in seismically active regions. While significant seismic events are relatively rare, they can have catastrophic consequences on older bridges. There has been a statewide effort to retrofit existing bridges to meet a "no collapse" life safety standard for the currently recognized earthquake hazard. Retrofits have been ongoing for the past two decades through the Local Bridge Seismic Retrofit Program (LBSRP), but there are still some outstanding projects yet to complete construction. Bridge Seismic needs were derived from the outstanding LBSRP list which includes 42 local agency bridges. Based on the total projected costs for these remaining projects and their individual percentage complete, the estimate outstanding seismic retrofit need is $310 million on the 42 local bridges. It is important to note that the list of bridges previous retrofitted is based on a large scale, statewide screening and evaluation process. Future earthquake events may uncover additional vulnerabilities built into the current inventory that could require further retrofit in the future.

4.8 Total Current Bridge Needs

California's critical local bridge infrastructure spans an area and magnitude that poses unique challenges in maintaining the current needs. The age of the bridge inventory continues to increase, as the rate of replacement and new construction cannot keep up with the bridges constructed in the postwar 1950's and 1960's. As a result**, the estimate of current needs in the system is approximately $7.2 billion**, when considering replacement, widening, scour, preservation, strengthening and seismic retrofit. This present value of the total needs represents a snapshot in time. Moving forward, the condition of the inventory changes over time. Some projects are completed while new needs develop as each bridge age. The aggregate needs of today's local bridge infrastructure in California are significant. Approximately 4,850 out of 12,339 bridges have some form of need, based on this analysis. The overall work required does vary significantly but represents the overall magnitude of the total need.

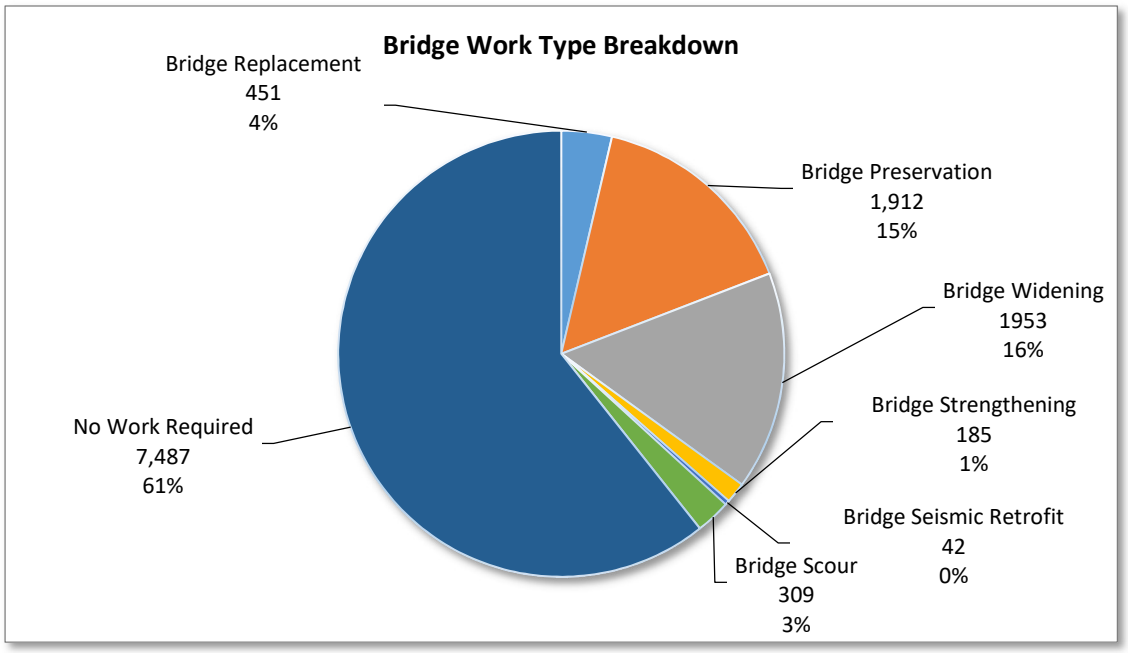


Figure 4.15 - Number of Bridge Projects Needed by Type

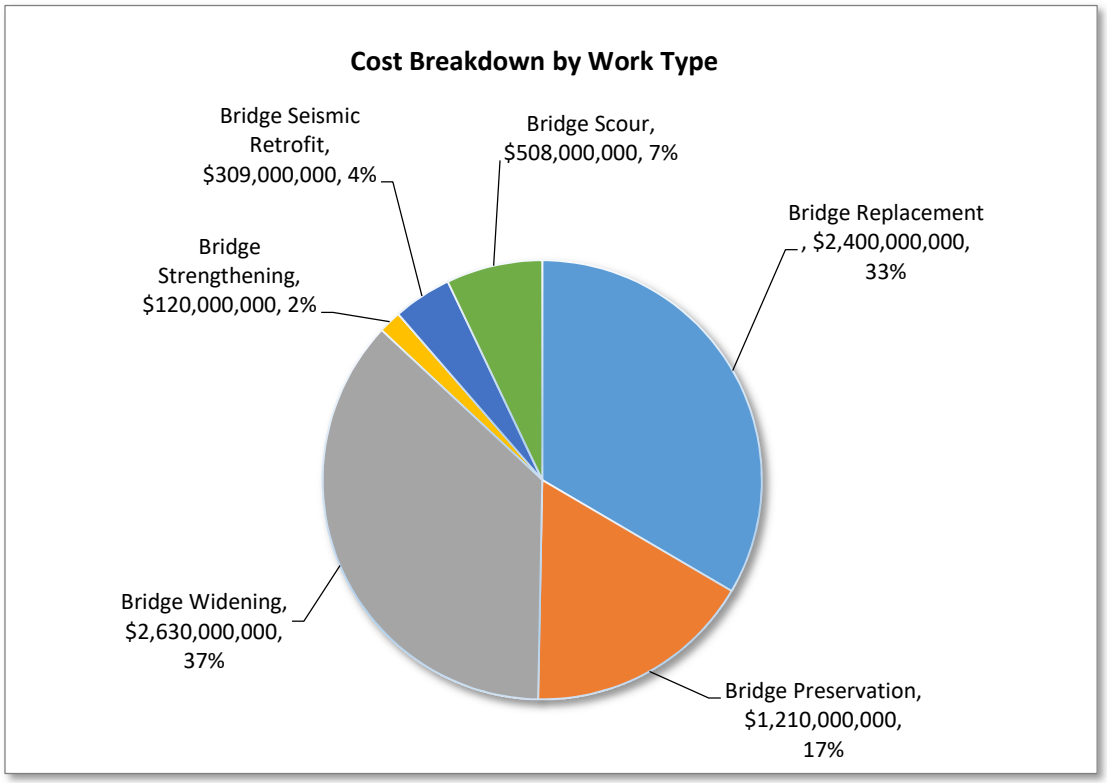


Figure 4.16 - Number of Bridges by Type of Work Breakdown

5 Non-NBI Bridge Needs

Vehicular bridges on public roads that are less than 20 feet long and non-vehicular bridge (bicycle and pedestrian) do not meet the federal definition of a bridge and are not included in the NBI database. Additionally, non-NBI bridges are not eligible to receive funding through the HBP. However, these bridges are still an important part of the local transportation network with their respective communities. They provide everyday access to roadway traffic, pedestrians, bicyclists, and emergency vehicles. Since the data for non-NBI bridges are not tracked in the NBI database, alternative methods were required to approximate the needs of the non-NBI bridge inventory.

A 20-question bridge-focused informational survey was sent out to all 539 of California's cities and counties (included in Appendix B). The survey requested input on different topics related to the local agency's non-NBI bridge inventory. The topics included but were not limited to capacity to maintain or improve inventory, expected needs for future projects, sources of funding, annual expenditures, challenges in local agency bridge projects, short span bridge count and projections, non-vehicular bridge count and projections, public safety projects as well as a few other topics.

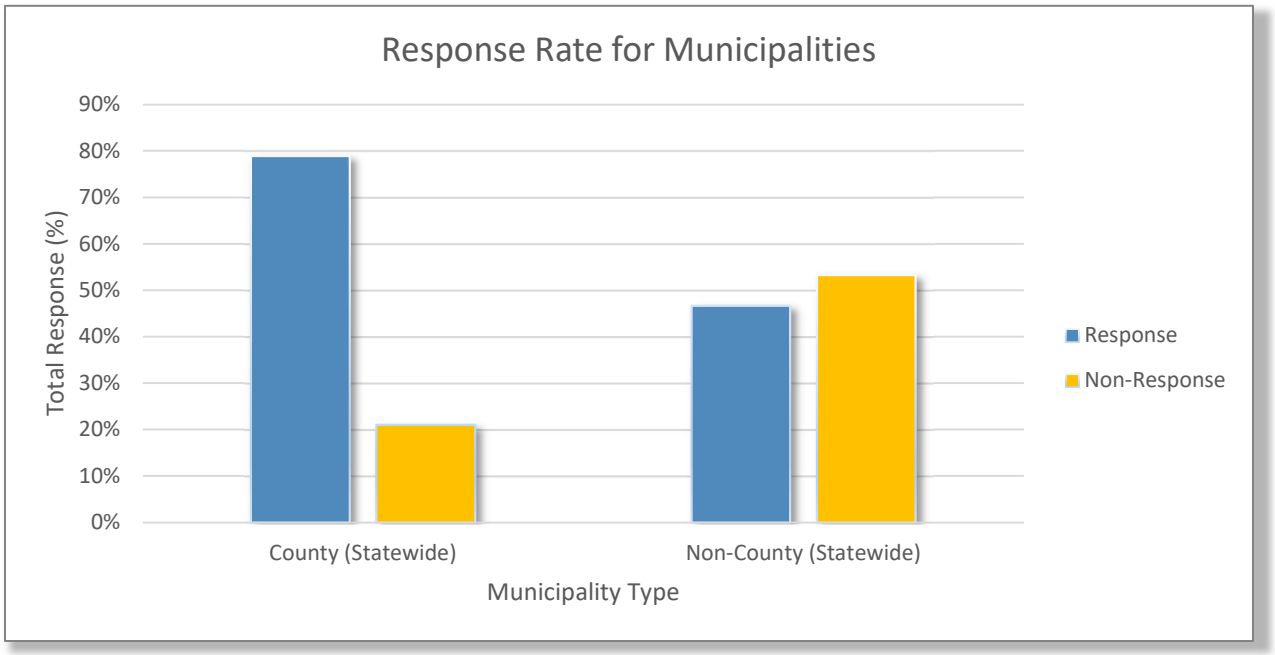


Figure 5.1 – Non-NBI Bridge Survey Response Rate

The response rate varied by question, but was approximately 42% for survey completion, with a maximum response rate to any single question of 49% among all municipalities. Most respondents noted only partial ability to review bridge inspection reports or conduct field maintenance and repairs without external contracting. Of the respondents, 36% noted that typical replacement, rehabilitation, and maintenance projects were the largest need, followed by widening with 19% of respondents noting it as a need. Participants noted that the greatest challenge to completing local bridge projects is funding, followed by environmental requirements and then State and Federal agency regulations as the third most prohibitive challenge.

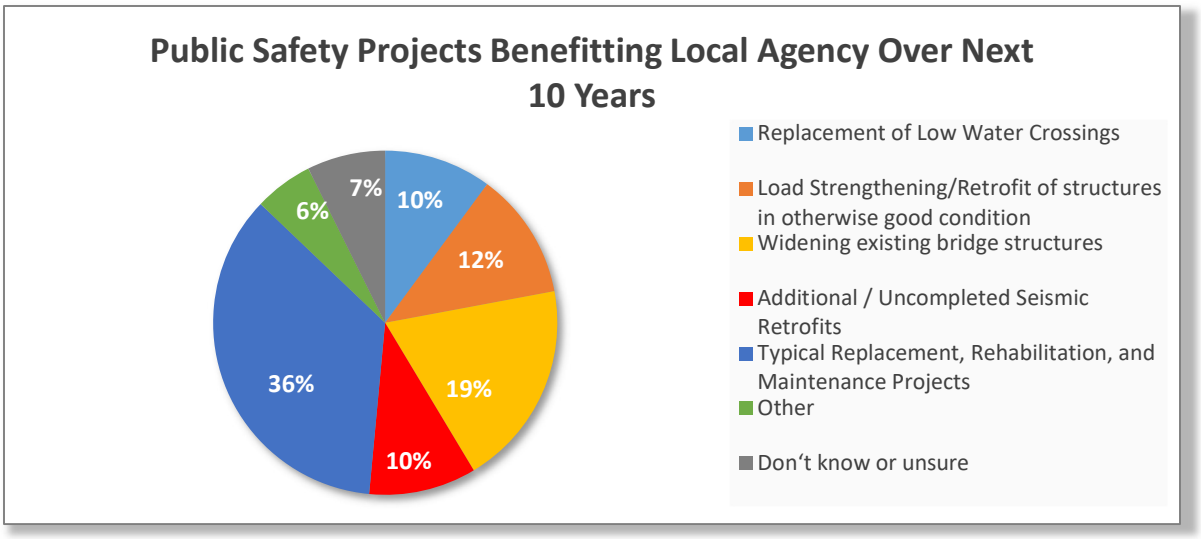


Figure 5.2 – Local Agency Response on Beneficial Projects

Based on responses, local agencies noted annual needs of approximately $87.1 million for non-NBI bridges. The local agency responses included ranges for expected values and assumed averages of these ranges were used to estimate approximate non-NBI needs.

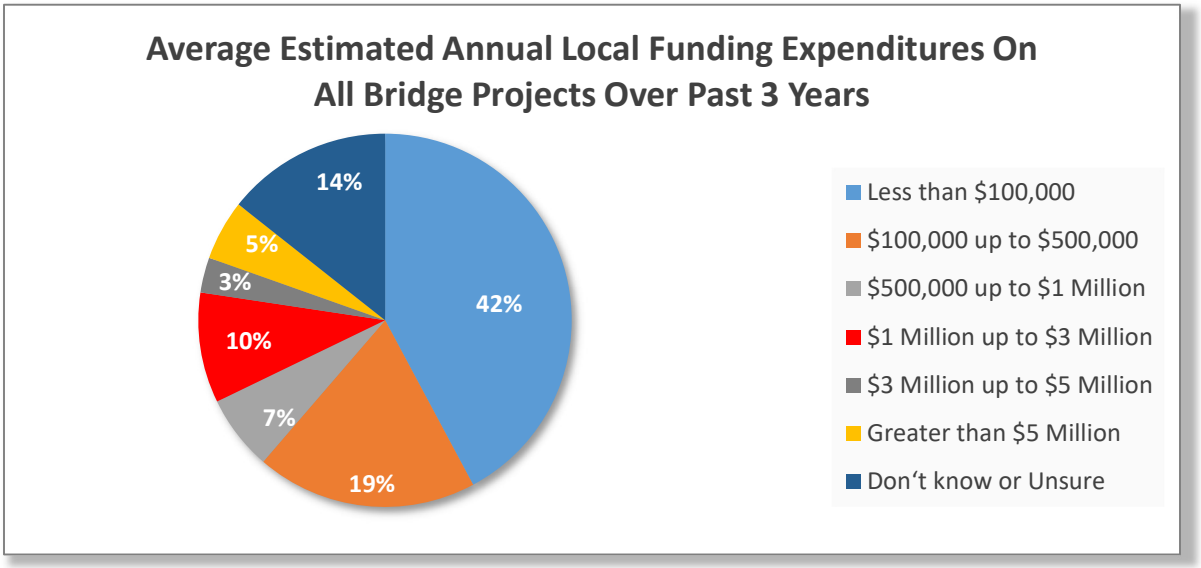


Figure 5.3 – Local Agency Response on Annual Expenditures

Responding agencies provided approximate ranges for annual expenditures on local non-NBI inventory. Various ranges were given, as shown in Figure 5.3, approximately 42% of respondents noted less than $100,000 in annual expenditures over the last 3 years. Not all local agencies responded, so it was necessary to project these responses across all local agencies statewide local to estimate non-NBI bridge needs. To approximate non-NBI bridges for non-responding agencies, a correlation was determined between responding agencies, non-NBI bridge inventory, and NBI bridge inventory. This correlation was then used to approximate non-NBI bridge inventory of non-responding agencies using the NBI database population. This relationship was used to develop the estimated local agency bridge annual needs for all local agency non-NBI bridge inventory of between **$115 million and $270 million**.

6 Future Funding Needs Projections

In addition to analyzing the current backlog of needs and costs built into the local agency bridge inventory, an assessment was made to evaluate future annual funding needs to compare annual needs to current funding levels and evaluate the potential funding shortfall. This was performed by Spy Pond Partners, LLC through a computer modeling software developed by FHWA and known as the National Bridge Investment Analysis Systems (NBIAS). NBIAS is funding analysis software developed by FHWA to assess the bridge needs on the national level. The NBIAS is a sophisticated tool that captures long term bridge needs through its Maintenance, Repair, and Rehabilitation (MR&R) model, and replacement rules. The MR&R model captures bridge degradation model through Markov decision matrices in numerous detailed bridge component levels. NBIAS prioritizes bridge replacements and MR&R by optimizing benefit-to-cost ratios of the individual bridge owners and users to predict current and future needs in comparison with a range of annual funding.

While the NBIAS program is an extremely sophisticated tool that has been developed over several years with detailed bridge component levels and complicated mathematical models, NBIAS by itself does not sufficiently capture the California bridge needs without proper California-specific input parameters. California is a unique state that requires more involvement for bridge project development and construction. For instance, the total project cost required to replace a bridge in California is greater than required in other states due to more stringent environmental requirements, high labor costs, more intensive permitting regulations, and higher fuel prices.

To perform this analysis, the current bridge needs were used to develop a bridge replacement Weighted Average Aggregate Unit Cost and bridge deck improvement Weighted Average Aggregate Unit Cost to calibrate the NBIAS model. These targeted values were used to run multiple cost-benefit scenarios and cost simulations for a 20-year analysis period to evaluate impacts of various annual budget funding levels. Projections were made for the effect these funding levels would have on the total bridge needs cost, the average local agency bridge Sufficiency Rating, and the Percentage of Poor local agency bridges.

Figure 6.1 on the next page shows that over a 20-year period, an annual budget of at least $500 million is needed to merely maintain the existing local bridge inventory at their current levels. This can be compared to making the minimum interest payment on a credit card bill; it maintains the financial burden without reducing the underlying debt. This level of funding would not improve the overall condition of the bridge inventory.

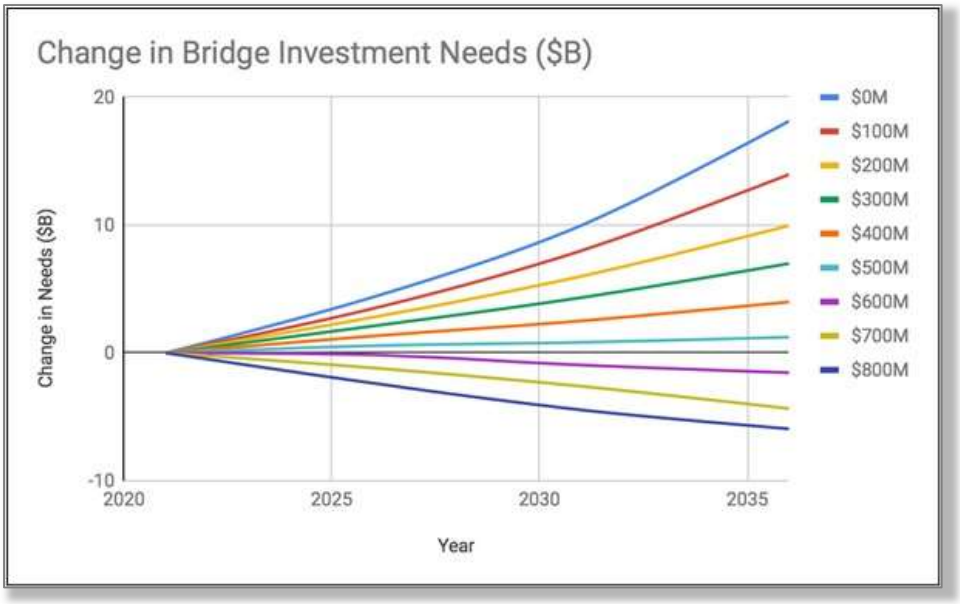


Figure 6.1 - Change in Total Bridge Needs vs. Annual Funding

A more meaningful measure to both the public and local agency owners is the relationship of bridge condition to annual funding levels. Figure 6.2 shows that over a 20-year period, **an annual budget of at least $600 million is needed to keep the current average Sufficiency Rating, based number of bridges, at the current inventory wide level.** This level of funding would not necessarily improve physical bridge conditions or reduce the backlog of cost needs.

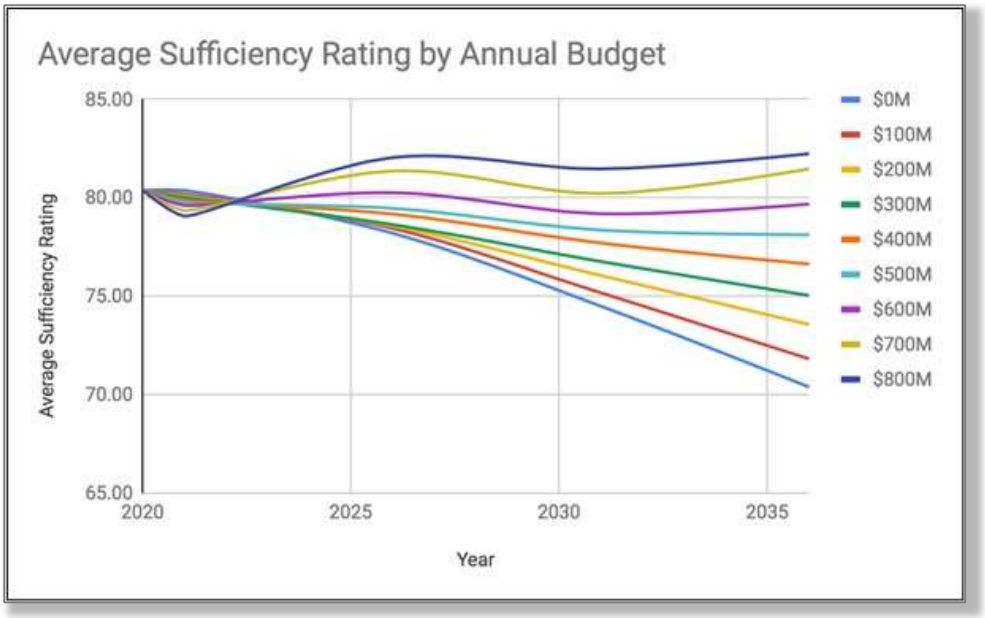


Figure 6.2 - Change in Sufficiency Rating vs. Annual Funding

In a similar manner an analysis of the relationship percent poor to annual budget was performed over a 20-year period and is shown in Figure 6.3. An annual budget of approximately $800 million is needed to keep the current percentage of poor bridges, weighted by deck area, at the current condition.

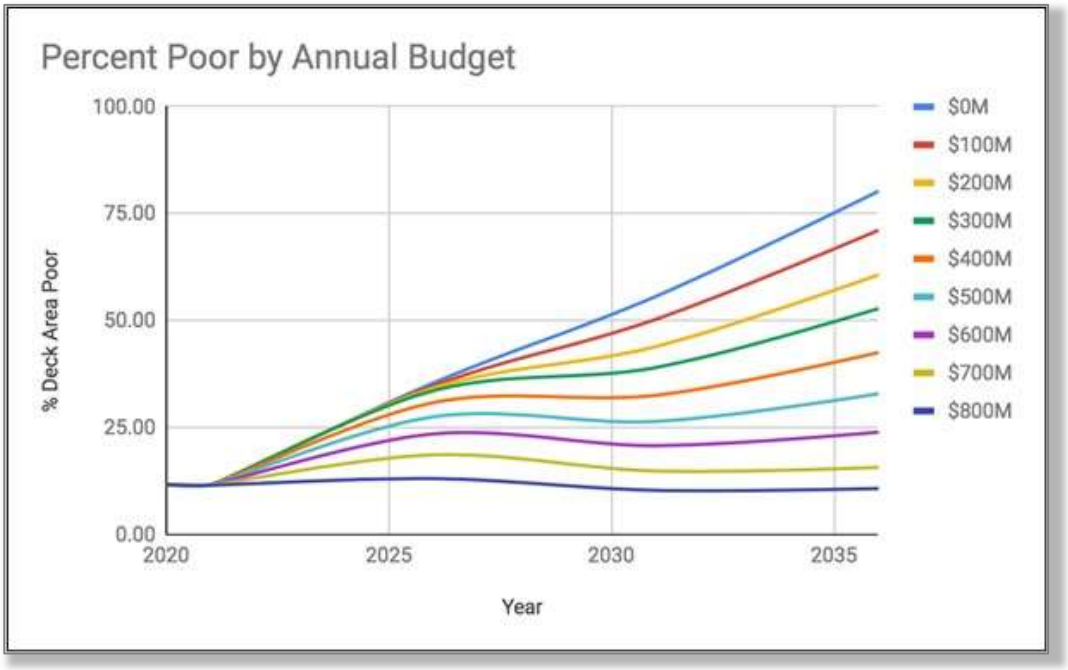


Figure 6.3 - Change in % Poor vs. Annual Funding

While the analysis shows the funds required to achieve a given target condition, it does not recommend a specific level of funding. Given that the investment needs in NBIAS are based on consideration of what work is economically justified, ideally a bridge owner would address all needs for their bridge inventory, rather than simply maintaining conditions. However, doing this in the short term would require a substantial increase in budget, and may not be practical. Another approach to setting a target level of investment is to base the investment level on a specific target condition. The percent of bridges classified as being in Poor Condition is a better measure than an average condition index for illustrating the extent of California's bridge needs backlog.

In all the scenarios analyzed, physical conditions tend to worsen initially then, in the cast of an annual budget of $700M or $800M, begin to improve. **Estimates using NBIAS project that an annual budget of $778 million would be required to achieve a value for percent bridge (weighted by deck area) in poor condition in 2040 that is equivalent to the initial value in 2020.**

For summarizing needs it is helpful to consider both predicted conditions and the level of investment need in dollars. Absent budget constraints an organization seeking to maximize economic efficiency would address all investment needs. Considering budget constraints, a reasonable goal is to at least keep needs from increasing by addressing new investment needs as they arise, if not to lower the backlog of needs over time. Even with the goal of gradually lowering needs, however, one faces a situation in which needed work is being deferred, potentially increasing the work that must be performed on a given bridge.

7 Current Local Bridge Funding Source

Funding for local bridge projects can potentially come from a multitude of sources including local, state, and federal programs. By far and large, the greatest source of funding has historically come from federal funds administered by Caltrans on behalf of FHWA known as the Highway Bridge Program (HBP) for bridges that are in the NBI. The program is a safety program that provides federal aid to local agencies to replace and rehabilitate poor condition locally owned public highway bridges, rehabilitate fair condition, or complete preventive maintenance on bridges that are not deficient. This process provides federal funds, in conjunction with matching contributions made by local agencies, on work items considered eligible based on specific published criteria and metrics, often tied to NBI condition data. This program has been available and utilized by local agencies for their bridge needs in various forms since 1978. Over the years, criteria such as which work items are eligible for federal funding and required percentage of local agency funding match funding has varied.

7.1 On- and Off- Federal Aid System Classification

One important criterion related to federal funding is the classification of "On-System" and "Off-System" bridges. Streets and highways are grouped into classes based on the character of service they provide. Larger classifications, such as Principal Arterials, typically offer increased mobility; they carry larger volumes of traffic traveling longer distances at higher speeds. Lower classifications, such as local roads, provide for direct access; they carry smaller volumes of traffic at lower speeds to specific locations. These functional classifications are documented in the California Road System maps (CRS Maps).

"On-System" roadways, and their bridges, are on the federal aid system and are typically comprised of the larger functional classifications. "Off-System" roads, and their bridges, are composed of the lower functional classifications including rural and urban local streets and roads and rural minor collectors. These distinctions are important for local agencies because they effect the percentage of federal funding available for qualified bridge projects. The classifications are shown below.

Roadway Functional Classification	Urban	Rural
Interstate	On-System	On-System
Freeways or Expressways	On-System	On-System
Principal Arterials	On-System	On-System
Minor Arterials	On-System	On-System
Major Collector	On-System	On-System
Minor Collector	On-System	Off-System
Local Streets/Roads	Off-System	Off-System

Table 7.1: Federal Roadway Functional Classification

Funding participation ratios are based on road functional classification. For both On-system and Off-system bridges, qualified bridges can receive up to 88.53% of participating project costs from HBP funding. This HBP funding portion is often called the federal matching share. The remaining 11.47% of project costs come from the local agency as a matching contribution. In California, local agencies can also receive Toll Credits to be used to fund the non-federal matching share for qualifying bridge projects involving Off-System bridges. Toll Credits typically cover the other 11.47% of the local agency match portion. The Toll Credit funding source was implemented in recent years to promote sufficient funding for off-system

bridges which are typically smaller, lower volume, and rural facilities. Without Toll Credits, many local agencies commonly do not have sufficient funding sources to pay for their Off-System bridge match.

7.2 Past HBP Performance

Over the past decade, available funding for local agencies within the HBP has remained at the same level of approximately $290 million per year for all project phases (Preliminary Engineering, Right-of-Way, and Construction) of local bridge projects. Without a significant alternative funding source for local agencies, that translates to generally flat overall funding for local agencies. Historically, the allocation for the funding within the HBP has been split at an approximate ratio of 25% for Off-System projects and 75% for On-System projects. Prior to 2010, the level of annual funding within the program was generally adequate to cover all project costs within the HBP. Policies such as Toll Credits were initiated and maintained to encourage program use and ensure full obligation of the program's annual budget.

Demands for funding began increasing during the 2011 to 2015 period. During these years, all annual funding was being obligated and local agency projects admitted into the program were beginning to accumulate a "backlog"; local agencies requested more funding for the various project phases than was available during the current fiscal year and work was being pushed forward into future years. By 2016, the commitment level of the program had reached a 20-year backlog, meaning it would take 20 years to complete all on-going local agency projects with the current annual funding levels without beginning any new projects and accounting for cost increases. In response to the program's overcommitment, several changes were implemented in the 2016-2020 period. The goal was to narrow focus on structural safety and preventative maintenance projects and reduce program backlog to a 15-year level. Eligibility for certain new projects such as bridge widenings and low water crossings was eliminated completely in conformance to changes to federal standards. An HBP prioritization policy was implemented in 2018 to categorize and prioritize all new applicants for program. No new projects have been added to the program since 2018. **The current program financial commitment is approximately $5.5 billion dollars. *It would take nearly 19 years to provide this funding at the current funding rate, without starting any new projects or accounting for cost increases to existing projects.*** It is important to note that an additional $500 million dollars of funding requests from local agencies has not been accepted into the system since 2018 through the prioritization process.

	Federal Fiscal Year 2020
On-System Commitment	**$4.0 billion**
Off-System Commitment	**$1.5 billion**
Total:	**$5.5 billion**

Table 7.2: HBP Fiscal Commitment

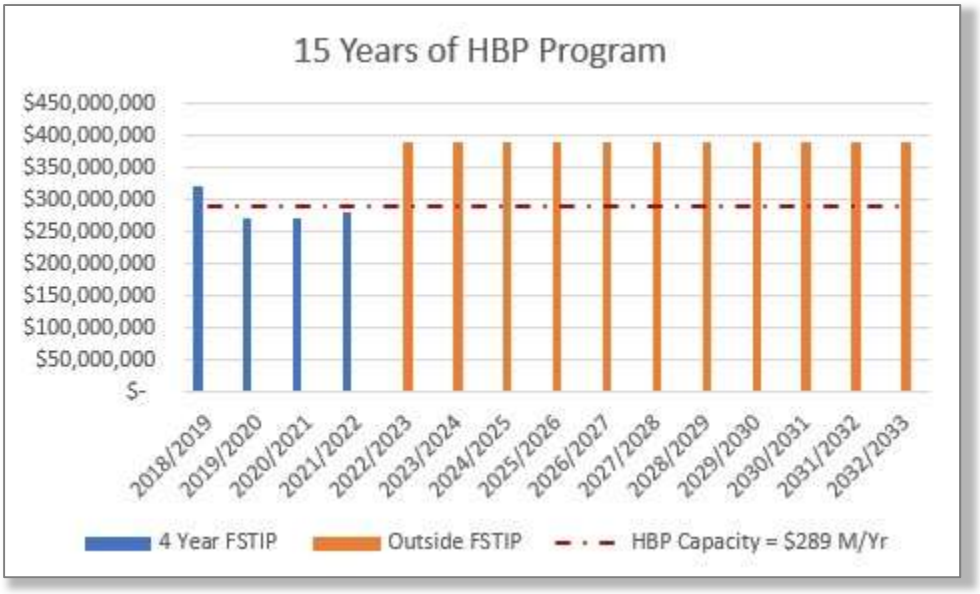


Figure 7.1 – 15 Year Funding Constrained Program Projection

7.3 Current and Future Funding Challenges

In addition to a decade long stagnation of annual funding, the HBP faces several current funding challenges that have long term implications for local bridges into the foreseeable future. These challenges include:

1. Escalation of bridge construction and project delivery costs.
2. The number and magnitude of High-Cost Bridge Projects.

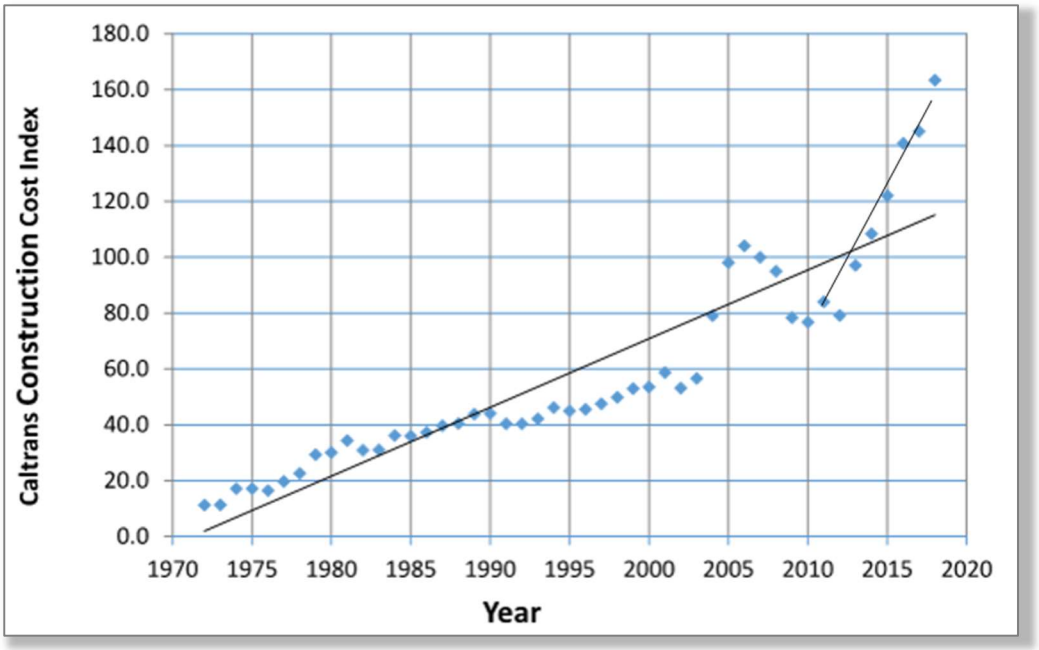


Figure 7.2 Caltrans Construction Cost Index (CCI)

For several decades, the cost escalation of bridge projects within the state was fairly uniform and predictable. In the past 15 years, prices have fluctuated more rapidly. In the economic growth and expansion period of the early 2000s, construction cost increases mirrored the general economy with pricing reflecting the demand for construction services based on availability of funding. Costs sank dramatically following the Great Recession period between 2007 and 2009. Additional factors include major infrastructure packages, such as the American Energy and Infrastructure Jobs Act of 2012 or Senate Bill 1 in 2017, that resulted in an upward pressure in the CCI following passage of the bills. Most recently, demand and pricing have been increasing at a rate above 10% annually for the past several years. This trend is not limited to construction activities only but extends to "soft cost" items that also experience material and labor escalations such as Engineering, Construction Inspection, and Environmental Mitigation. As a result, the ability to deliver projects decreases as funding remains fixed, but costs continue to rise exponentially.

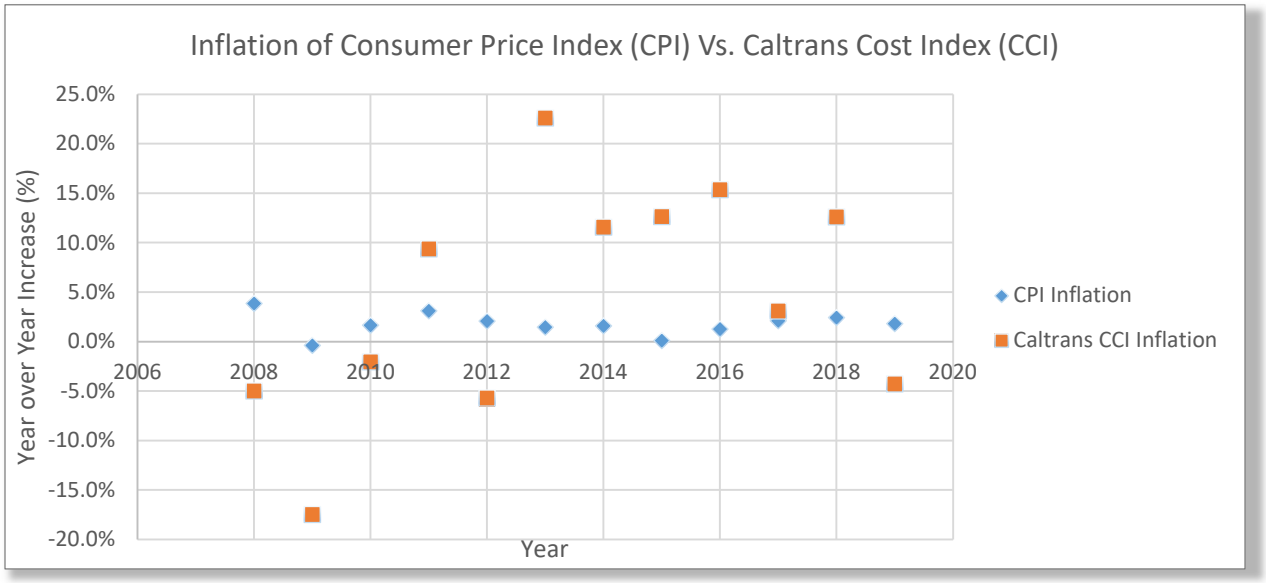


Figure 7.3 - CCI VS Consumer Price Index Inflation (CPI)

The CCI shown in figure 7.3 generally fluctuates much more than the CPI on an annual basis. The CPI represents a much broader basket of inputs, and therefore follows a much less volatile path. The CCI has historically been vulnerable to shifts in infrastructure spending, cost of raw materials, and labor force availability. This is reflected in the figures above which, overall, represents a significant increase in the cost of working on a bridge project in relation to the overall value of the dollar. In short, each dollar spent on a given project does not go as far as it had in the past.

The effect of increased costs on a fixed annual funding results in delivery of fewer projects. Between 2008 to 2013, an average of 47 HBP project per year began construction. During the 2017 to present time, that average has decrease to 35.5 projects per year entering the construction phase.

7.4 High-Cost Bridge Projects

High-Cost Bridge projects within the HBP are defined as projects with a Right-of-Way or Construction phase exceeding $20 million dollars. High-Cost projects have a large effect on the program as a whole and, in turn, other local bridge projects within the program. High-Cost bridge projects require commitment of large sums of federal funding over a multiple year period due to their size, complexity, and design and construction durations. These long-term commitments are also subject to a greater possibility of cost escalation over project lifetimes simply due to the length of time required to complete them. There are currently 53 High-Cost Bridge Projects within the program with current and future funding commitments totaling approximately $2.1 billion dollars. The average cost for a High Cost Bridge Project is $47.4 million. The largest High-Cost Bridge project in the system is the Sixth Street Bridge over the Los Angeles River in the City of Los Angeles with a total federal funding commitment of $245.8 million. Comparatively, the average cost of all HBP bridge projects is approximately $6.7 million. **The funding required to complete the currently programmed 53 High-Cost Bridge Projects is equivalent to the funding required to complete 312 "average" bridge projects.**

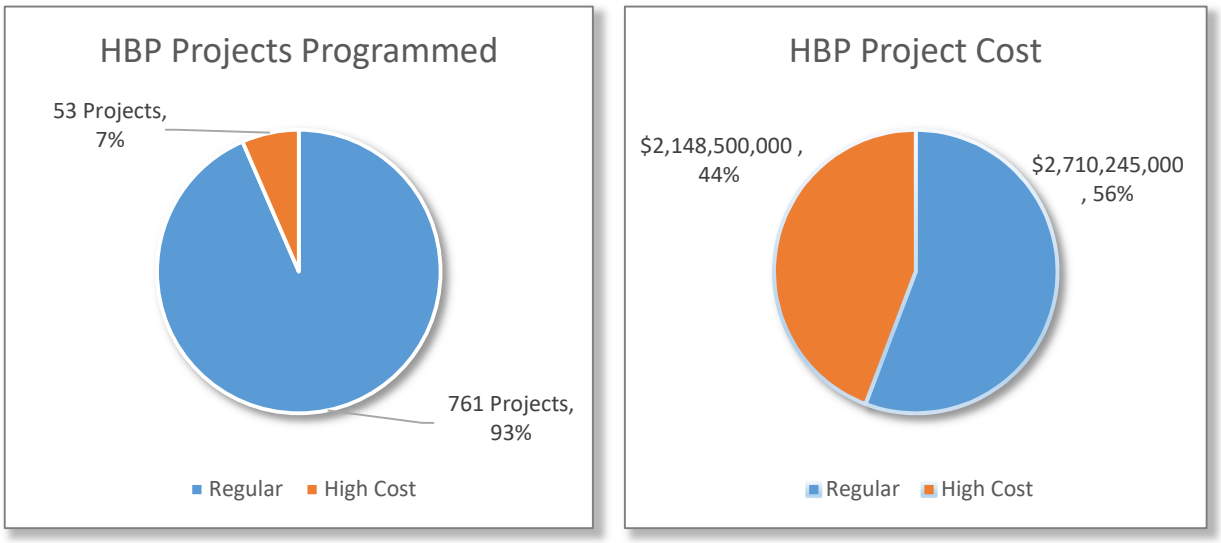


Figure 7.4 - HBP Projects Programmed and Cost

7.5 Sources of Funding

Although federal funds administered by the HBP have accounted for the majority of funding traditionally utilized by local agencies, alternative funding sources do exist. The table below lists additional funding sources that may be used on local bridges. Potential funding for local agency bridges as a part of these sources represents a part of a broader funding allocation program, encompassing a range of all transportation needs to a more general fund, and are typically used to supplement HBP funds for local needs. Some of these programs have more specific objectives beyond general bridge construction. One example is the Active Transportation program, which is focused on non-motorized modes of transport, and may reduce the way in which they can impact a local agency's overall bridge needs.

Additional Funding Sources for Local Agencies		
Federal	**State**	**Local**
Highway Safety Improvement Program (HSIP)	State Highway Maintenance and Rehabilitation	Local Steet and Road Maintenance and Rehabilitation
Highway Infrastructure Program (HIP)	Trade Corridor Enhancement Program	Transit Operations and Capital
Surface Transportation Block Grant Program (STBG)	Solutions for Congested Corridors Program	Local Partnership Program
	Parks, Off-Highway Vehicle, Boating, and Agricultural Programs	Active Transportation Program
	State Transportation Improvement Program – Interregional Share	State Transportation Improvement Program – Regional Share
	Freeway Service Patrol Programs	Local Planning Grants
	California University Transportation Research Programs	

Table 7.3 – Additional Funding Sources for Local Agencies

8 Impact of Senate Bill 1 Funding on Local Bridges

In April 2017, the Road Repair and Accountability Act (also known as SB1) was signed in California, which provides up to $5.4 billion annually to fix roads, freeways, and transportation infrastructure statewide. Of this amount, $2.65 billion is allocated for slew of Local Programs with $1.5 billion designated for local street and road maintenance and rehabilitation. While SB1 has greatly benefitted both the state and local transportation network, the impact on local bridges has been somewhat muted for several important reasons:

1. **Competing Priorities.** Funding from SB1 is divided up between several programs intended to fulfill various project needs such as safety projects, congestion relief, and projects intended to promote active transportation such as biking and walking. Of the $1.5 billion allocated for the Local Streets and Roads Program, there are many competing uses including work on repair and rehabilitation of pavements; upgrading safety features such as signals, signage, and guardrail; storm damage repairs; infrastructure for compliance with the Americans with Disabilities Act; drainage and culvert upgrades; and even acquisition of construction equipment for use by public works departments. Local agencies must choose between many competing interests and often choose to use SB1 funding on projects other than bridges which may not have other readily available funding sources.

2. **HBP Bottleneck.** Many agencies use SB1 funds to cover the required 11.47% local match portion of the HBP in order leverage federal funds for the remaining 88.53% of the project. While this strategy does help local agencies with their funding portion, it still places most of the cost burden

on the impacted HBP. Since the HBP is already overcommitted and is metering projects through phases to constrain project delivery to annual available funds, adding further projects to the program only pushes out future project delivery. This does not help local agencies perform bridge projects in a timely manner.

3. **Bridge Project Delivery Times.** There are some local agencies performing a limited number of bridge repair, rehabilitation, and replacement projects using primarily SB1 funds outside of the federally funded HBP. However, bridge projects typically take longer than many local transportation projects due to a higher level of engineering complexity, environmental processes, permits, required right-of-way and utility coordination. Based on analysis by FHWA, it takes 7 to 8 years on average to replace a California local agency bridge, from initiation of engineering to groundbreaking. SB1 has only been in effect since April 2017, less than 4 years. Additionally, revenue streams for SB1 were phased-in over several years from November 2017 to July 2020 and required time to reach full funding implementation levels. There simply hasn't been enough time elapsed to see quantifiable improvement in the condition of California's local bridges due to use of SB1 funding. Still, based on SB1 Proposed Project Lists, local agencies are not electing to complete many bridge projects using SB1 for more than as the HBP local match.

9 Summary

California's local bridges are aging and deteriorating at a rate faster than they are being repaired, rehabilitated, and replaced. An increased project delivery rate is required to maintain the current inventory condition state. Current funding is inadequate to achieve the required project delivery rate.

Local Bridge Age Analysis:

- The average age of California's local bridges is 53.4 years old while the national average is 44 years old.

- Most bridges are designed and built with the intent of a 75-to 100-year service life.

- It is possible that newer bridges, built to higher standards and codes may be able to exceed a 75-100-year lifespan. It is not likely that older bridges, built to lower standards and codes, will be able to significantly exceed the intended life span without significant deterioration, load posting, and closures.

- Approximately one-fifth (2,332 or 12,399) of the local bridge inventory is greater than or equal 80 years old. These bridges are reaching the end of their reliable useful service lives.

- To keep the bridge inventory from further aging, a replacement rate of approximately 250 bridges per year is required. The highest historical rate of bridge construction was approximately 230 bridges per year during the peak of the transportation construction era.

- Currently, fewer than 50 local agency bridge projects are delivered per year due to funding constraints.

Local Bridge Condition Analysis:

- 11.5% of California's local bridges, as a percentage of total deck area, are classified as being in Poor condition. In contrast, only 3.3% of the bridge deck area on the State Highway System is in Poor condition.

- The federal government has a national goal of no more than 10% Poor on the National Highway System. The State of California has a state goal of no more than 1.5% Poor by 2028.

- To achieve the 10% Poor goal, California local agencies would need to remediate over 1 million square feet of bridge deck area, equivalent to approximately 189 average-sized Poor condition local agency bridges. Achieving the 1.5% Poor goal would require remediating over 7.2 million square feet of local agency deck area, equivalent to approximately 1237 average-sized Poor condition local agency bridges.

Local Bridge Funding Analysis:

- The primary funding source for local bridge projects is federal funding through the HBP, which has been stagnant at $290 million dollars per year for the past ten years.

- At this funding level, the percentage of Poor of local bridges may climb above 50% over the next 20 years due to increasing deterioration of the aging inventory and insufficient replacement/rehabilitation rate. An annual funding amount of approximately $800 million per year is required to simply maintain the current local bridge inventory condition.

- Total aggregate needs were estimated by analyzing local bridge data in a "bottom up" approach. The methodology developed a total Bridge Needs value of $7.2 billion dollars locked into the current system. Delivering this order of work at the current HBP funding rate would require over 25 years, with no other additional projects or needs considered during that timeline.

- An assessment of the current HBP programming was also performed. This approach evaluated the total needs from a market demand approach. These are the needs self-identified by each local agency based on their understanding and prioritization of their own transportation networks. The current programmed demands are approximately $4.6 billion dollars. Since 2017, there has been an additional $1.6 billion worth of project applications not admitted into the program. This total demand backlog of $6.2 billion would require over 21 years to process, with no other additional project or needs considered during that timeline.

10 Appendices

APPENDIX A:
Detailed Replacement Methodology Overview

APPENDIX A: Detailed Replacement Methodology Sequence

Bridge replacement accounts for a significant portion of the overall inventory needs, accounting for $2.4 billion for replacement alone. Bridge replacement cost encompasses construction cost as well as "soft cost" such as preliminary engineering, environmental permits and mitigation, possible approach roadway realignments, right-of-way acquisition, and utility relocation.

Determination of the new bridge length, width, and bridge type are based on the site conditions of the existing bridge. The bridge replacement geometry, cost calculations, and procedures are defined in the steps below.

1.1.1 Bridge Replacement Calculations and Procedures

To assess the bridge replacement needs, the new proposed bridge geometry (length and width) was determined based on the existing bridge geometry. Equations and calculations below show the basic process of how this study calculated the total bridge replacement needs for a given bridge. The analyses performed herein and equations written were converted (from SI units in NBI database) to English units.

Step 1. Determine the number of lanes on the new bridge

The number of lanes on the replacement bridge is taken to be equal to the Existing Number of lanes on the existing bridge or 2 lanes at minimum.

Number of lanes = max (Existing number of lanes, 2 lanes)

The majority of HBP funded bridges are replaced with a minimum of 2 lanes to meet the AASHTO roadway design standards.

Step 2. Determine the new bridge width (out-to-out)

The new bridge width is taken to be equal to the Number of Lanes multiplied by 12 foot lanes, plus 5 foot shoulders and 2 foot barriers. In addition, if the bridge is designated as highway-pedestrian bridge, then an additional 5 feet should be added to the new bridge width.

Width of bridge = (number of lanes) x (12 ft) + (shoulder width (ADT dependent) + 2 ft barriers) x (2 for each side of bridge)

If a sidewalk exists (NBI item 50A & 50B) on either side, then 5 ft is added for each existing sidewalk to the calculated W bridge above.
W bridge = W bridge + 5 ft.x number of sidewalks

Step 3. Determine the new bridge length

Experience has shown the new bridge lengths are consistently longer than the original bridge replaced. Typically when a new bridge is designed over a waterway, the hydraulic opening requirement makes the existing bridge approximately 20% longer than the original bridge length.

In addition to the site condition, NBI item 76, allows local agencies to calculate a proposed desired new bridge length. If NBI database does not have a new length available (where site-specific data

is lacking), then Length of Structure Improvement may be taken based on an expansion bridge improvement Length Factor. The expansion bridge improvement Length Factor is estimated by a polynomial equation developed by the FHWA, where the bridge improvement length is indirectly proportional to the existing bridge length--illustrated in Figure 3.5 below.

In this study, the new bridge length is calculated as the existing bridge length plus 20% of the existing bridge length or 10 feet, whichever is greater. In addition, the new bridge length should be at minimum the proposed new bridge improvement length described in NBI.

$$L_{new\ bridge\_calc} = L_{existing\ bridge} + \max(20\% \times L_{existing\ bridge}, 10\ ft),$$
$$L_{new\ bridge} = \max(L_{new\ bridge\_calc}, L_{Proposed})$$

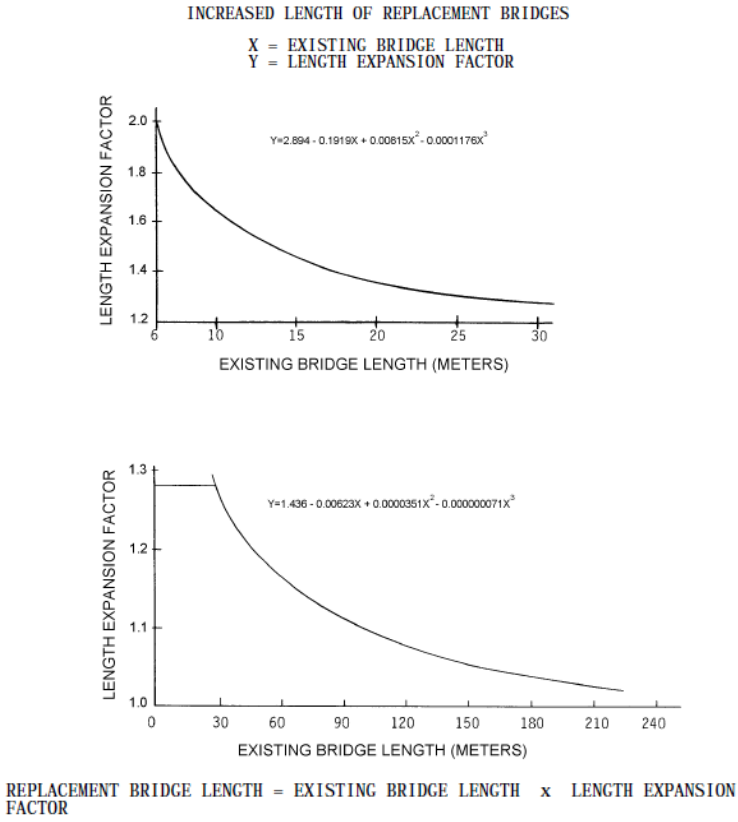


Figure A.1 - NBI Bridge Replacement Length Factor

Step 4. Determine new bridge replacement type

Many different site-specific factors determine the best type of bridge for any particular location. Bridges can be made with different material such as concrete, timber, or steel. Precast concrete and steel girders can be fabricated off site, while cast in place concrete is constructed in place.

With concrete materials, bridges can be constructed as traditional reinforced concrete (RC), or as prestressed (PS) concrete where high-strength strands are tensioned within the concrete structural element to strengthen the reinforced concrete. Prestress strands can be pre-tensioned (tensioned before concrete pour) or post-tensioned (tensioned after the concrete pour).

Pre-tensioning bridge elements are constructed on a pre-cast fabrication yard. At the fabrication yard, the pre-cast concrete beams are formed and built. Beams would be pretension to provide additional strength for the PC concrete beams. This construction method is called Pre-Cast (PC) Prestressed (PS).

Post-tensioned bridges are constructed on the project site. On site, temporary timber falsework is built to form the bridge and support wet concrete. Ducts are placed within the forms to provide openings for post-tensing strands. After the concrete is cast and adequate concrete strength is reached, the prestressing strands are stressed to provide additional strength for the structure. When the designed concrete strength are reached, the temporary falsework is then be removed. This construction method is called Cast-in-Place (CIP) Prestressed (PS). Figure A.2 below shows a post-tensioned cast-in-place concrete bridge type before concrete pour. And Figure A.3 on the following page shows a erection of precast girders on cast-in-place abutments.

Figure A.2 - Prestressing ducts placed in a cast-in-place box girder bridge
Manning Avenue over Kings River Bridge, City of Reedley, CA

Figure A.3 - Pre-cast Girder Bridge Erection
Hilderbrand Drive Bridge over Saint Helena Creek in Lake County, CA

In addition to different materials and construction methods, there are different bridge geometric and cross-section types. In general, deeper bridge sections can designed to accommodate longer bridge spans. For example, slabs are thin and have shorter span limits compared to beams that offers longer span limits. Few common types of concrete bridges include solid slabs, voided slabs, I-Beams, T-Beams or box girders. Hence, with different combinations, a bridge could be one of the following common type of bridge types. Common box girder and slab bride sections are shown in Figure A.4 below.

- CIP RC Slab
- CIP T-Beams
- CIP RC Box Girder
- CIP PS Slab
- CIP PS Box Girder
- PC PS Slab
- PC/PS "I" Girder
- Bulb Tee Girder
- Wide Flange Girder
- PC PS Box Girder

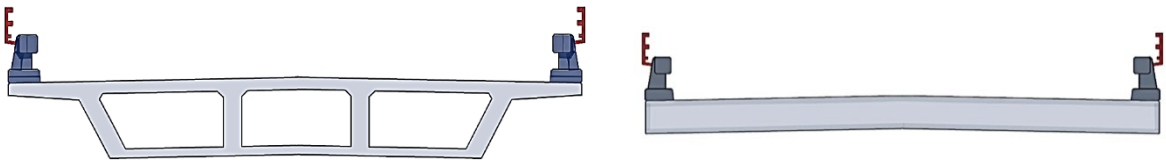


Figure A.4 - Cast-in-place concrete box girder (Left) and Cast-in-place concrete slab (Right)

Different construction methods and material offers different advantages and disadvantages. Depending on site location and site constraints, a specific material and construction method is more advantageous than other materials and construction methods. For example, PC concrete bridges and steel beams/girders minimize bridge site impacts because falsework is not required. For instance, if a bridge crosses a navigational waterway, constructing a cast-in-place concrete type of bridge may not be preferred because the falsework will likely inhibit navigational clearance. Similarly, if a bridge crosses over railroad or traffic lanes then a pre-cast option may be preferred over a CIP option, to minimize the duration of overhead construction activities. Figure A.5 below shows a pre-cast girder utilized to span rail road.

Figure A.5 - Pre-Cast Girders used to span railroads
Edna Overcrossing Bridge on Price Canyon Road, San Luis Obispo County, CA

Steel bridges offer more strength than concrete bridges, therefore they can span longer than comparable concrete bridges. However, steel bridges require more maintenance to frequently repaint the steel to provide coating protection to prevent corrosion. Figure A.6 on the following page shows an example of steel girder designed for the long span.

Figure A.6 - Steel plate girder bridge erection
Poema Avenue over Devils Canyon Creek, Los Angeles County, CA

For this analysis, the following methodology is used:

- For bridges crossing over navigational waterways, railroads, and traffic of more than four lanes, new bridges are assumed to be replaced with a pre-cast concrete bridge type. If the bridge to be replaced does not cross over navigational waterways, railroads, or traffic of more than four lanes, then the cast-in-place bridge type would be used.

- When the cast-in-place box girder type is required, it is also assumed to be prestressed concrete. Typically, concrete box girder types are required over long span lengths, and the prestressed concrete type allows for economical design by minimizing the superstructure depth compared to a conventionally reinforced concrete (non-prestressed) box girder.

- If cast-in-place slab type is elected, a conventionally reinforced concrete option is assumed. This type selection process is assumed because, typically, the added cost of utilizing prestressing in a thin slab does not outweigh the slight reduction in concrete volume savings. If a bridge can be designed be a short span, then the bridge could be designed without prestressing.

- A steel girder bridge is assumed if the length of a bridge span exceeds the common maximum allowable span length of concrete bridges, or if the existing bridge is a steel girder bridge. For common precast prestressed concrete box girder option, the maximum length is limited to 200 feet. For cast-in-place prestressed concrete box girder types, the maximum common length is limited at 250 feet. For span length exceeding those limits, steel girder bridges are commonly used. Steel bridges are considered to have higher maintenance and inspection costs as recurring paint coating maintenance is required to protect the steel from corrosion. Because steel bridges cost more, steel bridges are not selected as the replacement bridge type unless the site condition requires long bridge span lengths or indicates benefits with the use of steel.

Another category of bridge type considered are those that are classified as “Historically Significant” bridge types. "Historically Significant" bridges are structures that are on or are eligible to be on the National Register of Historic Places. These structures could be considered "Historically Significant" for a number of factors including their age and uniqueness, their type of design, the people who designed or built them, or the role they played in the context of their local setting. Typically, historic bridges are unique types that are no longer constructed today as they are not as cost-effective as more modern designs. An example of a historically significant bridge is a historic steel truss bridge shown below in Figure A.7. A timber truss bridge is another special type of uncommon bridge that are often considered historically significant, examples are shown below in Figure A.8. Historically significant bridges require more effort to rehabilitate or replace. These added efforts include special design considerations, environmental analysis and mitigation measures, and public outreach. Due to the additional effort required to work on historically significant bridges, these bridge replacement types were classified into their own category that requires higher construction and design costs. For this study if an existing bridge is a historically significant bridge it is assumed the new bridge will be a specialized design type that requires a higher level of engineering and environmental compliance process.

Figure A.7 - Historically Significant Steel Truss Bridge (Replaced)
Klamath River Road over Klamath River, Siskiyou County, CA

Figure A.8 - Potentially Historically Significant Timber Truss Bridge (Rehabilitated)
Brookwood Drive over Jacoby Creek, Humboldt County, CA

Step 5. Determine new bridge type unit cost

Different bridge types have different ranges of unit costs. The range of unit cost for a given bridge type is primarily based on the site location. For example, a bridge located in a remote rural area that is distant from a concrete manufacturing plant, a precast concrete yard, or a steel mill will cost more than a bridge located at a convenient, accessible location.

Shown in Figure A.9 below, Caltrans published a Comparative Bridge Costs that contains units cost information on different bridge types as general guidelines of its relative cost. The Caltrans comparative bridge type cost provides a good relative cost difference between different bridge types that is considered in this study. For this analysis, unit costs are determined primarily from actual historical construction bid data, with considerations for inflation.

COMPARATIVE BRIDGE COSTS

JANUARY 2019

The following tabular data provides some **general guidelines** for structure type selection and its relative cost. These costs should be used only for **preliminary estimates** until more detailed information is developed. The following factors must be taken into account when determining a price within the cost range:

Factors for Lower End of Cost Range	Factors for Higher End of Cost Range
Short Spans, Low Structure Height, No Environmental Constraints, Large Project, No Aesthetic Issues, Dry Conditions, No Bridge Skew	Long Spans, High Structure Height, Environmental Constraints, Small Project, Aesthetic Issues, Wet Conditions (cofferdams required), Skewed Bridges
Urban Location	Remote Location
Seat Abutment	Cantilever Abutment
Spread Footing	Pile Footing (Large Diameter Piling)
No Stage Construction	2-Stage Construction

Factors that will increase the price from 25% - 150% over the high end of the cost range

Structures with more than 2 construction stages	Unique substructure construction
Widenings less than 15 Ft.	

STRUCTURAL SECTION	COMMON SPAN RANGE (feet)	* COST RANGE (price/sqft)	REMARKS
RC SLAB	16 - 44	150-450	CAST-IN -PLACE CONCRETE BRIDGES ACCOUNT FOR APPROXIMATELY 65% OF BRIDGES BUILT ON CALIFORNIA STATE HIGHWAYS
RC T-BEAM GIRDER	40 - 60	175-500	
RC BOX GIRDER	50 - 120	150-400	
CIP/PS SLAB	40 - 65	No Current Cost Data	
CIP/PS BOX GIRDER	100 - 250	150-400	
PC/PS SLAB	20 - 50	200-550	NO FALSE WORK REQUIRED
PC/PS T GIRDER	30 - 120	No Current Cost Data	
BULB TEE GIRDER	90 - 145	150-375	
WIDE FLANGE GIRDER	90 - 180	300-450	
PC/PS I GIRDER	50 - 120	210-475	
ADJACENT PC/PS GIRDER	50 - 110	400-500	
PC/PS BOX GIRDER	120 - 200	No Current Cost Data	
STRUCTURAL STEEL I GIRDER	60 - 300	325 - 700	

NOTE: Removal of a box girder structure costs from $10 - $20 per square foot.

* "Price/SQFT" is calculated using "Bridge Costs Only" as defined by the Federal Highway Administration. The "Bridge Cost Only" is the sum of the "Superstructure" and "Substructure" bridge items, listed in Chapter 11 of the Bridge Design Aids Manual, multiplied by the bid item price. The "Superstructure" and "Substructure" bridge items do not include items such as: time related overhead, mobilization, bridge removal, approach slabs, slope paving, soundwalls, or retaining walls.

Figure A.9 - Caltrans Comparative Bridge Costs

Step 6. Determine bridge removal cost

Bridge removal cost is based on the amount of bridge to be removed as well as the bridge material type. A typical concrete bridge costs $15/SF to remove. However, if the existing bridge is a steel type built before year 1974, then lead abatement is typically required, increasing hazardous materials handling cost. For this study, the bridge removal cost of steel bridges built in and after 1974 is assumed to be $25/SF. For steel bridges built before 1974, the bridge removal cost increases to $35/SF. Figure A.10 below shows a containment system used at a steel truss bridge for lead abatement.

Figure A.10 - Containment System for Lead Abatement

Step 7. Comparison with NBI Bridge Improvement Cost

In the National Bridge Inventory database, a suggested bridge improvement cost and the year the improvement cost is estimated for a number of individual bridges. For this study, the suggested improvement cost is adjusted to 2020 present dollars from the estimated year to account for construction cost escalation.

In this analysis, a small percentage of the bridges had an adjusted NBI Bridge Improvement Cost greater than the replacement cost estimated from Steps 1-5 above. These bridges may contain special site specific characteristics that may not be captured within the global methodology. These site specific characteristics may include poor soil conditions such as liquefiable soil that requires higher bridge replacement cost due to stronger foundation needs--example shown below on Figure A.11. Of these few percentage of bridges, the higher replacement cost suggested by NBI data is used for this study.

Figure A.11 - Soil liquefaction and soil lateral spreading

Step 8. Determine Roadway Cost

Roadway cost is determined as a function of the bridge replacement cost. Through regression analysis, the roadway cost is estimated as a linear function of the bridge cost, f(x) = a*x + b.

To determine appropriate regression relationship between bridge and roadway construction cost, outliers bridge costs from high steel girder bridge types and historically significant bridge types are removed from regression analysis. Analysis results indicate that majority of the time the roadway cost could be estimated as 55% of the bridge construction cost.

Approach Roadway Construction Cost = 0.55 * Bridge Construction Cost

Step 9. Construction Cost

A partial sum project construction cost (Con Cost) is calculated from the sum of bridge replacement cost (bridge replacement and existing bridge removal) and approach roadway cost. This construction cost is used in estimating other construction related costs described below.

Con Cost = Bridge Construction Cost + Approach Roadway Construction Cost

Step 10. Determine Right-of-Way Cost

Right-of-Way cost is based on a site location. Right-of-Way is generally more costly to obtain at urban locations then rural locations. Based on regression analysis and accounting for inflation, the Right-of-Way cost on average is 15% of the construction cost at urban locations and 10% of the construction at rural locations.

Step 11. Determine PE Cost

Professional Engineering (PE) cost includes several components: preliminary engineering, environmental, and final design PS&E (Plans, Specifications & Estimates) costs. PE cost is not always directly proportional to the construction cost. For instance, California requires numerous environmental documents for all projects of different sizes. However, smaller scaled construction projects still require relatively the same amount of professional engineering cost compared to the larger scale construction costs. Therefore, the total PE cost does not increase directly proportional to the construction cost.

This study's regression analysis indicates that there is a bilinear relationship between the PE cost and the construction cost. The PE cost on average is 25% of the Construction cost up until projects costs up to $10,000,000. For project greater than ten-million dollars, the PE cost is a linear function of the construction cost, f(x) = a*x + b;

PE = 0.25* Con Cost, for Con Cost < $10 million

PE = 0.07 * Con Cost + 1,800,000 > $10 million

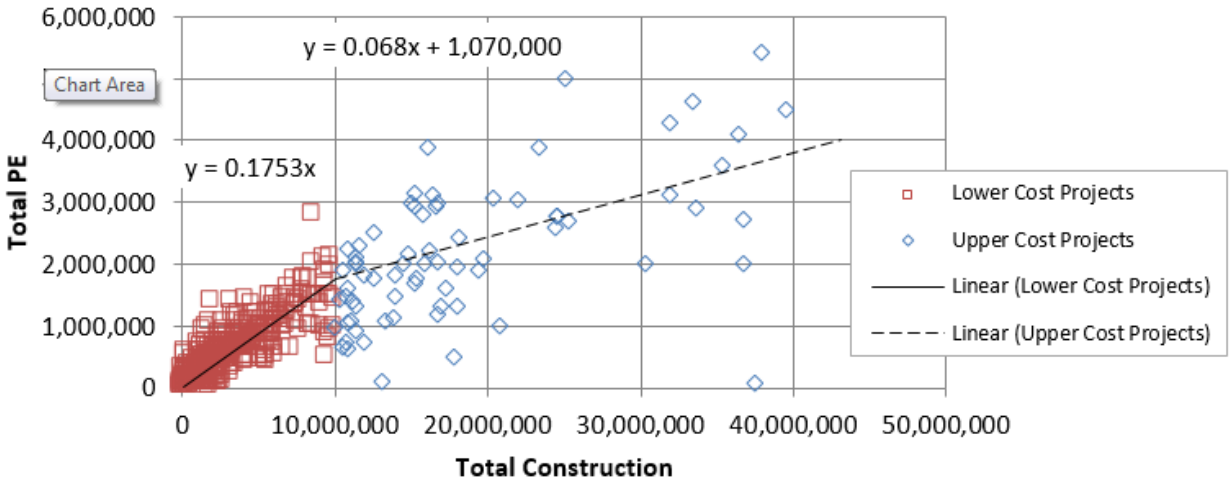


Figure A.12 - Bi-Linear Regression of PE Cost Estimate versus Construction Cost

Step 12. Determine Construction Mobilization Cost

Based on industry standards and confirmed by regression averages, the construction mobilization cost is usually 10% of the Construction Cost.

Mob Cost = 10% * Con Cost.

Step 13. Determine Construction Contingency Cost

Depending on what stage of the planning or design phase, construction contingency cost can range from 5% to 25%. With the detailed analysis of bridge type selection, roadway approach cost, and other construction associated cost calculations, the construction contingency cost is estimated at 10% of the construction cost.

Construction Contingency = 15% * Con Cost.

Step 14. Determine Construction Management Cost

Based on industry standards and construction support data collected, construction management cost is taken as 15% of the construction cost.

CM Cost = 15% * Con Cost.

Step 15. Total Bridge Replacement Cost for an individual bridge

The total cost to design and replace an individual bridge is the sum of all the costs described and calculated above. This study calculated the bridge replacement need on a bridge by bridge evaluation, and then calculations the total bridge replacement cost for each individual bridge. The sum of all the individual bridges' replacement cost is the total global state wide bridge replacement needs.

The total global state wide local agency bridge replacement cost is then obtained by summing the bridge replacement cost for each bridge:

Individual Bridge Replacement Cost = Σ of following

- Professional Engineering and Environmental cost
- Right-of-Way cost
- Existing bridge removal cost
- Bridge Replacement construction cost
- Approach Roadway construction cost
- Construction mobilization cost
- Construction contingency cost
- Construction management cost

Total Bridge Replacement Need = Σ of Individual Bridge Replacement Costs

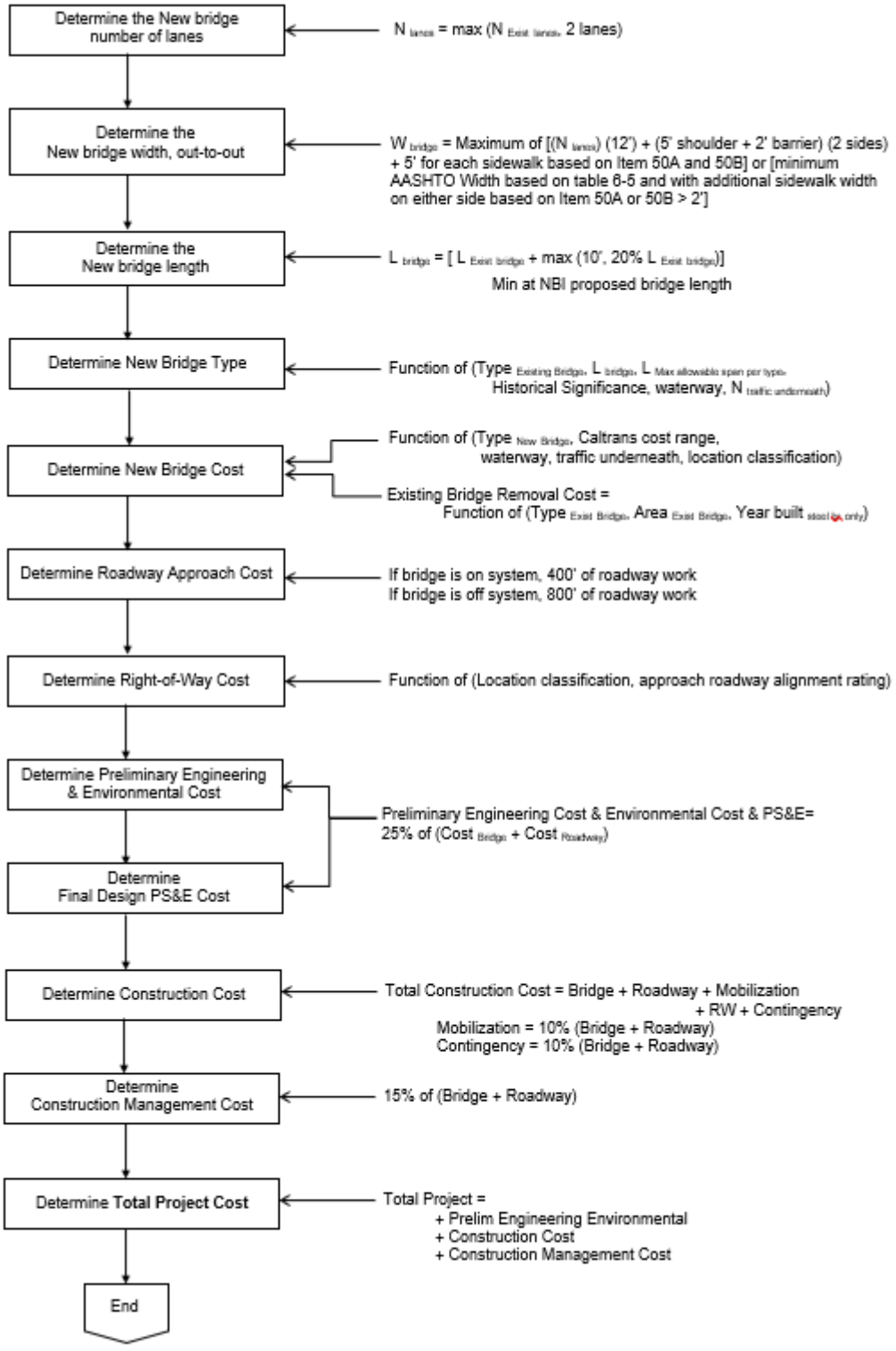


Figure A.13 - Determination of Bridge Replacement Geometry and Cost

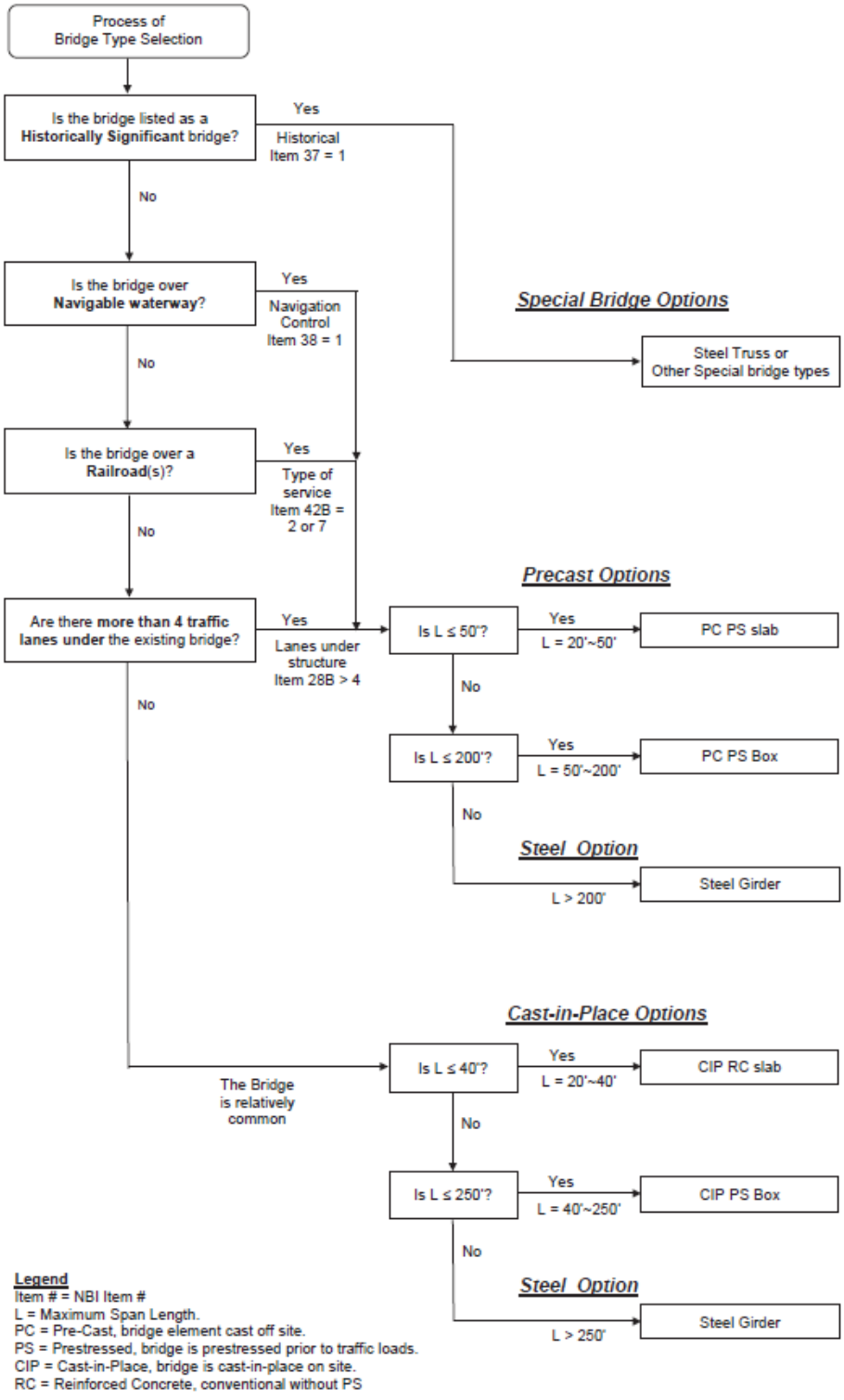


Figure A.14- Bridge Type Selection Flowchart

1.1.2 Determination Bridge Unit Cost

The detailed methodology shown above describes the process of how a replaced bridge's geometry and types are determined. Once a bridge type is selected, the process of how to determine the unit cost is described in detail below.

The unit cost for a selected type depends on the site characteristics. Bridges located at remote rural locations (defined as bridges with detour length greater than 10 miles for this study) are generally on the upper range of unit cost. Remote rural project sites require higher construction costs due to the site's greater distance from readily available construction materials and equipment and the resulting cost to mobilize to the site. Bridge replacements located in rural locations that are relatively easily accessible cost less. Bridge replacements located in urban areas usually cost more than bridges in rural areas due to factors such as traffic management, limited work space, utility coordination, and other urban constraints.

The bridge unit costs are generated from Caltrans unit costs as a starting baseline and are then adjusted based on awarded contract bid data from local agency projects from the last 10 years (adjusted for inflation). The average bridge unit cost obtained from actual historical projects is slightly higher than the range of 2011 unit price Caltrans suggests, since the Caltrans unit cost does not include bridge removal, retaining walls, other bridge construction costs, and inflation. Furthermore, projects with more than two construction stages, unique substructure foundations, or special site conditions would also increase the project cost beyond the Caltrans' typical unit cost range.

The flowchart Figure A.16 on the next page illustrates the determination of unit cost for different bridge types at different bridge site locations used in this study.

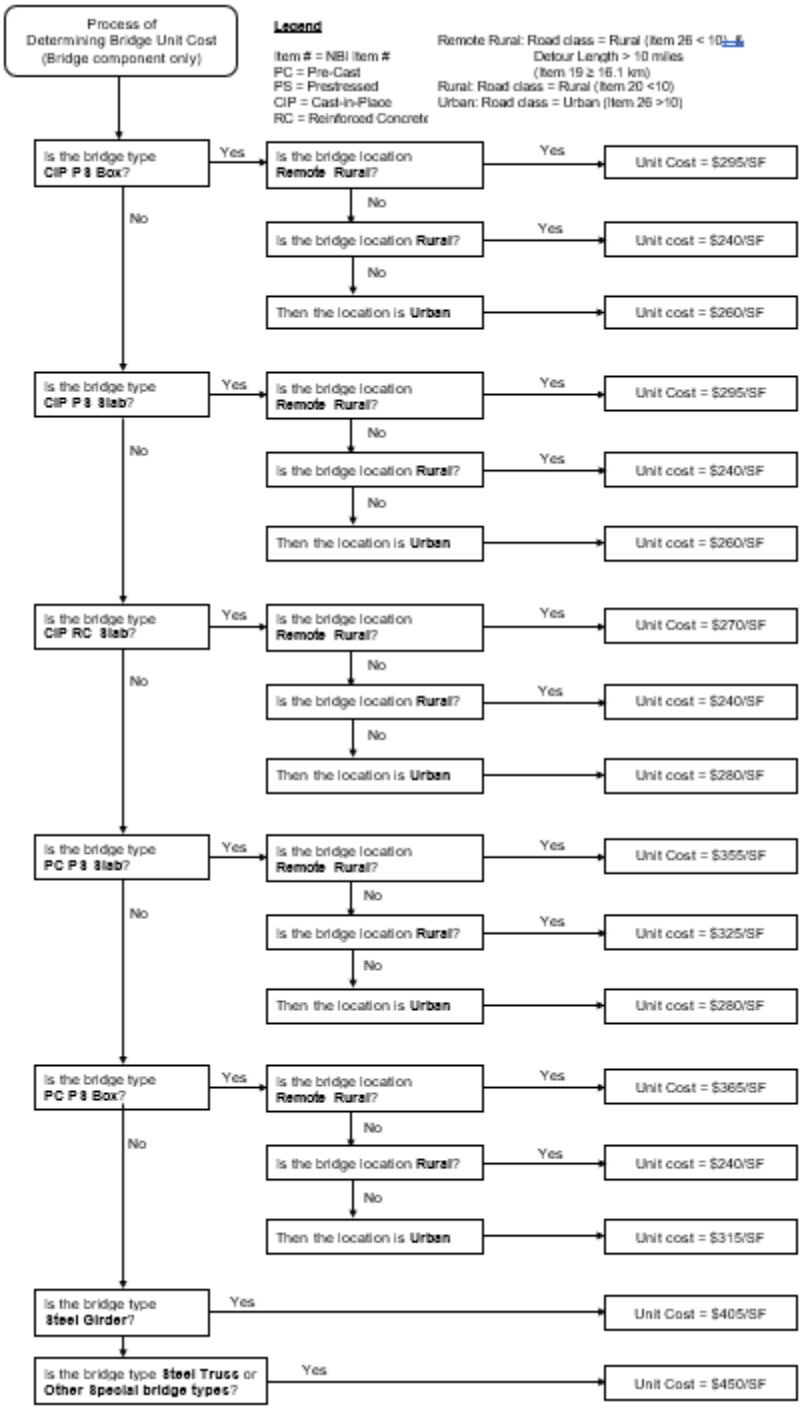


Figure A.16 - Replacement Unit Costs Flowchart

APPENDIX B:
Local Agency Bridge Survey Questionnaire

California Statewide Local Streets and Road Needs Assessment 2020
Bridge Portion - Local Agency Survey Questions and Results
6/5/2020

Local Agency Profile Information Section

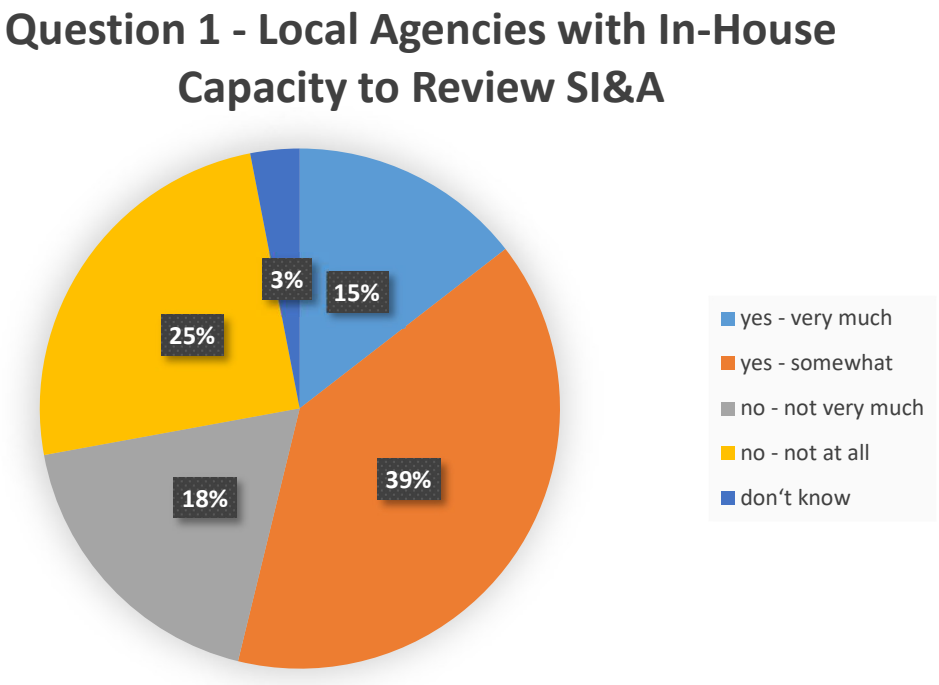
This portion of the survey is intended to gather information for understanding the current policy and operations of Local Agencies in managing their bridge inventory and bridge projects.

1. Does your local agency have in-house capacity to routinely review the Work Recommendations and Structure Inventory and Appraisal Report (SI&A) contained within Caltrans Bridge Inspection Reports to determine your agency's bridge needs (repairs, maintenance, rehabilitation, replacement, and other work recommend in Bridge Inspection Reports) including prioritization of bridge projects?

   Answer format - drop down box to select one of:
   - *Yes - very much*
   - *Yes - somewhat*
   - *No - not very much*
   - *No - not at all*
   - *"Don't know"*

   Results:

   Total Response: 262
   Total Non-Responses: 272
   Response Rate: 49%



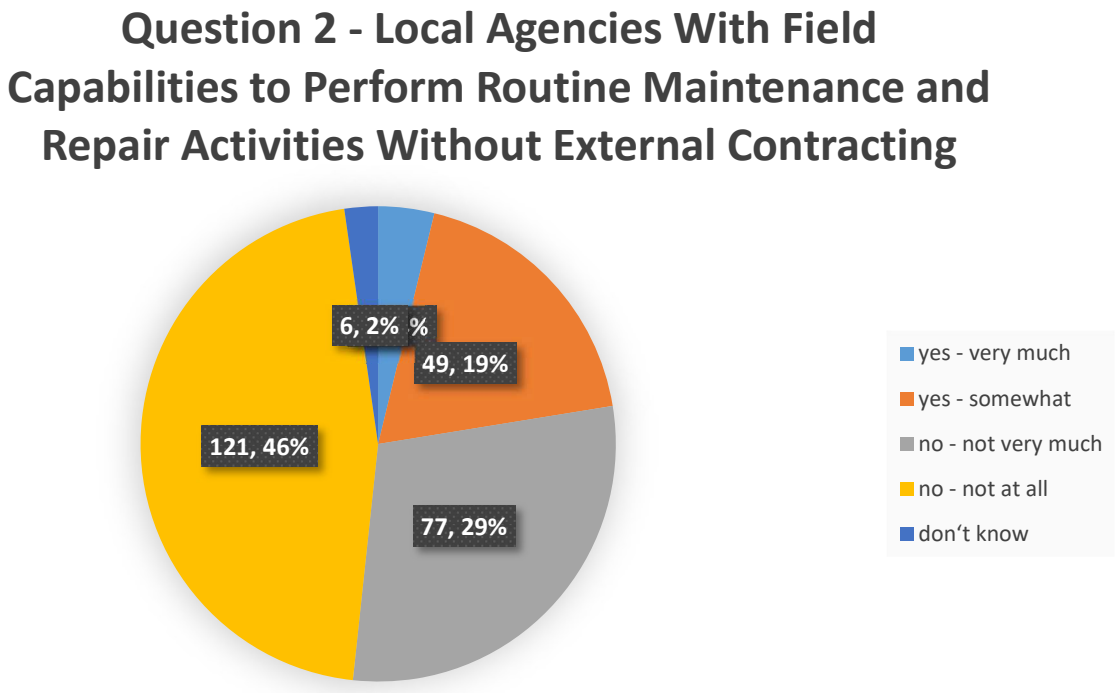
2. Does your agency have field capabilities to perform routine maintenance and repair activities on your bridge inventory without external contracting?

Answer format - drop down box to select one of:

- *Yes - very much*
- *Yes - somewhat*
- *No - not very much*
- *No - not at all*
- *"Don't know"*

Results:

Total Response: 263
Total Non-Responses: 276
Response Rate: 49%



3. During the past 3 years which other funding sources has your local agency used for bridge projects?

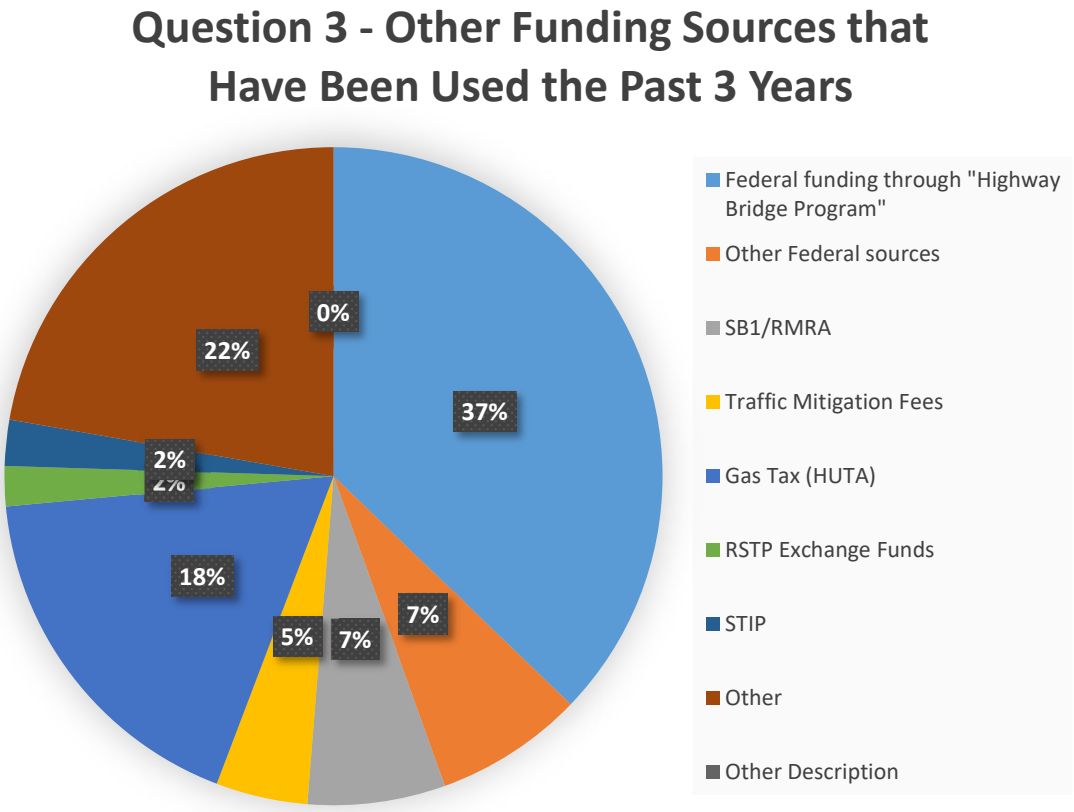
Answer format - Check boxes for the following options, check all the apply

- *Federal funding through "Highway Bridge Program"*
- *Other Federal sources*
- *SB1 RMRA*
- *Traffic Mitigation Fees*
- *Gas Tax (HUTA)*
- *RSTP Exchange Funds*
- *STIP*

- *Other local (Bond, Measure, etc)*

Results:

Total Response: 263
Total Non-Responses: 276
Response Rate: 49%



Other Descriptions: Local funds, Prop 1B, , General Funds, , Regional, CCTA, Seismic Retrofit, , Prop C, Bridge Program, FEMA, I-10 Bridges, Sales Tax, Local Measures, TUMF, Developer, Transportation Sales Tax, ATP Grant, BPMP, OBAG, MPO (TCAG), RSTP Exchange, Maintenance Funds

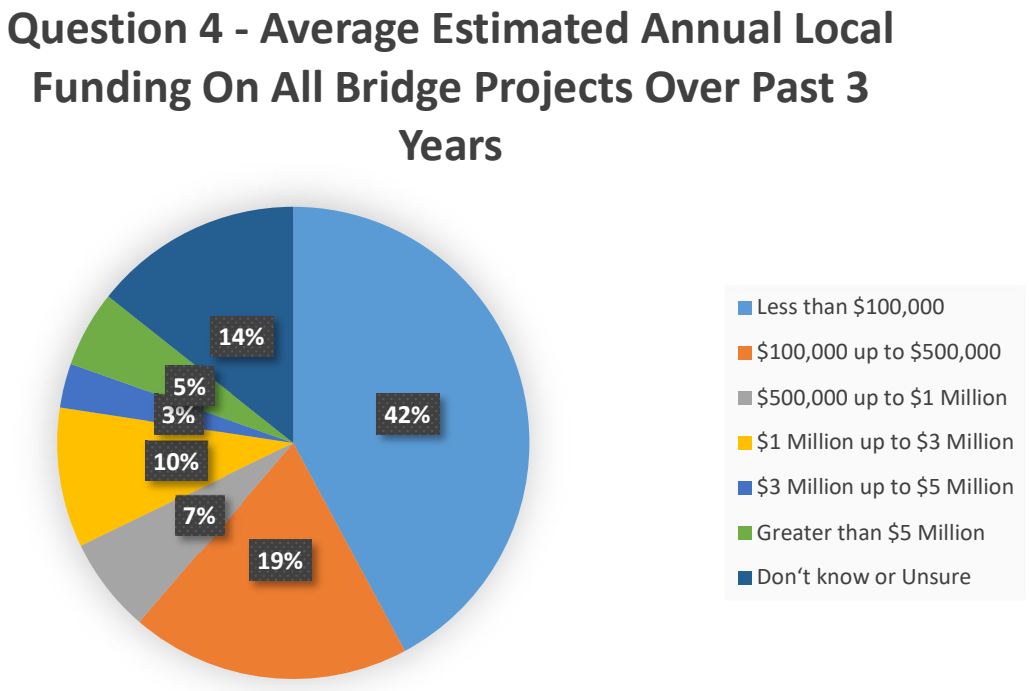
4. On average, using the past 3 years, what is the typical annual local funding your agency has expended on **all bridge projects** (total expenditures for replace, rehab, repair including associated project costs for engineering, environmental compliance, permitting, right-of-way, etc)?

Answer format - drop down box to select one of:

- *Less than $100,000*
- *$100,000 up to $500,000*
- *$500,000 up to $1 Million*
- *$1 Million up to $3 Million*
- *$3 Million up to $5 Million*
- *Greater than $5 Million*
- *"Don't know or Unsure"*

Results:

Total Response: 230
Total Non-Responses: 309
Response Rate: 43%



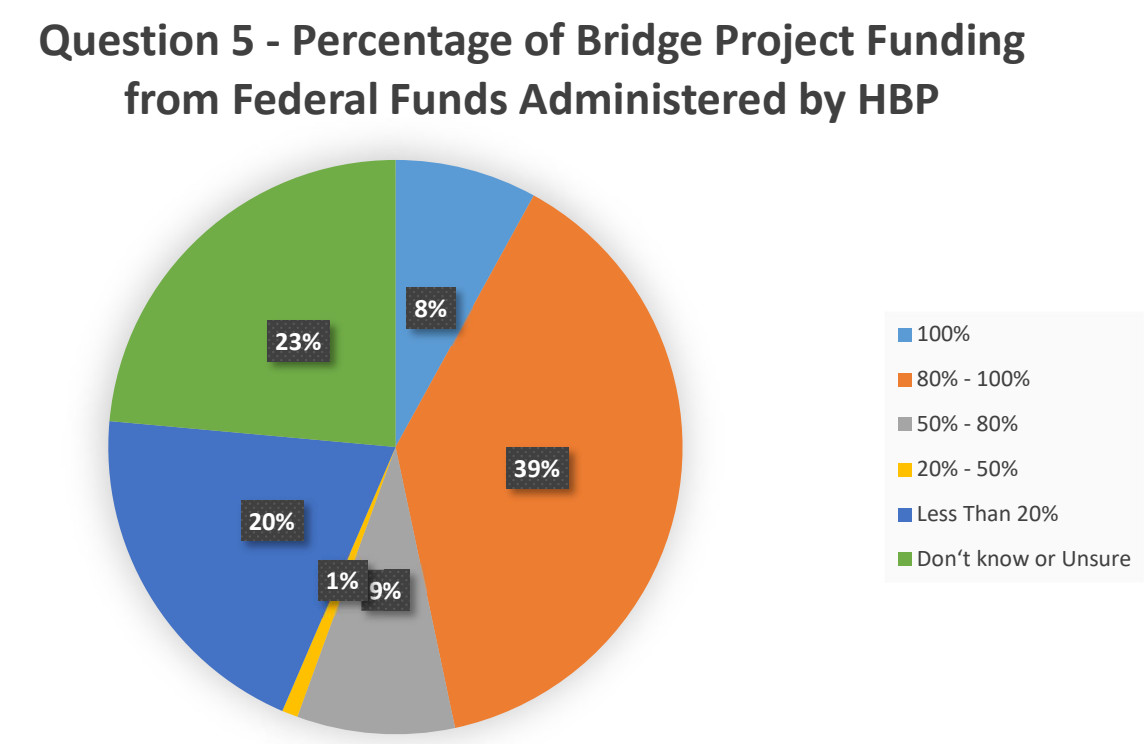
5. What percentage of your bridge project funding comes from the federal funds administered through Caltrans under the "Highway Bridge Program"?

Answer format - drop down box to select one of:

- *100%*
- *>80% to <100%*
- *>50% to ≤80%*
- *>20% to ≤50%*
- *20% or less*
- *"Don't know or Unsure"*

Results:

Total Response: 225
Total Non-Responses: 314
Response Rate: 42%



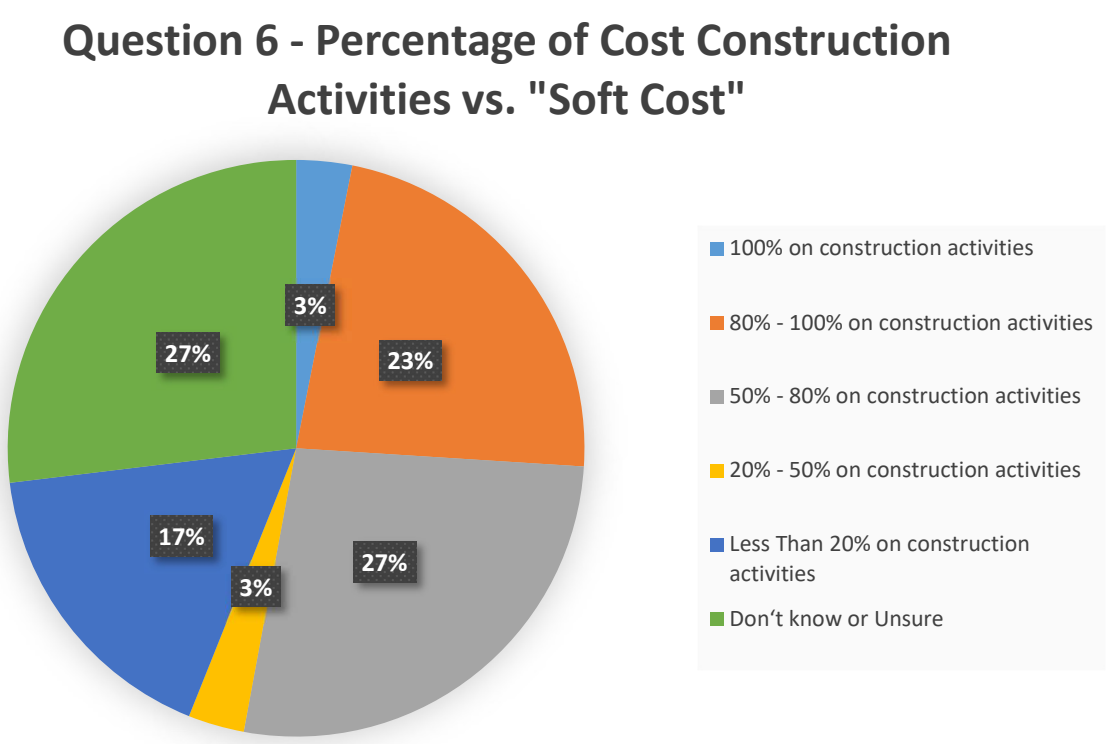
6. What percentage of your bridge project funding is spent on construction activities compared to non-construction project “soft costs” (such engineering, permitting, utility coordination)?

Answer format - drop down box to select one of:

- *100%*
- *>80% to <100%*
- *>50% to ≤ 80%*
- *>20% to ≤50%*
- *≤20%*
- *"Don't know or Unsure"*

Results:

Total Response: 223
Total Non-Responses: 316
Response Rate: 41%



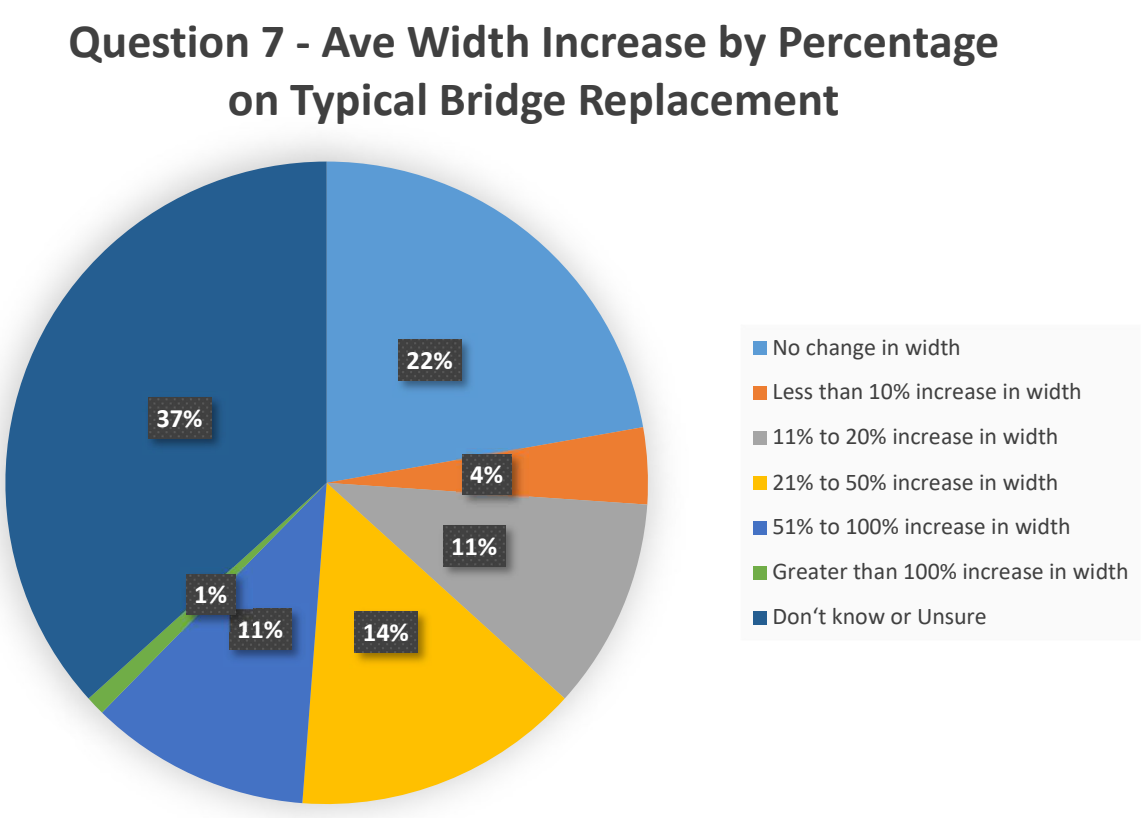
7. For Bridge Replacement Projects, on average what is the typical percentage of bridge width increase when replacing an old bridge?

Answer format - drop down box to select one of:

- *No change in width*
- *Less than 10% increase in width*
- *11% to 20% increase in width*
- *21% to 50% increase in width*
- *51% to 100% increase in width*
- *Greater than 100% increase in width*
- *"Don't know or Unsure"*

Results:

Total Response: 207
Total Non-Responses: 332
Response Rate: 38%



8. After reviewing the information about the Bridge Investment Credit (BIC) program in the Local Assistance Procedures Guidelines through the link below, does your agency plan to use the BIC program within the next three years?

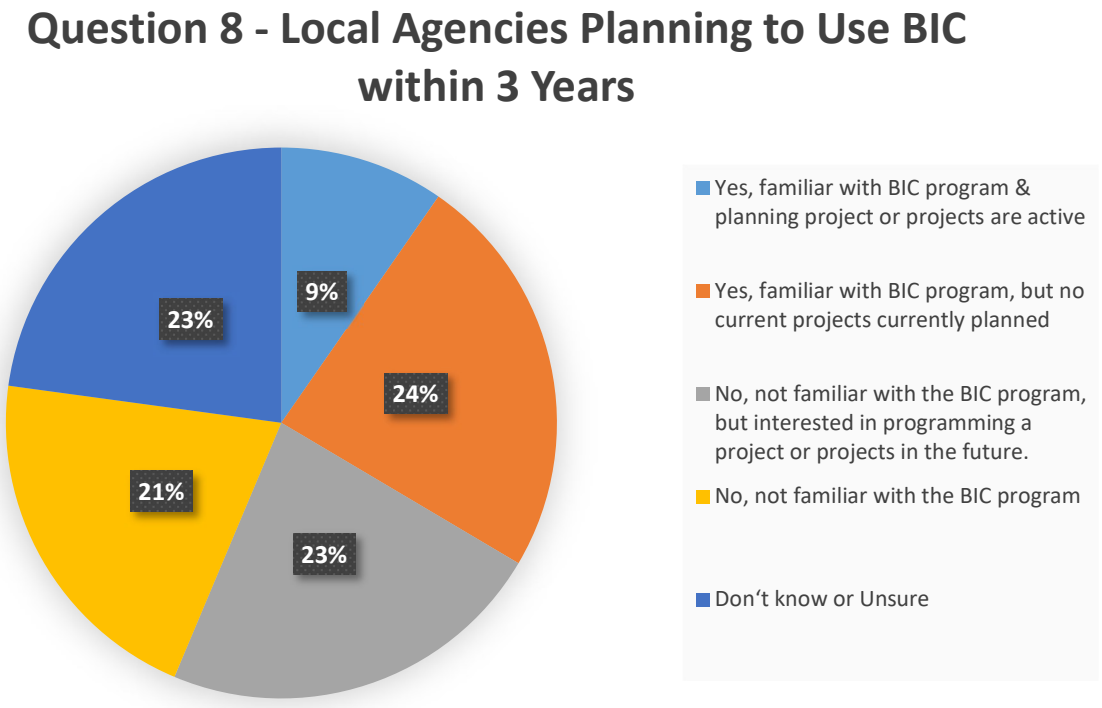
Answer format - drop down box to select one of:

- *Yes, familiar with BIC program & planning project or projects are active*
- *Yes, familiar with BIC program, but no current projects currently planned*
- *No, not familiar with the BIC program, but interested in programming a project or projects in the future.*
- *No, not familiar with the BIC program*
- *"Don't know or Unsure"*

(Detailed information about the BIC program can be found on page 32 of Caltrans' Local Assistance Procedures Guidelines at: https://dot.ca.gov/-/media/dot-media/programs/local-assistance/documents/lapg/g06.pdf)

Results:

Total Response: 197
Total Non-Responses: 342
Response Rate: 37%



9. What are the top three challenges faced by your local agency in completing bridge work projects (major rehabilitations and replacements)?

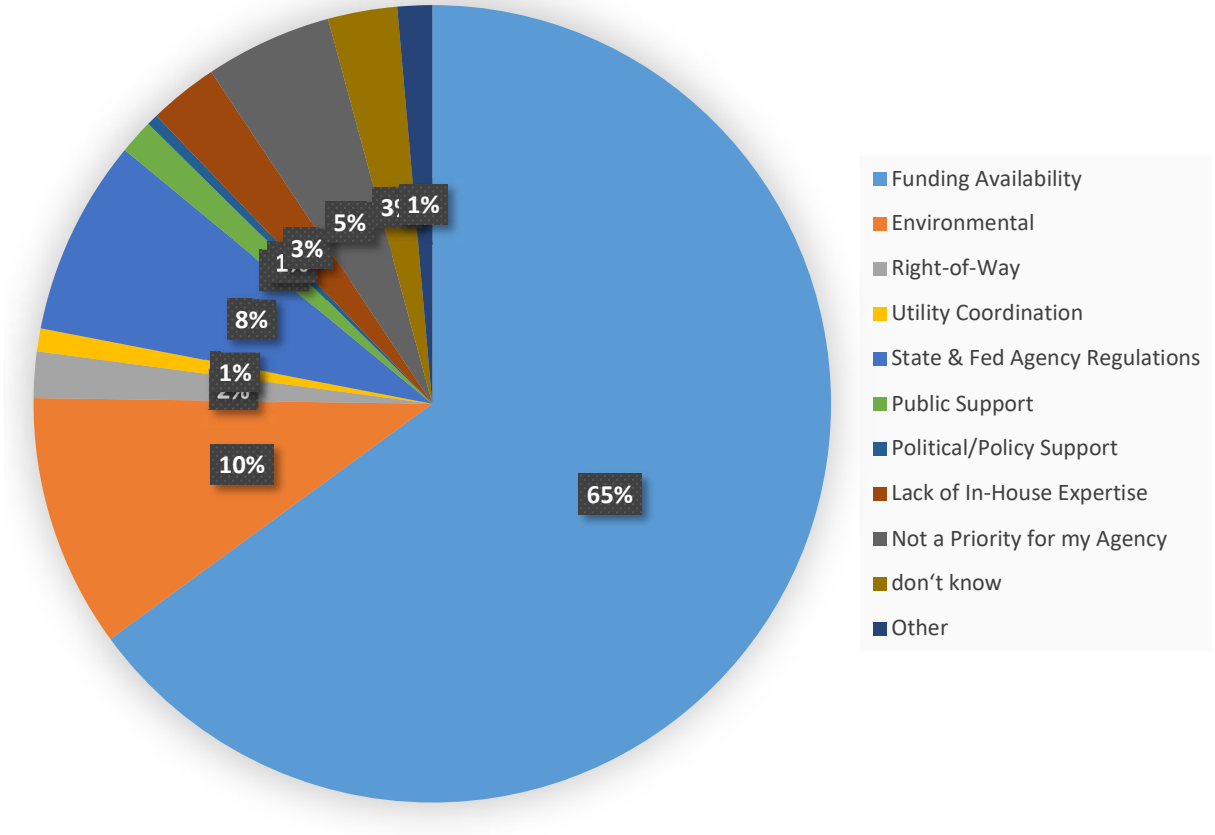
Answer format - three drop down boxes with do not allow selection of same criteria, other than "Don't know" ie "Don't know" could be selected more than once.

Greatest Challenge	*Second Greatest Challenge*	*Third Greatest Challenge*
• *Funding Availability* • *Environmental* • *Right-of-Way* • *Utility Coordination* • *State & Fed Agency Regulations* • *Public Support* • *Political/Policy Support* • Lack of In-House Expertise • Not a Priority for my Agency • *Don't know* • *Not listed*	• *Funding Availability* • *Environmental* • *Right-of-Way* • *Utility Coordination* • *State & Fed Agency Regulations* • *Public Support* • *Political/Policy Support* • Lack of In-House Expertise • Not a Priority for my Agency • *Don't know* • *Not listed*	• *Funding Availability* • *Environmental* • *Right-of-Way* • *Utility Coordination* • *State & Fed Agency Regulations* • *Public Support* • *Political/Policy Support* • Lack of In-House Expertise • Not a Priority for my Agency • *Don't know* • *Not listed*

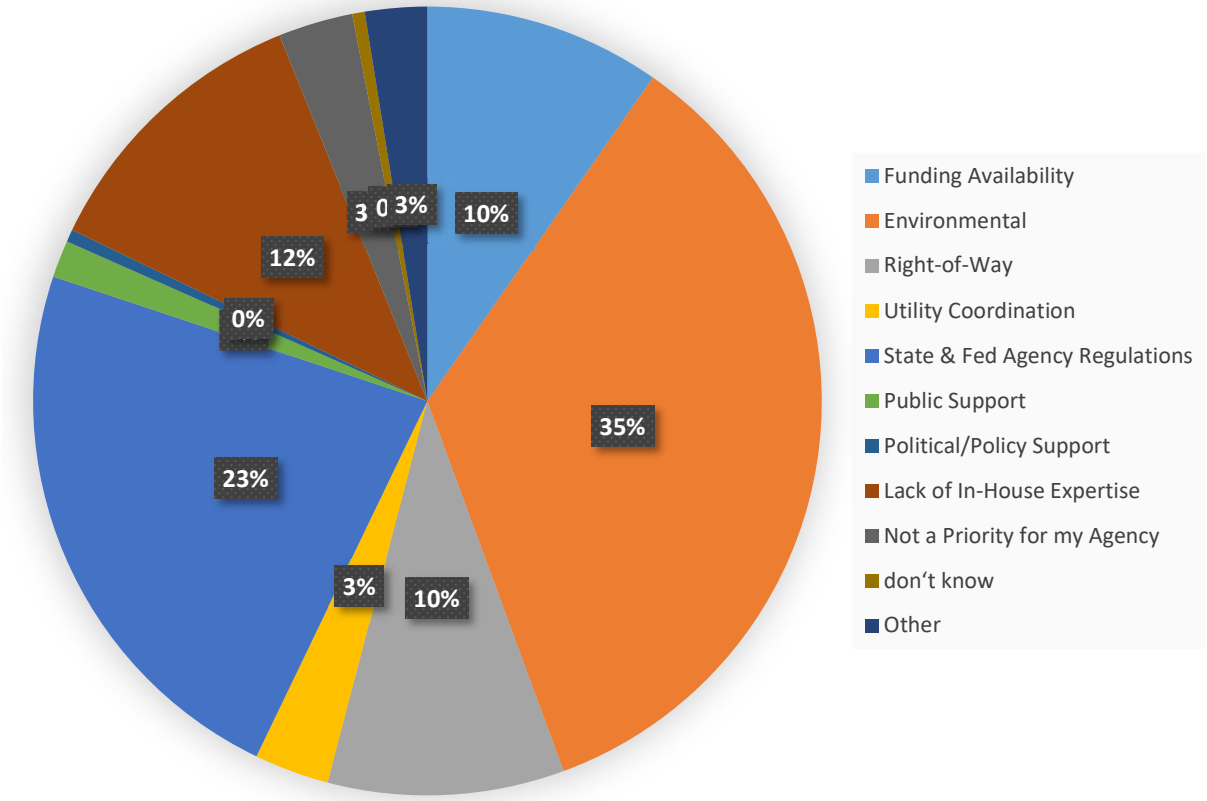
Results:

Total Response: 214 (Greatest), 196 (2nd Greatest), 192 (3rd Greatest)
Total Non-Responses: 325 (Greatest), 343 (2nd Greatest), 347 (3rd Greatest)
Response Rate: 40% (Greatest), 36% (2nd Greatest), 36% (3rd Greatest)

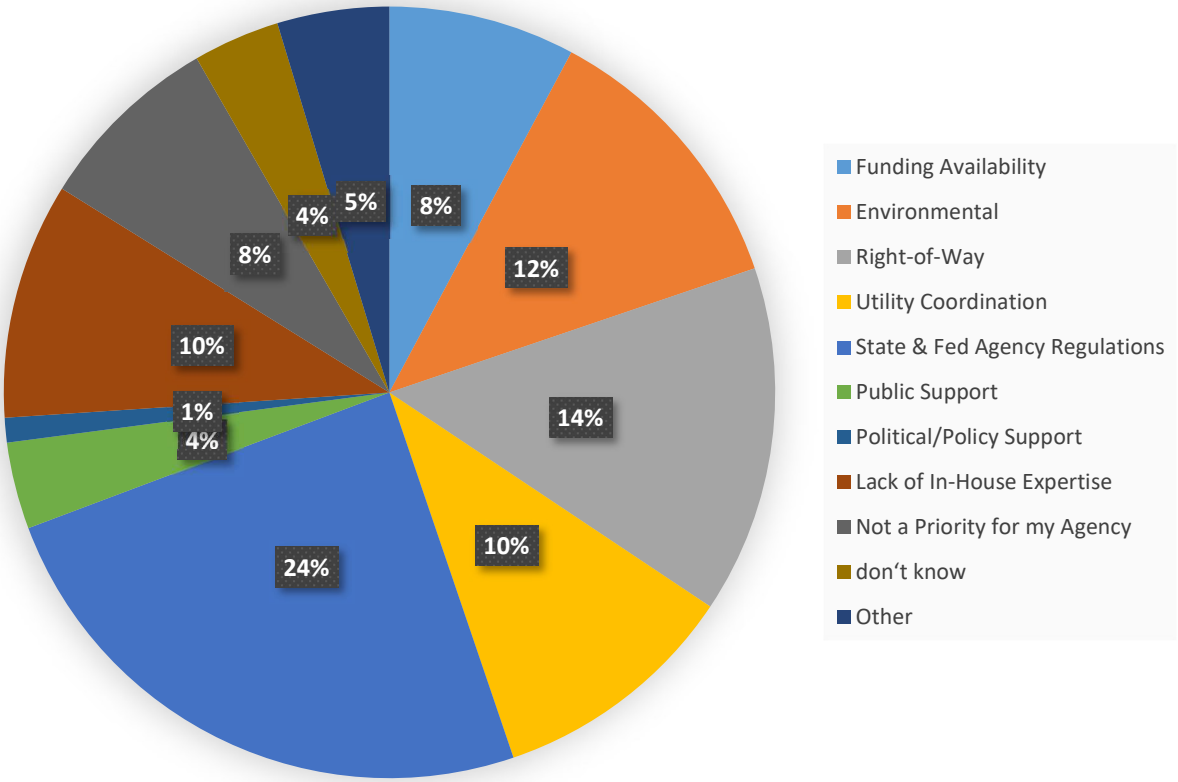
Question 9 - 1st Greatest Challenge Faced When Completing Bridge Work Projects

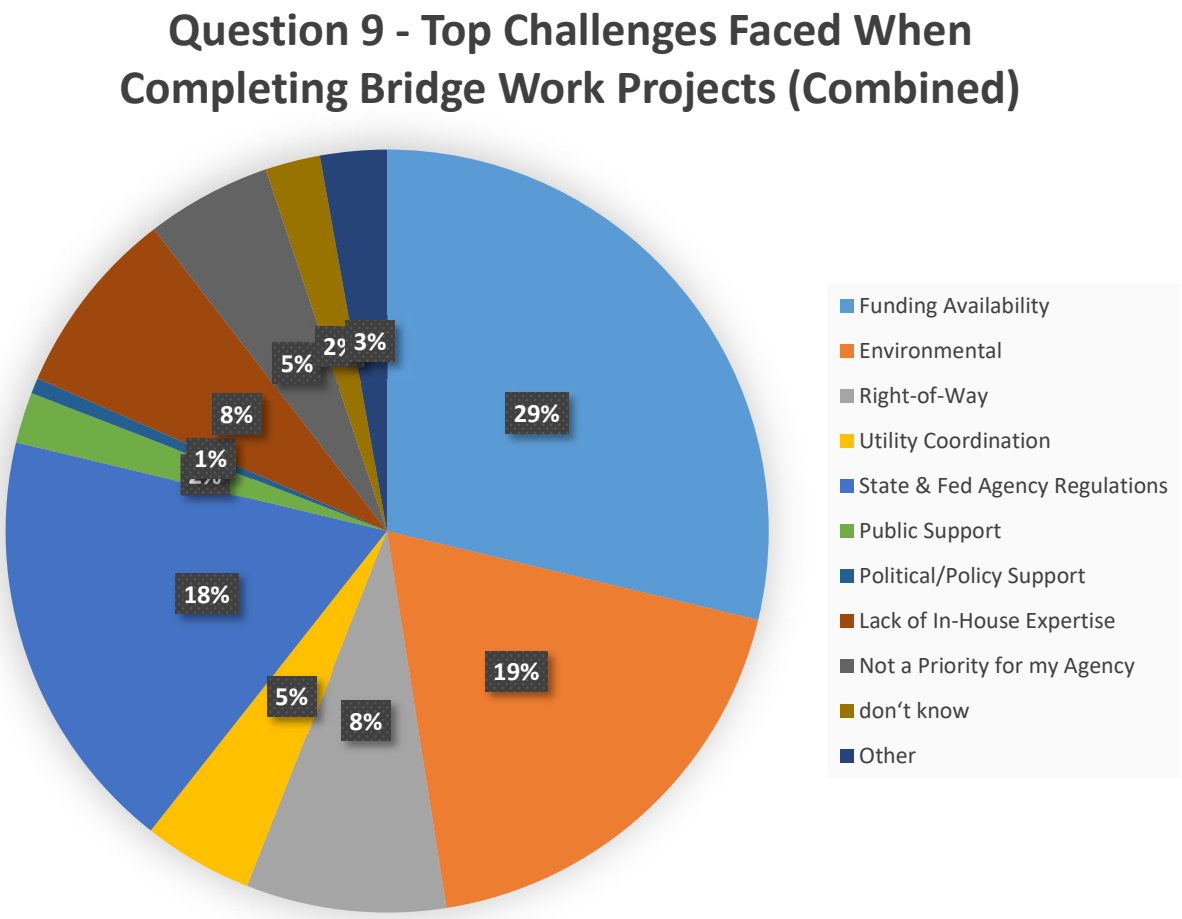


Question 9 - 2nd Greatest Challenge Faced When Completing Bridge Work Projects



Question 9 - 3rd Greatest Challenge Faced When Completing Bridge Work Projects





Other Descriptions: Staffing, High Cost, Competing Priorities, Caltrans Approvals,

Local Agency National Bridge Inventory Section

This portion of the survey is intended to gather information specific to Local Agency bridges within the National Bridge Inventory.

For defining the term "bridge", the definition contained in 23CFR 650.305 Definitions is used: *Bridge. A structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.*

10. Does your agency feel that the Work Recommendations, Structures Inventory and Appraisal Report, and Bridge Inspection Reports provided by Caltrans accurately reflect the needs and conditions of your local agency's NBI bridge inventory?

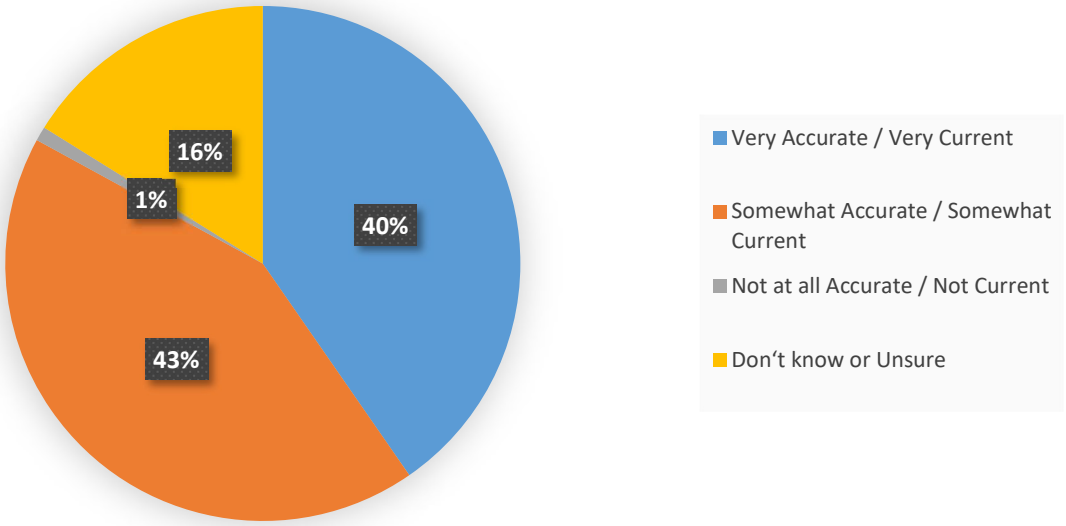
    Answer format - drop down box to select one of:

- *Very Accurate / Very Current*
- *Somewhat Accurate / Somewhat Current*
- *Not at all Accurate / Not Current*
- *"Don't know or Unsure"*

Results:

Total Response: 223
Total Non-Responses: 316
Response Rate: 41%

Question 10 - Reflection of Local Conditions in Caltrans Work Recommendations, Structures Inventory and Appraisal Report, and Bridge Inspection Reports



Comments: Don’t have qualified staff to protest SM&I findings. Functionally obsolete should be recommended for widening/replacement. A good secondary tool, but often the cost estimates are not realistic. Slowly addressing bridges 1 at a time due to funding system. Annual inspecting and reporting could provide more updated conditions of the bridges. Somtimes Site Conditions Differ. Very current but may under reporting conditions. The BIR's typically focus on the major aspects of the bridge. Sometimes they don't mention little issues. Ratings have gotten better in spite of there being no actions taken. This seems to be a result of having different inspectors. SI&A Report can be questionable... and inconsistencies with definitions of SD bridges have been found. Bridge conditions increased dramatically when Caltrans began calculating the sufficiency ratings. Ratings seem higher than expected. Lack of detail on work recommendation

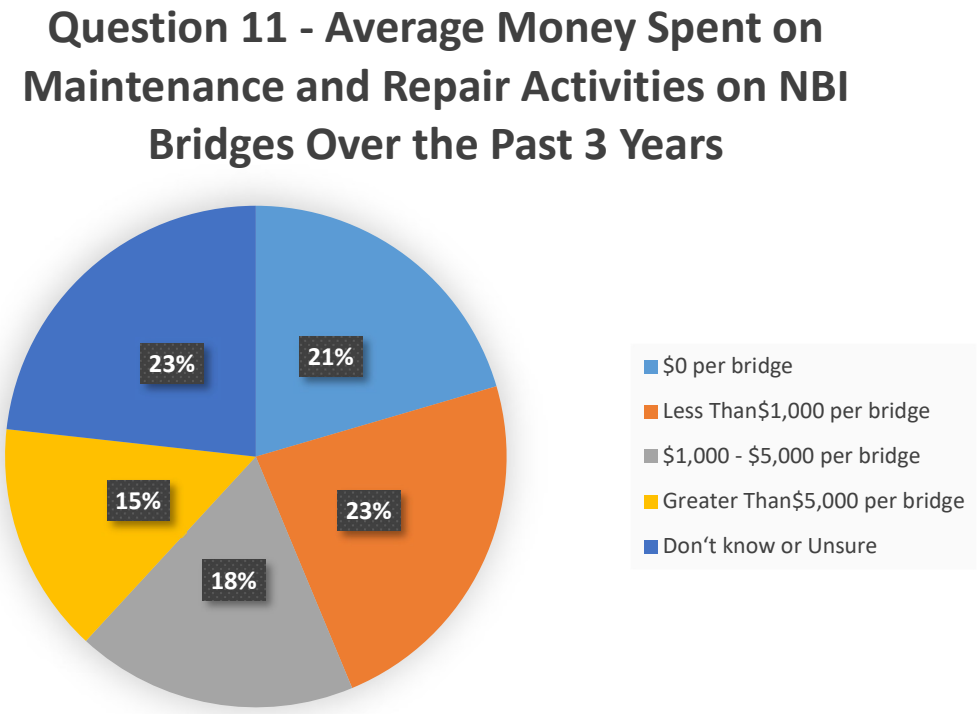
11. On average, over the past 3 years, how much local funding has your agency expended on ***maintenance and repair activities*** for your NBI bridge inventory (total maintenance expenditures divided by the number of your agency's NBI bridges)?

Answer format - drop down box to select one of:

- *$0 / bridge*
- *<$1000 / bridge*
- *$1,000 to <$5000 / bridge*
- *>$5000 / bridge*
- *"Don't know or Unsure"*

Results:

Total Response: 215
Total Non-Responses: 324
Response Rate: 40%



Local Agency Short Span Bridge Section

This portion of the survey is intended to gather information specific to "short span" Local Agency bridges that are not contained within the National Bridge Inventory (your agency does not receive inspection reports from Caltrans on these structures).

For the purposes of this survey, the definition of a "short-span" bridges should be considered to be a structures having an opening measured along the center of the roadway less than 20 feet clear, but greater than 8 feet between supports which carry public vehicular traffic.

12. How many short span bridges is your agency responsible for maintaining?

    Answer format: reportable number box or check box for "Don't know or Unsure"

Results:

Total Bridges: 2657* **
Total "Don't Know or Unsure": 72
Number of Responses with 0 Bridges: 48
Number of Responses with Greater than 0 Bridges: 86
Response Rate: 38%

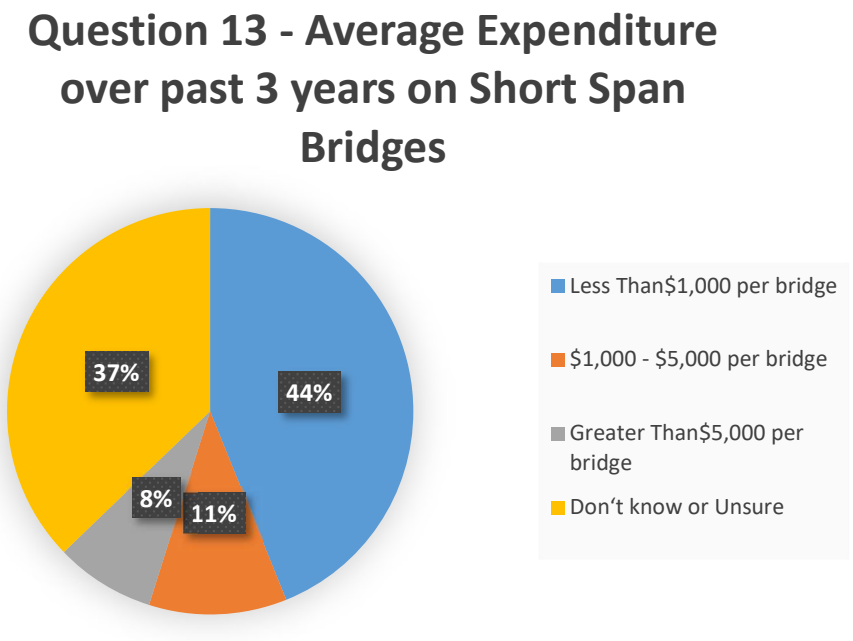
13. On average, over the past 3 years, what is your local agency's total annual expenditure for work completed on your short span bridges (total expenditure divided by the number of short span bridges reported in the question 12)?

    Answer format: drop down box to select-

    - *<$1000/bridge*
    - *$1000/bridge to <$5000/bridge*
    - *$5000 / bridge*
    - *"Don't know"*

Results:

Total Response: 164
Total Non-Responses: 375
Response Rate: 30%



Local Agency non-Vehicle Bridge Section

This portion of the survey is intended to gather information specific to non-vehicle Local Agency bridges used for Pedestrians and Bicycles

14. How many non-vehicular (pedestrian & bicycle) bridges is your agency responsible for maintaining?

    Answer format: reportable number box or check box for "Don't know"

    Results:

    Total Bridges: 669**
    Total "Don't Know or Unsure": 46
    Number of Responses with 0 Bridges: 68
    Number of Responses with Greater than 0 Bridges: 106
    Response Rate: 41%

15. What is the total square footage of non-vehicular (pedestrian & bicycle) bridges your agency responsible for maintaining?

    Answer format: reportable number box or check box for "Don't know"

    Results:

    Total Square Feet: 238,939 SF * **
    Total "Don't Know or Unsure": 106
    Number of Responses with 0 Bridges: 41
    Number of Responses with Greater than 0 Bridges: 47
    Response Rate: 36%

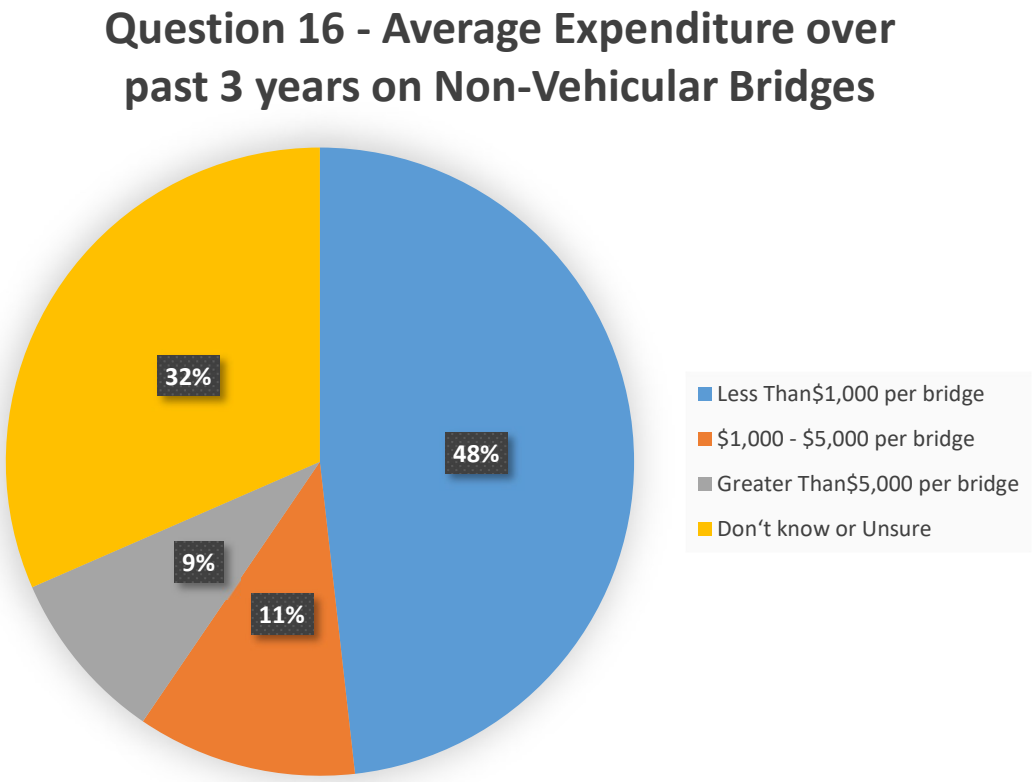
16. On average, over the past 3 years, what is your local agency's annual expenditure for work completed on your non-vehicular (bicycle & pedestrian) bridges?

    Answer format: drop down box to select-

    - *<$1000/bridge*
    - *$1000/bridge to <$5000/bridge*
    - *Greater than $5000 / bridges*
    - *"Don't know or Unsure"*

    Results:

    Total Response: 168
    Total Non-Responses: 371
    Response Rate: 31%



Future Local Agency Needs Projections - Vehicle Bridges

This portion of the survey is intended to gather information about the Local Agency's understanding of their current bridge challenges and future bridge needs

17. Based on ***public safety*** considerations, my local agency bridge inventory would benefit from the completion of the following types of projects over the next 10 years for Vehicle Bridges:

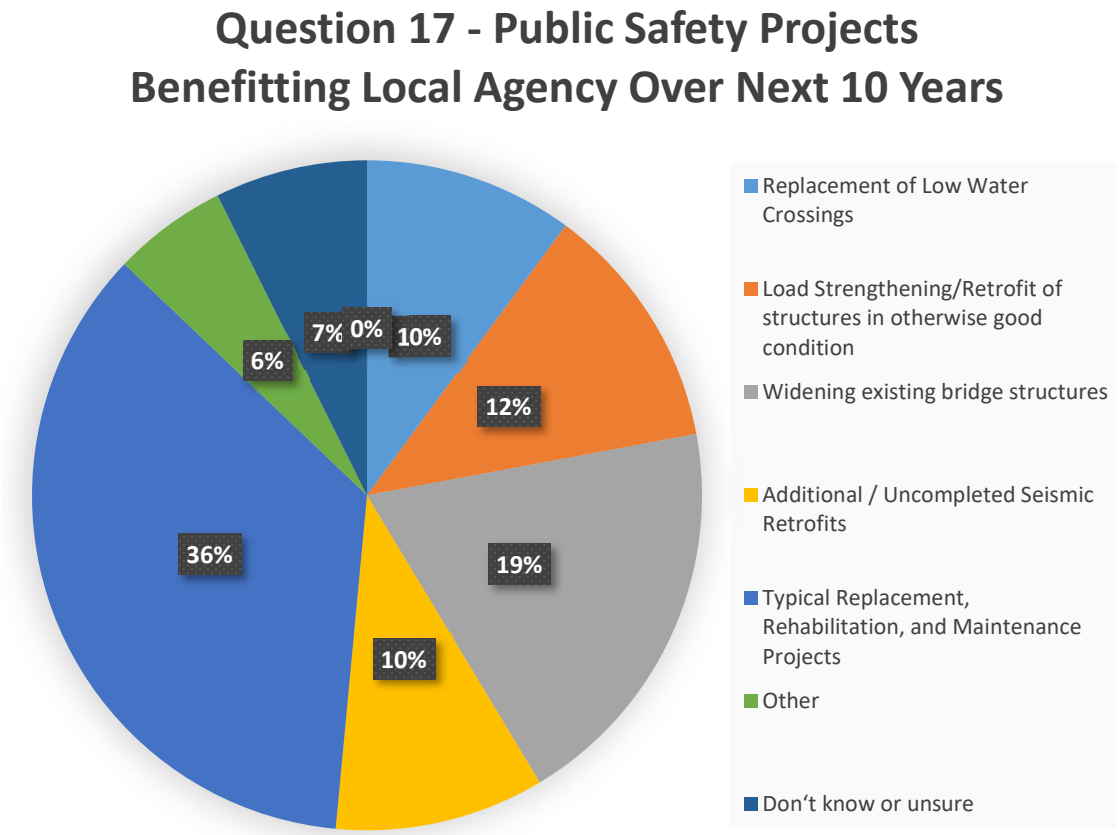
Answer format - Check boxes for the following options, check all the apply

- *Replacement of Low Water Crossings*
- *Load Strengthening/Retrofit of structures in otherwise good condition*
- *Widening existing bridge structures*
- *Additional / Uncompleted Seismic Retrofits*
- *Typical Replacement, Rehabilitation, and Maintenance Projects*

- *Other*
- *Don't Know or Unsure*

Results:

Total Response: 263
Total Non-Responses: 276
Response Rate: 49%



Comments: Inspection of ped bridges, Scour Repair, Culvert replacement less than 20' span, Upgrade substandard barriers, New Bridges, Replacement due to hydraulic inadequacy, Routine maintenance, bridge 11 years old, Deck Treatment and Joint Cleaning/Maintenance, Replacement of old culverts that become NBI bridges, Evaluation, Repair & Replacement of Short Span Bridges, Bank and rip rap protection,and scour reviews of pier caps, New Pedestrian Overcrossing.

18. The current value of completing the ***public safety*** projects identified in Question #17 including all project phases (engineering, construction, permitting, ROW, construction management, etc.) is best estimated at:

Answer format - drop down box to select-

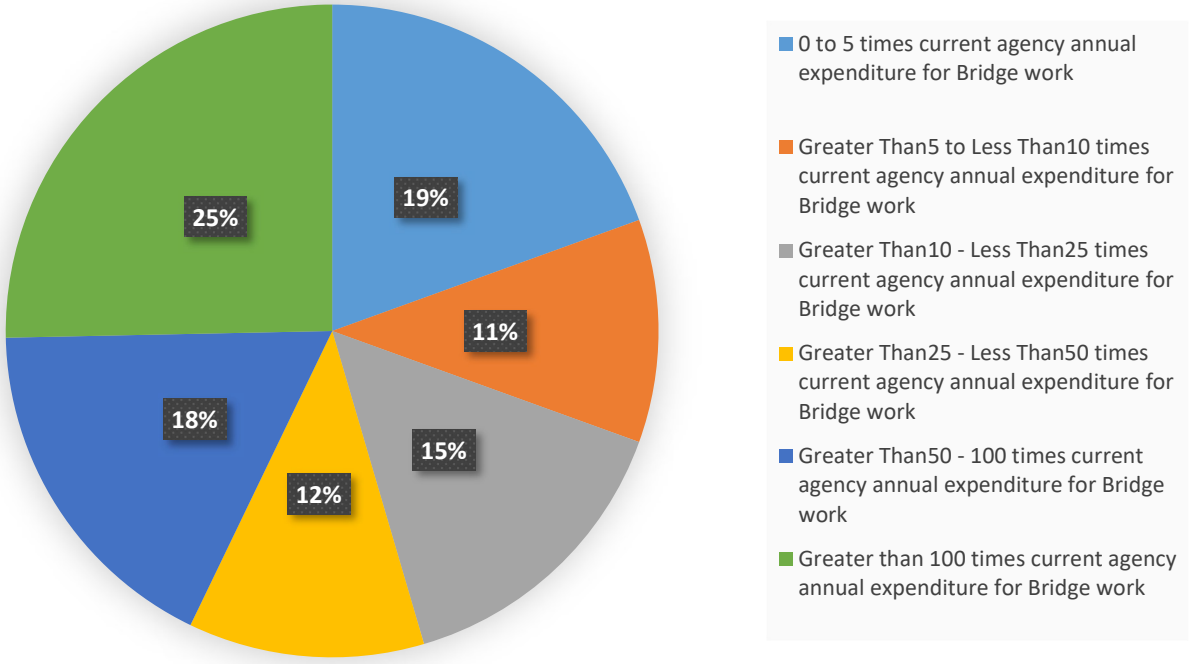
- *0 to 5 times current agency annual expenditure for Bridge work*
- *≥5 to <10 times current agency annual expenditure for Bridge work*

- *≥10 - <25 times current agency annual expenditure for Bridge work*
- *≥25 - <50 times current agency annual expenditure for Bridge work*
- *≥50 - 100 times current agency annual expenditure for Bridge work*
- *Greater than 100 times current agency annual expenditure for Bridge work*

Results:

Total Response: 154
Total Non-Responses: 385
Response Rate: 29%

Question - 18 - Public Safety Projects Cost Estimate (Multiple of Current Expenditures) Over Next 10 Years



19. Over the next ten years, the largest challenge facing my local agency bridge inventory (including NBI bridges, Short Span bridges, and Bicycle/Pedestrian bridges) is:

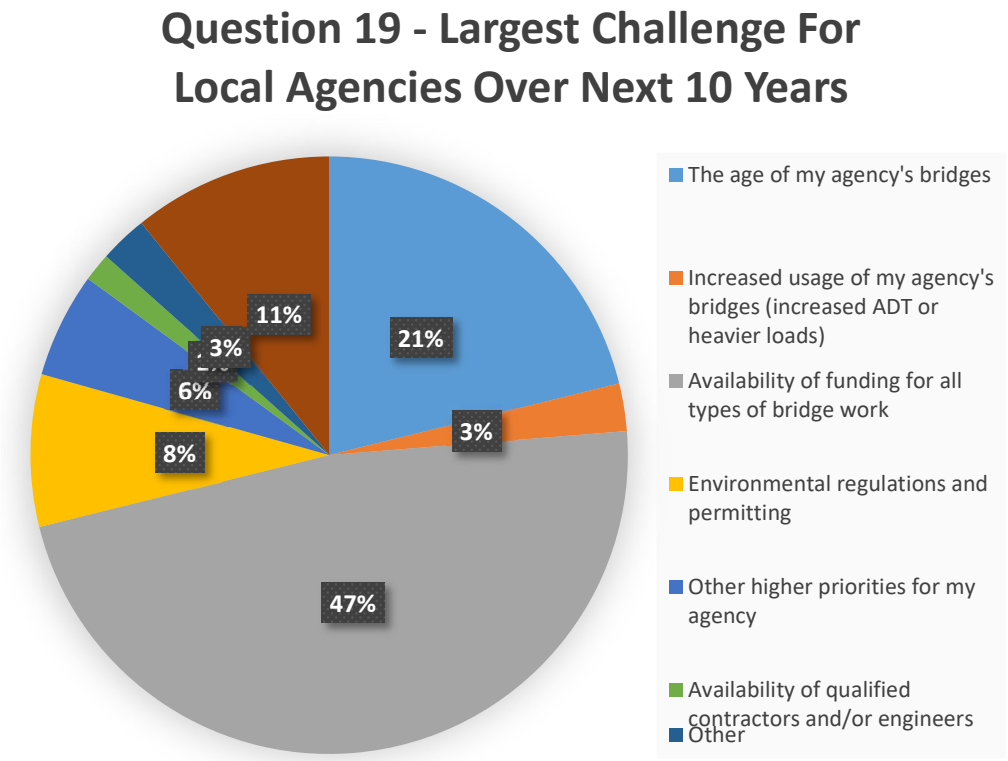
Answer format: drop down box to select-

- *The age of my agency's bridges*
- *Increased usage of my agency's bridges (increased ADT or heavier loads)*
- *Availability of funding for all types of bridge work*
- *Environmental regulations and permitting*
- *Other higher priorities for my agency*
- *Availability of qualified contractors and/or engineers*

- *Other*
- *Don't know or Unsure*

Results:

Total Response: 194
Total Non-Responses: 345
Response Rate: 36%



20. Based on local needs and planning considerations (Master plans, Bicycle and Pedestrian plans, implementation of Complete Street concepts, Local Standards, etc.) over the next ten years, my local agency expects the width of new and replacement bridge structures to:

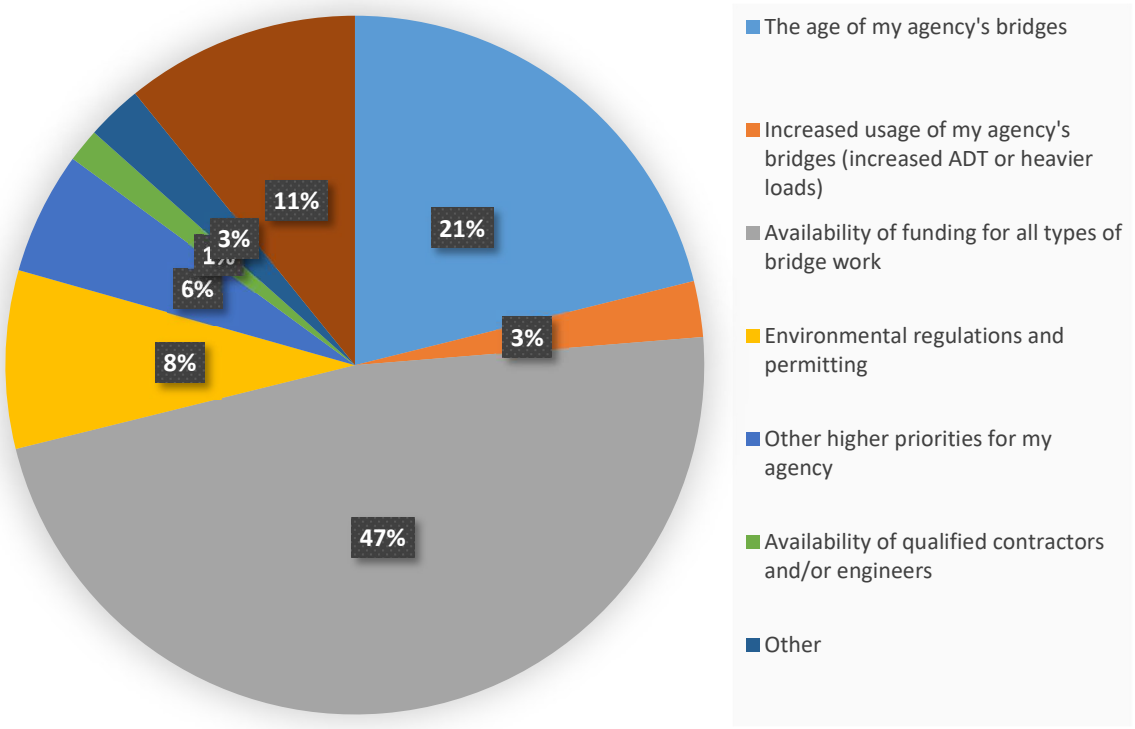
Answer format: drop down box to select-

- *Match minimum AASHTO Standards or Local standards, based on ADT*
- *Be greater than AASHTO or Local standards by at least 10%*
- *Be greater than AASHTO or Local standards by more than 10%*
- *Be lesser than AASHTO or Local standards*
- *Don't know*

Results:

Total Response: 188
Total Non-Responses: 351
Response Rate: 35%

Question 20 - Width Expectations of New Replacement Bridges Based on Local Needs and Planning



* On responses that included estimation with rough language, number listed is the number that is counted.
** On ranges, average taken

APPENDIX C:

California Local Bridge Projections – NBIAS Analysis by Spy Pond Partners

California Statewide Local Streets and Roads Needs Assessment
2020 Update

CALIFORNIA LOCAL BRIDGE NEEDS PROJECTIONS

Draft Report

Prepared for:

Nichols Consulting Engineers

Prepared by:
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spy pond partners, llc

January 2021

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INTRODUCTION

BACKGROUND

California's highway bridges are a critical component of the state's transportation system. The over 12,000 locally-owned bridges in California 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 state'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 because they were designed to carry lighter loads, less traffic or smaller vehicles than they now carry.

When needed investments in the bridge population are not made, travelers and taxpayers pay a high price over time. 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. For instance, failure to fix leaking bridge joints allows water and road salts to seep into the superstructure of the bridge, accelerating deterioration, and possibly triggering the need for emergency repairs, as well as for a far more costly rehabilitation or bridge replacement. Further, when needed actions are deferred, it may be necessary to restrict the loads a bridge can carry, or close the bridge to all traffic, increasing travel time and operating costs faced by travelers.

Addressing bridge investment needs is both a local and national challenge. In its report *Bridging the Gap*, the American Association of State Highway and Transportation Officials (AASHTO) describes age and deterioration as the first of five top problems facing the nation's bridge population *(1)*. Other problems include congestion, increased construction costs, maintaining bridge safety, and addressing new bridge needs. The U.S. Federal Highway Administration (FHWA) estimates that an annual investment of $12.9 billion is required to maintain bridge conditions, while an annual investment of $22.7 billion is required to improve bridge conditions, versus an actual annual investment of $14.4 billion *(2)*. California's bridge population is one of the largest in the country, and thus California bridge conditions have a significant bearing on any national-level analyses.

Although one can make a compelling case for making needed investments in California's local bridges, the simple truth is that local budgets are tightly constrained, there is significant uncertainty about future funding, and there are many different competing needs for available funds. Thus, bridge owners, taxpayers, and legislators need the most accurate information available to make the best decisions about how to allocate scarce resources.

This report details a projection of future bridge investment needs for California's local bridges, and is intended to provide information helpful in making difficult resource allocation decisions. Spy Pond Partners LLC (SPP) performed the analysis for Nichols Consulting Engineers in conjunction with work by Nichols and Quincy Engineers to characterize current bridge needs for California's local bridges. The analysis is one piece of a larger effort to update a previous statewide assessment of local streets and road investment needs.

The following sections summarize the scope of the analysis and detail the organization of this report.

STUDY SCOPE

The projection of future bridge investment needs was made for locally owned highway bridges and culverts located in California and listed in the National Bridge Inventory (NBI) using NBI inventory and inspection data. The NBI includes all bridges and culverts over 20 feet (6.1 meters) in length located on public roads. NBI structures are inspected visually at least every two years as specified by FHWA in *(3)*. A total of 12,344 structures were included in the analysis.

The analysis considered maintenance, repair, rehabilitation actions required to preserve existing structures. Also, it included needs to perform seismic retrofits, strengthen bridges, raise bridges to increase vertical clearance, widen bridges without adding lanes to address clearance and safety issues, and widen bridges to increase cpaacity. Bridge replacement was considered in the analysis when it was projected to be more cost effective than preservation or functional improvement, or when other actions were deemed to be infeasible. The analysis did not consider costs associated with adding lanes to existing structures to relieve congestion.

To develop the projections the project team used FHWA's National Bridge Investment Analysis System (NBIAS), detailed in *(4)*. FHWA uses NBIAS to develop its biannual Conditions and Performance Report *(2)*. NBIAS has a modeling approach similar to that originally implemented in the AASHTO BrM Bridge Management System (BMS), previously called Pontis, which is used by the California Department of Transportation (Caltrans) for managing its bridges. However, NBIAS requires only publicly-available NBI data to run, in contrast to BrM, which requires detailed element data that are not part of the NBI.

Though NBIAS is populated with default costs, deterioration models, and other parameters, it is important to calibrate the system results so that they provide as realistic a projection as possible. The costs in NBIAS were calibrated using data provided by Quincy Engineers and detailed in *(5)*. Further, Quincy Engineers calculated seismic retrofit needs, which are not modeled by NBIAS. The deterioration models used in the system were originally developed by Caltrans, and are included in NBIAS, along with models from other states. A set of calibration runs was performed in a previous analysis *(6)* to confirm the models.

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 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, as described further in the next section.

REPORT ORGANIZATION

The remainder of this document is organized into the following sections:

ANALYSIS APPROACH – This section details the data, modeling approach, key assumptions, analysis steps, and approach used to calibrate the models used for the analysis.

RESULTS – This section summarizes the existing conditions and projects the future investment needs and bridge conditions, along with a discussion of the results.

CONCLUSIONS – This section summarized the results and describes the major conclusions of the study.

APPENDICES – This section contains the detailed output from NBIAS for the statewide analyses.

Analysis Approach

This section details the approach used to projecting future investment needs for California's local bridge population. The following subsections document the data used for the analysis, provide an overview of the NBIAS model, detail key assumptions, and document the calibration approach.

Data Used for the Analysis

Data sources used for the analysis include the following:

- California's 2019 NBI data downloaded from FHWA in December 2020.
- Bridge condition ratings from California's 2020 NBI Data Submittal provided by Quincy Engineers, dated June 30, 2020.
- List of programmed bridges provided by Quincy Engineers.
- NBIAS default models provided by FHWA with NBIAS Version 5.3 dated August 2020.
- Caltrans bridge element deterioration and action effectiveness models (included in multiple versions of NBIAS and Pontis).
- Cost estimates, including unit replacement costs, total cost of initial needs, and seismic retrofit costs, provided by Quincy Engineers.

California's NBI data submittal provided the basic source of bridge inspection and inventory data. NBI data items are coded as detailed in *(3)*. The California submittal for 2019 includes a total of 25,778 structures. To obtain the set of bridges and culverts used in the analysis, we applied the following criteria to the data:

- Bridges included in the analysis should have an ownership code (NBI Item 22) of 2, 3, 4, 12, or 25. This includes bridges owned by a county, town, city, local park, forest or reservation agency, or other local agency. This criterion excluded state, federal and railroad-owned bridges, as well as the Golden Gate Bridge.
- Bridges included in the analysis should have a service type on the bridge (NBI Item 42A) of 1, 4, 5, 6, 7 or 8. This includes bridges that carry vehicular traffic, and excludes railroad and pedestrian bridges (unless they also carry traffic), as well as buildings.
- Bridges included in the analysis should have a "C" in the bridge structure number established by Caltrans (NBI Item 8). Applying this criterion removes certain park bridges and from the analysis set, and brings the analysis set into agreement with the list of local bridges published by Caltrans.

Table 1 summarizes the number of bridges by county from the data set used in the analysis. These numbers were obtained by applying the criteria listed above to the 2019 NBI data. As shown in the table, a total of 12,344 bridges were included in the analysis.

Table 1. California Local Bridge Count by County

County	Local Bridges
Alameda	206
Alpine	11

Amador	41
Butte	294
Calaveras	69
Colusa	149
Contra Costa	303
Del Norte	27
El Dorado	88
Fresno	493
Glenn	171
Humboldt	168
Imperial	131
Inyo	34
Kern	295
Kings	99
Lake	80
Lassen	65
Los Angeles	1477
Madera	156
Marin	115
Mariposa	55
Mendocino	138
Merced	316
Modoc	50
Mono	13
Monterey	143
Napa	109
Nevada	59
Orange	526
Placer	180
Plumas	92
Riverside	457
Sacramento	448
San Benito	47
San Bernardino	496
San Diego	543

San Francisco	24
San Joaquin	330
San Luis Obispo	201
San Mateo	146
Santa Barbara	189
Santa Clara	473
Santa Cruz	101
Shasta	285
Sierra	32
Siskiyou	177
Solano	206
Sonoma	443
Stanislaus	246
Sutter	90
Tehama	303
Trinity	98
Tulare	406
Tuolumne	56
Ventura	192
Yolo	126
Yuba	76
TOTAL	*12,344*

Table 2 presents the list of programmed bridges provided by Quincy Engineers. Based on the 2019 data, eight of these bridges are now in good condition (indicating the programmed work is complete) and two are still in poor condition (suggesting the programmed work was still underway at the time the 2019 data were finalized). For this reason, two bridges were omitted from the current analysis: 08C0043 and 51C0137. These bridges are not included in the local bridge counts in Table 1.

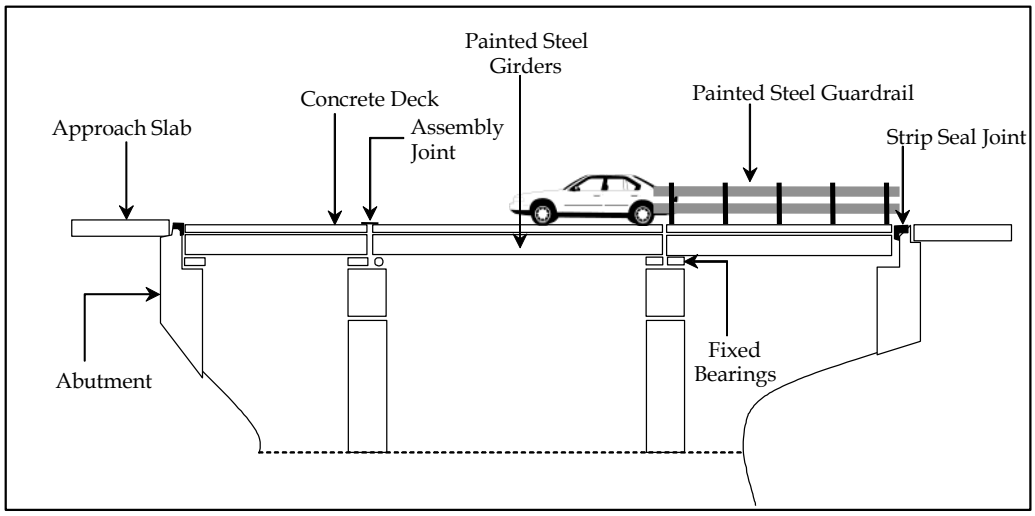
TABLE 2. BRIDGES WITH PROGRAMMED NEEDS

STRUCTURE NUMBER	COUNTY
08C0043	Tehama
12C0052	Butte
12C0053	Butte
18C0012	Sutter
18C0055	Sutter
19C0140	Placer

27C0052	Marin
38C0073	St Anislaus
51C0132	Santa Barbara
53C0137	Santa Barbara

MODEL OVERVIEW

The NBIAS modeling approach is detailed in *(4)* and summarized in *(7)*. NBIAS uses an approach similar to that originally introduced in the Pontis BMS (now called BrM), except it relies strictly upon NBI data and does not require element-level data used in Pontis. However, like Pontis, NBIAS models deterioration and maintenance, repair and rehabilitation (MR&R, also referred to as preservation) at the element level. Figure 1, reproduced from the NBIAS technical manual, illustrates the structural elements on a typical highway bridge, such as the bridge deck, joints, girders, and bearings.



Source: Montana Department of Transportation

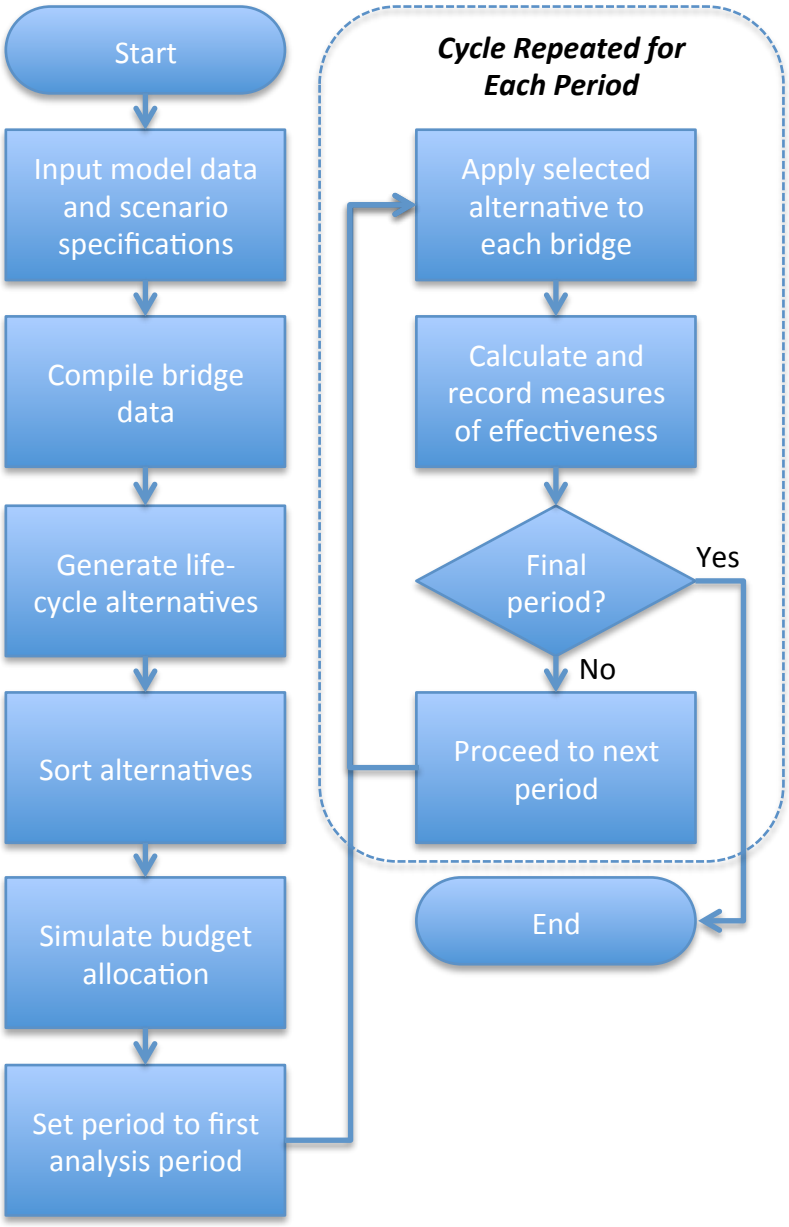
FIGURE 1. TYPICAL BRIDGE ELEMENTS

NBIAS predicts what elements exist on a bridge, as well as their condition, based on a set of Synthesis, Quantity and Condition (SQC) models. Version 5.3 of the system uses a revised set of element definitions based on AASHTO's Commonly Recognized (CoRe) element definitions and detailed in *(8)*. For each element a set of four condition states is defined, and the element's quantity is distributed between those states. Also, the system defines what preservation actions can be performed in each condition state, and the unit cost of those actions. A set of transition probabilities is specified for each element, as well. These probabilities describe both the predicted effectiveness of each preservation action, and how the element will deteriorate in the event no actions are performed. To determine what preservation actions should be performed the system formulates a Markov decision problem and calculates the set of actions to perform in each state to minimize life cycle costs. When evaluating what preservation actions to perform on the bridge the system determines what actions to perform for each element. However, the system may instead choose to recommend bridge replacement if it is more cost effective, or if the condition of the bridge falls below a user-specified condition threshold.

NBIAS also considers needs for functional improvements on a bridge. Improvement needs modeled include widening of existing lanes, raising a bridge, strengthening a bridge, and widening the bridge to increase traffic capacity. An improvement need is triggered based on policies for lane and shoulder width, clearances, and load ratings, and existing traffic. Functional needs are prioritized based on calculation of benefits, such as safety benefits from widening a bridge, or reduced travel time and operating costs from reducing detours through addressing a clearance or load limitation. Bridge replacement may be triggered by an improvement need if there are multiple functional needs on a bridge, if it is infeasible to address a need without replacing the bridge, or if replacement is the most cost-effective option.

To predict bridge conditions over time and the impact of investments in the bridge population, NBIAS performs a series of program simulations, simulating bridge deterioration as well as preservation and improvement projects for different budget levels. Figure 2 is a flow chart illustrating the steps performed as part of the program simulation.

As illustrated in the figure, the system generates a set of life cycle alternatives (up to 22) and selects which lifecycle alternative to perform for each bridge, sorts the list of alternatives based on incremental benefit/cost ratio, and then allocates the budget to the list until funds are expended. The system then calculates the effects of the selected projects, and of deterioration, and repeats the process for the next period. The simulation is performed for a range of different budget levels (up to 20 for a given run of the system). The system includes a “what if” module for interpolating results between different budget levels.



Source: NBIAS Technical Manual (4)

FIGURE 2. NBIAS PROGRAM SIMULATION FLOW CHART

Results from NBIAS are reported using a number of different measures of effectiveness (also referred to as "performance measures"). The key measure predicted by the system is the investment needs – the funds that should be invested to minimize bridge costs over time and address economically justified functional improvements. This is the measure that FHWA reports in its C&P report. Closely related to this measure is the backlog, or difference between the need and the amount of money spent on the bridge population. Other measures predicted by the system include the following.

Note that the primary measures of bridge condition used by FHWA are Good/Fair/Poor condition, described below. The measures Functionally Obsolete Status and Sufficiency Rating are no longer used by FHWA, but are included in the current analysis to facilitate comparisons with the analysis done previously.

In addition, although as of January 1, 2018 FHWA defines the measure Structurally Deficient to be the same as Poor Condition, NBIAS Version 5.3 calculates SD status based on the definition of SD in place as of 2017.

CONDITION RATINGS – the NBI includes several ratings of bridge conditions, including overall ratings for a bridge's deck, superstructure and substructure. Also, a single overall rating is used for culverts. The ratings are on a nine-point scale, with a value of 1 indicating "imminent failure" and a value of 9 indicating "excellent condition" *(3)*. A value of 0 is used to indicate the bridge has been closed. Inspectors may either enter the condition ratings directly, or, if performing element-level inspections, use software provided by FHWA to calculate condition ratings from element-level data. In practice, Caltrans uses the latter approach for reporting California bridge data to FHWA. Since NBIAS models bridge conditions at the element level, it uses a similar approach to translate element conditions into condition ratings, and reports these in terms of the number of bridges with each condition rating value.

GOOD/FAIR/POOR – Based on FHWA definitions, overall bridge condition is determined by the lowest rating of National Bridge Inventory (NBI) condition ratings (NBI Items 58, 59, 60, and 62). If the lowest rating is greater than or equal to 7, the bridge is classified as Good; if it is less than or equal to 4, the classification is Poor. Bridges rated 5 or 6 are classified as Fair.

STRUCTURALLY DEFICIENT STATUS – FHWA's prior definition of "Structurally Deficient" is documented in *(9)*. Prior to January 1, 2018 a bridge was considered to be deficient if one of its condition ratings (NBI Items 58, 59, 60, 62) is 4 or less (poor or worse condition), or if either the appraisal rating for Structural Condition (Item 67) or Waterway Adequacy (Item 71) is rated 2 or less. The fact that a bridge is classified as "Structurally Deficient" does not imply that the bridge is unsafe, just that deficiencies have been identified that require maintenance, rehabilitation or replacement to address. Counts of deficient bridges are often weighted in terms of deck area to more accurately reflect the impact of large bridges than a simple count of bridges weighted regardless of size. As of January 1, 2018, the definition of Structurally Deficient was changed to be the same as Poor Condition.

FUNCTIONALLY OBSOLETE STATUS – FHWA's definition of "Functionally Obsolete" is documented in *(9)*. A bridge is considered to be functionally obsolete if it fails to meet current functional standards, indicated by a rating of 3 or less for any of the following NBI appraisal ratings: Structural Condition (Item 67); Deck Geometry (Item 68); Underclearances (Item 69); Waterway Adequacy (Item 71); or Approach Roadway Alignment (Item 72). Note that if a bridge meets the criteria for being classified as Structurally Deficient and Functionally Obsolete, it is classified as being Structurally Deficient. Functionally Obsolete Status is used as one factor in determining funding eligibility (see below), but is easily confused with Structurally Deficient Status and when reported, is generally reported in conjunction with this measure.

SUFFICIENCY RATING – This rating is defined by FHWA in *(3)* and measures a bridge's sufficiency to remain in service. Sufficiency Rating is calculated on a 0 to 100 scale, with 0 representing an entirely insufficient bridge and 100 indicating an entirely sufficient bridge. Sufficiency Rating can be difficult to interpret because it incorporates consideration of both a bridge's physical condition and functional issues. However, it served as an important measure for establishing funding eligibility for the Highway Bridge

Replacement and Rehabilitation Program (HBRRP).[1] Under HBRRP guidelines, a bridge was eligible for replacement funding if it was Structurally Deficient or Functionally Obsolete and had a Sufficiency Rating of 50 or less. A bridge was eligible for rehabilitation funding if it was Structurally Deficient or Functionally Obsolete and had a Sufficiency Rating of 80 or less.

HEALTH INDEX – This is a measure defined by Caltrans *(10)* that describes the physical condition of a bridge. It is calculated on a 0 to 100 scale based on element level data. A bridge with a Health Index of 0 has all of its elements in the worst defined condition state. A bridge with a Health Index of 100 has all of its elements in the best condition state. Although there are not established thresholds for what is a "good" Health Index value, a Health Index of 75 is often used a threshold for determining when a bridge should be replaced or rehabilitated (this threshold value is used by default in NBIAS, for instance). Also, a bridge with a Health Index of 90 or greater is generally considered to be in good condition. Health Index is a useful measure because it provides an overall measure of condition, and unlike Sufficiency Rating, does not incorporate functional issues. However, because NBIAS uses NBI data for estimating element conditions, it is important to note the NBIAS predictions of Health Index are likely different from calculations made using actual element-level data.

KEY ASSUMPTIONS

The analysis was made incorporating key assumptions and parameters listed below. Unless otherwise noted, NBIAS default models and parameters were for the analysis. Assumptions/parameters of note include:

- All costs are projected in constant dollars and are unadjusted for inflation.
- All simulations were performed for a 20-year period starting in 2021. The presentation of results focuses on the 20-year period from 2021 to 2040.
- The system does not model seismic retrofit needs or scour. These needs have been calculated separately by Quincy Engineers and added to the totals predicted by NBIAS. Seismic needs total approximately $143 million for all local bridges and scour needs total $198 million.
- Replacement rules were used to specify cases where preservation was no longer a feasible alternative for a bridge. These defaults trigger bridge replacement if the bridge is in poor condition and is at least 65 years old.
- NBIAS includes several benefit/cost ratio cutoff values for screening out projects that are not economically justified. Using the FHWA defaults, the system was run with a value of 1 for the incremental benefit/cost ratio cutoff, stream benefit/cost ratio cutoff, and the one-year benefit/cost ratio cutoff. Taken together, the implication of these values is that only projects with benefits exceeding costs were considered as needs (as a result of the stream benefit/cost ratio cutoff value of 1). Further, when considering whether to up-scope a project (e.g., from preservation to replacement), the system considered this only if the incremental benefits of up

[1] With passage of MAP-21 in 2012, the HBRRP and other funding programs were consolidated with the intent of basing funding on overall performance rather than a set of program-specific criteria. Thus, Structurally Deficient/Functionally Obsolete Status and Sufficiency Rating are no longer used by FHWA to determine funding eligibility.

scoping exceeded the incremental costs (as a result of the incremental benefit/cost ratio cutoff value of 1).

- Overall adjustments were made to agency costs based on data from Quincy Engineers as described in the next section.
- The NBIAS "Sustain Steady State" preservation models were used. These models specify treatment costs and transititon probabilities by bridge element and vary by climate zone. However, the climate zone was fixed such that the model utilized the Caltrans transition probability models for all bridges. These transition probabilities define element deterioration rates and action effectiveness. The decision to use the Caltrans transition probabilities was based on the results of a calibration performed in a previous analysis *(6)*.

COST CALIBRATION

Adjusting unit costs is an important step in performing an analysis in NBIAS. For this analysis, data provided by Quincy Engineers *(5)* was used to adjust the costs in the system. Specifically, the following adjustments were made to the default costs in the system:

- Quincy Engineers estimated that the cost of bridge replacement is $625 per square foot (SF) including all costs, as well as accounting for the increased length of a replacement bridge. In NBIAS replacement bridges are assumed to be 1.2 times the length of the bridges they replace. Removing this factor, the unit bridge replacement cost of California bridges is $520.83/SF based on the Quincy estimate.
- To match the Quincy estimate a cost adjustment factor was specified in NBIAS. The default replacement cost in the system (for non-NHS bridges) is $252/SF. Thus, an adjustment factor of $520.83/$252.00 = 2.067 was specified. This factor is applied to all agency costs.
- Default values in NBIAS specified for California were used for preservation actions – these were not inflated using the 2.067 factor. A separate factor was applied specifically to preservation costs to offset the 2.067 factor, keeping these at default values for California.

RESULTS

This section details the projected conditions and needs analysis for California statewide local bridges. The analysis results are presented, followed by a discussion. Note that the presentation of results focuses on projected rather than existing conditions. For additional information on the existing conditions the reader is referred to the analysis prepared separately by Quincy Engineers *(5)*.

PROJECTED CONDITIONS AND NEEDS

Table 3 presents summary results for the 20-year analysis. The table shows results for annual budgets from $0 to $800 million. For each budget level shown the table shows results year by year for the following measures (see the Analysis Approach section for further discussion of the measures):

AVAILABLE BUDGET – the money available for spending on work during the year, shown in millions of dollars.

CHANGE IN NEEDS – change in investment need as of the beginning of the year, shown in millions of dollars. The investment needs projections include costs for replacement, functional improvement, rehabilitation, minor preservation activities, scour, and seismic retrofits. Note that the change in needs is shown here, rather than the total need, as the needs predicted by NBIAS are somewhat different from that predicted by Quincy due to differences in how initial preservation needs are calculated. Thus, the change in needs is more meaningful than the raw needs value.

WORK DONE – total spending over time, shown in millions of dollars. Typically, this measure increases by the budgeted amount each year, but in some cases may increase by less than the budgeted amount if no needs remain to be met, or if during the program simulation the available budget was less than the cost of the next recommended action.

BACKLOG – the difference between the needs at the beginning and work done during the year.

AVERAGE HEALTH INDEX – the average calculated from predicted element conditions, where a value of 75 or less for an individual bridge generally indicates the bridge is in fair or poor condition (in need of rehabilitation) and a value of 90 or greater for an individual bridge indicates the bridge is in good condition.

AVERAGE SUFFICIENCY RATING – average rating calculated based on FHWA definitions. Unlike Health Index Sufficiency Rating includes adjustments for functional characteristics of a bridge.

% DECK AREA GOOD – percent of bridges classified as Good, weighted by deck area. Defined by FHWA, bridge condition is determined by the lowest rating of National Bridge Inventory (NBI) condition ratings for Item 58 (Deck), Item 59 (Superstructure), Item 60 (Substructure), or Item 62 (Culvert). If the lowest rating is greater than or equal to 7, the bridge is classified as Good.

% DECK AREA FAIR – percent of bridges classified as Fair based on FHWA definitions, weighted by deck area. Defined by FHWA, bridge condition is determined by the lowest rating of National Bridge Inventory (NBI) condition ratings for Item 58 (Deck), Item 59 (Superstructure), Item 60 (Substructure), or Item 62 (Culvert). If the lowest rating is 5 or 6, the bridge is classified as Fair.

% DECK AREA POOR – percent of bridges classified as Poor based on FHWA definitions, weighted by deck area. Defined by FHWA, bridge condition is determined by the lowest rating of National Bridge Inventory

(NBI) condition ratings for Item 58 (Deck), Item 59 (Superstructure), Item 60 (Substructure), or Item 62 (Culvert). If the lowest rating is less than or equal to 4, the bridge is classified as Poor.

TABLE 3. SUMMARY RESULTS FOR 2021 TO 2040

	Value by Year																				
Description	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Available Budget ($M)																					
$0M		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$100M		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
$200M		200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
$300M		300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
$400M		400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
$500M		500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
$600M		600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
$700M		700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700
$800M		800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800
Change in Needs ($M)																					
$0M		0	0	0	0	0	4,376	4,376	4,376	4,376	4,376	9,970	9,970	9,970	9,970	9,970	18,136	18,136	18,136	18,136	18,136
$100M		0	-129	-259	-388	-517	3,482	3,382	3,282	3,182	3,081	7,993	7,730	7,467	7,205	6,942	13,962	13,693	13,423	13,153	12,883
$200M		0	-233	-467	-700	-934	2,799	2,600	2,400	2,201	2,001	5,992	5,565	5,139	4,713	4,286	9,957	9,605	9,252	8,899	8,546
$300M		0	-352	-704	-1,055	-1,407	2,109	1,802	1,495	1,188	881	4,326	3,789	3,251	2,714	2,176	6,991	6,595	6,199	5,802	5,406
$400M		0	-485	-970	-1,455	-1,940	1,323	938	552	167	-219	2,509	1,890	1,272	654	35	3,990	3,514	3,039	2,563	2,088
$500M		0	-601	-1,203	-1,804	-2,405	565	83	-399	-882	-1,364	829	155	-519	-1,193	-1,867	1,233	679	125	-428	-982
$600M		0	-712	-1,424	-2,135	-2,847	-155	-731	-1,307	-1,884	-2,460	-947	-1,673	-2,398	-3,124	-3,850	-1,548	-2,185	-2,822	-3,459	-4,096
$700M		0	-844	-1,689	-2,533	-3,378	-1,174	-1,766	-2,358	-2,950	-3,542	-2,606	-3,401	-4,195	-4,990	-5,785	-4,351	-5,083	-5,816	-6,549	-7,282
$800M		0	-976	-1,953	-2,929	-3,906	-2,366	-3,001	-3,635	-4,270	-4,904	-4,458	-5,136	-5,813	-6,491	-7,168	-5,934	-6,668	-7,402	-8,136	-8,870
Work Done ($M)																					
$0M		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$100M		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
$200M		200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
$300M		300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
$400M		400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	398	398	398	398	398
$500M		500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	498	498	498	498	498
$600M		600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	597	597	597	597	597
$700M		700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	697	697	697	697	697
$800M		799	799	799	799	799	800	800	800	800	800	614	614	614	614	614	703	703	703	703	703
Backlog ($M)																					
$0M		11,408	11,408	11,408	11,408	11,408	15,784	15,784	15,784	15,784	15,784	21,379	21,379	21,379	21,379	21,379	29,544	29,544	29,544	29,544	29,544
$100M		11,279	11,150	11,021	10,891	10,762	14,791	14,690	14,590	14,490	14,389	19,139	18,876	18,613	18,350	18,087	25,101	24,831	24,561	24,291	24,021
$200M		11,175	10,942	10,708	10,475	10,241	14,008	13,808	13,609	13,409	13,210	16,974	16,547	16,121	15,695	15,268	21,013	20,660	20,307	19,955	19,602
$300M		11,057	10,705	10,353	10,001	9,649	13,211	12,904	12,597	12,290	11,983	15,197	14,660	14,122	13,585	13,047	18,003	17,607	17,211	16,814	16,418
$400M		10,923	10,438	9,953	9,468	8,983	12,346	11,961	11,575	11,190	10,804	13,299	12,680	12,062	11,444	10,825	14,922	14,447	13,971	13,496	13,020
$500M		10,807	10,206	9,604	9,003	8,402	11,491	11,009	10,527	10,045	9,562	11,564	10,890	10,215	9,541	8,867	12,088	11,534	10,980	10,426	9,872
$600M		10,697	9,985	9,273	8,561	7,850	10,677	10,101	9,525	8,948	8,372	9,736	9,010	8,284	7,559	6,833	9,223	8,586	7,949	7,313	6,676
$700M		10,564	9,720	8,875	8,031	7,186	9,642	9,050	8,458	7,866	7,274	8,008	7,213	6,418	5,624	4,829	6,325	5,592	4,859	4,127	3,394
$800M		10,432	9,455	8,479	7,502	6,526	8,407	7,773	7,139	6,504	5,870	6,272	5,595	4,917	4,240	3,562	4,740	4,006	3,273	2,539	1,805
Health Index																					
$0M	87.79	87.79	87.18	86.57	85.96	85.36	84.75	84.15	83.55	82.96	82.36	81.76	81.18	80.59	80.01	79.42	78.83	78.26	77.68	77.11	76.53
$100M	87.79	87.57	87.07	86.56	86.06	85.55	85.02	84.68	84.35	84.02	83.69	83.10	82.65	82.20	81.75	81.30	80.62	80.20	79.77	79.35	78.92
$200M	87.79	87.46	87.04	86.62	86.19	85.77	85.21	85.23	85.25	85.27	85.30	84.80	84.49	84.19	83.88	83.58	82.79	82.52	82.25	81.98	81.70
$300M	87.79	87.38	87.05	86.71	86.37	86.04	85.42	85.70	85.98	86.26	86.54	86.00	85.83	85.65	85.48	85.30	84.41	84.26	84.11	83.95	83.80
$400M	87.79	87.21	87.12	87.03	86.94	86.85	86.44	86.90	87.35	87.80	88.25	87.60	87.57	87.54	87.51	87.49	86.49	86.48	86.46	86.45	86.44
$500M	87.79	87.10	87.28	87.47	87.65	87.83	87.51	88.07	88.64	89.21	89.77	88.91	89.03	89.16	89.28	89.41	88.39	88.49	88.60	88.70	88.81
$600M	87.79	86.95	87.44	87.93	88.42	88.91	88.79	89.41	90.02	90.64	91.26	90.09	90.37	90.65	90.93	91.21	90.14	90.37	90.61	90.84	91.07
$700M	87.79	86.65	87.45	88.26	89.06	89.86	89.86	90.55	91.24	91.93	92.62	91.14	91.57	92.00	92.42	92.85	91.62	91.99	92.36	92.73	93.10
$800M	87.79	86.36	87.43	88.51	89.58	90.66	90.75	91.46	92.17	92.88	93.59	92.42	92.80	93.17	93.55	93.93	92.61	93.02	93.43	93.84	94.25
Sufficiency Rating																					
$0M	80.39	80.39	79.96	79.52	79.09	78.65	78.21	77.47	76.73	75.99	75.24	74.50	73.68	72.86	72.03	71.21	70.39	69.28	68.17	67.06	65.94
$100M	80.39	80.20	79.86	79.51	79.17	78.82	78.45	77.84	77.24	76.63	76.02	75.18	74.55	73.92	73.29	72.66	71.82	70.94	70.06	69.18	68.29
$200M	80.39	80.10	79.82	79.54	79.26	78.98	78.57	78.16	77.75	77.35	76.94	76.06	75.65	75.24	74.83	74.41	73.57	72.94	72.30	71.67	71.03
$300M	80.39	80.03	79.80	79.58	79.36	79.14	78.65	78.42	78.19	77.96	77.73	76.77	76.55	76.33	76.11	75.89	75.04	74.61	74.18	73.75	73.32
$400M	80.39	79.87	79.79	79.71	79.63	79.55	79.18	79.08	78.98	78.89	78.79	77.71	77.67	77.62	77.58	77.54	76.64	76.46	76.27	76.08	75.90
$500M	80.39	79.77	79.80	79.83	79.86	79.89	79.47	79.50	79.53	79.57	79.60	78.37	78.52	78.68	78.83	78.99	78.13	78.12	78.12	78.11	78.10
$600M	80.39	79.62	79.87	80.11	80.35	80.59	80.27	80.37	80.47	80.57	80.67	79.20	79.54	79.87	80.21	80.55	79.69	79.89	80.08	80.28	80.47
$700M	80.39	79.36	79.90	80.45	81.00	81.55	81.37	81.52	81.68	81.83	81.98	80.23	80.77	81.32	81.86	82.41	81.48	81.87	82.26	82.66	83.05
$800M	80.39	79.08	79.86	80.63	81.40	82.17	82.05	82.27	82.49	82.71	82.92	81.48	81.93	82.39	82.84	83.30	82.25	82.69	83.14	83.58	84.02
% Deck Area Good																					
$0M	39.45	39.45	32.18	24.92	17.65	10.39	3.12	2.58	2.04	1.51	0.97	0.43	0.36	0.28	0.21	0.13	0.06	0.05	0.03	0.02	0.01
$100M	39.45	39.35	32.47	25.58	18.69	11.81	4.92	5.89	6.86	7.84	8.81	9.75	9.81	9.88	9.94	10.00	10.03	10.17	10.31	10.45	10.60
$200M	39.45	39.30	32.82	26.34	19.86	13.39	6.90	9.76	12.63	15.49	18.36	21.10	21.30	21.49	21.69	21.89	21.96	22.26	22.57	22.87	23.17
$300M	39.45	39.27	33.27	27.27	21.28	15.28	9.25	13.42	17.60	21.77	25.94	29.83	30.19	30.54	30.90	31.26	31.35	31.72	32.09	32.46	32.84
$400M	39.45	39.19	34.56	29.93	25.29	20.66	15.97	20.96	25.94	30.92	35.90	40.37	40.86	41.36	41.85	42.34	42.35	42.82	43.29	43.76	44.23
$500M	39.45	39.14	36.18	33.21	30.25	27.28	24.18	29.46	34.73	40.01	45.28	49.76	50.41	51.07	51.72	52.37	52.35	52.91	53.47	54.03	54.59
$600M	39.45	39.07	38.04	37.01	35.97	34.94	33.68	38.82	43.96	49.11	54.25	58.24	59.03	59.81	60.60	61.38	61.25	61.93	62.62	63.30	63.98
$700M	39.45	38.94	39.68	40.41	41.15	41.89	42.25	47.49	52.73	57.98	63.22	66.87	67.77	68.67	69.57	70.47	70.10	70.89	71.69	72.49	73.29
$800M	39.45	38.81	41.32	43.83	46.35	48.86	50.83	55.63	60.44	65.25	70.06	73.37	74.11	74.85	75.59	76.33	75.69	76.47	77.26	78.05	78.84
% Deck Area Fair																					
$0M	48.86	48.86	51.37	53.89	56.40	58.92	61.43	57.92	54.41	50.90	47.40	43.89	39.04	34.20	29.35	24.51	19.66	17.27	14.88	12.48	10.09
$100M	48.86	48.74	51.05	53.35	55.66	57.97	60.25	56.15	52.05	47.95	43.84	39.62	35.41	31.21	27.00	22.79	18.53	16.40	14.27	12.14	10.00
$200M	48.86	48.68	50.70	52.72	54.74	56.76	58.69	53.86	49.04	44.21	39.38	34.35	30.84	27.34	23.83	20.33	16.72	14.98	13.23	11.48	9.73
$300M	48.86	48.63	50.30	51.97	53.64	55.31	56.80	51.53	46.26	41.00	35.73	30.18	27.16	24.15	21.13	18.12	14.98	13.58	12.18	10.78	9.39
$400M	48.86	48.54	49.43	50.33	51.23	52.12	52.83	47.49	42.15	36.82	31.48	25.82	23.48	21.15	18.81	16.47	13.98	12.85	11.71	10.58	9.44
$500M	48.86	48.48	48.38	48.29	48.19	48.10	47.73	42.69	37.66	32.63	27.59	22.20	20.49	18.77	17.06	15.34	13.45	12.57	11.69	10.81	9.92
$600M	48.86	48.39	47.19	45.99	44.80	43.60	42.11	37.57	33.03	28.49	23.95	19.03	17.93	16.83	15.73	14.63	13.33	12.48	11.64	10.79	9.94
$700M	48.86	48.23	46.30	44.37	42.43	40.50	38.23	33.86	29.48	25.10	20.73	15.97	15.31	14.64	13.97	13.31	12.41	11.73	11.04	10.35	9.66
$800M	48.86	48.06	45.53	43.00	40.46	37.93	35.02	30.93	26.85	22.76	18.68	14.30	13.83	13.37	12.90	12.44	11.76	11.20	10.64	10.08	9.52
% Deck Area Poor																					
$0M	11.69	11.69	16.45	21.20	25.95	30.70	35.45	39.50	43.54	47.59	51.64	55.68	60.60	65.52	70.44	75.36	80.28	82.68	85.09	87.50	89.90
$100M	11.69	11.67	16.29	20.92	25.55	30.18	34.79	37.93	41.07	44.20	47.34	50.32	54.52	58.73	62.94	67.14	71.15	73.19	75.24	77.29	79.34
$200M	11.69	11.65	16.18	20.72	25.25	29.78	34.26	36.25	38.24	40.23	42.22	43.95	47.38	50.80	54.23	57.66	60.73	62.30	63.86	65.42	66.98
$300M	11.69	11.64	16.06	20.48	24.90	29.31	33.62	34.78	35.94	37.10	38.26	39.05	41.90	44.74	47.59	50.44	52.84	54.03	55.22	56.42	57.61
$400M	11.69	11.62	15.48	19.35	23.22	27.08	30.84	31.26	31.69	32.12	32.55	32.56	34.66	36.75	38.85	40.94	42.56	43.44	44.33	45.22	46.10
$500M	11.69	11.60	14.82	18.03	21.25	24.47	27.52	27.39	27.27	27.14	27.01	26.45	27.83	29.21	30.59	31.96	32.92	33.50	34.07	34.65	35.23
$600M	11.69	11.58	14.00	16.42	18.85	21.27	23.52	23.06	22.59	22.13	21.66	20.78	21.49	22.19	22.89	23.60	23.94	24.40	24.86	25.32	25.79
$700M	11.69	11.54	12.99	14.45	15.90	17.35	18.63	17.94	17.26	16.57	15.88	14.84	15.07	15.30	15.53	15.76	15.71	15.96	16.20	16.45	16.70
$800M	11.69	11.50	11.85	12.19	12.54	12.88	13.08	12.58	12.07	11.56	11.05	10.33	10.46	10.58	10.71	10.83	10.76	10.89	11.02	11.16	11.29

Figures 3 to 6 show the results over 20 years for annual budgets from $0 to $800 million. To put these projections in perspective, note that the actual level of spending is approximately $200 million per year. Figure 3 shows the change in bridge investment needs over time. Figures 4 and 5 show average Health Index and Sufficiency Rating respectively, and figure 6 shows percentage of bridge deck area in Poor condition. Additional detailed results from NBIAS are included in Appendix A.

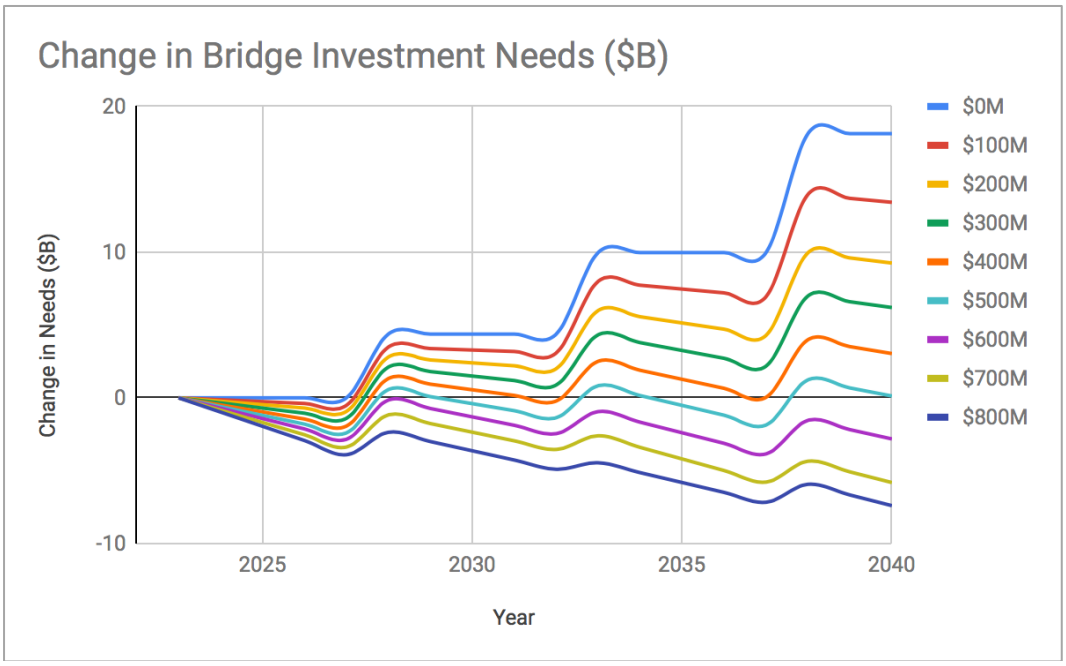


FIGURE 3. CHANGE IN BRIDGE INVESTMENT NEEDS THROUGH 2040

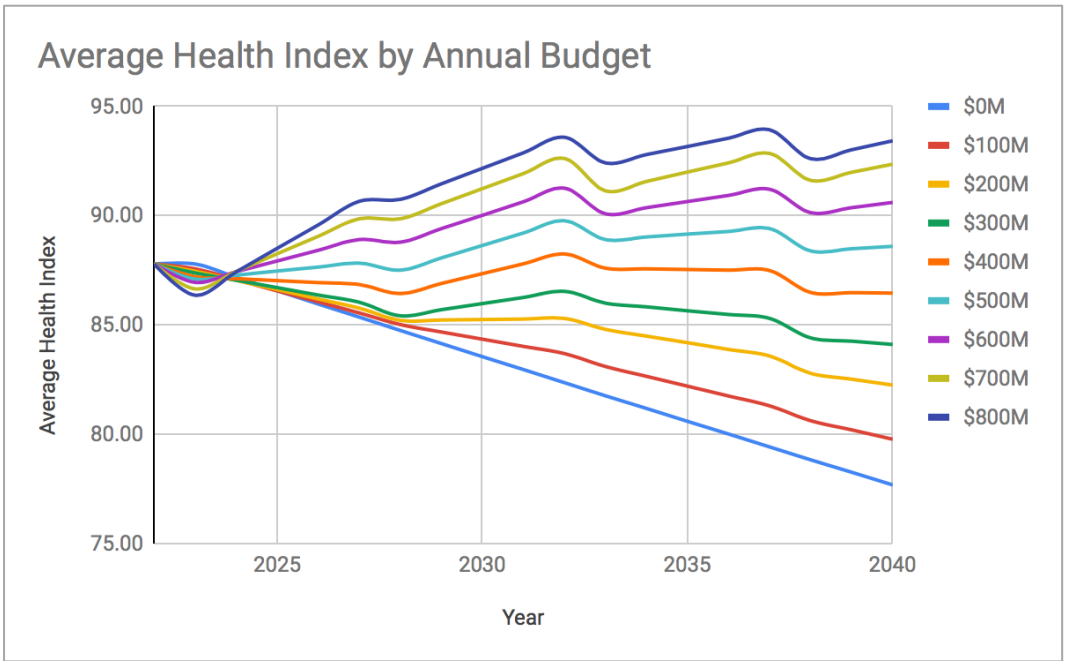


FIGURE 4. PROJECTED HEALTH INDEX THROUGH 2040

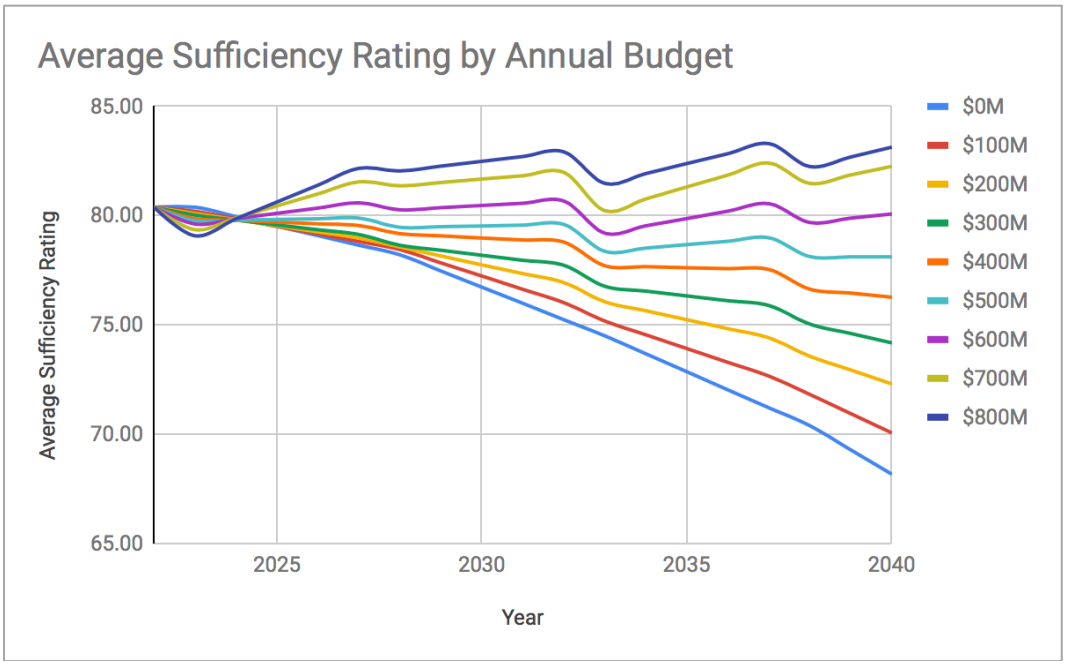


FIGURE 5. PROJECTED SUFFICIENCY RATING THROUGH 2040

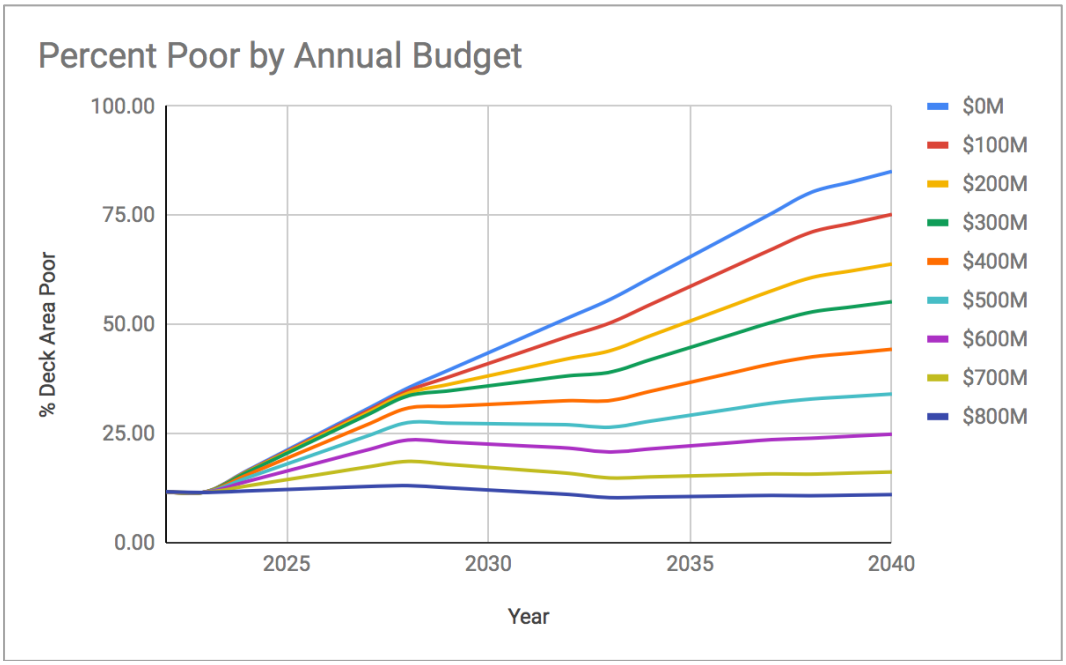


FIGURE 6. PROJECTED PERCENT BRIDGES IN POOR CONDITION THROUGH 2040

The table and figures show that over a 20-year period an annual budget of approximately $500 million is needed to maintain current needs and $800 million is needed to maintain conditions. In all of the scenarios analyzed, physical conditions tend to worsen initially then, in the cast of an annual budget of $700M or $800M, begin to improve. This reflects that for bridges that require replacement, physical conditions may continue to worsen without the value of investment needs increasing.

Table 4 shows the specific annual budget required to maintain current conditions and needs through 2040. The system estimates that an annual budget of $778 million would be required to achieve a value for percent bridge deck area in poor condition in 2040 that is equivalent to the initial value in 2020.

TABLE 4. BUDGET REQUIRED TO MAINTAIN CONDITIONS

MEASURE	ANNUAL BUDGET REQUIRED TO ACHIEVE CURRENT CONDITION IN 2040
Condition	$778M
Total Needs	$473M

DISCUSSION

GENERAL OBSERVATIONS

The analysis shows that an annual budget of $778 million would be required to maintain the level of investment need over a 20-year period for California's local bridges.

While the analysis shows the funds required to achieve a given target condition, it does not recommend a specific level of funding. Given that the investment needs in NBIAS are based on consideration of what work is economically justified, ideally a bridge owner would address all needs rather for their bridge inventory, rather than simply maintaining conditions. However, doing this in the short term would require a substantial increase in budget, and may not be practical. Another approach to setting a target level of investment is to base the investment level on a specific target condition. There are several issues with this approach in the case of California's local bridges. First, it difficult to summarize conditions using any one measure of condition. Average measures of condition, such as Health Index, are useful for illustrating trends, but less useful for characterizing the distribution of conditions.

The percent of bridges classified as being in Good or Poor Condition is a better measure than an average condition index for illustrating the extent of California's bridge needs backlog. However, some caution is needed in interpreting these measures. Because it is a threshold measure (a value of 4 or less for any of the ratings renders the bridge in Poor Condition) a small error in future predictions of condition ratings can result in a large error in the percent predicted to be in poor condition.

For summarizing needs it is helpful to consider both predicted conditions and the level of investment need in dollars. Absent budget constraints an organization seeking to maximize economic efficiency would address all investment needs. Considering budget constraints, a reasonable goal is to at least keep needs from increasing by addressing new investment needs as they arise, if not to lower the backlog of needs over time. Even with the goal of gradually lowering needs, however, one faces a situation in which needed work is being deferred, potentially increasing the work that must be performed on a given bridge.

Qualifications on the Results

The analysis detailed here is subject to a number of qualifications. Please note the following in interpreting the results of the analysis:

- The results are extremely sensitive to assumptions about agency costs, and to the relative differences between replacement and preservation/rehabilitation costs.
- The results are also sensitive to the selection of deterioration models. The Caltrans models used for the analysis appear to be the models which best match actual conditions over time. However, these models should be seen as a work-in progress and are subject to subsequent revision by Caltrans staff.
- The models assume that bridge work will be performed as recommended by the system (that is, using its prioritization approach), and that bridge funds will be used for the activities modeled.
- NBIAS makes estimates of the elements on each bridge in the inventory using NBI data. More detailed information on element composition and conditions are collected for California bridges, but are not included in the NBI and not publicly available.
- All predictive models such as NBIAS are subject to significant error. Confidence intervals are not typically provided for results from investment models such as that in NBIAS, but if they were one can expect they would be on the order of $\pm$20%.
- Existing bridge models, including NBIAS and Pontis, consider needs for preservation, functional improvement and replacement with an objective of minimizing agency and user costs. In practice, bridge owners consider a broader range of needs, including seismic retrofit needs which have been added to the analysis, scour mitigation, congestion reduction, and others. Also, bridge owners have a broader set of objectives than simply minimizing costs. Thus, the results of the analysis should be viewed in the context of the full set of needs and objectives local agencies consider when they make investment decisions about their bridge inventory.

CONCLUSIONS

This report details an analysis of projected bridge needs for California's 12,344 locally owned highway bridges. The analysis was performed using the FHWA bridge-modeling tool NBIAS 5.3. The system was run with 2019 NBI data, 2020 bridge condition ratings, and Caltrans element-level deterioration models. The costs in the system were adjusted based on data provided by Quincy Engineers estimating replacement and rehabilitation costs for the bridge inventory.

In performing the analysis, the project team simulated investment needs and predicted conditions for a range of budget levels. The analysis results are summarized in terms of needs, average Health Index, average Sufficiency Rating, and percent of bridges classified as Poor (weighted by deck area). Note that Health Index and Sufficiency Rating are overall measures of bridge condition on a 0 to 100 scale. Bridges classified as Poor are bridges that require rehabilitation or replacement but are not necessarily an immediate safety risk.

The statewide analysis indicated an overall level of need similar to that predicted by Quincy Engineers using a different methodology including economically justified needs for replacement, functional improvement, rehabilitation, minor preservation actions, scour mitigation, and seismic retrofits. Over the next 20 years an average annual budget of $778 million would be required to maintain the current percent of poor condition bridges at its current level, and an average annual budget of $473 million would be required to keep investment needs from increasing on a constant dollar basis.

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APPENDIX A. DETAILED RESULTS – 20 YEARS

This appendix includes detailed outputs from NBIAS showing a 20-year projection beginning in 2021. The reader is referred to the NBIAS user manual for more information on the contents of these outputs. Note that the needs projections in these outputs exclude seismic needs that were added to the totals separately.

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

20-YEAR TOTALS:

Total budget available over 20 years: $0M

	Work Done ($M)	Work Done (bridges)	User Benefits Obtained ($M)
Total	0.0		0.0
Replacement	0.0	0	0.0
Struct/Func. motivated (S/F)	0.0	0	0.0
Economically motivated (E/M)	0.0	0	0.0
Improvement	0.0	0	0.0
Raising	0.0	0	0.0
Widening	0.0	0	0.0
Capacity Expansion	0.0	0	0.0
Strengthening	0.0	0	0.0
MR&R	0.0		0.0
Federal MR&R	0.0		-
Local MR&R	0.0		-
(not included in the total)			

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cumulative work done ($M)											
Total work	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S/F motivated	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
+Econ. motivated	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Replacement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S/F motivated	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
+Econ. motivated	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Improvement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Raising	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Widening	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capacity Expansion	---	---	---	---	---	---	---	---	---	---	---
Strengthening	---	---	---	---	---	---	---	---	---	---	---
Federally Eligible MR&R	---	---	---	---	---	---	---	---	---	---	---
Cumulative work done (number of bridges)											
Replacement	0	0	0	0	0	0	0	0	0	0	0
S/F motivated	0	0	0	0	0	0	0	0	0	0	0
+Econ. motivated	0	0	0	0	0	0	0	0	0	0	0
Improvement	0	0	0	0	0	0	0	0	0	0	0
Raising	---	---	---	---	---	---	---	---	---	---	---
Widening	---	---	---	---	---	---	---	---	---	---	---
Capacity Expansion	---	---	---	---	---	---	---	---	---	---	---
Total structurally/functionally (S/F) motivated annual needs and work ($M)											
S/F motivated needs	11408	11408	11408	11408	11408	15784	15784	15784	15784	15784	
Total work done	0	0	0	0	0	0	0	0	0	0	
S/F motivated	---	---	---	---	---	---	---	---	---	---	---
+Econ. motivated	---	---	---	---	---	---	---	---	---	---	---
Backlog - total	11408	11408	11408	11408	11408	15784	15784	15784	15784	15784	
Replacement ($M)											
S/F motivated needs	5926.1	5926.1	5926.1	5926.1	5926.1	9085.4	9085.4	9085.4	9085.4	9085.4	
Total work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
S/F motivated	---	---	---	---	---	---	---	---	---	---	---
+Econ. motivated	---	---	---	---	---	---	---	---	---	---	---
Backlog - total	5926.1	5926.1	5926.1	5926.1	5926.1	9085.4	9085.4	9085.4	9085.4	9085.4	
Improvement ($M)											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Needs		352.5	352.5	352.5	352.5	352.5	386.1	386.1	386.1	386.1	386.1
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		352.5	352.5	352.5	352.5	352.5	386.1	386.1	386.1	386.1	386.1
Raising ($M)											
Needs		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Widening ($M)											
Needs		184.5	184.5	184.5	184.5	184.5	207.4	207.4	207.4	207.4	207.4
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		184.5	184.5	184.5	184.5	184.5	207.4	207.4	207.4	207.4	207.4
Capacity Expansion ($M)											
Needs		15.3	15.3	15.3	15.3	15.3	17.8	17.8	17.8	17.8	17.8
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		15.3	15.3	15.3	15.3	15.3	17.8	17.8	17.8	17.8	17.8
Strengthening ($M)											
Needs		152.3	152.3	152.3	152.3	152.3	160.6	160.6	160.6	160.6	160.6
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		152.3	152.3	152.3	152.3	152.3	160.6	160.6	160.6	160.6	160.6
Federally Eligible MR&R ($M)											
Needs		5129.9	5129.9	5129.9	5129.9	5129.9	6312.4	6312.4	6312.4	6312.4	6312.4
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		5129.9	5129.9	5129.9	5129.9	5129.9	6312.4	6312.4	6312.4	6312.4	6312.4
Maintenance ($M)											
Needs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		---	---	---	---	---	---	---	---	---	---

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Replacement (number of bridges)											
S/F motivated needs	2039	2039	2039	2039	2039	2039	2943	2943	2943	2943	2943
Total work done	0	0	0	0	0	0	0	0	0	0	0
S/F motivated	---	---	---	---	---	---	---	---	---	---	---
+Econ. motivated	---	---	---	---	---	---	---	---	---	---	---
Backlog - total	2039	2039	2039	2039	2039	2039	2943	2943	2943	2943	2943
Improvement (number of bridges)											
Needs	707	707	707	707	707	707	747	747	747	747	747
Work done	0	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0	0
Backlog - total	707	707	707	707	707	707	747	747	747	747	747
Raising (number of bridges)											
Needs	1	1	1	1	1	1	1	1	1	1	1
Work done	0	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0	0
Backlog - total	1	1	1	1	1	1	1	1	1	1	1
Widening (number of bridges)											
Needs	445	445	445	445	445	445	474	474	474	474	474
Work done	0	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0	0
Backlog - total	445	445	445	445	445	445	474	474	474	474	474
Capacity Expansion (number of bridges)											
Needs	23	23	23	23	23	23	27	27	27	27	27
Work done	0	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0	0
Backlog - total	23	23	23	23	23	23	27	27	27	27	27
Strengthening (number of bridges)											
Needs	238	238	238	238	238	238	245	245	245	245	245
Work done	0	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0	0
Backlog - total	238	238	238	238	238	238	245	245	245	245	245

Total User Benefits ($M)

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential, S/F motivated	2414.0	2414.0	2414.0	2414.0	2414.0	2644.8	2644.8	2644.8	2644.8	2644.8	
Total obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
By S/F motivated work	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
+Econ. motivated work	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Offset of S/F	---	---	---	---	---	---	---	---	---	---	
Excess over offset	---	---	---	---	---	---	---	---	---	---	
Backlog - total	2414.0	2414.0	2414.0	2414.0	2414.0	2644.8	2644.8	2644.8	2644.8	2644.8	
Benefits of S/F motivated replacements ($M)											
Potential	2067.1	2067.1	2067.1	2067.1	2067.1	2254.9	2254.9	2254.9	2254.9	2254.9	
Total obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
S/F motivated	---	---	---	---	---	---	---	---	---	---	
+Econ. motivated	---	---	---	---	---	---	---	---	---	---	
Backlog - total	2067.1	2067.1	2067.1	2067.1	2067.1	2254.9	2254.9	2254.9	2254.9	2254.9	
Improvement Benefits ($M)											
Potential	337.6	337.6	337.6	337.6	337.6	379.0	379.0	379.0	379.0	379.0	
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Backlog - total	337.6	337.6	337.6	337.6	337.6	379.0	379.0	379.0	379.0	379.0	
Raising Benefits ($M)											
Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Backlog - total	---	---	---	---	---	---	---	---	---	---	
Widening Benefits ($M)											
Potential	25.5	25.5	25.5	25.5	25.5	29.0	29.0	29.0	29.0	29.0	
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Backlog - total	25.5	25.5	25.5	25.5	25.5	29.0	29.0	29.0	29.0	29.0	
Capacity Expansion Benefits ($M)											
Potential	3.8	3.8	3.8	3.8	3.8	5.6	5.6	5.6	5.6	5.6	
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Backlog - total	3.8	3.8	3.8	3.8	3.8	5.6	5.6	5.6	5.6	5.6	
Strengthening Benefits ($M)											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential		308.3	308.3	308.3	308.3	308.3	344.4	344.4	344.4	344.4	344.4
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		308.3	308.3	308.3	308.3	308.3	344.4	344.4	344.4	344.4	344.4
Benefits of MR&R ($M)											
Potential		9.2	9.2	9.2	9.2	9.2	10.9	10.9	10.9	10.9	10.9
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		9.2	9.2	9.2	9.2	9.2	10.9	10.9	10.9	10.9	10.9
Average Benefit/Cost ratios											
Overall		---	---	---	---	---	---	---	---	---	---
Replacement		---	---	---	---	---	---	---	---	---	---
Improvement		---	---	---	---	---	---	---	---	---	---
Raising		---	---	---	---	---	---	---	---	---	---
Widening		---	---	---	---	---	---	---	---	---	---
Capacity Expansion		---	---	---	---	---	---	---	---	---	---
Strengthening		---	---	---	---	---	---	---	---	---	---
MR&R		---	---	---	---	---	---	---	---	---	---
Benefit/Cost cutoff ratio (federally eligible work only)		---	---	---	---	---	---	---	---	---	---

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Average network condition measures											
Sufficiency rating	80.39	80.39	79.96	79.52	79.09	78.65	78.21	77.47	76.73	75.99	75.24
Health index	87.79	87.79	87.18	86.57	85.96	85.36	84.75	84.15	83.55	82.96	82.36
Bridge population distribution by deck rating (numbers of bridges)											
Deck rating 9	0	0	0	0	0	0	0	0	0	0	0
Deck rating 8	139	139	111	83	56	28	0	0	0	0	0
Deck rating 7	5593	5593	4479	3365	2251	1137	23	18	14	9	5
Deck rating 6	462	462	1135	1808	2481	3154	3827	3068	2309	1551	792
Deck rating 5	2760	2760	2817	2874	2931	2988	3045	3265	3484	3704	3923
Deck rating 4	586	586	940	1293	1647	2000	2354	2787	3221	3654	4088
Deck rating 3	5	5	55	105	154	204	254	357	460	564	667
Deck rating 2	1	1	2	2	3	3	4	11	18	26	33
Deck rating 1	0	0	0	0	0	0	0	0	0	0	0
Deck rating 0	3	3	3	2	2	1	1	1	1	1	1
Deck rating N	2786	2786	2794	2802	2811	2819	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)											
Superstructure rating 9	0	0	0	0	0	0	0	0	0	0	0
Superstructure rating 8	301	301	256	212	167	123	78	62	47	31	16
Superstructure rating 7	6229	6229	5399	4570	3740	2911	2081	1721	1362	1002	643
Superstructure rating 6	363	363	1175	1987	2799	3611	4423	4438	4453	4467	4482
Superstructure rating 5	2589	2589	2400	2211	2022	1833	1644	1796	1948	2100	2252
Superstructure rating 4	350	350	577	805	1032	1260	1487	1654	1820	1987	2153
Superstructure rating 3	9	9	32	55	79	102	125	162	200	237	275
Superstructure rating 2	1	1	2	2	3	3	4	8	12	16	20
Superstructure rating 1	0	0	0	0	0	0	0	0	1	1	2
Superstructure rating 0	1	1	1	1	1	1	1	1	1	1	1
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)											
Substructure rating 9	0	0	0	0	0	0	0	0	0	0	0
Substructure rating 8	264	264	232	200	167	135	103	82	62	41	21
Substructure rating 7	6773	6773	6109	5445	4782	4118	3454	2910	2366	1822	1278
Substructure rating 6	212	212	889	1566	2244	2921	3598	4095	4592	5090	5587

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Substructure rating 5	2299	2299	2161	2022	1884	1745	1607	1519	1430	1342	1253
Substructure rating 4	258	258	396	534	673	811	949	1093	1237	1381	1525
Substructure rating 3	9	9	23	37	51	65	79	91	102	114	125
Substructure rating 2	26	26	25	25	24	24	23	22	21	21	20
Substructure rating 1	1	1	2	3	3	4	5	6	7	8	9
Substructure rating 0	2	2	2	2	2	2	2	2	2	2	2
Substructure rating N	2491	2491	2496	2501	2505	2510	2515	2515	2515	2515	2515

Culvert population distribution by rating (numbers of culverts)

Culvert rating 9	0	0	0	0	0	0	0	0	0	0	0
Culvert rating 8	123	123	106	89	72	55	38	30	23	15	8
Culvert rating 7	1328	1328	1193	1057	922	786	651	541	431	320	210
Culvert rating 6	958	958	1024	1089	1155	1220	1286	1315	1343	1372	1400
Culvert rating 5	23	23	108	193	277	362	447	524	601	678	755
Culvert rating 4	56	56	55	55	54	54	53	61	69	78	86
Culvert rating 3	2	2	5	7	10	12	15	19	23	26	30
Culvert rating 2	0	0	0	0	0	0	0	0	0	1	1
Culvert rating 1	1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844

Bridge population distribution by sufficiency rating (number of bridges)

SR > 80% (Good)	6552	6552	6448	6343	6239	6134	6030	5854	5678	5503	5327
50% < SR <=80% (Fair)	4512	4512	4495	4479	4462	4446	4429	4458	4488	4517	4547
SR <=50% (Poor)	1271	1271	1392	1513	1634	1755	1876	2022	2169	2315	2462

Structurally deficient and functionally obsolete bridges

Number of bridges	3277	3277	3668	4059	4449	4840	5231	5658	6085	6512	6939
Percent of deck area	26.09	26.09	29.83	33.57	37.30	41.04	44.78	48.50	52.21	55.93	59.64

Structurally deficient bridges

Number of bridges	1041	1041	1578	2114	2651	3187	3724	4246	4767	5289	5810
Percent of deck area	11.46	11.46	16.08	20.69	25.31	29.93	34.54	38.76	42.98	47.20	51.41

Functionally obsolete bridges

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Number of bridges	2236	2236	2090	1944	1799	1653	1507	1412	1318	1223	1129
Percent of deck area	14.63	14.63	13.75	12.87	11.99	11.12	10.24	9.73	9.23	8.73	8.23
Good structural condition											
Number of bridges	5263	5263	4363	3463	2562	1662	762	631	499	368	236
Percent of deck area	39.45	39.45	32.18	24.92	17.65	10.39	3.12	2.58	2.04	1.51	0.97
Fair structural condition											
Number of bridges	6029	6029	6385	6742	7098	7455	7811	7425	7038	6652	6265
Percent of deck area	48.86	48.86	51.37	53.89	56.40	58.92	61.43	57.92	54.41	50.90	47.40
Poor structural condition											
Number of bridges	1043	1043	1587	2131	2674	3218	3762	4280	4798	5315	5833
Percent of deck area	11.69	11.69	16.45	21.20	25.95	30.70	35.45	39.50	43.54	47.59	51.64

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cumulative work done ($M)										
Total work	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S/F motivated	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
+Econ. motivated	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Replacement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S/F motivated	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
+Econ. motivated	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Improvement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Raising	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Widening	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capacity Expansion	---	---	---	---	---	---	---	---	---	---
Strengthening	---	---	---	---	---	---	---	---	---	---
Federally Eligible MR&R	---	---	---	---	---	---	---	---	---	---
Cumulative work done (number of bridges)										
Replacement	0	0	0	0	0	0	0	0	0	0
S/F motivated	0	0	0	0	0	0	0	0	0	0
+Econ. motivated	0	0	0	0	0	0	0	0	0	0
Improvement	0	0	0	0	0	0	0	0	0	0
Raising	---	---	---	---	---	---	---	---	---	---
Widening	---	---	---	---	---	---	---	---	---	---
Capacity Expansion	---	---	---	---	---	---	---	---	---	---
Total structurally/functionally (S/F) motivated annual needs and work ($M)										
S/F motivated needs	21379	21379	21379	21379	21379	29544	29544	29544	29544	29544
Total work done	0	0	0	0	0	0	0	0	0	0
S/F motivated	---	---	---	---	---	---	---	---	---	---
+Econ. motivated	---	---	---	---	---	---	---	---	---	---
Backlog - total	21379	21379	21379	21379	21379	29544	29544	29544	29544	29544
Replacement ($M)										
S/F motivated needs	13300	13300	13300	13300	13300	20049	20049	20049	20049	20049
Total work done	0	0	0	0	0	0	0	0	0	0
S/F motivated	---	---	---	---	---	---	---	---	---	---
+Econ. motivated	---	---	---	---	---	---	---	---	---	---
Backlog - total	13300	13300	13300	13300	13300	20049	20049	20049	20049	20049
Improvement ($M)										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Needs	431.9	431.9	431.9	431.9	431.9	459.8	459.8	459.8	459.8	459.8
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	431.9	431.9	431.9	431.9	431.9	459.8	459.8	459.8	459.8	459.8
Raising ($M)										
Needs	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Widening ($M)										
Needs	230.3	230.3	230.3	230.3	230.3	241.2	241.2	241.2	241.2	241.2
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	230.3	230.3	230.3	230.3	230.3	241.2	241.2	241.2	241.2	241.2
Capacity Expansion ($M)										
Needs	32.7	32.7	32.7	32.7	32.7	38.6	38.6	38.6	38.6	38.6
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	32.7	32.7	32.7	32.7	32.7	38.6	38.6	38.6	38.6	38.6
Strengthening ($M)										
Needs	168.7	168.7	168.7	168.7	168.7	179.8	179.8	179.8	179.8	179.8
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	168.7	168.7	168.7	168.7	168.7	179.8	179.8	179.8	179.8	179.8
Federally Eligible MR&R ($M)										
Needs	7646.8	7646.8	7646.8	7646.8	7646.8	9035.5	9035.5	9035.5	9035.5	9035.5
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	7646.8	7646.8	7646.8	7646.8	7646.8	9035.5	9035.5	9035.5	9035.5	9035.5
Maintenance ($M)										
Needs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Replacement (number of bridges)										
S/F motivated needs	4139	4139	4139	4139	4139	5801	5801	5801	5801	5801
Total work done	0	0	0	0	0	0	0	0	0	0
S/F motivated	---	---	---	---	---	---	---	---	---	---
+Econ. motivated	---	---	---	---	---	---	---	---	---	---
Backlog - total	4139	4139	4139	4139	4139	5801	5801	5801	5801	5801
Improvement (number of bridges)										
Needs	797	797	797	797	797	839	839	839	839	839
Work done	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0
Backlog - total	797	797	797	797	797	839	839	839	839	839
Raising (number of bridges)										
Needs	1	1	1	1	1	1	1	1	1	1
Work done	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0
Backlog - total	1	1	1	1	1	1	1	1	1	1
Widening (number of bridges)										
Needs	501	501	501	501	501	524	524	524	524	524
Work done	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0
Backlog - total	501	501	501	501	501	524	524	524	524	524
Capacity Expansion (number of bridges)										
Needs	37	37	37	37	37	45	45	45	45	45
Work done	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0
Backlog - total	37	37	37	37	37	45	45	45	45	45
Strengthening (number of bridges)										
Needs	258	258	258	258	258	269	269	269	269	269
Work done	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0
Backlog - total	258	258	258	258	258	269	269	269	269	269

Total User Benefits ($M)

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential, S/F motivated	2958.8	2958.8	2958.8	2958.8	2958.8	3330.8	3330.8	3330.8	3330.8	3330.8
Total obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
By S/F motivated work	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
+Econ. motivated work	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset of S/F	---	---	---	---	---	---	---	---	---	---
Excess over offset	---	---	---	---	---	---	---	---	---	---
Backlog - total	2958.8	2958.8	2958.8	2958.8	2958.8	3330.8	3330.8	3330.8	3330.8	3330.8
Benefits of S/F motivated replacements ($M)										
Potential	2500.8	2500.8	2500.8	2500.8	2500.8	2826.2	2826.2	2826.2	2826.2	2826.2
Total obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S/F motivated	---	---	---	---	---	---	---	---	---	---
+Econ. motivated	---	---	---	---	---	---	---	---	---	---
Backlog - total	2500.8	2500.8	2500.8	2500.8	2500.8	2826.2	2826.2	2826.2	2826.2	2826.2
Improvement Benefits ($M)										
Potential	438.3	438.3	438.3	438.3	438.3	483.4	483.4	483.4	483.4	483.4
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	438.3	438.3	438.3	438.3	438.3	483.4	483.4	483.4	483.4	483.4
Raising Benefits ($M)										
Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)										
Potential	32.6	32.6	32.6	32.6	32.6	35.5	35.5	35.5	35.5	35.5
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	32.6	32.6	32.6	32.6	32.6	35.5	35.5	35.5	35.5	35.5
Capacity Expansion Benefits ($M)										
Potential	9.4	9.4	9.4	9.4	9.4	13.1	13.1	13.1	13.1	13.1
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	9.4	9.4	9.4	9.4	9.4	13.1	13.1	13.1	13.1	13.1
Strengthening Benefits ($M)										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential	396.4	396.4	396.4	396.4	396.4	434.7	434.7	434.7	434.7	434.7
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	396.4	396.4	396.4	396.4	396.4	434.7	434.7	434.7	434.7	434.7
Benefits of MR&R ($M)										
Potential	19.7	19.7	19.7	19.7	19.7	21.3	21.3	21.3	21.3	21.3
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	19.7	19.7	19.7	19.7	19.7	21.3	21.3	21.3	21.3	21.3
Average Benefit/Cost ratios										
Overall	---	---	---	---	---	---	---	---	---	---
Replacement	---	---	---	---	---	---	---	---	---	---
Improvement	---	---	---	---	---	---	---	---	---	---
Raising	---	---	---	---	---	---	---	---	---	---
Widening	---	---	---	---	---	---	---	---	---	---
Capacity Expansion	---	---	---	---	---	---	---	---	---	---
Strengthening	---	---	---	---	---	---	---	---	---	---
MR&R	---	---	---	---	---	---	---	---	---	---
Benefit/Cost cutoff ratio (federally eligible work only)	---	---	---	---	---	---	---	---	---	---

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Average network condition measures										
Sufficiency rating	74.50	73.68	72.86	72.03	71.21	70.39	69.28	68.17	67.06	65.94
Health index	81.76	81.18	80.59	80.01	79.42	78.83	78.26	77.68	77.11	76.53
Bridge population distribution by deck rating (numbers of bridges)										
Deck rating 9	0	0	0	0	0	0	0	0	0	0
Deck rating 8	0	0	0	0	0	0	0	0	0	0
Deck rating 7	0	0	0	0	0	0	0	0	0	0
Deck rating 6	33	26	20	13	7	0	0	0	0	0
Deck rating 5	4143	3511	2878	2246	1613	981	785	589	392	196
Deck rating 4	4521	4800	5079	5359	5638	5917	5521	5124	4728	4331
Deck rating 3	770	1102	1433	1765	2096	2428	2945	3462	3979	4496
Deck rating 2	40	67	95	122	150	177	249	322	394	467
Deck rating 1	0	1	2	2	3	4	7	10	14	17
Deck rating 0	1	1	1	1	1	1	1	1	1	1
Deck rating N	2827	2827	2827	2827	2827	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)										
Superstructure rating 9	0	0	0	0	0	0	0	0	0	0
Superstructure rating 8	0	0	0	0	0	0	0	0	0	0
Superstructure rating 7	283	239	195	151	107	63	50	38	25	13
Superstructure rating 6	4497	4199	3900	3602	3303	3005	2681	2356	2032	1707
Superstructure rating 5	2404	2509	2614	2719	2824	2929	3047	3165	3282	3400
Superstructure rating 4	2320	2461	2603	2744	2886	3027	3072	3117	3163	3208
Superstructure rating 3	312	399	487	574	662	749	908	1067	1225	1384
Superstructure rating 2	24	32	41	49	58	66	80	93	107	120
Superstructure rating 1	2	2	2	3	3	3	5	6	8	9
Superstructure rating 0	1	1	1	1	1	1	1	1	1	1
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)										
Substructure rating 9	0	0	0	0	0	0	0	0	0	0
Substructure rating 8	0	0	0	0	0	0	0	0	0	0
Substructure rating 7	734	610	485	361	236	112	91	71	50	30
Substructure rating 6	6084	5943	5802	5662	5521	5380	4941	4502	4062	3623

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Substructure rating 5	1165	1314	1463	1612	1761	1910	2285	2660	3035	3410
Substructure rating 4	1669	1763	1856	1950	2043	2137	2159	2182	2204	2227
Substructure rating 3	137	159	181	204	226	248	309	370	431	492
Substructure rating 2	19	19	19	18	18	18	19	19	20	20
Substructure rating 1	10	11	11	12	12	13	14	15	15	16
Substructure rating 0	2	2	2	2	2	2	2	2	2	2
Substructure rating N	2515	2515	2515	2515	2515	2515	2515	2515	2515	2515

Culvert population distribution by rating (numbers of culverts)

Culvert rating 9	0	0	0	0	0	0	0	0	0	0
Culvert rating 8	0	0	0	0	0	0	0	0	0	0
Culvert rating 7	100	82	64	47	29	11	9	7	4	2
Culvert rating 6	1429	1355	1281	1207	1133	1059	944	828	713	597
Culvert rating 5	832	893	954	1015	1076	1137	1205	1273	1340	1408
Culvert rating 4	94	122	150	177	205	233	273	313	352	392
Culvert rating 3	34	37	39	42	44	47	56	65	73	82
Culvert rating 2	1	1	2	2	3	3	4	5	7	8
Culvert rating 1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844

Bridge population distribution by sufficiency rating (number of bridges)

SR > 80% (Good)	5151	4973	4795	4617	4439	4261	4066	3871	3677	3482
50% < SR <=80% (Fair)	4576	4619	4661	4704	4746	4789	4811	4833	4854	4876
SR <=50% (Poor)	2608	2743	2879	3014	3150	3285	3458	3631	3804	3977

Structurally deficient and functionally obsolete bridges

Number of bridges	7366	7836	8306	8776	9246	9716	9891	10066	10241	10416
Percent of deck area	63.36	67.33	71.30	75.28	79.25	83.22	85.27	87.32	89.37	91.42

Structurally deficient bridges

Number of bridges	6332	6901	7470	8039	8608	9177	9390	9602	9815	10027
Percent of deck area	55.63	60.56	65.49	70.43	75.36	80.29	82.69	85.10	87.50	89.91

Functionally obsolete bridges

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $0M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Number of bridges	1034	935	836	737	638	539	501	464	426	389
Percent of deck area	7.73	6.77	5.81	4.85	3.89	2.93	2.58	2.22	1.87	1.51
Good structural condition										
Number of bridges	105	87	68	50	31	13	10	8	5	3
Percent of deck area	0.43	0.36	0.28	0.21	0.13	0.06	0.05	0.03	0.02	0.01
Fair structural condition										
Number of bridges	5879	5333	4786	4240	3693	3147	2937	2727	2516	2306
Percent of deck area	43.89	39.04	34.20	29.35	24.51	19.66	17.27	14.88	12.48	10.09
Poor structural condition										
Number of bridges	6351	6916	7481	8045	8610	9175	9388	9601	9813	10026
Percent of deck area	55.68	60.60	65.52	70.44	75.36	80.28	82.68	85.09	87.50	89.90

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $500M
BRIDGES: All Bridges; on and off NHS

20-YEAR TOTALS:

Total budget available over 20 years: $2000M

	Work Done ($M)	Work Done (bridges)	User Benefits Obtained ($M)
Total	1999.9		1593.8
Replacement	1230.3	409	1592.7
Struct/Func. motivated (S/F)	1014.3	399	1447.8
Economically motivated (E/M)	216.0	10	144.9
Improvement	0.4	5	0.2
Raising	0.0	0	0.0
Widening	0.4	3	0.2
Capacity Expansion	0.0	2	0.0
Strengthening	0.0	0	0.0
MR&R	769.2		0.9
Federal MR&R	769.2		-
Local MR&R	0.0		-
(not included in the total)			

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cumulative work done ($M)											
Total work	100.0	200.0	300.0	400.0	500.0	600.0	700.0	800.0	900.0	1000.0	
S/F motivated	71.8	143.7	215.5	287.3	359.1	452.5	545.9	639.3	732.7	826.1	
+Econ. motivated	28.2	56.3	84.5	112.7	140.9	147.5	154.1	160.7	167.3	173.9	
Replacement	76.1	152.2	228.3	304.4	380.4	392.2	404.0	415.8	427.6	439.3	
S/F motivated	47.9	95.8	143.7	191.7	239.6	244.8	249.9	255.1	260.3	265.5	
+Econ. motivated	28.2	56.3	84.5	112.7	140.9	147.5	154.1	160.7	167.3	173.9	
Improvement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Raising	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Widening	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Capacity Expansion	---	---	---	---	---	---	---	---	---	---	
Strengthening	---	---	---	---	---	---	---	---	---	---	
Federally Eligible MR&R	23.9	47.8	71.7	95.6	119.6	207.8	296.0	384.2	472.4	560.7	
Cumulative work done (number of bridges)											
Replacement	16	33	52	73	97	99	101	103	106	113	
S/F motivated	14	29	46	65	87	89	91	93	96	103	
+Econ. motivated	2	4	6	8	10	10	10	10	10	10	
Improvement	0	0	0	0	0	0	0	0	0	0	
Raising	---	---	---	---	---	---	---	---	---	---	
Widening	---	---	---	---	---	---	---	---	---	---	
Capacity Expansion	---	---	---	---	---	---	---	---	---	---	
Total structurally/functionally (S/F) motivated annual needs and work ($M)											
S/F motivated needs	11408	11279	11150	11021	10891	14891	14791	14690	14590	14490	
Total work done	100	100	100	100	100	100	100	100	100	100	
S/F motivated	72	72	72	72	72	93	93	93	93	93	
+Econ. motivated	28	28	28	28	28	7	7	7	7	7	
Backlog - total	11279	11150	11021	10891	10762	14791	14690	14590	14490	14389	
Replacement ($M)											
S/F motivated needs	5926.1	5878.1	5830.2	5782.3	5734.4	8691.8	8686.6	8681.4	8676.3	8671.1	
Total work done	76.1	76.1	76.1	76.1	76.1	11.8	11.8	11.8	11.8	11.8	
S/F motivated	47.9	47.9	47.9	47.9	47.9	5.2	5.2	5.2	5.2	5.2	
+Econ. motivated	28.2	28.2	28.2	28.2	28.2	6.6	6.6	6.6	6.6	6.6	
Backlog - total	5878.1	5830.2	5782.3	5734.4	5686.5	8686.6	8681.4	8676.3	8671.1	8665.9	
Improvement ($M)											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Needs		352.5	351.7	351.0	350.3	349.5	382.4	381.9	381.3	380.8	380.3
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.7	0.7	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5
Backlog - total		351.7	351.0	350.3	349.5	348.8	381.9	381.3	380.8	380.3	379.7
Raising ($M)											
Needs		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Widening ($M)											
Needs		184.5	184.3	184.1	183.9	183.7	206.2	206.2	206.2	206.1	206.1
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.2	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0
Backlog - total		184.3	184.1	183.9	183.7	183.4	206.2	206.2	206.1	206.1	206.1
Capacity Expansion ($M)											
Needs		15.3	15.3	15.3	15.3	15.3	17.8	17.8	17.8	17.8	17.8
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		15.3	15.3	15.3	15.3	15.3	17.8	17.8	17.8	17.8	17.8
Strengthening ($M)											
Needs		152.3	151.8	151.3	150.8	150.3	158.1	157.6	157.1	156.6	156.1
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Backlog - total		151.8	151.3	150.8	150.3	149.8	157.6	157.1	156.6	156.1	155.6
Federally Eligible MR&R ($M)											
Needs		5129.9	5049.2	4968.6	4887.9	4807.3	5816.6	5722.0	5627.5	5532.9	5438.3
Work done		23.9	23.9	23.9	23.9	23.9	88.2	88.2	88.2	88.2	88.2
Offset by E/M repl.		56.7	56.7	56.7	56.7	56.7	6.3	6.3	6.3	6.3	6.3
Backlog - total		5049.2	4968.6	4887.9	4807.3	4726.6	5722.0	5627.5	5532.9	5438.3	5343.8
Maintenance ($M)											
Needs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		---	---	---	---	---	---	---	---	---	---

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Replacement (number of bridges)											
S/F motivated needs	2039	2026	2011	1995	1978	2845	2843	2841	2839	2837	
Total work done	16	17	19	21	24	2	2	2	3	7	
S/F motivated	14	15	17	19	22	2	2	2	3	7	
+Econ. motivated	2	2	2	2	2	---	---	---	---	---	
Backlog - total	2026	2011	1995	1978	1957	2843	2841	2839	2837	2834	
Improvement (number of bridges)											
Needs	707	707	707	706	702	732	732	732	732	731	
Work done	0	0	0	0	0	0	0	0	0	0	
Offset by E/M repl.	0	0	1	4	10	0	0	0	1	2	
Backlog - total	707	707	706	702	692	732	732	732	731	729	
Raising (number of bridges)											
Needs	1	1	1	1	1	1	1	1	1	1	
Work done	0	0	0	0	0	0	0	0	0	0	
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0	
Backlog - total	1	1	1	1	1	1	1	1	1	1	
Widening (number of bridges)											
Needs	445	445	445	445	444	468	468	468	468	468	
Work done	0	0	0	0	0	0	0	0	0	0	
Offset by E/M repl.	0	0	0	1	5	0	0	0	0	1	
Backlog - total	445	445	445	444	439	468	468	468	468	467	
Capacity Expansion (number of bridges)											
Needs	23	23	23	23	23	27	27	27	27	27	
Work done	0	0	0	0	0	0	0	0	0	0	
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0	
Backlog - total	23	23	23	23	23	27	27	27	27	27	
Strengthening (number of bridges)											
Needs	238	238	238	237	234	236	236	236	236	235	
Work done	0	0	0	0	0	0	0	0	0	0	
Offset by E/M repl.	0	0	1	3	5	0	0	0	1	1	
Backlog - total	238	238	237	234	229	236	236	236	235	234	

Total User Benefits ($M)

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential, S/F motivated		2414.0	2219.3	2024.6	1830.0	1635.3	1614.6	1604.2	1593.7	1583.3	1572.9
Total obtained		175.7	175.7	175.7	175.7	175.7	9.5	9.5	9.5	9.5	9.5
By S/F motivated work		173.2	173.2	173.2	173.2	173.2	8.8	8.8	8.8	8.8	8.8
+Econ. motivated work		19.0	19.0	19.0	19.0	19.0	1.0	1.0	1.0	1.0	1.0
Offset of S/F		19.0	19.0	19.0	19.0	19.0	1.0	1.0	1.0	1.0	1.0
Excess over offset		---	---	---	---	---	---	---	---	---	---
Backlog - total		2219.3	2024.6	1830.0	1635.3	1440.7	1604.2	1593.7	1583.3	1572.9	1562.5
Benefits of S/F motivated replacements ($M)											
Potential		2067.1	1891.5	1715.8	1540.1	1364.5	1328.8	1319.5	1310.2	1300.9	1291.6
Total obtained		175.7	175.7	175.7	175.7	175.7	9.3	9.3	9.3	9.3	9.3
S/F motivated		173.2	173.2	173.2	173.2	173.2	8.6	8.6	8.6	8.6	8.6
+Econ. motivated		2.5	2.5	2.5	2.5	2.5	0.7	0.7	0.7	0.7	0.7
Backlog - total		1891.5	1715.8	1540.1	1364.5	1188.8	1319.5	1310.2	1300.9	1291.6	1282.3
Improvement Benefits ($M)											
Potential		337.6	318.6	299.6	280.7	261.7	275.0	274.0	273.1	272.1	271.2
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		19.0	19.0	19.0	19.0	19.0	1.0	1.0	1.0	1.0	1.0
Backlog - total		318.6	299.6	280.7	261.7	242.7	274.0	273.1	272.1	271.2	270.2
Raising Benefits ($M)											
Potential		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)											
Potential		25.5	25.4	25.4	25.3	25.2	28.4	28.4	28.4	28.4	28.4
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Backlog - total		25.4	25.4	25.3	25.2	25.1	28.4	28.4	28.4	28.4	28.4
Capacity Expansion Benefits ($M)											
Potential		3.8	3.8	3.8	3.8	3.8	5.6	5.6	5.6	5.6	5.6
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		3.8	3.8	3.8	3.8	3.8	5.6	5.6	5.6	5.6	5.6
Strengthening Benefits ($M)											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential		308.3	289.4	270.5	251.6	232.7	240.9	240.0	239.0	238.1	237.1
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		18.9	18.9	18.9	18.9	18.9	0.9	0.9	0.9	0.9	0.9
Backlog - total		289.4	270.5	251.6	232.7	213.8	240.0	239.0	238.1	237.1	236.2
Benefits of MR&R ($M)											
Potential		9.2	9.2	9.2	9.2	9.2	10.8	10.6	10.4	10.3	10.1
Obtained		0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.2
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		9.2	9.2	9.2	9.2	9.2	10.6	10.4	10.3	10.1	10.0
Average Benefit/Cost ratios											
Overall		6.405	6.405	6.405	6.405	6.405	3.221	3.221	3.221	3.221	3.221
Replacement		7.203	7.203	7.203	7.203	7.203	4.807	4.807	4.807	4.807	4.807
Improvement		---	---	---	---	---	---	---	---	---	---
Raising		---	---	---	---	---	---	---	---	---	---
Widening		---	---	---	---	---	---	---	---	---	---
Capacity Expansion		---	---	---	---	---	---	---	---	---	---
Strengthening		---	---	---	---	---	---	---	---	---	---
MR&R		3.865	3.865	3.865	3.865	3.865	3.009	3.009	3.009	3.009	3.009
Benefit/Cost cutoff ratio (federally eligible work only)		2.235	2.235	2.235	2.235	2.235	1.137	1.137	1.137	1.137	1.137

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Average network condition measures											
Sufficiency rating	80.39	80.20	79.86	79.51	79.17	78.82	78.45	77.84	77.24	76.63	76.02
Health index	87.79	87.57	87.07	86.56	86.06	85.55	85.02	84.68	84.35	84.02	83.69
Bridge population distribution by deck rating (numbers of bridges)											
Deck rating 9	0	0	20	39	59	78	98	170	242	313	385
Deck rating 8	139	139	121	103	84	66	48	136	225	313	402
Deck rating 7	5593	5593	4480	3367	2255	1142	29	36	43	49	56
Deck rating 6	462	462	1120	1778	2435	3093	3751	3007	2264	1520	777
Deck rating 5	2760	2760	2808	2857	2905	2954	3002	3130	3258	3385	3513
Deck rating 4	586	586	934	1282	1631	1979	2327	2677	3026	3376	3725
Deck rating 3	5	5	54	102	151	199	248	340	433	525	618
Deck rating 2	1	1	2	2	3	3	4	11	18	24	31
Deck rating 1	0	0	0	0	0	0	0	0	0	0	0
Deck rating 0	3	3	3	2	2	1	1	1	1	1	1
Deck rating N	2786	2786	2794	2802	2811	2819	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)											
Superstructure rating 9	0	0	28	55	83	110	138	252	365	479	592
Superstructure rating 8	301	301	256	211	167	122	77	68	59	49	40
Superstructure rating 7	6229	6229	5396	4562	3729	2895	2062	1698	1335	971	608
Superstructure rating 6	363	363	1164	1964	2765	3565	4366	4305	4244	4182	4121
Superstructure rating 5	2589	2589	2395	2201	2008	1814	1620	1753	1886	2018	2151
Superstructure rating 4	350	350	571	791	1012	1232	1453	1603	1754	1904	2055
Superstructure rating 3	9	9	32	54	77	99	122	155	188	221	254
Superstructure rating 2	1	1	2	2	3	3	4	8	12	15	19
Superstructure rating 1	0	0	0	0	0	0	0	0	1	1	2
Superstructure rating 0	1	1	1	1	1	1	1	1	1	1	1
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)											
Substructure rating 9	0	0	31	62	92	123	154	327	501	674	848
Substructure rating 8	264	264	231	199	166	134	101	86	71	56	41
Substructure rating 7	6773	6773	6101	5429	4757	4085	3413	2860	2307	1755	1202
Substructure rating 6	212	212	877	1542	2206	2871	3536	3910	4283	4657	5030

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Substructure rating 5	2299	2299	2154	2009	1865	1720	1575	1465	1355	1244	1134
Substructure rating 4	258	258	393	528	663	798	933	1054	1176	1297	1419
Substructure rating 3	9	9	23	37	50	64	78	88	98	107	117
Substructure rating 2	26	26	25	25	24	24	23	22	21	20	19
Substructure rating 1	1	1	2	3	3	4	5	6	7	7	8
Substructure rating 0	2	2	2	2	2	2	2	2	2	2	2
Substructure rating N	2491	2491	2496	2501	2505	2510	2515	2515	2515	2515	2515
Culvert population distribution by rating (numbers of culverts)											
Culvert rating 9	0	0	1	1	2	2	3	53	102	152	201
Culvert rating 8	123	123	106	89	72	55	38	30	23	15	8
Culvert rating 7	1328	1328	1192	1057	921	786	650	537	425	312	200
Culvert rating 6	958	958	1024	1089	1155	1220	1286	1286	1286	1285	1285
Culvert rating 5	23	23	107	192	276	361	445	504	563	623	682
Culvert rating 4	56	56	55	55	54	54	53	61	68	76	83
Culvert rating 3	2	2	5	7	10	12	15	19	23	26	30
Culvert rating 2	0	0	0	0	0	0	0	0	0	1	1
Culvert rating 1	1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844
Bridge population distribution by sufficiency rating (number of bridges)											
SR > 80% (Good)	6552	6552	6462	6372	6282	6192	6102	5954	5806	5657	5509
50% < SR <=80% (Fair)	4512	4512	4494	4476	4457	4439	4421	4442	4463	4484	4505
SR <=50% (Poor)	1271	1271	1379	1487	1596	1704	1812	1939	2066	2194	2321
Structurally deficient and functionally obsolete bridges											
Number of bridges	3277	3277	3653	4029	4406	4782	5158	5510	5863	6215	6568
Percent of deck area	26.09	26.03	29.63	33.23	36.83	40.43	44.02	46.94	49.86	52.78	55.71
Structurally deficient bridges											
Number of bridges	1041	1041	1567	2093	2618	3144	3670	4101	4533	4964	5396
Percent of deck area	11.46	11.43	15.94	20.44	24.95	29.45	33.94	37.24	40.54	43.84	47.13
Functionally obsolete bridges											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Number of bridges	2236	2236	2086	1937	1787	1638	1488	1409	1330	1251	1172
Percent of deck area	14.63	14.59	13.69	12.79	11.88	10.98	10.07	9.70	9.32	8.95	8.57
Good structural condition											
Number of bridges	5263	5263	4390	3517	2644	1771	898	927	956	986	1015
Percent of deck area	39.45	39.35	32.47	25.58	18.69	11.81	4.92	5.89	6.86	7.84	8.81
Fair structural condition											
Number of bridges	6029	6029	6369	6709	7050	7390	7730	7273	6816	6360	5903
Percent of deck area	48.86	48.74	51.05	53.35	55.66	57.97	60.25	56.15	52.05	47.95	43.84
Poor structural condition											
Number of bridges	1043	1043	1576	2109	2641	3174	3707	4135	4562	4990	5417
Percent of deck area	11.69	11.67	16.29	20.92	25.55	30.18	34.79	37.93	41.07	44.20	47.34

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cumulative work done ($M)										
Total work	1100.0	1200.0	1300.0	1399.9	1499.9	1599.9	1699.9	1799.9	1899.9	1999.9
S/F motivated	919.6	1013.1	1106.6	1200.0	1293.5	1391.6	1489.7	1587.7	1685.8	1783.9
+Econ. motivated	180.4	186.9	193.4	199.9	206.4	208.3	210.2	212.2	214.1	216.0
Replacement	519.4	599.5	679.7	759.8	839.9	917.9	996.0	1074.1	1152.2	1230.3
S/F motivated	339.1	412.7	486.3	559.9	633.5	709.6	785.8	861.9	938.1	1014.3
+Econ. motivated	180.4	186.9	193.4	199.9	206.4	208.3	210.2	212.2	214.1	216.0
Improvement	0.1	0.1	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.4
Raising	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Widening	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4
Capacity Expansion	---	---	---	---	---	---	---	---	---	---
Strengthening	---	---	---	---	---	---	---	---	---	---
Federally Eligible MR&R	580.5	600.3	620.1	639.9	659.8	681.7	703.5	725.4	747.3	769.2
Cumulative work done (number of bridges)										
Replacement	146	181	219	258	297	316	337	360	384	409
S/F motivated	136	171	209	248	287	306	327	350	374	399
+Econ. motivated	10	10	10	10	10	10	10	10	10	10
Improvement	0	0	0	2	4	4	4	4	4	5
Raising	---	---	---	---	---	---	---	---	---	---
Widening	---	---	---	1	2	2	2	2	2	3
Capacity Expansion	---	---	---	1	2	2	2	2	2	2
Total structurally/functionally (S/F) motivated annual needs and work ($M)										
S/F motivated needs	19401	19139	18876	18613	18350	25371	25101	24831	24561	24291
Total work done	100	100	100	100	100	100	100	100	100	100
S/F motivated	93	93	93	93	93	98	98	98	98	98
+Econ. motivated	7	7	7	7	7	2	2	2	2	2
Backlog - total	19139	18876	18613	18350	18087	25101	24831	24561	24291	24021
Replacement ($M)										
S/F motivated needs	12391	12318	12244	12170	12097	18123	18046	17970	17894	17818
Total work done	80	80	80	80	80	78	78	78	78	78
S/F motivated	74	74	74	74	74	76	76	76	76	76
+Econ. motivated	7	7	7	7	7	2	2	2	2	2
Backlog - total	12318	12244	12170	12097	12023	18046	17970	17894	17818	17742
Improvement ($M)										

All Performance Measures by Year

5yr PERIOD BUDGET: $500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Needs	425.6	422.9	420.2	417.6	414.9	440.3	437.9	435.6	433.2	430.8
Work done	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	2.6	2.6	2.6	2.6	2.6	2.3	2.3	2.3	2.3	2.3
Backlog - total	422.9	420.2	417.6	414.9	412.3	437.9	435.6	433.2	430.8	428.5
Raising ($M)										
Needs	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Widening ($M)										
Needs	229.0	227.8	226.7	225.5	224.4	234.2	234.1	233.9	233.7	233.5
Work done	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	1.1	1.1	1.1	1.1	1.1	0.2	0.2	0.2	0.2	0.2
Backlog - total	227.8	226.7	225.5	224.4	223.2	234.1	233.9	233.7	233.5	233.3
Capacity Expansion ($M)										
Needs	32.7	32.7	32.7	32.7	32.7	38.6	38.6	38.6	38.6	38.6
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	32.7	32.7	32.7	32.7	32.7	38.6	38.6	38.6	38.6	38.6
Strengthening ($M)										
Needs	163.6	162.1	160.6	159.1	157.6	167.2	165.0	162.8	160.7	158.5
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	1.5	1.5	1.5	1.5	1.5	2.2	2.2	2.2	2.2	2.2
Backlog - total	162.1	160.6	159.1	157.6	156.1	165.0	162.8	160.7	158.5	156.3
Federally Eligible MR&R ($M)										
Needs	6584.6	6398.0	6211.5	6024.9	5838.3	6807.9	6616.5	6425.0	6233.6	6042.2
Work done	19.8	19.8	19.8	19.8	19.8	21.9	21.9	21.9	21.9	21.9
Offset by E/M repl.	166.8	166.8	166.8	166.8	166.8	169.5	169.5	169.5	169.5	169.5
Backlog - total	6398.0	6211.5	6024.9	5838.3	5651.7	6616.5	6425.0	6233.6	6042.2	5850.8
Maintenance ($M)										
Needs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---

All Performance Measures by Year

5yr PERIOD BUDGET: $500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Replacement (number of bridges)										
S/F motivated needs	3911	3880	3849	3813	3776	5237	5219	5198	5176	5153
Total work done	33	35	38	39	39	19	21	23	24	25
S/F motivated	33	35	38	39	39	19	21	23	24	25
+Econ. motivated	---	---	---	---	---	---	---	---	---	---
Backlog - total	3880	3849	3813	3776	3738	5219	5198	5176	5153	5129
Improvement (number of bridges)										
Needs	779	775	770	763	753	785	785	784	783	780
Work done	0	0	0	2	2	0	0	0	0	1
Offset by E/M repl.	4	5	7	8	11	0	1	1	3	8
Backlog - total	775	770	763	753	740	785	784	783	780	771
Raising (number of bridges)										
Needs	1	1	1	1	1	1	1	1	1	1
Work done	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0
Backlog - total	1	1	1	1	1	1	1	1	1	1
Widening (number of bridges)										
Needs	494	493	491	487	482	500	500	500	500	499
Work done	0	0	0	1	1	0	0	0	0	1
Offset by E/M repl.	1	2	4	4	5	0	0	0	1	2
Backlog - total	493	491	487	482	476	500	500	500	499	496
Capacity Expansion (number of bridges)										
Needs	37	37	37	37	36	45	45	45	45	45
Work done	0	0	0	1	1	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	1
Backlog - total	37	37	37	36	35	45	45	45	45	44
Strengthening (number of bridges)										
Needs	247	244	241	238	234	239	239	238	237	235
Work done	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	3	3	3	4	6	0	1	1	2	5
Backlog - total	244	241	238	234	228	239	238	237	235	230

Total User Benefits ($M)

All Performance Measures by Year

5yr PERIOD BUDGET: $500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential, S/F motivated	1759.6	1625.7	1491.8	1357.9	1224.0	1369.1	1336.2	1303.3	1270.4	1237.5
Total obtained	104.7	104.7	104.7	104.7	104.7	28.9	28.9	28.9	28.9	28.9
By S/F motivated work	81.4	81.4	81.4	81.4	81.4	26.4	26.4	26.4	26.4	26.4
+Econ. motivated work	29.2	29.2	29.2	29.2	29.2	4.0	4.0	4.0	4.0	4.0
Offset of S/F	29.2	29.2	29.2	29.2	29.2	4.0	4.0	4.0	4.0	4.0
Excess over offset	---	---	---	---	---	---	---	---	---	---
Backlog - total	1625.7	1491.8	1357.9	1224.0	1090.1	1336.2	1303.3	1270.4	1237.5	1204.7
Benefits of S/F motivated replacements ($M)										
Potential	1421.6	1316.9	1212.3	1107.6	1002.9	1158.5	1129.6	1100.7	1071.8	1042.9
Total obtained	104.7	104.7	104.7	104.7	104.7	28.9	28.9	28.9	28.9	28.9
S/F motivated	81.4	81.4	81.4	81.4	81.4	26.4	26.4	26.4	26.4	26.4
+Econ. motivated	23.3	23.3	23.3	23.3	23.3	2.5	2.5	2.5	2.5	2.5
Backlog - total	1316.9	1212.3	1107.6	1002.9	898.3	1129.6	1100.7	1071.8	1042.9	1014.0
Improvement Benefits ($M)										
Potential	320.3	291.1	261.8	232.6	203.4	191.4	187.5	183.5	179.6	175.6
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	29.2	29.2	29.2	29.2	29.2	3.9	3.9	3.9	3.9	3.9
Backlog - total	291.1	261.8	232.6	203.4	174.1	187.5	183.5	179.6	175.6	171.6
Raising Benefits ($M)										
Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)										
Potential	32.0	31.8	31.6	31.5	31.3	33.9	33.9	33.8	33.8	33.7
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Backlog - total	31.8	31.6	31.5	31.3	31.1	33.9	33.8	33.8	33.7	33.7
Capacity Expansion Benefits ($M)										
Potential	9.4	9.4	9.4	9.4	9.4	13.1	13.1	13.1	13.0	13.0
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	9.4	9.4	9.4	9.4	9.3	13.1	13.1	13.0	13.0	13.0
Strengthening Benefits ($M)										

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BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential	278.9	249.9	220.8	191.8	162.7	144.4	140.5	136.6	132.7	128.9
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	29.1	29.1	29.1	29.1	29.1	3.9	3.9	3.9	3.9	3.9
Backlog - total	249.9	220.8	191.8	162.7	133.7	140.5	136.6	132.7	128.9	125.0
Benefits of MR&R ($M)										
Potential	17.7	17.7	17.7	17.7	17.7	19.1	19.1	19.1	19.0	19.0
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	17.7	17.7	17.7	17.7	17.7	19.1	19.1	19.0	19.0	19.0
Average Benefit/Cost ratios										
Overall	12.009	12.009	12.009	12.009	12.009	10.513	10.513	10.513	10.513	10.513
Replacement	14.222	14.222	14.222	14.222	14.222	12.635	12.635	12.635	12.635	12.635
Improvement	1.351	1.351	1.351	1.351	1.351	1.306	1.306	1.306	1.306	1.306
Raising	---	---	---	---	---	---	---	---	---	---
Widening	1.298	1.298	1.298	1.298	1.298	1.306	1.306	1.306	1.306	1.306
Capacity Expansion	1.710	1.710	1.710	1.710	1.710	---	---	---	---	---
Strengthening	---	---	---	---	---	---	---	---	---	---
MR&R	3.096	3.096	3.096	3.096	3.096	2.955	2.955	2.955	2.955	2.955
Benefit/Cost cutoff ratio (federally eligible work only)	1.137	1.137	1.137	1.137	1.137	1.137	1.137	1.137	1.137	1.137

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Average network condition measures										
Sufficiency rating	75.18	74.55	73.92	73.29	72.66	71.82	70.94	70.06	69.18	68.29
Health index	83.10	82.65	82.20	81.75	81.30	80.62	80.20	79.77	79.35	78.92
Bridge population distribution by deck rating (numbers of bridges)										
Deck rating 9	457	398	340	281	223	164	152	141	129	118
Deck rating 8	490	498	506	513	521	529	575	621	668	714
Deck rating 7	63	131	199	268	336	404	377	349	322	294
Deck rating 6	33	33	33	33	33	33	34	36	37	39
Deck rating 5	3641	3085	2530	1974	1419	863	702	542	381	221
Deck rating 4	4075	4291	4506	4722	4937	5153	4805	4457	4110	3762
Deck rating 3	710	1009	1308	1606	1905	2204	2640	3077	3513	3950
Deck rating 2	38	61	84	107	130	153	215	276	338	399
Deck rating 1	0	1	2	2	3	4	6	8	9	11
Deck rating 0	1	1	1	1	1	1	1	1	1	1
Deck rating N	2827	2827	2827	2827	2827	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)										
Superstructure rating 9	706	732	759	785	812	838	846	853	861	868
Superstructure rating 8	31	27	23	18	14	10	20	30	39	49
Superstructure rating 7	244	208	172	135	99	63	52	41	29	18
Superstructure rating 6	4060	3781	3502	3222	2943	2664	2377	2090	1804	1517
Superstructure rating 5	2284	2373	2462	2552	2641	2730	2820	2910	3000	3090
Superstructure rating 4	2205	2328	2451	2574	2697	2820	2857	2893	2930	2966
Superstructure rating 3	287	361	435	509	583	657	799	941	1082	1224
Superstructure rating 2	23	30	37	43	50	57	68	78	89	99
Superstructure rating 1	2	2	2	3	3	3	5	6	8	9
Superstructure rating 0	1	1	1	1	1	1	1	1	1	1
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)										
Substructure rating 9	1021	1044	1067	1091	1114	1137	1135	1134	1132	1131
Substructure rating 8	26	24	23	21	20	18	37	55	74	92
Substructure rating 7	649	543	438	332	227	121	104	87	69	52
Substructure rating 6	5404	5275	5146	5018	4889	4760	4372	3984	3596	3208

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FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Substructure rating 5	1024	1157	1290	1423	1556	1689	2015	2340	2666	2991
Substructure rating 4	1540	1602	1664	1727	1789	1851	1862	1873	1884	1895
Substructure rating 3	127	144	162	179	197	214	264	315	365	416
Substructure rating 2	18	18	18	17	17	17	17	18	18	19
Substructure rating 1	9	9	10	10	11	11	12	13	13	14
Substructure rating 0	2	2	2	2	2	2	2	2	2	2
Substructure rating N	2515	2515	2515	2515	2515	2515	2515	2515	2515	2515
Culvert population distribution by rating (numbers of culverts)										
Culvert rating 9	251	251	250	250	249	249	249	249	250	250
Culvert rating 8	0	1	2	3	4	5	5	5	5	5
Culvert rating 7	87	71	55	40	24	8	6	5	3	2
Culvert rating 6	1285	1217	1150	1082	1015	947	842	738	633	529
Culvert rating 5	741	796	852	907	963	1018	1081	1144	1208	1271
Culvert rating 4	91	116	142	167	193	218	251	284	317	350
Culvert rating 3	34	36	37	39	40	42	51	59	68	76
Culvert rating 2	1	1	2	2	3	3	4	5	7	8
Culvert rating 1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844
Bridge population distribution by sufficiency rating (number of bridges)										
SR > 80% (Good)	5361	5227	5094	4960	4827	4693	4535	4377	4218	4060
50% < SR <=80% (Fair)	4526	4567	4607	4648	4688	4729	4744	4758	4773	4787
SR <=50% (Poor)	2448	2541	2634	2727	2820	2913	3057	3200	3344	3487
Structurally deficient and functionally obsolete bridges										
Number of bridges	6920	7316	7712	8107	8503	8899	9043	9187	9331	9475
Percent of deck area	58.45	61.85	65.24	68.64	72.04	75.22	76.97	78.71	80.45	82.19
Structurally deficient bridges										
Number of bridges	5827	6309	6790	7272	7753	8235	8415	8594	8774	8953
Percent of deck area	50.27	54.49	58.71	62.93	67.14	71.16	73.21	75.25	77.30	79.35
Functionally obsolete bridges										

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BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Number of bridges	1093	1007	921	836	750	664	628	593	557	522
Percent of deck area	8.17	7.35	6.54	5.72	4.90	4.07	3.76	3.45	3.15	2.84
Good structural condition										
Number of bridges	1044	1053	1061	1070	1078	1087	1100	1112	1125	1137
Percent of deck area	9.75	9.81	9.88	9.94	10.00	10.03	10.17	10.31	10.45	10.60
Fair structural condition										
Number of bridges	5446	4960	4474	3987	3501	3015	2823	2630	2438	2245
Percent of deck area	39.62	35.41	31.21	27.00	22.79	18.53	16.40	14.27	12.14	10.00
Poor structural condition										
Number of bridges	5845	6323	6800	7278	7755	8233	8413	8593	8772	8952
Percent of deck area	50.32	54.52	58.73	62.94	67.14	71.15	73.19	75.24	77.29	79.34

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1000M
BRIDGES: All Bridges; on and off NHS

20-YEAR TOTALS:

Total budget available over 20 years: $4000M

	Work Done ($M)	Work Done (bridges)	User Benefits Obtained ($M)
Total	3999.1		1899.7
Replacement	2520.6	775	1895.9
Struct/Func. motivated (S/F)	1962.7	750	1751.5
Economically motivated (E/M)	557.9	25	144.4
Improvement	4.9	22	1.7
Raising	0.0	0	0.0
Widening	4.1	15	1.3
Capacity Expansion	0.8	7	0.3
Strengthening	0.0	0	0.0
MR&R	1474.4		2.2
Federal MR&R	1474.4		-
Local MR&R	0.0		-
(not included in the total)			

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cumulative work done ($M)											
Total work	200.0	400.0	600.0	800.0	1000.0	1200.0	1400.0	1600.0	1800.0	2000.0	
S/F motivated	141.8	283.6	425.4	567.2	709.0	883.8	1058.6	1233.3	1408.1	1582.8	
+Econ. motivated	58.2	116.4	174.6	232.8	291.0	316.2	341.4	366.7	391.9	417.1	
Replacement	131.0	262.0	392.9	523.9	654.9	700.0	745.2	790.3	835.5	880.6	
S/F motivated	72.8	145.6	218.4	291.2	364.0	383.9	403.8	423.7	443.6	463.5	
+Econ. motivated	58.2	116.4	174.6	232.8	291.0	316.2	341.4	366.7	391.9	417.1	
Improvement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Raising	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Widening	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Capacity Expansion	---	---	---	---	---	---	---	---	---	---	
Strengthening	---	---	---	---	---	---	---	---	---	---	
Federally Eligible MR&R	69.0	138.0	207.1	276.1	345.1	500.0	654.8	809.7	964.5	1119.4	
Cumulative work done (number of bridges)											
Replacement	38	76	115	155	199	204	212	223	235	247	
S/F motivated	35	70	106	143	184	188	195	205	216	227	
+Econ. motivated	3	6	9	12	15	16	17	18	19	20	
Improvement	0	0	0	0	0	0	0	0	0	1	
Raising	---	---	---	---	---	---	---	---	---	---	
Widening	---	---	---	---	---	---	---	---	---	---	
Capacity Expansion	---	---	---	---	---	---	---	---	---	1	
Total structurally/functionally (S/F) motivated annual needs and work ($M)											
S/F motivated needs	11408	11175	10942	10708	10475	14208	14008	13808	13609	13409	
Total work done	200	200	200	200	200	200	200	200	200	200	
S/F motivated	142	142	142	142	142	175	175	175	175	175	
+Econ. motivated	58	58	58	58	58	25	25	25	25	25	
Backlog - total	11175	10942	10708	10475	10241	14008	13808	13609	13409	13210	
Replacement ($M)											
S/F motivated needs	5926.1	5853.3	5780.5	5707.7	5634.9	8479.8	8459.9	8440.0	8420.1	8400.2	
Total work done	131.0	131.0	131.0	131.0	131.0	45.1	45.1	45.1	45.1	45.1	
S/F motivated	72.8	72.8	72.8	72.8	72.8	19.9	19.9	19.9	19.9	19.9	
+Econ. motivated	58.2	58.2	58.2	58.2	58.2	25.2	25.2	25.2	25.2	25.2	
Backlog - total	5853.3	5780.5	5707.7	5634.9	5562.1	8459.9	8440.0	8420.1	8400.2	8380.3	
Improvement ($M)											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

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BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Needs		352.5	350.6	348.8	346.9	345.1	376.9	375.1	373.3	371.5	369.7
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Backlog - total		350.6	348.8	346.9	345.1	343.3	375.1	373.3	371.5	369.7	367.9
Raising ($M)											
Needs		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Widening ($M)											
Needs		184.5	184.0	183.4	182.8	182.2	204.5	204.1	203.8	203.4	203.0
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.6	0.6	0.6	0.6	0.6	0.4	0.4	0.4	0.4	0.4
Backlog - total		184.0	183.4	182.8	182.2	181.7	204.1	203.8	203.4	203.0	202.7
Capacity Expansion ($M)											
Needs		15.3	15.3	15.3	15.3	15.3	17.8	17.8	17.8	17.8	17.8
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		15.3	15.3	15.3	15.3	15.3	17.8	17.8	17.8	17.8	17.8
Strengthening ($M)											
Needs		152.3	151.1	149.8	148.6	147.3	154.3	152.9	151.5	150.1	148.6
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4
Backlog - total		151.1	149.8	148.6	147.3	146.0	152.9	151.5	150.1	148.6	147.2
Federally Eligible MR&R ($M)											
Needs		5129.9	4971.1	4812.3	4653.6	4494.8	5350.9	5173.1	4995.2	4817.3	4639.4
Work done		69.0	69.0	69.0	69.0	69.0	154.9	154.9	154.9	154.9	154.9
Offset by E/M repl.		89.7	89.7	89.7	89.7	89.7	23.0	23.0	23.0	23.0	23.0
Backlog - total		4971.1	4812.3	4653.6	4494.8	4336.1	5173.1	4995.2	4817.3	4639.4	4461.6
Maintenance ($M)											
Needs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		---	---	---	---	---	---	---	---	---	---

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BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Replacement (number of bridges)											
S/F motivated needs	2039	2009	1978	1944	1907	2744	2741	2737	2732	2723	
Total work done	38	38	39	40	44	5	8	11	12	12	
S/F motivated	35	35	36	37	41	4	7	10	11	11	
+Econ. motivated	3	3	3	3	3	1	1	1	1	1	
Backlog - total	2009	1978	1944	1907	1869	2741	2737	2732	2723	2713	
Improvement (number of bridges)											
Needs	707	705	702	697	687	713	713	712	711	708	
Work done	0	0	0	0	0	0	0	0	0	1	
Offset by E/M repl.	2	3	5	10	14	0	1	1	3	7	
Backlog - total	705	702	697	687	673	713	712	711	708	700	
Raising (number of bridges)											
Needs	1	1	1	1	1	1	1	1	1	1	
Work done	0	0	0	0	0	0	0	0	0	0	
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0	
Backlog - total	1	1	1	1	1	1	1	1	1	1	
Widening (number of bridges)											
Needs	445	445	444	442	438	461	461	461	461	460	
Work done	0	0	0	0	0	0	0	0	0	0	
Offset by E/M repl.	0	1	2	4	6	0	0	0	1	3	
Backlog - total	445	444	442	438	432	461	461	461	460	457	
Capacity Expansion (number of bridges)											
Needs	23	23	23	23	23	26	26	26	26	26	
Work done	0	0	0	0	0	0	0	0	0	1	
Offset by E/M repl.	0	0	0	0	1	0	0	0	0	0	
Backlog - total	23	23	23	23	22	26	26	26	26	25	
Strengthening (number of bridges)											
Needs	238	236	234	231	225	225	225	224	223	221	
Work done	0	0	0	0	0	0	0	0	0	0	
Offset by E/M repl.	2	2	3	6	7	0	1	1	2	4	
Backlog - total	236	234	231	225	218	225	224	223	221	217	

Total User Benefits ($M)

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FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential, S/F motivated		2414.0	2159.5	1905.1	1650.7	1396.2	1319.1	1261.6	1204.2	1146.7	1089.3
Total obtained		229.4	229.4	229.4	229.4	229.4	39.4	39.4	39.4	39.4	39.4
By S/F motivated work		223.7	223.7	223.7	223.7	223.7	22.3	22.3	22.3	22.3	22.3
+Econ. motivated work		25.1	25.1	25.1	25.1	25.1	18.0	18.0	18.0	18.0	18.0
Offset of S/F		25.1	25.1	25.1	25.1	25.1	18.0	18.0	18.0	18.0	18.0
Excess over offset		---	---	---	---	---	---	---	---	---	---
Backlog - total		2159.5	1905.1	1650.7	1396.2	1141.8	1261.6	1204.2	1146.7	1089.3	1031.8
Benefits of S/F motivated replacements ($M)											
Potential		2067.1	1837.8	1608.4	1379.1	1149.7	1065.2	1026.2	987.2	948.2	909.3
Total obtained		229.4	229.4	229.4	229.4	229.4	39.0	39.0	39.0	39.0	39.0
S/F motivated		223.7	223.7	223.7	223.7	223.7	21.9	21.9	21.9	21.9	21.9
+Econ. motivated		5.7	5.7	5.7	5.7	5.7	17.1	17.1	17.1	17.1	17.1
Backlog - total		1837.8	1608.4	1379.1	1149.7	920.4	1026.2	987.2	948.2	909.3	870.3
Improvement Benefits ($M)											
Potential		337.6	312.5	287.5	262.4	237.4	243.2	225.1	207.1	189.0	171.0
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		25.0	25.0	25.0	25.0	25.0	18.0	18.0	18.0	18.0	18.0
Backlog - total		312.5	287.5	262.4	237.4	212.4	225.1	207.1	189.0	171.0	152.9
Raising Benefits ($M)											
Potential		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)											
Potential		25.5	25.4	25.3	25.2	25.0	28.3	28.2	28.2	28.1	28.1
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Backlog - total		25.4	25.3	25.2	25.0	24.9	28.2	28.2	28.1	28.1	28.1
Capacity Expansion Benefits ($M)											
Potential		3.8	3.8	3.7	3.7	3.7	5.5	5.5	5.5	5.5	5.5
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		3.8	3.7	3.7	3.7	3.7	5.5	5.5	5.5	5.5	5.5
Strengthening Benefits ($M)											

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FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential		308.3	283.4	258.5	233.6	208.6	209.4	191.4	173.4	155.4	137.4
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		24.9	24.9	24.9	24.9	24.9	18.0	18.0	18.0	18.0	18.0
Backlog - total		283.4	258.5	233.6	208.6	183.7	191.4	173.4	155.4	137.4	119.4
Benefits of MR&R ($M)											
Potential		9.2	9.2	9.2	9.2	9.1	10.7	10.3	9.9	9.4	9.0
Obtained		0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.4	0.4	0.4
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		9.2	9.2	9.2	9.1	9.1	10.3	9.9	9.4	9.0	8.6
Average Benefit/Cost ratios											
Overall		5.448	5.448	5.448	5.448	5.448	3.331	3.331	3.331	3.331	3.331
Replacement		6.395	6.395	6.395	6.395	6.395	4.692	4.692	4.692	4.692	4.692
Improvement		---	---	---	---	---	2.114	2.114	2.114	2.114	2.114
Raising		---	---	---	---	---	---	---	---	---	---
Widening		---	---	---	---	---	---	---	---	---	---
Capacity Expansion		---	---	---	---	---	2.114	2.114	2.114	2.114	2.114
Strengthening		---	---	---	---	---	---	---	---	---	---
MR&R		3.649	3.649	3.649	3.649	3.649	2.934	2.934	2.934	2.934	2.934
Benefit/Cost cutoff ratio (federally eligible work only)		2.153	2.153	2.153	2.153	2.153	1.137	1.137	1.137	1.137	1.137

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Average network condition measures											
Sufficiency rating	80.39	80.10	79.82	79.54	79.26	78.98	78.57	78.16	77.75	77.35	76.94
Health index	87.79	87.46	87.04	86.62	86.19	85.77	85.21	85.23	85.25	85.27	85.30
Bridge population distribution by deck rating (numbers of bridges)											
Deck rating 9	0	0	39	78	117	156	195	355	515	675	835
Deck rating 8	139	139	131	123	116	108	100	280	460	641	821
Deck rating 7	5593	5593	4481	3370	2258	1147	35	53	72	90	109
Deck rating 6	462	462	1101	1740	2380	3019	3658	2933	2208	1482	757
Deck rating 5	2760	2760	2803	2846	2888	2931	2974	2995	3015	3036	3056
Deck rating 4	586	586	928	1270	1612	1954	2296	2559	2821	3084	3346
Deck rating 3	5	5	53	101	149	197	245	322	400	477	555
Deck rating 2	1	1	2	2	3	3	4	10	16	22	28
Deck rating 1	0	0	0	0	0	0	0	0	0	0	0
Deck rating 0	3	3	3	2	2	1	1	1	1	1	1
Deck rating N	2786	2786	2794	2802	2811	2819	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)											
Superstructure rating 9	0	0	54	108	162	216	270	519	768	1016	1265
Superstructure rating 8	301	301	256	211	167	122	77	72	67	63	58
Superstructure rating 7	6229	6229	5388	4548	3707	2867	2026	1663	1299	936	572
Superstructure rating 6	363	363	1154	1946	2737	3529	4320	4161	4002	3842	3683
Superstructure rating 5	2589	2589	2390	2192	1993	1795	1596	1712	1828	1944	2060
Superstructure rating 4	350	350	566	782	997	1213	1429	1558	1687	1817	1946
Superstructure rating 3	9	9	31	53	76	98	120	149	179	208	238
Superstructure rating 2	1	1	2	2	3	3	4	8	11	15	18
Superstructure rating 1	0	0	0	0	0	0	0	0	1	1	2
Superstructure rating 0	1	1	1	1	1	1	1	1	1	1	1
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)											
Substructure rating 9	0	0	65	131	196	262	327	693	1059	1425	1791
Substructure rating 8	264	264	231	198	166	133	100	90	80	71	61
Substructure rating 7	6773	6773	6089	5406	4722	4039	3355	2796	2236	1677	1117
Substructure rating 6	212	212	866	1521	2175	2830	3484	3709	3934	4160	4385

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Substructure rating 5	2299	2299	2147	1995	1844	1692	1540	1413	1285	1158	1030
Substructure rating 4	258	258	388	518	649	779	909	1007	1105	1203	1301
Substructure rating 3	9	9	22	35	49	62	75	83	90	98	105
Substructure rating 2	26	26	25	25	24	24	23	22	21	20	19
Substructure rating 1	1	1	2	3	3	4	5	6	7	7	8
Substructure rating 0	2	2	2	2	2	2	2	2	2	2	2
Substructure rating N	2491	2491	2496	2501	2505	2510	2515	2515	2515	2515	2515
Culvert population distribution by rating (numbers of culverts)											
Culvert rating 9	0	0	3	6	10	13	16	120	225	329	434
Culvert rating 8	123	123	106	89	72	55	38	30	23	15	8
Culvert rating 7	1328	1328	1192	1056	920	784	648	534	420	306	192
Culvert rating 6	958	958	1023	1088	1152	1217	1282	1247	1213	1178	1144
Culvert rating 5	23	23	107	190	274	357	441	482	524	565	607
Culvert rating 4	56	56	55	54	52	51	50	57	64	71	78
Culvert rating 3	2	2	5	7	10	12	15	18	21	25	28
Culvert rating 2	0	0	0	0	0	0	0	0	0	1	1
Culvert rating 1	1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844
Bridge population distribution by sufficiency rating (number of bridges)											
SR > 80% (Good)	6552	6552	6480	6409	6337	6266	6194	6078	5963	5847	5732
50% < SR <=80% (Fair)	4512	4512	4488	4463	4439	4414	4390	4402	4414	4425	4437
SR <=50% (Poor)	1271	1271	1367	1463	1559	1655	1751	1855	1959	2062	2166
Structurally deficient and functionally obsolete bridges											
Number of bridges	3277	3277	3640	4003	4367	4730	5093	5366	5639	5912	6185
Percent of deck area	26.09	25.99	29.50	33.00	36.50	40.01	43.44	45.39	47.34	49.28	51.23
Structurally deficient bridges											
Number of bridges	1041	1041	1556	2071	2585	3100	3615	3952	4290	4627	4965
Percent of deck area	11.46	11.42	15.83	20.24	24.65	29.06	33.42	35.57	37.72	39.88	42.03
Functionally obsolete bridges											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Number of bridges	2236	2236	2084	1933	1781	1630	1478	1414	1349	1285	1220
Percent of deck area	14.63	14.58	13.67	12.76	11.86	10.95	10.03	9.82	9.61	9.40	9.20
Good structural condition											
Number of bridges	5263	5263	4419	3575	2730	1886	1042	1258	1474	1689	1905
Percent of deck area	39.45	39.30	32.82	26.34	19.86	13.39	6.90	9.76	12.63	15.49	18.36
Fair structural condition											
Number of bridges	6029	6029	6351	6674	6996	7319	7641	7093	6545	5996	5448
Percent of deck area	48.86	48.68	50.70	52.72	54.74	56.76	58.69	53.86	49.04	44.21	39.38
Poor structural condition											
Number of bridges	1043	1043	1565	2087	2608	3130	3652	3984	4317	4649	4982
Percent of deck area	11.69	11.65	16.18	20.72	25.25	29.78	34.26	36.25	38.24	40.23	42.22

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cumulative work done ($M)										
Total work	2199.9	2399.9	2599.9	2799.9	2999.9	3199.7	3399.5	3599.4	3799.2	3999.1
S/F motivated	1769.4	1956.0	2142.6	2329.2	2515.8	2700.9	2885.9	3071.0	3256.1	3441.2
+Econ. motivated	430.5	443.9	457.3	470.7	484.1	498.8	513.6	528.4	543.1	557.9
Replacement	1045.4	1210.2	1375.0	1539.8	1704.6	1867.8	2031.0	2194.2	2357.4	2520.6
S/F motivated	614.9	766.3	917.7	1069.2	1220.6	1369.0	1517.4	1665.9	1814.3	1962.7
+Econ. motivated	430.5	443.9	457.3	470.7	484.1	498.8	513.6	528.4	543.1	557.9
Improvement	0.2	0.4	0.6	0.9	1.1	1.8	2.6	3.3	4.1	4.9
Raising	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Widening	0.2	0.4	0.6	0.7	0.9	1.6	2.2	2.8	3.4	4.1
Capacity Expansion	---	0.1	0.1	0.1	0.1	0.3	0.4	0.5	0.7	0.8
Strengthening	---	---	---	---	---	---	---	---	---	---
Federally Eligible MR&R	1154.4	1189.3	1224.3	1259.3	1294.3	1330.3	1366.3	1402.4	1438.4	1474.4
Cumulative work done (number of bridges)										
Replacement	304	362	422	483	546	587	630	678	726	775
S/F motivated	284	342	402	463	526	566	608	655	702	750
+Econ. motivated	20	20	20	20	20	21	22	23	24	25
Improvement	1	2	4	6	10	11	12	13	14	22
Raising	---	---	---	---	---	---	---	---	---	---
Widening	---	1	2	3	5	6	7	8	9	15
Capacity Expansion	1	1	2	3	5	5	5	5	5	7
Total structurally/functionally (S/F) motivated annual needs and work ($M)										
S/F motivated needs	17400	16974	16547	16121	15695	21366	21013	20660	20307	19955
Total work done	200	200	200	200	200	200	200	200	200	200
S/F motivated	187	187	187	187	187	185	185	185	185	185
+Econ. motivated	13	13	13	13	13	15	15	15	15	15
Backlog - total	16974	16547	16121	15695	15268	21013	20660	20307	19955	19602
Replacement ($M)										
S/F motivated needs	11378	11227	11075	10924	10772	15689	15541	15393	15244	15096
Total work done	165	165	165	165	165	163	163	163	163	163
S/F motivated	151	151	151	151	151	148	148	148	148	148
+Econ. motivated	13	13	13	13	13	15	15	15	15	15
Backlog - total	11227	11075	10924	10772	10621	15541	15393	15244	15096	14947
Improvement ($M)										

All Performance Measures by Year

5yr PERIOD BUDGET: $1000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Needs	411.1	408.7	406.4	404.0	401.7	427.4	421.0	414.6	408.1	401.7
Work done	0.2	0.2	0.2	0.2	0.2	0.8	0.8	0.8	0.8	0.8
Offset by E/M repl.	2.1	2.1	2.1	2.1	2.1	5.7	5.7	5.7	5.7	5.7
Backlog - total	408.7	406.4	404.0	401.7	399.3	421.0	414.6	408.1	401.7	395.3
Raising ($M)										
Needs	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Widening ($M)										
Needs	224.1	223.0	221.9	220.8	219.7	229.6	227.5	225.4	223.3	221.2
Work done	0.2	0.2	0.2	0.2	0.2	0.6	0.6	0.6	0.6	0.6
Offset by E/M repl.	0.9	0.9	0.9	0.9	0.9	1.5	1.5	1.5	1.5	1.5
Backlog - total	223.0	221.9	220.8	219.7	218.6	227.5	225.4	223.3	221.2	219.1
Capacity Expansion ($M)										
Needs	32.7	32.7	32.7	32.6	32.6	38.6	38.1	37.6	37.1	36.6
Work done	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.4	0.4	0.4
Backlog - total	32.7	32.7	32.6	32.6	32.6	38.1	37.6	37.1	36.6	36.2
Strengthening ($M)										
Needs	154.0	152.8	151.6	150.3	149.1	158.9	155.1	151.3	147.4	143.6
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	1.2	1.2	1.2	1.2	1.2	3.8	3.8	3.8	3.8	3.8
Backlog - total	152.8	151.6	150.3	149.1	147.8	155.1	151.3	147.4	143.6	139.8
Federally Eligible MR&R ($M)										
Needs	5611.1	5338.4	5065.8	4793.1	4520.5	5248.8	5050.9	4853.0	4655.1	4457.2
Work done	35.0	35.0	35.0	35.0	35.0	36.0	36.0	36.0	36.0	36.0
Offset by E/M repl.	237.7	237.7	237.7	237.7	237.7	161.9	161.9	161.9	161.9	161.9
Backlog - total	5338.4	5065.8	4793.1	4520.5	4247.8	5050.9	4853.0	4655.1	4457.2	4259.3
Maintenance ($M)										
Needs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Replacement (number of bridges)										
S/F motivated needs	3676	3623	3568	3511	3452	4695	4656	4617	4573	4528
Total work done	57	58	60	61	63	41	43	48	48	49
S/F motivated	57	58	60	61	63	40	42	47	47	48
+Econ. motivated	---	---	---	---	---	1	1	1	1	1
Backlog - total	3623	3568	3511	3452	3391	4656	4617	4573	4528	4480
Improvement (number of bridges)										
Needs	748	744	739	732	725	754	749	743	736	727
Work done	0	1	2	2	4	1	1	1	1	8
Offset by E/M repl.	4	4	5	5	14	4	5	6	8	16
Backlog - total	744	739	732	725	707	749	743	736	727	703
Raising (number of bridges)										
Needs	1	1	1	1	1	1	1	1	1	1
Work done	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0
Backlog - total	1	1	1	1	1	1	1	1	1	1
Widening (number of bridges)										
Needs	482	480	477	474	471	486	484	481	478	473
Work done	0	1	1	1	2	1	1	1	1	6
Offset by E/M repl.	2	2	2	2	7	1	2	2	4	7
Backlog - total	480	477	474	471	462	484	481	478	473	460
Capacity Expansion (number of bridges)										
Needs	36	36	36	35	34	44	44	44	44	44
Work done	0	0	1	1	2	0	0	0	0	2
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	1
Backlog - total	36	36	35	34	32	44	44	44	44	41
Strengthening (number of bridges)										
Needs	229	227	225	222	219	223	220	217	213	209
Work done	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	2	2	3	3	7	3	3	4	4	8
Backlog - total	227	225	222	219	212	220	217	213	209	201

Total User Benefits ($M)

All Performance Measures by Year

5yr PERIOD BUDGET: $1000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential, S/F motivated	1258.3	1174.0	1089.6	1005.2	920.8	976.8	935.1	893.3	851.6	809.8
Total obtained	76.2	76.2	76.2	76.2	76.2	35.0	35.0	35.0	35.0	35.0
By S/F motivated work	73.3	73.3	73.3	73.3	73.3	31.8	31.8	31.8	31.8	31.8
+Econ. motivated work	8.2	8.2	8.2	8.2	8.2	6.8	6.8	6.8	6.8	6.8
Offset of S/F	8.2	8.2	8.2	8.2	8.2	6.8	6.8	6.8	6.8	6.8
Excess over offset	---	---	---	---	---	---	---	---	---	---
Backlog - total	1174.0	1089.6	1005.2	920.8	836.5	935.1	893.3	851.6	809.8	768.1
Benefits of S/F motivated replacements ($M)										
Potential	1066.7	990.6	914.5	838.3	762.2	810.3	775.6	740.9	706.2	671.5
Total obtained	76.1	76.1	76.1	76.1	76.1	34.7	34.7	34.7	34.7	34.7
S/F motivated	73.2	73.2	73.2	73.2	73.2	31.6	31.6	31.6	31.6	31.6
+Econ. motivated	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1
Backlog - total	990.6	914.5	838.3	762.2	686.1	775.6	740.9	706.2	671.5	636.8
Improvement Benefits ($M)										
Potential	176.5	168.3	160.1	151.9	143.7	150.4	143.4	136.4	129.4	122.4
Obtained	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Offset by E/M repl.	8.1	8.1	8.1	8.1	8.1	6.8	6.8	6.8	6.8	6.8
Backlog - total	168.3	160.1	151.9	143.7	135.4	143.4	136.4	129.4	122.4	115.4
Raising Benefits ($M)										
Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)										
Potential	31.5	31.3	31.0	30.8	30.5	33.0	32.6	32.1	31.7	31.2
Obtained	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Offset by E/M repl.	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Backlog - total	31.3	31.0	30.8	30.5	30.3	32.6	32.1	31.7	31.2	30.8
Capacity Expansion Benefits ($M)										
Potential	9.2	9.2	9.2	9.2	9.2	13.0	12.9	12.8	12.7	12.7
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	9.2	9.2	9.2	9.2	9.1	12.9	12.8	12.7	12.7	12.6
Strengthening Benefits ($M)										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential	135.8	127.8	119.9	111.9	103.9	104.4	97.9	91.5	85.0	78.5
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	8.0	8.0	8.0	8.0	8.0	6.5	6.5	6.5	6.5	6.5
Backlog - total	127.8	119.9	111.9	103.9	96.0	97.9	91.5	85.0	78.5	72.0
Benefits of MR&R ($M)										
Potential	15.1	15.1	15.0	15.0	15.0	16.1	16.0	16.0	16.0	15.9
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	15.1	15.0	15.0	15.0	14.9	16.0	16.0	16.0	15.9	15.9
Average Benefit/Cost ratios										
Overall	8.199	8.199	8.199	8.199	8.199	5.759	5.759	5.759	5.759	5.759
Replacement	9.313	9.313	9.313	9.313	9.313	6.389	6.389	6.389	6.389	6.389
Improvement	1.278	1.278	1.278	1.278	1.278	1.131	1.131	1.131	1.131	1.131
Raising	---	---	---	---	---	---	---	---	---	---
Widening	1.206	1.206	1.206	1.206	1.206	1.138	1.138	1.138	1.138	1.138
Capacity Expansion	1.984	1.984	1.984	1.984	1.984	1.097	1.097	1.097	1.097	1.097
Strengthening	---	---	---	---	---	---	---	---	---	---
MR&R	2.988	2.988	2.988	2.988	2.988	2.989	2.989	2.989	2.989	2.989
Benefit/Cost cutoff ratio (federally eligible work only)	1.137	1.137	1.137	1.137	1.137	1.137	1.137	1.137	1.137	1.137

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Average network condition measures										
Sufficiency rating	76.06	75.65	75.24	74.83	74.41	73.57	72.94	72.30	71.67	71.03
Health index	84.80	84.49	84.19	83.88	83.58	82.79	82.52	82.25	81.98	81.70
Bridge population distribution by deck rating (numbers of bridges)										
Deck rating 9	995	851	707	563	419	275	264	252	241	229
Deck rating 8	1001	1021	1041	1061	1081	1101	1194	1287	1381	1474
Deck rating 7	127	276	424	573	721	870	795	720	644	569
Deck rating 6	32	40	48	56	64	72	75	79	82	86
Deck rating 5	3077	2607	2137	1666	1196	726	602	478	353	229
Deck rating 4	3609	3767	3925	4084	4242	4400	4090	3781	3471	3162
Deck rating 3	632	891	1150	1408	1667	1926	2298	2670	3041	3413
Deck rating 2	34	54	74	94	114	134	184	235	285	336
Deck rating 1	0	1	1	2	2	3	5	6	8	9
Deck rating 0	1	1	1	1	1	1	1	1	1	1
Deck rating N	2827	2827	2827	2827	2827	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)										
Superstructure rating 9	1514	1556	1597	1639	1680	1722	1733	1744	1756	1767
Superstructure rating 8	53	47	41	35	29	23	42	61	79	98
Superstructure rating 7	209	182	155	129	102	75	63	52	40	29
Superstructure rating 6	3524	3267	3010	2753	2496	2239	1999	1760	1520	1281
Superstructure rating 5	2176	2245	2314	2383	2452	2521	2576	2631	2687	2742
Superstructure rating 4	2075	2181	2287	2392	2498	2604	2635	2666	2698	2729
Superstructure rating 3	267	334	402	469	537	604	729	854	979	1104
Superstructure rating 2	22	28	34	40	46	52	60	68	77	85
Superstructure rating 1	2	2	2	2	2	2	4	5	7	8
Superstructure rating 0	1	1	1	1	1	1	1	1	1	1
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)										
Substructure rating 9	2157	2192	2226	2261	2295	2330	2326	2322	2319	2315
Substructure rating 8	51	48	45	41	38	35	63	91	120	148
Substructure rating 7	558	474	389	305	220	136	120	104	88	72
Substructure rating 6	4610	4496	4382	4267	4153	4039	3707	3375	3044	2712

All Performance Measures by Year

5yr PERIOD BUDGET: $1000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Substructure rating 5	903	1013	1123	1233	1343	1453	1729	2005	2282	2558
Substructure rating 4	1399	1442	1485	1528	1571	1614	1616	1618	1619	1621
Substructure rating 3	113	127	142	156	171	185	230	275	319	364
Substructure rating 2	18	17	17	16	16	15	15	15	14	14
Substructure rating 1	9	9	10	10	11	11	12	13	13	14
Substructure rating 0	2	2	2	2	2	2	2	2	2	2
Substructure rating N	2515	2515	2515	2515	2515	2515	2515	2515	2515	2515
Culvert population distribution by rating (numbers of culverts)										
Culvert rating 9	538	536	535	533	532	530	531	532	534	535
Culvert rating 8	0	2	4	6	8	10	10	10	9	9
Culvert rating 7	78	64	50	36	22	8	6	5	3	2
Culvert rating 6	1109	1051	993	934	876	818	727	636	546	455
Culvert rating 5	648	695	742	788	835	882	937	992	1046	1101
Culvert rating 4	85	108	131	155	178	201	229	258	286	315
Culvert rating 3	31	32	34	35	37	38	45	52	59	66
Culvert rating 2	1	1	2	2	3	3	4	5	7	8
Culvert rating 1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844
Bridge population distribution by sufficiency rating (number of bridges)										
SR > 80% (Good)	5616	5520	5425	5329	5234	5138	5019	4901	4782	4664
50% < SR <=80% (Fair)	4449	4478	4507	4535	4564	4593	4596	4599	4601	4604
SR <=50% (Poor)	2270	2337	2404	2470	2537	2604	2720	2836	2951	3067
Structurally deficient and functionally obsolete bridges										
Number of bridges	6458	6783	7108	7432	7757	8082	8199	8316	8432	8549
Percent of deck area	52.85	55.65	58.44	61.24	64.03	66.44	67.78	69.13	70.47	71.82
Structurally deficient bridges										
Number of bridges	5302	5697	6093	6488	6884	7279	7426	7574	7721	7869
Percent of deck area	43.92	47.36	50.79	54.23	57.67	60.75	62.31	63.87	65.43	66.99
Functionally obsolete bridges										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Number of bridges	1156	1085	1015	944	874	803	772	742	711	681
Percent of deck area	8.93	8.29	7.65	7.01	6.36	5.69	5.48	5.26	5.05	4.83
Good structural condition										
Number of bridges	2121	2145	2168	2192	2215	2239	2262	2286	2309	2333
Percent of deck area	21.10	21.30	21.49	21.69	21.89	21.96	22.26	22.57	22.87	23.17
Fair structural condition										
Number of bridges	4900	4484	4068	3652	3236	2820	2649	2478	2307	2136
Percent of deck area	34.35	30.84	27.34	23.83	20.33	16.72	14.98	13.23	11.48	9.73
Poor structural condition										
Number of bridges	5314	5706	6099	6491	6884	7276	7424	7571	7719	7866
Percent of deck area	43.95	47.38	50.80	54.23	57.66	60.73	62.30	63.86	65.42	66.98

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

20-YEAR TOTALS:

Total budget available over 20 years: $6000M

	Work Done ($M)	Work Done (bridges)	User Benefits Obtained ($M)
Total	5997.8		2087.2
Replacement	3844.7	1196	2079.4
Struct/Func. motivated (S/F)	2941.1	1141	1916.6
Economically motivated (E/M)	903.7	55	162.8
Improvement	20.7	58	4.7
Raising	0.0	0	0.0
Widening	16.9	45	3.7
Capacity Expansion	2.1	10	0.7
Strengthening	1.7	3	0.3
MR&R	2134.4		3.1
Federal MR&R	2134.4		-
Local MR&R	0.0		-
(not included in the total)			

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cumulative work done ($M)											
Total work	300.0	600.0	900.0	1200.0	1499.9	1799.9	2099.9	2399.9	2699.9	2999.9	
S/F motivated	240.3	480.6	721.0	961.3	1201.6	1434.6	1667.7	1900.7	2133.8	2366.8	
+Econ. motivated	59.7	119.3	179.0	238.7	298.3	365.3	432.2	499.2	566.2	633.1	
Replacement	158.0	315.9	473.9	631.9	789.8	893.1	996.4	1099.7	1203.0	1306.3	
S/F motivated	98.3	196.6	294.9	393.2	491.5	527.8	564.2	600.5	636.8	673.2	
+Econ. motivated	59.7	119.3	179.0	238.7	298.3	365.3	432.2	499.2	566.2	633.1	
Improvement	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	
Raising	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Widening	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	
Capacity Expansion	---	---	---	---	0.1	0.1	0.1	0.1	0.1	0.1	
Strengthening	---	---	---	---	---	---	---	---	---	---	
Federally Eligible MR&R	142.0	284.0	426.1	568.1	710.1	906.8	1103.4	1300.1	1496.8	1693.4	
Cumulative work done (number of bridges)											
Replacement	54	109	165	224	284	299	316	333	354	376	
S/F motivated	51	103	156	212	269	281	295	309	327	346	
+Econ. motivated	3	6	9	12	15	18	21	24	27	30	
Improvement	0	0	0	1	2	2	2	2	2	4	
Raising	---	---	---	---	---	---	---	---	---	---	
Widening	---	---	---	---	---	---	---	---	---	1	
Capacity Expansion	---	---	---	1	2	2	2	2	2	3	
Total structurally/functionally (S/F) motivated annual needs and work ($M)											
S/F motivated needs	11408	11057	10705	10353	10001	13518	13211	12904	12597	12290	
Total work done	300	300	300	300	300	300	300	300	300	300	
S/F motivated	240	240	240	240	240	233	233	233	233	233	
+Econ. motivated	60	60	60	60	60	67	67	67	67	67	
Backlog - total	11057	10705	10353	10001	9649	13211	12904	12597	12290	11983	
Replacement ($M)											
S/F motivated needs	5926.1	5827.8	5729.5	5631.1	5532.8	8311.7	8275.4	8239.1	8202.7	8166.4	
Total work done	158.0	158.0	158.0	158.0	158.0	103.3	103.3	103.3	103.3	103.3	
S/F motivated	98.3	98.3	98.3	98.3	98.3	36.3	36.3	36.3	36.3	36.3	
+Econ. motivated	59.7	59.7	59.7	59.7	59.7	67.0	67.0	67.0	67.0	67.0	
Backlog - total	5827.8	5729.5	5631.1	5532.8	5434.5	8275.4	8239.1	8202.7	8166.4	8130.1	
Improvement ($M)											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Needs		352.5	349.3	346.2	343.0	339.8	370.7	368.0	365.2	362.5	359.8
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		3.1	3.1	3.1	3.1	3.1	2.7	2.7	2.7	2.7	2.7
Backlog - total		349.3	346.2	343.0	339.8	336.7	368.0	365.2	362.5	359.8	357.0
Raising ($M)											
Needs		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Widening ($M)											
Needs		184.5	183.5	182.5	181.4	180.4	202.4	201.8	201.2	200.5	199.9
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		1.0	1.0	1.0	1.0	1.0	0.6	0.6	0.6	0.6	0.6
Backlog - total		183.5	182.5	181.4	180.4	179.4	201.8	201.2	200.5	199.9	199.3
Capacity Expansion ($M)											
Needs		15.3	15.3	15.3	15.3	15.3	17.8	17.8	17.8	17.8	17.8
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		15.3	15.3	15.3	15.3	15.2	17.8	17.8	17.8	17.8	17.8
Strengthening ($M)											
Needs		152.3	150.2	148.1	146.0	143.9	150.3	148.1	146.0	143.9	141.8
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Backlog - total		150.2	148.1	146.0	143.9	141.8	148.1	146.0	143.9	141.8	139.7
Federally Eligible MR&R ($M)											
Needs		5129.9	4879.5	4629.2	4378.9	4128.5	4835.3	4567.3	4299.4	4031.4	3763.5
Work done		142.0	142.0	142.0	142.0	142.0	196.7	196.7	196.7	196.7	196.7
Offset by E/M repl.		108.3	108.3	108.3	108.3	108.3	71.3	71.3	71.3	71.3	71.3
Backlog - total		4879.5	4629.2	4378.9	4128.5	3878.2	4567.3	4299.4	4031.4	3763.5	3495.5
Maintenance ($M)											
Needs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		---	---	---	---	---	---	---	---	---	---

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Replacement (number of bridges)											
S/F motivated needs	2039	1992	1943	1893	1840	2652	2642	2630	2618	2605	
Total work done	54	55	56	59	60	15	17	17	21	22	
S/F motivated	51	52	53	56	57	12	14	14	18	19	
+Econ. motivated	3	3	3	3	3	3	3	3	3	3	
Backlog - total	1992	1943	1893	1840	1787	2642	2630	2618	2605	2589	
Improvement (number of bridges)											
Needs	707	701	695	684	671	696	695	694	692	686	
Work done	0	0	0	1	1	0	0	0	0	2	
Offset by E/M repl.	6	6	11	12	18	1	1	2	6	10	
Backlog - total	701	695	684	671	652	695	694	692	686	674	
Raising (number of bridges)											
Needs	1	1	1	1	1	1	1	1	1	1	
Work done	0	0	0	0	0	0	0	0	0	0	
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0	
Backlog - total	1	1	1	1	1	1	1	1	1	1	
Widening (number of bridges)											
Needs	445	443	441	437	432	454	454	454	454	451	
Work done	0	0	0	0	0	0	0	0	0	1	
Offset by E/M repl.	2	2	4	5	8	0	0	0	3	5	
Backlog - total	443	441	437	432	424	454	454	454	451	445	
Capacity Expansion (number of bridges)											
Needs	23	23	23	23	22	26	26	26	26	26	
Work done	0	0	0	1	1	0	0	0	0	1	
Offset by E/M repl.	0	0	0	0	1	0	0	0	0	0	
Backlog - total	23	23	23	22	20	26	26	26	26	25	
Strengthening (number of bridges)											
Needs	238	234	230	223	216	215	214	213	211	208	
Work done	0	0	0	0	0	0	0	0	0	0	
Offset by E/M repl.	4	4	7	7	9	1	1	2	3	5	
Backlog - total	234	230	223	216	207	214	213	211	208	203	

Total User Benefits ($M)

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential, S/F motivated		2414.0	2123.8	1833.7	1543.5	1253.4	1138.6	1074.9	1011.2	947.5	883.8
Total obtained		260.5	260.5	260.5	260.5	260.5	42.9	42.9	42.9	42.9	42.9
By S/F motivated work		252.8	252.8	252.8	252.8	252.8	24.4	24.4	24.4	24.4	24.4
+Econ. motivated work		29.6	29.6	29.6	29.6	29.6	20.8	20.8	20.8	20.8	20.8
Offset of S/F		29.6	29.6	29.6	29.6	29.6	20.8	20.8	20.8	20.8	20.8
Excess over offset		---	---	---	---	---	---	---	---	---	---
Backlog - total		2123.8	1833.7	1543.5	1253.4	963.2	1074.9	1011.2	947.5	883.8	820.1
Benefits of S/F motivated replacements ($M)											
Potential		2067.1	1806.7	1546.2	1285.7	1025.2	909.0	866.7	824.3	782.0	739.6
Total obtained		260.5	260.5	260.5	260.5	260.5	42.3	42.3	42.3	42.3	42.3
S/F motivated		252.7	252.7	252.7	252.7	252.7	23.8	23.8	23.8	23.8	23.8
+Econ. motivated		7.8	7.8	7.8	7.8	7.8	18.5	18.5	18.5	18.5	18.5
Backlog - total		1806.7	1546.2	1285.7	1025.2	764.8	866.7	824.3	782.0	739.6	697.3
Improvement Benefits ($M)											
Potential		337.6	308.0	278.3	248.7	219.1	219.0	198.3	177.5	156.7	135.9
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		29.6	29.6	29.6	29.6	29.6	20.7	20.7	20.7	20.7	20.7
Backlog - total		308.0	278.3	248.7	219.1	189.5	198.3	177.5	156.7	135.9	115.2
Raising Benefits ($M)											
Potential		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)											
Potential		25.5	25.3	25.1	24.9	24.7	27.9	27.8	27.7	27.5	27.4
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Backlog - total		25.3	25.1	24.9	24.7	24.5	27.8	27.7	27.5	27.4	27.3
Capacity Expansion Benefits ($M)											
Potential		3.8	3.7	3.7	3.7	3.7	5.5	5.5	5.5	5.5	5.5
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		3.7	3.7	3.7	3.7	3.6	5.5	5.5	5.5	5.5	5.5
Strengthening Benefits ($M)											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential		308.3	278.9	249.5	220.1	190.7	185.6	165.0	144.3	123.7	103.0
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		29.4	29.4	29.4	29.4	29.4	20.6	20.6	20.6	20.6	20.6
Backlog - total		278.9	249.5	220.1	190.7	161.3	165.0	144.3	123.7	103.0	82.4
Benefits of MR&R ($M)											
Potential		9.2	9.2	9.1	9.1	9.0	10.5	10.0	9.4	8.8	8.2
Obtained		0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.6	0.6	0.6
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		9.2	9.1	9.1	9.0	9.0	10.0	9.4	8.8	8.2	7.6
Average Benefit/Cost ratios											
Overall		4.977	4.977	4.977	4.977	4.977	3.702	3.702	3.702	3.702	3.702
Replacement		6.372	6.372	6.372	6.372	6.372	5.158	5.158	5.158	5.158	5.158
Improvement		1.998	1.998	1.998	1.998	1.998	1.427	1.427	1.427	1.427	1.427
Raising		---	---	---	---	---	---	---	---	---	---
Widening		---	---	---	---	---	1.353	1.353	1.353	1.353	1.353
Capacity Expansion		1.998	1.998	1.998	1.998	1.998	2.422	2.422	2.422	2.422	2.422
Strengthening		---	---	---	---	---	---	---	---	---	---
MR&R		3.426	3.426	3.426	3.426	3.426	2.937	2.937	2.937	2.937	2.937
Benefit/Cost cutoff ratio (federally eligible work only)		2.153	2.153	2.153	2.153	2.153	1.136	1.136	1.136	1.136	1.136

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Average network condition measures											
Sufficiency rating	80.39	80.03	79.80	79.58	79.36	79.14	78.65	78.42	78.19	77.96	77.73
Health index	87.79	87.38	87.05	86.71	86.37	86.04	85.42	85.70	85.98	86.26	86.54
Bridge population distribution by deck rating (numbers of bridges)											
Deck rating 9	0	0	57	115	172	230	287	505	723	942	1160
Deck rating 8	139	139	148	156	165	173	182	422	663	903	1144
Deck rating 7	5593	5593	4482	3371	2260	1149	38	68	98	127	157
Deck rating 6	462	462	1081	1701	2320	2940	3559	2855	2150	1446	741
Deck rating 5	2760	2760	2792	2825	2857	2890	2922	2870	2819	2767	2716
Deck rating 4	586	586	924	1262	1599	1937	2275	2468	2661	2855	3048
Deck rating 3	5	5	52	99	146	193	240	309	378	447	516
Deck rating 2	1	1	2	2	3	3	4	9	15	20	26
Deck rating 1	0	0	0	0	0	0	0	0	0	0	0
Deck rating 0	3	3	3	2	2	1	1	1	1	1	1
Deck rating N	2786	2786	2794	2802	2811	2819	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)											
Superstructure rating 9	0	0	85	170	255	340	425	764	1103	1441	1780
Superstructure rating 8	301	301	257	212	168	123	79	78	78	77	77
Superstructure rating 7	6229	6229	5380	4532	3683	2835	1986	1626	1266	906	546
Superstructure rating 6	363	363	1144	1924	2705	3485	4266	4040	3814	3588	3362
Superstructure rating 5	2589	2589	2384	2179	1974	1769	1564	1668	1773	1877	1982
Superstructure rating 4	350	350	560	769	979	1188	1398	1511	1624	1738	1851
Superstructure rating 3	9	9	31	53	76	98	120	147	173	200	226
Superstructure rating 2	1	1	2	2	3	3	4	7	10	14	17
Superstructure rating 1	0	0	0	0	0	0	0	0	1	1	2
Superstructure rating 0	1	1	1	1	1	1	1	1	1	1	1
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)											
Substructure rating 9	0	0	104	208	311	415	519	1015	1512	2008	2505
Substructure rating 8	264	264	231	199	166	134	101	95	89	82	76
Substructure rating 7	6773	6773	6077	5380	4684	3987	3291	2731	2172	1612	1053
Substructure rating 6	212	212	854	1497	2139	2782	3424	3549	3674	3799	3924

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Substructure rating 5	2299	2299	2139	1980	1820	1661	1501	1362	1223	1083	944
Substructure rating 4	258	258	383	508	632	757	882	960	1038	1115	1193
Substructure rating 3	9	9	22	35	47	60	73	79	86	92	99
Substructure rating 2	26	26	25	24	24	23	22	21	20	18	17
Substructure rating 1	1	1	2	3	3	4	5	6	6	7	7
Substructure rating 0	2	2	2	2	2	2	2	2	2	2	2
Substructure rating N	2491	2491	2496	2501	2505	2510	2515	2515	2515	2515	2515
Culvert population distribution by rating (numbers of culverts)											
Culvert rating 9	0	0	4	8	13	17	21	170	319	467	616
Culvert rating 8	123	123	106	89	72	55	38	30	23	15	8
Culvert rating 7	1328	1328	1192	1056	919	783	647	532	417	302	187
Culvert rating 6	958	958	1022	1086	1151	1215	1279	1219	1158	1098	1037
Culvert rating 5	23	23	107	190	274	357	441	465	490	514	539
Culvert rating 4	56	56	55	54	52	51	50	57	63	70	76
Culvert rating 3	2	2	4	7	9	12	14	17	20	23	26
Culvert rating 2	0	0	0	0	0	0	0	0	0	1	1
Culvert rating 1	1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844
Bridge population distribution by sufficiency rating (number of bridges)											
SR > 80% (Good)	6552	6552	6497	6443	6388	6334	6279	6192	6105	6018	5931
50% < SR <=80% (Fair)	4512	4512	4484	4457	4429	4402	4374	4376	4378	4380	4382
SR <=50% (Poor)	1271	1271	1353	1435	1518	1600	1682	1767	1852	1937	2022
Structurally deficient and functionally obsolete bridges											
Number of bridges	3277	3277	3626	3975	4323	4672	5021	5234	5447	5661	5874
Percent of deck area	26.09	25.97	29.36	32.75	36.14	39.53	42.78	43.93	45.09	46.24	47.39
Structurally deficient bridges											
Number of bridges	1041	1041	1544	2048	2551	3055	3558	3822	4085	4349	4612
Percent of deck area	11.46	11.41	15.70	20.00	24.30	28.59	32.78	34.10	35.43	36.75	38.07
Functionally obsolete bridges											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Number of bridges	2236	2236	2081	1927	1772	1618	1463	1413	1362	1312	1261
Percent of deck area	14.63	14.56	13.66	12.75	11.85	10.94	10.00	9.83	9.66	9.49	9.32
Good structural condition											
Number of bridges	5263	5263	4451	3639	2828	2016	1204	1552	1901	2249	2598
Percent of deck area	39.45	39.27	33.27	27.27	21.28	15.28	9.25	13.42	17.60	21.77	25.94
Fair structural condition											
Number of bridges	6029	6029	6330	6632	6933	7235	7536	6929	6322	5716	5109
Percent of deck area	48.86	48.63	50.30	51.97	53.64	55.31	56.80	51.53	46.26	41.00	35.73
Poor structural condition											
Number of bridges	1043	1043	1553	2064	2574	3085	3595	3853	4112	4370	4629
Percent of deck area	11.69	11.64	16.06	20.48	24.90	29.31	33.62	34.78	35.94	37.10	38.26

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cumulative work done ($M)										
Total work	3299.8	3599.7	3899.6	4199.5	4499.4	4799.1	5098.8	5398.5	5698.1	5997.8
S/F motivated	2647.5	2928.1	3208.8	3489.5	3770.1	4035.0	4299.8	4564.6	4829.4	5094.2
+Econ. motivated	652.3	671.6	690.8	710.0	729.2	764.1	799.0	833.9	868.8	903.7
Replacement	1562.3	1818.3	2074.3	2330.3	2586.2	2837.9	3089.6	3341.3	3593.0	3844.7
S/F motivated	909.9	1146.7	1383.5	1620.2	1857.0	2073.8	2290.6	2507.5	2724.3	2941.1
+Econ. motivated	652.3	671.6	690.8	710.0	729.2	764.1	799.0	833.9	868.8	903.7
Improvement	1.8	3.3	4.9	6.4	7.9	10.5	13.0	15.6	18.1	20.7
Raising	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Widening	1.4	2.6	3.8	4.9	6.1	8.3	10.4	12.6	14.8	16.9
Capacity Expansion	0.2	0.3	0.4	0.5	0.6	0.9	1.2	1.5	1.8	2.1
Strengthening	0.2	0.5	0.7	1.0	1.2	1.3	1.4	1.5	1.6	1.7
Federally Eligible MR&R	1735.9	1778.4	1820.9	1863.3	1905.8	1951.5	1997.3	2043.0	2088.7	2134.4
Cumulative work done (number of bridges)										
Replacement	463	550	639	729	824	895	969	1044	1119	1196
S/F motivated	430	514	600	687	779	848	920	993	1066	1141
+Econ. motivated	33	36	39	42	45	47	49	51	53	55
Improvement	6	9	13	20	30	33	36	40	45	58
Raising	---	---	---	---	---	---	---	---	---	---
Widening	3	6	10	16	22	25	28	32	37	45
Capacity Expansion	3	3	3	4	6	6	6	6	6	10
Total structurally/functionally (S/F) motivated annual needs and work ($M)										
S/F motivated needs	15735	15197	14660	14122	13585	18400	18003	17607	17211	16814
Total work done	300	300	300	300	300	300	300	300	300	300
S/F motivated	281	281	281	281	281	265	265	265	265	265
+Econ. motivated	19	19	19	19	19	35	35	35	35	35
Backlog - total	15197	14660	14122	13585	13047	18003	17607	17211	16814	16418
Replacement ($M)										
S/F motivated needs	10781	10544	10307	10071	9834	14049	13833	13616	13399	13182
Total work done	256	256	256	256	256	252	252	252	252	252
S/F motivated	237	237	237	237	237	217	217	217	217	217
+Econ. motivated	19	19	19	19	19	35	35	35	35	35
Backlog - total	10544	10307	10071	9834	9597	13833	13616	13399	13182	12965
Improvement ($M)										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

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5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Needs	399.7	395.0	390.4	385.8	381.1	404.7	393.0	381.4	369.8	358.1
Work done	1.5	1.5	1.5	1.5	1.5	2.6	2.6	2.6	2.6	2.6
Offset by E/M repl.	3.1	3.1	3.1	3.1	3.1	9.1	9.1	9.1	9.1	9.1
Backlog - total	395.0	390.4	385.8	381.1	376.5	393.0	381.4	369.8	358.1	346.5
Raising ($M)										
Needs	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Widening ($M)										
Needs	220.5	218.2	215.9	213.5	211.2	219.8	215.4	211.1	206.8	202.4
Work done	1.2	1.2	1.2	1.2	1.2	2.2	2.2	2.2	2.2	2.2
Offset by E/M repl.	1.1	1.1	1.1	1.1	1.1	2.2	2.2	2.2	2.2	2.2
Backlog - total	218.2	215.9	213.5	211.2	208.9	215.4	211.1	206.8	202.4	198.1
Capacity Expansion ($M)										
Needs	32.7	32.6	32.5	32.4	32.3	38.6	37.6	36.6	35.6	34.7
Work done	0.1	0.1	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.7	0.7	0.7
Backlog - total	32.6	32.5	32.4	32.3	32.2	37.6	36.6	35.6	34.7	33.7
Strengthening ($M)										
Needs	146.3	144.0	141.8	139.6	137.4	146.0	139.7	133.4	127.1	120.8
Work done	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Offset by E/M repl.	2.0	2.0	2.0	2.0	2.0	6.2	6.2	6.2	6.2	6.2
Backlog - total	144.0	141.8	139.6	137.4	135.1	139.7	133.4	127.1	120.8	114.4
Federally Eligible MR&R ($M)										
Needs	4554.3	4258.2	3962.0	3665.8	3369.7	3945.5	3777.6	3609.7	3441.8	3273.9
Work done	42.5	42.5	42.5	42.5	42.5	45.7	45.7	45.7	45.7	45.7
Offset by E/M repl.	253.7	253.7	253.7	253.7	253.7	122.2	122.2	122.2	122.2	122.2
Backlog - total	4258.2	3962.0	3665.8	3369.7	3073.5	3777.6	3609.7	3441.8	3273.9	3106.0
Maintenance ($M)										
Needs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Replacement (number of bridges)										
S/F motivated needs	3467	3385	3302	3217	3130	4219	4153	4086	4018	3949
Total work done	87	87	89	90	95	71	74	75	75	77
S/F motivated	84	84	86	87	92	69	72	73	73	75
+Econ. motivated	3	3	3	3	3	2	2	2	2	2
Backlog - total	3385	3302	3217	3130	3042	4153	4086	4018	3949	3876
Improvement (number of bridges)										
Needs	720	715	705	694	675	694	685	673	656	635
Work done	2	3	4	7	10	3	3	4	5	13
Offset by E/M repl.	3	7	7	12	16	6	9	13	16	23
Backlog - total	715	705	694	675	649	685	673	656	635	599
Raising (number of bridges)										
Needs	1	1	1	1	1	1	1	1	1	1
Work done	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0
Backlog - total	1	1	1	1	1	1	1	1	1	1
Widening (number of bridges)										
Needs	469	466	460	453	442	452	448	441	431	420
Work done	2	3	4	6	6	3	3	4	5	8
Offset by E/M repl.	1	3	3	5	8	1	4	6	6	9
Backlog - total	466	460	453	442	428	448	441	431	420	403
Capacity Expansion (number of bridges)										
Needs	36	36	36	36	35	44	44	44	44	44
Work done	0	0	0	1	2	0	0	0	0	4
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	2
Backlog - total	36	36	36	35	33	44	44	44	44	38
Strengthening (number of bridges)										
Needs	214	212	208	204	197	197	192	187	180	170
Work done	0	0	0	0	2	0	0	0	0	1
Offset by E/M repl.	2	4	4	7	8	5	5	7	10	12
Backlog - total	212	208	204	197	187	192	187	180	170	157

Total User Benefits ($M)

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential, S/F motivated	1028.7	951.1	873.6	796.0	718.4	747.3	698.5	649.8	601.1	552.3
Total obtained	72.4	72.4	72.4	72.4	72.4	41.5	41.5	41.5	41.5	41.5
By S/F motivated work	71.0	71.0	71.0	71.0	71.0	36.7	36.7	36.7	36.7	36.7
+Econ. motivated work	5.1	5.1	5.1	5.1	5.1	7.2	7.2	7.2	7.2	7.2
Offset of S/F	5.1	5.1	5.1	5.1	5.1	7.2	7.2	7.2	7.2	7.2
Excess over offset	---	---	---	---	---	---	---	---	---	---
Backlog - total	951.1	873.6	796.0	718.4	640.9	698.5	649.8	601.1	552.3	503.6
Benefits of S/F motivated replacements ($M)										
Potential	882.6	810.6	738.6	666.6	594.6	614.6	573.5	532.5	491.4	450.4
Total obtained	72.0	72.0	72.0	72.0	72.0	41.1	41.1	41.1	41.1	41.1
S/F motivated	70.6	70.6	70.6	70.6	70.6	36.2	36.2	36.2	36.2	36.2
+Econ. motivated	1.4	1.4	1.4	1.4	1.4	4.8	4.8	4.8	4.8	4.8
Backlog - total	810.6	738.6	666.6	594.6	522.6	573.5	532.5	491.4	450.4	409.3
Improvement Benefits ($M)										
Potential	133.0	127.5	122.0	116.5	111.0	119.1	111.4	103.8	96.1	88.5
Obtained	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5
Offset by E/M repl.	5.1	5.1	5.1	5.1	5.1	7.2	7.2	7.2	7.2	7.2
Backlog - total	127.5	122.0	116.5	111.0	105.5	111.4	103.8	96.1	88.5	80.8
Raising Benefits ($M)										
Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)										
Potential	30.6	30.0	29.4	28.8	28.2	30.1	29.4	28.6	27.9	27.1
Obtained	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Offset by E/M repl.	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4
Backlog - total	30.0	29.4	28.8	28.2	27.6	29.4	28.6	27.9	27.1	26.4
Capacity Expansion Benefits ($M)										
Potential	9.2	9.2	9.2	9.1	9.1	13.0	12.5	12.0	11.5	11.0
Obtained	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.4	0.4	0.4
Backlog - total	9.2	9.2	9.1	9.1	9.1	12.5	12.0	11.5	11.0	10.5
Strengthening Benefits ($M)										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential	93.1	88.3	83.4	78.5	73.7	76.0	69.6	63.2	56.8	50.4
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	4.8	4.8	4.8	4.8	4.8	6.4	6.4	6.4	6.4	6.4
Backlog - total	88.3	83.4	78.5	73.7	68.8	69.6	63.2	56.8	50.4	43.9
Benefits of MR&R ($M)										
Potential	13.0	13.0	12.9	12.8	12.8	13.6	13.6	13.6	13.5	13.5
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Backlog - total	13.0	12.9	12.8	12.8	12.7	13.6	13.6	13.5	13.5	13.5
Average Benefit/Cost ratios										
Overall	6.032	6.032	6.032	6.032	6.032	3.455	3.455	3.455	3.455	3.455
Replacement	6.561	6.561	6.561	6.561	6.561	3.548	3.548	3.548	3.548	3.548
Improvement	1.105	1.105	1.105	1.105	1.105	1.008	1.008	1.008	1.008	1.008
Raising	---	---	---	---	---	---	---	---	---	---
Widening	1.119	1.119	1.119	1.119	1.119	0.993	0.993	0.993	0.993	0.993
Capacity Expansion	1.175	1.175	1.175	1.175	1.175	1.128	1.128	1.128	1.128	1.128
Strengthening	1.006	1.006	1.006	1.006	1.006	0.972	0.972	0.972	0.972	0.972
MR&R	3.011	3.011	3.011	3.011	3.011	3.064	3.064	3.064	3.064	3.064
Benefit/Cost cutoff ratio (federally eligible work only)	1.136	1.136	1.136	1.136	1.136	1.136	1.136	1.136	1.136	1.136

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Average network condition measures										
Sufficiency rating	76.77	76.55	76.33	76.11	75.89	75.04	74.61	74.18	73.75	73.32
Health index	86.00	85.83	85.65	85.48	85.30	84.41	84.26	84.11	83.95	83.80
Bridge population distribution by deck rating (numbers of bridges)										
Deck rating 9	1378	1182	985	789	592	396	385	374	364	353
Deck rating 8	1384	1414	1445	1475	1506	1536	1656	1775	1895	2014
Deck rating 7	187	390	592	795	997	1200	1094	989	883	778
Deck rating 6	37	49	62	74	87	99	106	114	121	129
Deck rating 5	2664	2256	1848	1440	1032	624	526	427	329	230
Deck rating 4	3241	3356	3472	3587	3703	3818	3542	3267	2991	2716
Deck rating 3	585	811	1037	1264	1490	1716	2033	2350	2667	2984
Deck rating 2	31	48	65	82	99	116	161	206	250	295
Deck rating 1	0	0	1	1	2	2	4	5	7	8
Deck rating 0	1	1	1	1	1	1	1	1	1	1
Deck rating N	2827	2827	2827	2827	2827	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)										
Superstructure rating 9	2119	2176	2232	2289	2345	2402	2411	2420	2429	2438
Superstructure rating 8	76	68	60	53	45	37	64	91	118	145
Superstructure rating 7	186	166	146	126	106	86	74	63	51	40
Superstructure rating 6	3136	2896	2655	2415	2174	1934	1731	1529	1326	1124
Superstructure rating 5	2086	2141	2197	2252	2308	2363	2393	2424	2454	2485
Superstructure rating 4	1964	2054	2145	2235	2326	2416	2441	2466	2490	2515
Superstructure rating 3	253	313	373	434	494	554	671	788	905	1022
Superstructure rating 2	20	26	31	37	42	48	52	57	61	66
Superstructure rating 1	2	2	2	2	2	2	4	5	7	8
Superstructure rating 0	1	1	1	1	1	1	1	1	1	1
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)										
Substructure rating 9	3001	3049	3098	3146	3195	3243	3236	3229	3221	3214
Substructure rating 8	70	67	64	62	59	56	90	124	159	193
Substructure rating 7	493	424	354	285	215	146	133	120	108	95
Substructure rating 6	4049	3940	3832	3723	3615	3506	3218	2931	2643	2356

All Performance Measures by Year

5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Substructure rating 5	805	900	995	1090	1185	1280	1516	1752	1987	2223
Substructure rating 4	1271	1296	1320	1345	1369	1394	1395	1395	1396	1396
Substructure rating 3	105	118	131	144	157	170	207	243	280	316
Substructure rating 2	16	15	14	14	13	12	12	12	12	12
Substructure rating 1	8	9	9	10	10	11	11	12	12	13
Substructure rating 0	2	2	2	2	2	2	2	2	2	2
Substructure rating N	2515	2515	2515	2515	2515	2515	2515	2515	2515	2515
Culvert population distribution by rating (numbers of culverts)										
Culvert rating 9	765	763	761	760	758	756	758	760	761	763
Culvert rating 8	0	3	7	10	14	17	17	17	18	18
Culvert rating 7	72	59	46	34	21	8	6	5	3	2
Culvert rating 6	977	926	875	825	774	723	641	559	477	395
Culvert rating 5	563	603	644	684	725	765	817	869	922	974
Culvert rating 4	83	103	123	144	164	184	206	228	249	271
Culvert rating 3	29	30	31	32	33	34	41	47	54	60
Culvert rating 2	1	1	2	2	3	3	4	5	6	7
Culvert rating 1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844
Bridge population distribution by sufficiency rating (number of bridges)										
SR > 80% (Good)	5844	5792	5740	5687	5635	5583	5504	5425	5347	5268
50% < SR <=80% (Fair)	4384	4390	4397	4403	4410	4416	4401	4386	4372	4357
SR <=50% (Poor)	2107	2153	2199	2244	2290	2336	2430	2523	2617	2710
Structurally deficient and functionally obsolete bridges										
Number of bridges	6087	6350	6612	6875	7137	7400	7483	7567	7650	7734
Percent of deck area	48.09	50.38	52.67	54.96	57.25	59.04	60.01	60.98	61.94	62.91
Structurally deficient bridges										
Number of bridges	4876	5206	5536	5866	6196	6526	6647	6769	6890	7012
Percent of deck area	39.03	41.88	44.74	47.59	50.45	52.85	54.05	55.24	56.43	57.62
Functionally obsolete bridges										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $1500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Number of bridges	1211	1144	1076	1009	941	874	836	798	760	722
Percent of deck area	9.06	8.49	7.93	7.37	6.80	6.18	5.96	5.74	5.51	5.29
Good structural condition										
Number of bridges	2946	2988	3029	3071	3112	3154	3182	3211	3239	3268
Percent of deck area	29.83	30.19	30.54	30.90	31.26	31.35	31.72	32.09	32.46	32.84
Fair structural condition										
Number of bridges	4502	4133	3765	3396	3028	2659	2509	2359	2209	2059
Percent of deck area	30.18	27.16	24.15	21.13	18.12	14.98	13.58	12.18	10.78	9.39
Poor structural condition										
Number of bridges	4887	5214	5541	5868	6195	6522	6644	6765	6887	7008
Percent of deck area	39.05	41.90	44.74	47.59	50.44	52.84	54.03	55.22	56.42	57.61

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2000M
BRIDGES: All Bridges; on and off NHS

20-YEAR TOTALS:

Total budget available over 20 years: $8000M

	Work Done ($M)	Work Done (bridges)	User Benefits Obtained ($M)
Total	7988.0		2255.6
Replacement	5078.8	1674	2240.2
Struct/Func. motivated (S/F)	3950.3	1589	2065.4
Economically motivated (E/M)	1128.5	85	174.8
Improvement	65.3	137	11.0
Raising	0.0	0	0.0
Widening	47.4	108	8.1
Capacity Expansion	11.9	20	2.0
Strengthening	5.9	9	0.8
MR&R	2855.9		4.5
Federal MR&R	2855.9		-
Local MR&R	0.0		-
(not included in the total)			

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cumulative work done ($M)											
Total work	400.0	800.0	1200.0	1599.9	1999.9	2399.9	2799.9	3199.9	3599.9	3999.9	
S/F motivated	337.1	674.1	1011.2	1348.2	1685.3	2000.8	2316.3	2631.8	2947.3	3262.8	
+Econ. motivated	62.9	125.9	188.8	251.7	314.6	399.1	483.6	568.1	652.6	737.1	
Replacement	217.9	435.7	653.6	871.4	1089.3	1208.6	1328.0	1447.4	1566.7	1686.1	
S/F motivated	154.9	309.9	464.8	619.7	774.7	809.5	844.4	879.2	914.1	948.9	
+Econ. motivated	62.9	125.9	188.8	251.7	314.6	399.1	483.6	568.1	652.6	737.1	
Improvement	0.3	0.5	0.8	1.0	1.3	1.7	2.2	2.6	3.0	3.5	
Raising	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Widening	0.2	0.5	0.7	1.0	1.2	1.6	1.9	2.2	2.5	2.8	
Capacity Expansion	---	---	---	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
Strengthening	---	---	---	---	---	0.1	0.2	0.4	0.5	0.6	
Federally Eligible MR&R	181.9	363.8	545.6	727.5	909.4	1189.6	1469.8	1750.0	2030.2	2310.5	
Cumulative work done (number of bridges)											
Replacement	85	173	264	357	450	466	483	504	527	551	
S/F motivated	81	165	252	341	430	442	455	472	491	511	
+Econ. motivated	4	8	12	16	20	24	28	32	36	40	
Improvement	0	1	3	5	9	9	10	12	14	19	
Raising	---	---	---	---	---	---	---	---	---	---	
Widening	---	1	2	3	6	6	7	9	11	14	
Capacity Expansion	---	---	1	2	3	3	3	3	3	3	
Total structurally/functionally (S/F) motivated annual needs and work ($M)											
S/F motivated needs	11408	10923	10438	9953	9468	12731	12346	11961	11575	11190	
Total work done	400	400	400	400	400	400	400	400	400	400	
S/F motivated	337	337	337	337	337	315	315	315	315	315	
+Econ. motivated	63	63	63	63	63	85	85	85	85	85	
Backlog - total	10923	10438	9953	9468	8983	12346	11961	11575	11190	10804	
Replacement ($M)											
S/F motivated needs	5926.1	5771.1	5616.2	5461.3	5306.3	7964.8	7930.0	7895.1	7860.3	7825.4	
Total work done	217.9	217.9	217.9	217.9	217.9	119.4	119.4	119.4	119.4	119.4	
S/F motivated	154.9	154.9	154.9	154.9	154.9	34.9	34.9	34.9	34.9	34.9	
+Econ. motivated	62.9	62.9	62.9	62.9	62.9	84.5	84.5	84.5	84.5	84.5	
Backlog - total	5771.1	5616.2	5461.3	5306.3	5151.4	7930.0	7895.1	7860.3	7825.4	7790.5	
Improvement ($M)											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Needs		352.5	346.9	341.4	335.9	330.3	358.8	355.9	352.9	349.9	347.0
Work done		0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4
Offset by E/M repl.		5.3	5.3	5.3	5.3	5.3	2.5	2.5	2.5	2.5	2.5
Backlog - total		346.9	341.4	335.9	330.3	324.8	355.9	352.9	349.9	347.0	344.0
Raising ($M)											
Needs		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Widening ($M)											
Needs		184.5	182.7	180.8	178.9	177.0	198.1	197.2	196.2	195.3	194.3
Work done		0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Offset by E/M repl.		1.6	1.6	1.6	1.6	1.6	0.6	0.6	0.6	0.6	0.6
Backlog - total		182.7	180.8	178.9	177.0	175.1	197.2	196.2	195.3	194.3	193.4
Capacity Expansion ($M)											
Needs		15.3	15.3	15.3	15.3	15.2	17.8	17.8	17.8	17.8	17.8
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		15.3	15.3	15.3	15.2	15.2	17.8	17.8	17.8	17.8	17.8
Strengthening ($M)											
Needs		152.3	148.7	145.1	141.5	137.8	142.6	140.6	138.6	136.6	134.6
Work done		0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Offset by E/M repl.		3.6	3.6	3.6	3.6	3.6	1.9	1.9	1.9	1.9	1.9
Backlog - total		148.7	145.1	141.5	137.8	134.2	140.6	138.6	136.6	134.6	132.6
Federally Eligible MR&R ($M)											
Needs		5129.9	4805.2	4480.6	4156.0	3831.3	4407.6	4060.1	3712.5	3365.0	3017.5
Work done		181.9	181.9	181.9	181.9	181.9	280.2	280.2	280.2	280.2	280.2
Offset by E/M repl.		142.8	142.8	142.8	142.8	142.8	67.3	67.3	67.3	67.3	67.3
Backlog - total		4805.2	4480.6	4156.0	3831.3	3506.7	4060.1	3712.5	3365.0	3017.5	2669.9
Maintenance ($M)											
Needs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		---	---	---	---	---	---	---	---	---	---

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Replacement (number of bridges)											
S/F motivated needs	2039	1960	1879	1798	1714	2478	2469	2457	2445	2430	
Total work done	85	88	91	93	93	16	17	21	23	24	
S/F motivated	81	84	87	89	89	12	13	17	19	20	
+Econ. motivated	4	4	4	4	4	4	4	4	4	4	
Backlog - total	1960	1879	1798	1714	1628	2469	2457	2445	2430	2414	
Improvement (number of bridges)											
Needs	707	696	682	663	641	658	657	655	650	640	
Work done	0	1	2	2	4	0	1	2	2	5	
Offset by E/M repl.	11	13	17	20	24	1	1	3	8	11	
Backlog - total	696	682	663	641	613	657	655	650	640	624	
Raising (number of bridges)											
Needs	1	1	1	1	1	1	1	1	1	1	
Work done	0	0	0	0	0	0	0	0	0	0	
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0	
Backlog - total	1	1	1	1	1	1	1	1	1	1	
Widening (number of bridges)											
Needs	445	441	435	427	418	435	435	434	431	425	
Work done	0	1	1	1	3	0	1	2	2	3	
Offset by E/M repl.	4	5	7	8	10	0	0	1	4	5	
Backlog - total	441	435	427	418	405	435	434	431	425	417	
Capacity Expansion (number of bridges)											
Needs	23	23	23	22	21	26	26	26	26	26	
Work done	0	0	1	1	1	0	0	0	0	0	
Offset by E/M repl.	0	0	0	0	1	0	0	0	0	0	
Backlog - total	23	23	22	21	19	26	26	26	26	26	
Strengthening (number of bridges)											
Needs	238	231	223	213	201	196	195	194	192	188	
Work done	0	0	0	0	0	0	0	0	0	2	
Offset by E/M repl.	7	8	10	12	13	1	1	2	4	6	
Backlog - total	231	223	213	201	188	195	194	192	188	180	

Total User Benefits ($M)

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential, S/F motivated		2414.0	2081.5	1749.1	1416.7	1084.2	926.0	868.1	810.2	752.4	694.5
Total obtained		297.5	297.5	297.5	297.5	297.5	38.6	38.6	38.6	38.6	38.6
By S/F motivated work		287.4	287.4	287.4	287.4	287.4	20.7	20.7	20.7	20.7	20.7
+Econ. motivated work		35.0	35.0	35.0	35.0	35.0	19.3	19.3	19.3	19.3	19.3
Offset of S/F		35.0	35.0	35.0	35.0	35.0	19.3	19.3	19.3	19.3	19.3
Excess over offset		---	---	---	---	---	---	---	---	---	---
Backlog - total		2081.5	1749.1	1416.7	1084.2	751.8	868.1	810.2	752.4	694.5	647.1
Benefits of S/F motivated replacements ($M)											
Potential		2067.1	1770.0	1472.9	1175.8	878.7	726.4	688.6	650.8	613.0	575.2
Total obtained		297.1	297.1	297.1	297.1	297.1	37.8	37.8	37.8	37.8	37.8
S/F motivated		287.0	287.0	287.0	287.0	287.0	19.9	19.9	19.9	19.9	19.9
+Econ. motivated		10.1	10.1	10.1	10.1	10.1	17.9	17.9	17.9	17.9	17.9
Backlog - total		1770.0	1472.9	1175.8	878.7	581.6	688.6	650.8	613.0	575.2	547.9
Improvement Benefits ($M)											
Potential		337.6	302.5	267.5	232.4	197.3	190.1	170.7	151.3	131.9	112.5
Obtained		0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Offset by E/M repl.		35.0	35.0	35.0	35.0	35.0	19.2	19.2	19.2	19.2	19.2
Backlog - total		302.5	267.5	232.4	197.3	162.3	170.7	151.3	131.9	112.5	93.1
Raising Benefits ($M)											
Potential		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)											
Potential		25.5	25.1	24.7	24.3	23.9	26.8	26.6	26.4	26.1	25.9
Obtained		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Offset by E/M repl.		0.3	0.3	0.3	0.3	0.3	0.1	0.1	0.1	0.1	0.1
Backlog - total		25.1	24.7	24.3	23.9	23.5	26.6	26.4	26.1	25.9	25.7
Capacity Expansion Benefits ($M)											
Potential		3.8	3.7	3.7	3.7	3.6	5.5	5.5	5.5	5.5	5.5
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		3.7	3.7	3.7	3.6	3.6	5.5	5.5	5.5	5.5	5.5
Strengthening Benefits ($M)											

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BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential		308.3	273.6	239.0	204.4	169.8	157.8	138.6	119.4	100.2	81.1
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		34.6	34.6	34.6	34.6	34.6	19.2	19.2	19.2	19.2	19.2
Backlog - total		273.6	239.0	204.4	169.8	135.1	138.6	119.4	100.2	81.1	61.9
Benefits of MR&R ($M)											
Potential		9.2	9.0	8.7	8.5	8.2	9.5	8.8	8.1	7.5	6.8
Obtained		0.2	0.2	0.2	0.2	0.2	0.7	0.7	0.7	0.7	0.7
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		9.0	8.7	8.5	8.2	8.0	8.8	8.1	7.5	6.8	6.1
Average Benefit/Cost ratios											
Overall		4.873	4.873	4.873	4.873	4.873	3.189	3.189	3.189	3.189	3.189
Replacement		5.979	5.979	5.979	5.979	5.979	4.404	4.404	4.404	4.404	4.404
Improvement		1.223	1.223	1.223	1.223	1.223	1.185	1.185	1.185	1.185	1.185
Raising		---	---	---	---	---	---	---	---	---	---
Widening		1.173	1.173	1.173	1.173	1.173	1.268	1.268	1.268	1.268	1.268
Capacity Expansion		2.055	2.055	2.055	2.055	2.055	---	---	---	---	---
Strengthening		---	---	---	---	---	0.964	0.964	0.964	0.964	0.964
MR&R		3.553	3.553	3.553	3.553	3.553	2.675	2.675	2.675	2.675	2.675
Benefit/Cost cutoff ratio (federally eligible work only)		1.473	1.473	1.473	1.473	1.473	1.136	1.136	1.136	1.136	1.136

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BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Average network condition measures											
Sufficiency rating	80.39	79.87	79.79	79.71	79.63	79.55	79.18	79.08	78.98	78.89	78.79
Health index	87.79	87.21	87.12	87.03	86.94	86.85	86.44	86.90	87.35	87.80	88.25
Bridge population distribution by deck rating (numbers of bridges)											
Deck rating 9	0	0	110	220	331	441	551	789	1027	1264	1502
Deck rating 8	139	139	203	268	332	397	461	781	1102	1422	1743
Deck rating 7	5593	5593	4494	3395	2295	1196	97	152	206	261	315
Deck rating 6	462	462	1004	1546	2089	2631	3173	2550	1926	1303	679
Deck rating 5	2760	2760	2774	2788	2801	2815	2829	2667	2505	2343	2181
Deck rating 4	586	586	902	1218	1534	1850	2166	2278	2390	2501	2613
Deck rating 3	5	5	49	93	138	182	226	282	338	393	449
Deck rating 2	1	1	2	2	3	3	4	9	14	19	24
Deck rating 1	0	0	0	0	0	0	0	0	0	0	0
Deck rating 0	3	3	3	2	2	1	1	1	1	1	1
Deck rating N	2786	2786	2794	2802	2811	2819	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)											
Superstructure rating 9	0	0	170	340	510	680	850	1272	1694	2117	2539
Superstructure rating 8	301	301	255	210	164	119	73	84	95	107	118
Superstructure rating 7	6229	6229	5356	4482	3609	2735	1862	1519	1175	832	488
Superstructure rating 6	363	363	1108	1854	2599	3345	4090	3789	3488	3188	2887
Superstructure rating 5	2589	2589	2369	2148	1928	1707	1487	1578	1669	1759	1850
Superstructure rating 4	350	350	552	753	955	1156	1358	1451	1544	1638	1731
Superstructure rating 3	9	9	31	53	74	96	118	142	165	189	212
Superstructure rating 2	1	1	2	2	3	3	4	7	10	12	15
Superstructure rating 1	0	0	0	0	0	0	0	0	1	1	2
Superstructure rating 0	1	1	1	1	1	1	1	1	1	1	1
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)											
Substructure rating 9	0	0	233	466	699	932	1165	1781	2397	3012	3628
Substructure rating 8	264	264	230	196	163	129	95	98	101	103	106
Substructure rating 7	6773	6773	6025	5277	4530	3782	3034	2511	1988	1466	943
Substructure rating 6	212	212	808	1405	2001	2598	3194	3193	3191	3190	3188

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Substructure rating 5	2299	2299	2120	1941	1763	1584	1405	1254	1102	951	799
Substructure rating 4	258	258	372	487	601	716	830	883	936	989	1042
Substructure rating 3	9	9	21	33	46	58	70	75	79	84	88
Substructure rating 2	26	26	25	24	23	22	21	20	18	17	15
Substructure rating 1	1	1	2	2	3	3	4	5	6	6	7
Substructure rating 0	2	2	2	2	2	2	2	2	2	2	2
Substructure rating N	2491	2491	2496	2501	2505	2510	2515	2515	2515	2515	2515
Culvert population distribution by rating (numbers of culverts)											
Culvert rating 9	0	0	8	16	24	32	40	244	447	651	854
Culvert rating 8	123	123	106	89	73	56	39	32	25	17	10
Culvert rating 7	1328	1328	1191	1054	918	781	644	528	412	295	179
Culvert rating 6	958	958	1020	1081	1143	1204	1266	1171	1076	982	887
Culvert rating 5	23	23	106	189	272	355	438	444	450	455	461
Culvert rating 4	56	56	55	53	52	50	49	55	60	66	71
Culvert rating 3	2	2	4	7	9	12	14	17	20	23	26
Culvert rating 2	0	0	0	0	0	0	0	0	0	1	1
Culvert rating 1	1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844
Bridge population distribution by sufficiency rating (number of bridges)											
SR > 80% (Good)	6552	6552	6537	6522	6507	6492	6477	6424	6372	6319	6267
50% < SR <=80% (Fair)	4512	4512	4467	4423	4378	4334	4289	4274	4260	4245	4231
SR <=50% (Poor)	1271	1271	1331	1390	1450	1509	1569	1636	1703	1771	1838
Structurally deficient and functionally obsolete bridges											
Number of bridges	3277	3277	3592	3907	4221	4536	4851	4994	5136	5279	5421
Percent of deck area	26.09	25.92	28.86	31.79	34.73	37.66	40.45	40.90	41.34	41.79	42.23
Structurally deficient bridges											
Number of bridges	1041	1041	1515	1988	2462	2935	3409	3588	3767	3946	4125
Percent of deck area	11.46	11.39	15.20	19.02	22.83	26.65	30.35	30.88	31.40	31.92	32.44
Functionally obsolete bridges											

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BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Number of bridges	2236	2236	2077	1918	1760	1601	1442	1406	1369	1333	1296
Percent of deck area	14.63	14.53	13.65	12.77	11.89	11.01	10.10	10.02	9.94	9.87	9.79
Good structural condition											
Number of bridges	5263	5263	4538	3813	3089	2364	1639	2127	2615	3102	3590
Percent of deck area	39.45	39.19	34.56	29.93	25.29	20.66	15.97	20.96	25.94	30.92	35.90
Fair structural condition											
Number of bridges	6029	6029	6274	6519	6765	7010	7255	6593	5931	5269	4607
Percent of deck area	48.86	48.54	49.43	50.33	51.23	52.12	52.83	47.49	42.15	36.82	31.48
Poor structural condition											
Number of bridges	1043	1043	1523	2002	2482	2961	3441	3615	3789	3964	4138
Percent of deck area	11.69	11.62	15.48	19.35	23.22	27.08	30.84	31.26	31.69	32.12	32.55

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

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5yr PERIOD BUDGET: $2000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cumulative work done ($M)										
Total work	4399.7	4799.5	5199.3	5599.1	5998.9	6396.7	6794.5	7192.4	7590.2	7988.0
S/F motivated	3639.5	4016.1	4392.8	4769.4	5146.1	5488.8	5831.5	6174.1	6516.8	6859.5
+Econ. motivated	760.3	783.4	806.5	829.6	852.8	907.9	963.1	1018.2	1073.4	1128.5
Replacement	2026.5	2367.0	2707.5	3047.9	3388.4	3726.5	4064.6	4402.7	4740.7	5078.8
S/F motivated	1266.3	1583.6	1901.0	2218.3	2535.7	2818.6	3101.5	3384.4	3667.4	3950.3
+Econ. motivated	760.3	783.4	806.5	829.6	852.8	907.9	963.1	1018.2	1073.4	1128.5
Improvement	8.2	12.9	17.6	22.4	27.1	34.7	42.3	50.0	57.6	65.3
Raising	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Widening	6.6	10.5	14.3	18.1	22.0	27.1	32.2	37.2	42.3	47.4
Capacity Expansion	0.3	0.5	0.7	0.9	1.1	3.3	5.4	7.6	9.8	11.9
Strengthening	1.3	2.0	2.6	3.3	4.0	4.4	4.8	5.1	5.5	5.9
Federally Eligible MR&R	2365.3	2420.1	2474.9	2529.7	2584.5	2638.8	2693.0	2747.3	2801.6	2855.9
Cumulative work done (number of bridges)										
Replacement	658	767	878	992	1108	1217	1329	1442	1557	1674
S/F motivated	616	723	832	944	1058	1160	1265	1371	1479	1589
+Econ. motivated	42	44	46	48	50	57	64	71	78	85
Improvement	27	36	47	60	80	87	96	105	118	137
Raising	---	---	---	---	---	---	---	---	---	---
Widening	21	29	38	49	63	70	78	86	96	108
Capacity Expansion	4	5	6	7	9	9	10	11	14	20
Total structurally/functionally (S/F) motivated annual needs and work ($M)										
S/F motivated needs	13917	13299	12680	12062	11444	15398	14922	14447	13971	13496
Total work done	400	400	400	400	400	398	398	398	398	398
S/F motivated	377	377	377	377	377	343	343	343	343	343
+Econ. motivated	23	23	23	23	23	55	55	55	55	55
Backlog - total	13299	12680	12062	11444	10825	14922	14447	13971	13496	13020
Replacement ($M)										
S/F motivated needs	9860	9542	9225	8907	8590	12006	11723	11440	11157	10874
Total work done	340	340	340	340	340	338	338	338	338	338
S/F motivated	317	317	317	317	317	283	283	283	283	283
+Econ. motivated	23	23	23	23	23	55	55	55	55	55
Backlog - total	9542	9225	8907	8590	8273	11723	11440	11157	10874	10591
Improvement ($M)										

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FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Needs	386.3	378.2	370.1	361.9	353.8	374.0	354.4	334.9	315.3	295.8
Work done	4.7	4.7	4.7	4.7	4.7	7.6	7.6	7.6	7.6	7.6
Offset by E/M repl.	3.4	3.4	3.4	3.4	3.4	11.9	11.9	11.9	11.9	11.9
Backlog - total	378.2	370.1	361.9	353.8	345.7	354.4	334.9	315.3	295.8	276.2
Raising ($M)										
Needs	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Widening ($M)										
Needs	214.5	209.5	204.5	199.5	194.5	200.3	192.5	184.8	177.0	169.2
Work done	3.8	3.8	3.8	3.8	3.8	5.1	5.1	5.1	5.1	5.1
Offset by E/M repl.	1.2	1.2	1.2	1.2	1.2	2.7	2.7	2.7	2.7	2.7
Backlog - total	209.5	204.5	199.5	194.5	189.5	192.5	184.8	177.0	169.2	161.4
Capacity Expansion ($M)										
Needs	32.7	32.5	32.3	32.1	31.9	38.6	35.0	31.4	27.8	24.2
Work done	0.2	0.2	0.2	0.2	0.2	2.2	2.2	2.2	2.2	2.2
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	1.4	1.4	1.4	1.4	1.4
Backlog - total	32.5	32.3	32.1	31.9	31.7	35.0	31.4	27.8	24.2	20.7
Strengthening ($M)										
Needs	138.8	135.9	133.0	130.1	127.2	134.8	126.6	118.4	110.3	102.1
Work done	0.7	0.7	0.7	0.7	0.7	0.4	0.4	0.4	0.4	0.4
Offset by E/M repl.	2.2	2.2	2.2	2.2	2.2	7.8	7.8	7.8	7.8	7.8
Backlog - total	135.9	133.0	130.1	127.2	124.3	126.6	118.4	110.3	102.1	93.9
Federally Eligible MR&R ($M)										
Needs	3671.2	3378.3	3085.4	2792.5	2499.6	3018.2	2845.2	2672.2	2499.1	2326.1
Work done	54.8	54.8	54.8	54.8	54.8	54.3	54.3	54.3	54.3	54.3
Offset by E/M repl.	238.1	238.1	238.1	238.1	238.1	118.7	118.7	118.7	118.7	118.7
Backlog - total	3378.3	3085.4	2792.5	2499.6	2206.7	2845.2	2672.2	2499.1	2326.1	2153.1
Maintenance ($M)										
Needs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---

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5yr PERIOD BUDGET: $2000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Replacement (number of bridges)										
S/F motivated needs	3154	3052	2948	2842	2733	3619	3518	3415	3311	3206
Total work done	107	109	111	114	116	109	112	113	115	117
S/F motivated	105	107	109	112	114	102	105	106	108	110
+Econ. motivated	2	2	2	2	2	7	7	7	7	7
Backlog - total	3052	2948	2842	2733	2623	3518	3415	3311	3206	3099
Improvement (number of bridges)										
Needs	668	655	640	617	591	604	587	566	541	507
Work done	8	9	11	13	20	7	9	9	13	19
Offset by E/M repl.	5	6	12	13	15	10	12	16	21	28
Backlog - total	655	640	617	591	556	587	566	541	507	460
Raising (number of bridges)										
Needs	1	1	1	1	1	1	1	1	1	1
Work done	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0
Backlog - total	1	1	1	1	1	1	1	1	1	1
Widening (number of bridges)										
Needs	441	432	422	408	391	394	383	370	356	338
Work done	7	8	9	11	14	7	8	8	10	12
Offset by E/M repl.	2	2	5	6	7	4	5	6	8	11
Backlog - total	432	422	408	391	370	383	370	356	338	315
Capacity Expansion (number of bridges)										
Needs	36	35	34	33	32	44	44	43	42	38
Work done	1	1	1	1	2	0	1	1	3	6
Offset by E/M repl.	0	0	0	0	0	0	0	0	1	3
Backlog - total	35	34	33	32	30	44	43	42	38	29
Strengthening (number of bridges)										
Needs	190	187	183	175	167	165	159	152	142	130
Work done	0	0	1	1	4	0	0	0	0	1
Offset by E/M repl.	3	4	7	7	8	6	7	10	12	14
Backlog - total	187	183	175	167	155	159	152	142	130	115

Total User Benefits ($M)

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential, S/F motivated	821.0	745.9	670.8	595.7	520.6	530.2	478.5	426.8	375.1	323.4
Total obtained	71.8	71.8	71.8	71.8	71.8	43.3	43.3	43.3	43.3	43.3
By S/F motivated work	70.5	70.5	70.5	70.5	70.5	37.6	37.6	37.6	37.6	37.6
+Econ. motivated work	3.3	3.3	3.3	3.3	3.3	8.4	8.4	8.4	8.4	8.4
Offset of S/F	3.3	3.3	3.3	3.3	3.3	8.4	8.4	8.4	8.4	8.4
Excess over offset	---	---	---	---	---	---	---	---	---	---
Backlog - total	745.9	670.8	595.7	520.6	445.5	478.5	426.8	375.1	323.4	271.8
Benefits of S/F motivated replacements ($M)										
Potential	701.5	630.7	559.9	489.1	418.2	418.8	376.5	334.2	291.9	249.6
Total obtained	70.8	70.8	70.8	70.8	70.8	42.3	42.3	42.3	42.3	42.3
S/F motivated	69.6	69.6	69.6	69.6	69.6	36.6	36.6	36.6	36.6	36.6
+Econ. motivated	1.2	1.2	1.2	1.2	1.2	5.7	5.7	5.7	5.7	5.7
Backlog - total	630.7	559.9	489.1	418.2	347.4	376.5	334.2	291.9	249.6	207.4
Improvement Benefits ($M)										
Potential	109.2	105.0	100.8	96.5	92.3	100.7	91.4	82.0	72.7	63.3
Obtained	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0
Offset by E/M repl.	3.3	3.3	3.3	3.3	3.3	8.4	8.4	8.4	8.4	8.4
Backlog - total	105.0	100.8	96.5	92.3	88.1	91.4	82.0	72.7	63.3	54.0
Raising Benefits ($M)										
Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)										
Potential	28.9	27.9	26.9	26.0	25.0	26.3	25.2	24.1	23.0	21.9
Obtained	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Offset by E/M repl.	0.2	0.2	0.2	0.2	0.2	0.5	0.5	0.5	0.5	0.5
Backlog - total	27.9	26.9	26.0	25.0	24.1	25.2	24.1	23.0	21.9	20.7
Capacity Expansion Benefits ($M)										
Potential	9.2	9.2	9.1	9.0	8.9	13.0	11.3	9.7	8.1	6.5
Obtained	0.1	0.1	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	1.3	1.3	1.3	1.3	1.3
Backlog - total	9.2	9.1	9.0	8.9	8.9	11.3	9.7	8.1	6.5	4.9
Strengthening Benefits ($M)										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential	71.1	67.9	64.7	61.5	58.3	61.4	54.8	48.2	41.6	35.0
Obtained	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	3.1	3.1	3.1	3.1	3.1	6.6	6.6	6.6	6.6	6.6
Backlog - total	67.9	64.7	61.5	58.3	55.1	54.8	48.2	41.6	35.0	28.3
Benefits of MR&R ($M)										
Potential	10.3	10.2	10.2	10.1	10.0	10.7	10.6	10.6	10.5	10.5
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Backlog - total	10.2	10.2	10.1	10.0	10.0	10.6	10.6	10.5	10.5	10.4
Average Benefit/Cost ratios										
Overall	4.548	4.548	4.548	4.548	4.548	2.801	2.801	2.801	2.801	2.801
Replacement	4.840	4.840	4.840	4.840	4.840	2.796	2.796	2.796	2.796	2.796
Improvement	1.021	1.021	1.021	1.021	1.021	0.951	0.951	0.951	0.951	0.951
Raising	---	---	---	---	---	---	---	---	---	---
Widening	1.017	1.017	1.017	1.017	1.017	0.950	0.950	0.950	0.950	0.950
Capacity Expansion	1.189	1.189	1.189	1.189	1.189	0.966	0.966	0.966	0.966	0.966
Strengthening	0.994	0.994	0.994	0.994	0.994	0.885	0.885	0.885	0.885	0.885
MR&R	3.021	3.021	3.021	3.021	3.021	3.020	3.020	3.020	3.020	3.020
Benefit/Cost cutoff ratio (federally eligible work only)	1.136	1.136	1.136	1.136	1.136	1.136	1.136	1.136	1.136	1.136

All Performance Measures by Year

5yr PERIOD BUDGET: $2000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Average network condition measures										
Sufficiency rating	77.71	77.67	77.62	77.58	77.54	76.64	76.46	76.27	76.08	75.90
Health index	87.60	87.57	87.54	87.51	87.49	86.49	86.48	86.46	86.45	86.44
Bridge population distribution by deck rating (numbers of bridges)										
Deck rating 9	1740	1490	1239	989	738	488	500	513	525	538
Deck rating 8	2063	2103	2144	2184	2225	2265	2408	2551	2693	2836
Deck rating 7	370	622	874	1125	1377	1629	1488	1347	1207	1066
Deck rating 6	56	71	85	100	114	129	139	148	158	167
Deck rating 5	2019	1715	1411	1108	804	500	438	376	315	253
Deck rating 4	2725	2775	2825	2876	2926	2976	2744	2511	2279	2046
Deck rating 3	505	689	873	1056	1240	1424	1662	1899	2137	2374
Deck rating 2	29	42	55	69	82	95	126	157	188	219
Deck rating 1	0	0	0	1	1	1	3	4	6	7
Deck rating 0	1	1	1	1	1	1	1	1	1	1
Deck rating N	2827	2827	2827	2827	2827	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)										
Superstructure rating 9	2961	3028	3096	3163	3231	3298	3322	3347	3371	3396
Superstructure rating 8	129	114	98	83	67	52	86	120	155	189
Superstructure rating 7	145	136	126	117	107	98	85	73	60	48
Superstructure rating 6	2586	2372	2158	1944	1730	1516	1363	1210	1057	904
Superstructure rating 5	1941	1983	2024	2066	2107	2149	2148	2147	2145	2144
Superstructure rating 4	1824	1896	1968	2039	2111	2183	2190	2197	2204	2211
Superstructure rating 3	236	290	344	398	452	506	604	702	800	898
Superstructure rating 2	18	22	26	30	34	38	40	42	45	47
Superstructure rating 1	2	2	2	2	2	2	3	4	6	7
Superstructure rating 0	1	1	1	1	1	1	1	1	0	0
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)										
Substructure rating 9	4244	4305	4365	4426	4486	4547	4548	4549	4551	4552
Substructure rating 8	109	101	93	84	76	68	115	162	208	255
Substructure rating 7	420	367	315	262	210	157	148	139	130	121
Substructure rating 6	3187	3090	2992	2895	2797	2700	2483	2267	2050	1834

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Substructure rating 5	648	728	807	887	966	1046	1216	1386	1556	1726
Substructure rating 4	1095	1106	1116	1127	1137	1148	1128	1108	1089	1069
Substructure rating 3	93	101	109	116	124	132	160	188	217	245
Substructure rating 2	14	13	13	12	12	11	11	10	10	9
Substructure rating 1	8	8	8	9	9	9	9	8	8	7
Substructure rating 0	2	2	2	2	2	2	2	2	2	2
Substructure rating N	2515	2515	2515	2515	2515	2515	2515	2515	2515	2515
Culvert population distribution by rating (numbers of culverts)										
Culvert rating 9	1058	1057	1055	1054	1052	1051	1051	1052	1052	1053
Culvert rating 8	3	8	12	17	21	26	28	29	31	32
Culvert rating 7	63	52	41	30	19	8	6	5	3	2
Culvert rating 6	792	752	711	671	630	590	525	461	396	332
Culvert rating 5	467	498	529	559	590	621	662	702	743	783
Culvert rating 4	77	94	111	127	144	161	179	197	214	232
Culvert rating 3	29	29	30	30	31	31	36	41	45	50
Culvert rating 2	1	1	1	2	2	2	3	4	5	6
Culvert rating 1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844
Bridge population distribution by sufficiency rating (number of bridges)										
SR > 80% (Good)	6214	6198	6181	6165	6148	6132	6112	6092	6073	6053
50% < SR <=80% (Fair)	4216	4208	4199	4191	4182	4174	4139	4103	4068	4032
SR <=50% (Poor)	1905	1930	1955	1979	2004	2029	2084	2139	2195	2250
Structurally deficient and functionally obsolete bridges										
Number of bridges	5564	5739	5913	6088	6262	6437	6480	6523	6566	6609
Percent of deck area	42.14	43.74	45.33	46.93	48.53	49.57	50.23	50.89	51.55	52.22
Structurally deficient bridges										
Number of bridges	4304	4537	4770	5002	5235	5468	5549	5631	5712	5794
Percent of deck area	32.55	34.65	36.75	38.85	40.96	42.58	43.47	44.35	45.24	46.12
Functionally obsolete bridges										

All Performance Measures by Year

5yr PERIOD BUDGET: $2000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Number of bridges	1260	1202	1144	1085	1027	969	931	892	854	815
Percent of deck area	9.59	9.09	8.58	8.08	7.57	6.99	6.76	6.54	6.32	6.09
Good structural condition										
Number of bridges	4078	4134	4190	4246	4302	4358	4405	4452	4500	4547
Percent of deck area	40.37	40.86	41.36	41.85	42.34	42.35	42.82	43.29	43.76	44.23
Fair structural condition										
Number of bridges	3945	3659	3373	3086	2800	2514	2385	2256	2128	1999
Percent of deck area	25.82	23.48	21.15	18.81	16.47	13.98	12.85	11.71	10.58	9.44
Poor structural condition										
Number of bridges	4312	4542	4772	5003	5233	5463	5545	5626	5708	5789
Percent of deck area	32.56	34.66	36.75	38.85	40.94	42.56	43.44	44.33	45.22	46.10

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2500M
BRIDGES: All Bridges; on and off NHS

20-YEAR TOTALS:

Total budget available over 20 years: $10000M

	Work Done ($M)	Work Done (bridges)	User Benefits Obtained ($M)
Total	9987.3		2310.6
Replacement	6511.9	2114	2291.8
Struct/Func. motivated (S/F)	4926.9	1984	2108.4
Economically motivated (E/M)	1585.0	130	183.4
Improvement	87.5	194	13.3
Raising	0.0	0	0.0
Widening	66.2	159	10.1
Capacity Expansion	12.6	21	2.1
Strengthening	8.7	14	1.1
MR&R	3400.6		5.5
Federal MR&R	3400.6		-
Local MR&R	0.0		-
(not included in the total)			

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cumulative work done ($M)											
Total work	500.0	1000.0	1499.9	1999.9	2499.9	2999.9	3499.9	3999.9	4499.8	4999.8	
S/F motivated	435.6	871.3	1306.9	1742.5	2178.1	2543.2	2908.2	3273.3	3638.3	4003.3	
+Econ. motivated	64.4	128.7	193.1	257.4	321.8	456.7	591.7	726.6	861.5	996.5	
Replacement	259.1	518.2	777.2	1036.3	1295.4	1487.9	1680.3	1872.8	2065.3	2257.8	
S/F motivated	194.7	389.5	584.2	778.9	973.6	1031.2	1088.7	1146.2	1203.7	1261.3	
+Econ. motivated	64.4	128.7	193.1	257.4	321.8	456.7	591.7	726.6	861.5	996.5	
Improvement	0.5	1.0	1.6	2.1	2.6	3.1	3.5	4.0	4.4	4.9	
Raising	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Widening	0.5	1.0	1.5	2.0	2.5	2.9	3.2	3.6	4.0	4.3	
Capacity Expansion	---	---	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	
Strengthening	---	---	---	---	---	0.1	0.2	0.2	0.3	0.4	
Federally Eligible MR&R	240.4	480.8	721.2	961.6	1202.0	1509.1	1816.1	2123.2	2430.3	2737.3	
Cumulative work done (number of bridges)											
Replacement	109	220	331	444	559	588	617	648	680	715	
S/F motivated	103	208	313	420	529	550	571	594	618	645	
+Econ. motivated	6	12	18	24	30	38	46	54	62	70	
Improvement	1	3	5	8	14	15	16	18	20	27	
Raising	---	---	---	---	---	---	---	---	---	---	
Widening	1	2	3	5	10	11	12	14	16	19	
Capacity Expansion	---	1	2	3	4	4	4	4	4	6	
Total structurally/functionally (S/F) motivated annual needs and work ($M)											
S/F motivated needs	11408	10807	10206	9604	9003	11974	11491	11009	10527	10045	
Total work done	500	500	500	500	500	500	500	500	500	500	
S/F motivated	436	436	436	436	436	365	365	365	365	365	
+Econ. motivated	64	64	64	64	64	135	135	135	135	135	
Backlog - total	10807	10206	9604	9003	8402	11491	11009	10527	10045	9562	
Replacement ($M)											
S/F motivated needs	5926.1	5731.3	5536.6	5341.9	5147.1	7652.7	7595.1	7537.6	7480.1	7422.6	
Total work done	259.1	259.1	259.1	259.1	259.1	192.5	192.5	192.5	192.5	192.5	
S/F motivated	194.7	194.7	194.7	194.7	194.7	57.5	57.5	57.5	57.5	57.5	
+Econ. motivated	64.4	64.4	64.4	64.4	64.4	134.9	134.9	134.9	134.9	134.9	
Backlog - total	5731.3	5536.6	5341.9	5147.1	4952.4	7595.1	7537.6	7480.1	7422.6	7365.0	
Improvement ($M)											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Needs		352.5	345.2	337.8	330.5	323.2	350.0	345.6	341.3	337.0	332.7
Work done		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Offset by E/M repl.		6.8	6.8	6.8	6.8	6.8	3.8	3.8	3.8	3.8	3.8
Backlog - total		345.2	337.8	330.5	323.2	315.9	345.6	341.3	337.0	332.7	328.4
Raising ($M)											
Needs		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Widening ($M)											
Needs		184.5	181.9	179.2	176.6	173.9	194.3	193.3	192.3	191.2	190.2
Work done		0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4
Offset by E/M repl.		2.2	2.2	2.2	2.2	2.2	0.6	0.6	0.6	0.6	0.6
Backlog - total		181.9	179.2	176.6	173.9	171.3	193.3	192.3	191.2	190.2	189.2
Capacity Expansion ($M)											
Needs		15.3	15.3	15.3	15.2	15.2	17.8	17.8	17.8	17.7	17.7
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		15.3	15.3	15.2	15.2	15.2	17.8	17.8	17.7	17.7	17.7
Strengthening ($M)											
Needs		152.3	147.7	143.1	138.4	133.8	137.6	134.3	131.1	127.8	124.5
Work done		0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Offset by E/M repl.		4.6	4.6	4.6	4.6	4.6	3.2	3.2	3.2	3.2	3.2
Backlog - total		147.7	143.1	138.4	133.8	129.2	134.3	131.1	127.8	124.5	121.2
Federally Eligible MR&R ($M)											
Needs		5129.9	4730.5	4331.2	3931.9	3532.6	3970.9	3550.5	3130.1	2709.7	2289.3
Work done		240.4	240.4	240.4	240.4	240.4	307.1	307.1	307.1	307.1	307.1
Offset by E/M repl.		158.9	158.9	158.9	158.9	158.9	113.3	113.3	113.3	113.3	113.3
Backlog - total		4730.5	4331.2	3931.9	3532.6	3133.2	3550.5	3130.1	2709.7	2289.3	1868.9
Maintenance ($M)											
Needs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		---	---	---	---	---	---	---	---	---	---

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Replacement (number of bridges)											
S/F motivated needs	2039	1940	1838	1736	1630	2352	2334	2314	2293	2270	
Total work done	109	111	111	113	115	29	29	31	32	35	
S/F motivated	103	105	105	107	109	21	21	23	24	27	
+Econ. motivated	6	6	6	6	6	8	8	8	8	8	
Backlog - total	1940	1838	1736	1630	1523	2334	2314	2293	2270	2244	
Improvement (number of bridges)											
Needs	707	692	671	650	619	628	626	622	615	606	
Work done	1	2	2	3	6	1	1	2	2	7	
Offset by E/M repl.	14	19	19	28	31	1	3	5	7	9	
Backlog - total	692	671	650	619	582	626	622	615	606	590	
Raising (number of bridges)											
Needs	1	1	1	1	1	1	1	1	1	1	
Work done	0	0	0	0	0	0	0	0	0	0	
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0	
Backlog - total	1	1	1	1	1	1	1	1	1	1	
Widening (number of bridges)											
Needs	445	439	431	423	408	419	418	415	411	407	
Work done	1	1	1	2	5	1	1	2	2	3	
Offset by E/M repl.	5	7	7	13	14	0	2	2	2	4	
Backlog - total	439	431	423	408	389	418	415	411	407	400	
Capacity Expansion (number of bridges)											
Needs	23	23	22	21	20	26	26	26	26	26	
Work done	0	1	1	1	1	0	0	0	0	2	
Offset by E/M repl.	0	0	0	0	1	0	0	0	0	0	
Backlog - total	23	22	21	20	18	26	26	26	26	24	
Strengthening (number of bridges)											
Needs	238	229	217	205	190	182	181	180	177	172	
Work done	0	0	0	0	0	0	0	0	0	2	
Offset by E/M repl.	9	12	12	15	16	1	1	3	5	5	
Backlog - total	229	217	205	190	174	181	180	177	172	165	

Total User Benefits ($M)

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential, S/F motivated		2414.0	2060.6	1707.3	1353.9	1000.6	818.3	756.8	695.3	633.9	577.4
Total obtained		316.1	316.1	316.1	316.1	316.1	42.5	42.5	42.5	42.5	42.5
By S/F motivated work		305.0	305.0	305.0	305.0	305.0	24.4	24.4	24.4	24.4	24.4
+Econ. motivated work		37.3	37.3	37.3	37.3	37.3	18.9	18.9	18.9	18.9	18.9
Offset of S/F		37.3	37.3	37.3	37.3	37.3	18.9	18.9	18.9	18.9	18.9
Excess over offset		---	---	---	---	---	---	---	---	---	---
Backlog - total		2060.6	1707.3	1353.9	1000.6	647.2	756.8	695.3	633.9	577.4	531.7
Benefits of S/F motivated replacements ($M)											
Potential		2067.1	1751.7	1436.3	1120.9	805.5	632.9	591.2	549.5	507.8	471.2
Total obtained		315.4	315.4	315.4	315.4	315.4	41.7	41.7	41.7	41.7	41.7
S/F motivated		304.4	304.4	304.4	304.4	304.4	23.6	23.6	23.6	23.6	23.6
+Econ. motivated		11.0	11.0	11.0	11.0	11.0	18.1	18.1	18.1	18.1	18.1
Backlog - total		1751.7	1436.3	1120.9	805.5	490.1	591.2	549.5	507.8	471.2	445.2
Improvement Benefits ($M)											
Potential		337.6	300.1	262.6	225.1	187.6	177.0	157.9	138.8	119.7	100.7
Obtained		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Offset by E/M repl.		37.3	37.3	37.3	37.3	37.3	18.9	18.9	18.9	18.9	18.9
Backlog - total		300.1	262.6	225.1	187.6	150.2	157.9	138.8	119.7	100.7	81.6
Raising Benefits ($M)											
Potential		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)											
Potential		25.5	24.9	24.3	23.7	23.1	25.7	25.4	25.1	24.7	24.4
Obtained		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Offset by E/M repl.		0.4	0.4	0.4	0.4	0.4	0.2	0.2	0.2	0.2	0.2
Backlog - total		24.9	24.3	23.7	23.1	22.5	25.4	25.1	24.7	24.4	24.0
Capacity Expansion Benefits ($M)											
Potential		3.8	3.7	3.7	3.7	3.6	5.5	5.5	5.5	5.5	5.5
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		3.7	3.7	3.7	3.6	3.6	5.5	5.5	5.5	5.5	5.4
Strengthening Benefits ($M)											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

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BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential		308.3	271.4	234.6	197.7	160.9	145.7	127.0	108.3	89.5	70.8
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		36.8	36.8	36.8	36.8	36.8	18.7	18.7	18.7	18.7	18.7
Backlog - total		271.4	234.6	197.7	160.9	124.1	127.0	108.3	89.5	70.8	52.1
Benefits of MR&R ($M)											
Potential		9.2	8.8	8.3	7.9	7.4	8.4	7.7	7.0	6.3	5.6
Obtained		0.4	0.4	0.4	0.4	0.4	0.7	0.7	0.7	0.7	0.7
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		8.8	8.3	7.9	7.4	7.0	7.7	7.0	6.3	5.6	4.9
Average Benefit/Cost ratios											
Overall		4.661	4.661	4.661	4.661	4.661	3.296	3.296	3.296	3.296	3.296
Replacement		5.640	5.640	5.640	5.640	5.640	4.474	4.474	4.474	4.474	4.474
Improvement		1.214	1.214	1.214	1.214	1.214	1.212	1.212	1.212	1.212	1.212
Raising		---	---	---	---	---	---	---	---	---	---
Widening		1.189	1.189	1.189	1.189	1.189	1.240	1.240	1.240	1.240	1.240
Capacity Expansion		1.818	1.818	1.818	1.818	1.818	1.574	1.574	1.574	1.574	1.574
Strengthening		---	---	---	---	---	1.012	1.012	1.012	1.012	1.012
MR&R		3.613	3.613	3.613	3.613	3.613	2.561	2.561	2.561	2.561	2.561
Benefit/Cost cutoff ratio (federally eligible work only)		1.189	1.189	1.189	1.189	1.189	1.135	1.135	1.135	1.135	1.135

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Average network condition measures											
Sufficiency rating	80.39	79.77	79.80	79.83	79.86	79.89	79.47	79.50	79.53	79.57	79.60
Health index	87.79	87.10	87.28	87.47	87.65	87.83	87.51	88.07	88.64	89.21	89.77
Bridge population distribution by deck rating (numbers of bridges)											
Deck rating 9	0	0	166	332	498	664	830	1036	1241	1447	1652
Deck rating 8	139	139	342	545	747	950	1153	1483	1813	2144	2474
Deck rating 7	5593	5593	4499	3405	2312	1218	124	206	287	369	450
Deck rating 6	462	462	852	1242	1632	2022	2412	1943	1474	1005	536
Deck rating 5	2760	2760	2755	2749	2744	2738	2733	2472	2211	1950	1689
Deck rating 4	586	586	876	1166	1456	1746	2036	2097	2158	2219	2280
Deck rating 3	5	5	47	89	131	173	215	262	310	357	405
Deck rating 2	1	1	2	2	3	3	4	8	12	17	21
Deck rating 1	0	0	0	0	0	0	0	0	0	0	0
Deck rating 0	3	3	3	2	2	1	1	1	1	1	1
Deck rating N	2786	2786	2794	2802	2811	2819	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)											
Superstructure rating 9	0	0	291	581	872	1162	1453	1886	2318	2751	3183
Superstructure rating 8	301	301	254	207	159	112	65	84	103	122	141
Superstructure rating 7	6229	6229	5299	4370	3440	2511	1581	1287	993	698	404
Superstructure rating 6	363	363	1059	1755	2450	3146	3842	3499	3157	2814	2472
Superstructure rating 5	2589	2589	2362	2135	1907	1680	1453	1533	1614	1694	1775
Superstructure rating 4	350	350	545	741	936	1132	1327	1407	1487	1568	1648
Superstructure rating 3	9	9	31	52	74	95	117	139	160	182	203
Superstructure rating 2	1	1	2	2	3	3	4	7	10	12	15
Superstructure rating 1	0	0	0	0	0	0	0	0	0	1	1
Superstructure rating 0	1	1	1	1	1	1	1	1	1	1	1
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)											
Substructure rating 9	0	0	442	885	1327	1770	2212	2830	3447	4065	4682
Substructure rating 8	264	264	228	192	157	121	85	92	99	107	114
Substructure rating 7	6773	6773	5934	5095	4256	3417	2578	2127	1675	1224	772
Substructure rating 6	212	212	740	1269	1797	2326	2854	2777	2700	2622	2545

All Performance Measures by Year

5yr PERIOD BUDGET: $2500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Substructure rating 5	2299	2299	2085	1871	1657	1443	1229	1092	955	818	681
Substructure rating 4	258	258	360	462	563	665	767	805	844	882	921
Substructure rating 3	9	9	21	33	44	56	68	71	75	78	82
Substructure rating 2	26	26	25	24	23	22	21	19	18	16	15
Substructure rating 1	1	1	2	2	3	3	4	5	6	6	7
Substructure rating 0	2	2	2	2	2	2	2	2	2	1	1
Substructure rating N	2491	2491	2496	2501	2505	2510	2515	2515	2515	2515	2515
Culvert population distribution by rating (numbers of culverts)											
Culvert rating 9	0	0	12	24	35	47	59	292	525	757	990
Culvert rating 8	123	123	106	89	72	55	38	31	24	17	10
Culvert rating 7	1328	1328	1191	1053	916	778	641	523	405	287	169
Culvert rating 6	958	958	1018	1077	1137	1196	1256	1144	1031	919	806
Culvert rating 5	23	23	105	187	270	352	434	430	426	423	419
Culvert rating 4	56	56	54	53	51	50	48	53	58	64	69
Culvert rating 3	2	2	4	7	9	12	14	17	20	23	26
Culvert rating 2	0	0	0	0	0	0	0	0	0	1	1
Culvert rating 1	1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844
Bridge population distribution by sufficiency rating (number of bridges)											
SR > 80% (Good)	6552	6552	6573	6594	6614	6635	6656	6626	6595	6565	6534
50% < SR <=80% (Fair)	4512	4512	4444	4376	4308	4240	4172	4153	4133	4114	4094
SR <=50% (Poor)	1271	1271	1318	1365	1413	1460	1507	1557	1607	1656	1706
Structurally deficient and functionally obsolete bridges											
Number of bridges	3277	3277	3557	3837	4118	4398	4678	4773	4868	4963	5058
Percent of deck area	26.09	25.89	28.20	30.52	32.83	35.15	37.25	37.22	37.19	37.16	37.12
Structurally deficient bridges											
Number of bridges	1041	1041	1483	1925	2366	2808	3250	3370	3490	3609	3729
Percent of deck area	11.46	11.37	14.56	17.75	20.93	24.12	27.15	27.09	27.04	26.98	26.93
Functionally obsolete bridges											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Number of bridges	2236	2236	2074	1913	1751	1590	1428	1403	1378	1354	1329
Percent of deck area	14.63	14.52	13.64	12.77	11.90	11.03	10.10	10.12	10.15	10.17	10.20
Good structural condition											
Number of bridges	5263	5263	4662	4061	3460	2859	2258	2785	3312	3840	4367
Percent of deck area	39.45	39.14	36.18	33.21	30.25	27.28	24.18	29.46	34.73	40.01	45.28
Fair structural condition											
Number of bridges	6029	6029	6183	6337	6491	6645	6799	6156	5513	4871	4228
Percent of deck area	48.86	48.48	48.38	48.29	48.19	48.10	47.73	42.69	37.66	32.63	27.59
Poor structural condition											
Number of bridges	1043	1043	1490	1937	2384	2831	3278	3394	3509	3625	3740
Percent of deck area	11.69	11.60	14.82	18.03	21.25	24.47	27.52	27.39	27.27	27.14	27.01

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cumulative work done ($M)										
Total work	5499.6	5999.4	6499.2	6999.0	7498.8	7996.5	8494.2	8991.9	9489.6	9987.3
S/F motivated	4474.4	4945.4	5416.4	5887.5	6358.5	6767.3	7176.0	7584.8	7993.6	8402.3
+Econ. motivated	1025.3	1054.0	1082.8	1111.6	1140.3	1229.3	1318.2	1407.1	1496.0	1585.0
Replacement	2679.9	3102.0	3524.1	3946.2	4368.3	4797.0	5225.7	5654.4	6083.2	6511.9
S/F motivated	1654.6	2048.0	2441.3	2834.6	3228.0	3567.8	3907.6	4247.3	4587.1	4926.9
+Econ. motivated	1025.3	1054.0	1082.8	1111.6	1140.3	1229.3	1318.2	1407.1	1496.0	1585.0
Improvement	15.7	26.5	37.2	48.0	58.8	64.5	70.3	76.0	81.8	87.5
Raising	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Widening	13.8	23.3	32.8	42.3	51.8	54.7	57.5	60.4	63.3	66.2
Capacity Expansion	0.4	0.6	0.8	1.0	1.2	3.5	5.7	8.0	10.3	12.6
Strengthening	1.5	2.6	3.7	4.8	5.9	6.4	7.0	7.6	8.1	8.7
Federally Eligible MR&R	2804.4	2871.5	2938.6	3005.7	3072.9	3138.4	3203.9	3269.5	3335.0	3400.6
Cumulative work done (number of bridges)										
Replacement	861	1007	1156	1305	1455	1584	1714	1845	1978	2114
S/F motivated	788	931	1077	1223	1370	1490	1611	1733	1857	1984
+Econ. motivated	73	76	79	82	85	94	103	112	121	130
Improvement	45	67	91	117	149	154	160	166	177	194
Raising	---	---	---	---	---	---	---	---	---	---
Widening	37	57	79	101	127	131	136	141	149	159
Capacity Expansion	6	7	8	9	10	11	12	13	16	21
Total structurally/functionally (S/F) motivated annual needs and work ($M)										
S/F motivated needs	12238	11564	10890	10215	9541	12641	12088	11534	10980	10426
Total work done	500	500	500	500	500	498	498	498	498	498
S/F motivated	471	471	471	471	471	409	409	409	409	409
+Econ. motivated	29	29	29	29	29	89	89	89	89	89
Backlog - total	11564	10890	10215	9541	8867	12088	11534	10980	10426	9872
Replacement ($M)										
S/F motivated needs	9098	8705	8312	7918	7525	10101	9762	9422	9082	8742
Total work done	422	422	422	422	422	429	429	429	429	429
S/F motivated	393	393	393	393	393	340	340	340	340	340
+Econ. motivated	29	29	29	29	29	89	89	89	89	89
Backlog - total	8705	8312	7918	7525	7132	9762	9422	9082	8742	8402
Improvement ($M)										

All Performance Measures by Year

5yr PERIOD BUDGET: $2500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Needs	371.0	353.9	336.8	319.7	302.6	314.5	295.1	275.6	256.2	236.8
Work done	10.8	10.8	10.8	10.8	10.8	5.7	5.7	5.7	5.7	5.7
Offset by E/M repl.	6.3	6.3	6.3	6.3	6.3	13.7	13.7	13.7	13.7	13.7
Backlog - total	353.9	336.8	319.7	302.6	285.4	295.1	275.6	256.2	236.8	217.4
Raising ($M)										
Needs	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Widening ($M)										
Needs	210.5	199.0	187.5	176.0	164.5	164.6	158.0	151.4	144.8	138.2
Work done	9.5	9.5	9.5	9.5	9.5	2.9	2.9	2.9	2.9	2.9
Offset by E/M repl.	2.0	2.0	2.0	2.0	2.0	3.7	3.7	3.7	3.7	3.7
Backlog - total	199.0	187.5	176.0	164.5	153.0	158.0	151.4	144.8	138.2	131.6
Capacity Expansion ($M)										
Needs	32.7	32.5	32.3	32.1	31.9	38.6	33.7	28.7	23.8	18.8
Work done	0.2	0.2	0.2	0.2	0.2	2.3	2.3	2.3	2.3	2.3
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	2.7	2.7	2.7	2.7	2.7
Backlog - total	32.5	32.3	32.1	31.9	31.7	33.7	28.7	23.8	18.8	13.9
Strengthening ($M)										
Needs	127.6	122.1	116.7	111.3	105.9	111.0	103.1	95.2	87.4	79.5
Work done	1.1	1.1	1.1	1.1	1.1	0.6	0.6	0.6	0.6	0.6
Offset by E/M repl.	4.3	4.3	4.3	4.3	4.3	7.3	7.3	7.3	7.3	7.3
Backlog - total	122.1	116.7	111.3	105.9	100.5	103.1	95.2	87.4	79.5	71.6
Federally Eligible MR&R ($M)										
Needs	2768.4	2504.7	2241.1	1977.5	1713.8	2225.6	2031.0	1836.4	1641.8	1447.2
Work done	67.1	67.1	67.1	67.1	67.1	65.5	65.5	65.5	65.5	65.5
Offset by E/M repl.	196.5	196.5	196.5	196.5	196.5	129.1	129.1	129.1	129.1	129.1
Backlog - total	2504.7	2241.1	1977.5	1713.8	1450.2	2031.0	1836.4	1641.8	1447.2	1252.6
Maintenance ($M)										
Needs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Replacement (number of bridges)										
S/F motivated needs	2898	2761	2623	2480	2337	2999	2883	2765	2647	2527
Total work done	146	146	149	149	150	129	130	131	133	136
S/F motivated	143	143	146	146	147	120	121	122	124	127
+Econ. motivated	3	3	3	3	3	9	9	9	9	9
Backlog - total	2761	2623	2480	2337	2192	2883	2765	2647	2527	2404
Improvement (number of bridges)										
Needs	638	613	579	540	494	488	474	456	435	404
Work done	18	22	24	26	32	5	6	6	11	17
Offset by E/M repl.	7	12	15	20	21	9	12	15	20	28
Backlog - total	613	579	540	494	441	474	456	435	404	359
Raising (number of bridges)										
Needs	1	1	1	1	1	1	1	1	1	1
Work done	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0
Backlog - total	1	1	1	1	1	1	1	1	1	1
Widening (number of bridges)										
Needs	425	404	379	350	319	309	301	291	279	263
Work done	18	20	22	22	26	4	5	5	8	10
Offset by E/M repl.	3	5	7	9	9	4	5	7	8	11
Backlog - total	404	379	350	319	284	301	291	279	263	242
Capacity Expansion (number of bridges)										
Needs	36	36	35	34	33	44	43	42	41	36
Work done	0	1	1	1	1	1	1	1	3	5
Offset by E/M repl.	0	0	0	0	0	0	0	0	2	5
Backlog - total	36	35	34	33	32	43	42	41	36	26
Strengthening (number of bridges)										
Needs	176	172	164	155	141	134	129	122	114	104
Work done	0	1	1	3	5	0	0	0	0	2
Offset by E/M repl.	4	7	8	11	12	5	7	8	10	12
Backlog - total	172	164	155	141	124	129	122	114	104	90

Total User Benefits ($M)

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential, S/F motivated	683.8	610.5	537.2	463.9	390.6	385.9	344.1	302.3	260.5	218.8
Total obtained	69.2	69.2	69.2	69.2	69.2	34.3	34.3	34.3	34.3	34.3
By S/F motivated work	67.7	67.7	67.7	67.7	67.7	28.3	28.3	28.3	28.3	28.3
+Econ. motivated work	4.1	4.1	4.1	4.1	4.1	7.4	7.4	7.4	7.4	7.4
Offset of S/F	4.1	4.1	4.1	4.1	4.1	7.4	7.4	7.4	7.4	7.4
Excess over offset	---	---	---	---	---	---	---	---	---	---
Backlog - total	610.5	537.2	463.9	390.6	317.3	344.1	302.3	260.5	218.8	177.5
Benefits of S/F motivated replacements ($M)										
Potential	578.9	511.3	443.6	375.9	308.2	297.6	264.0	230.4	196.9	163.3
Total obtained	67.7	67.7	67.7	67.7	67.7	33.6	33.6	33.6	33.6	33.6
S/F motivated	66.1	66.1	66.1	66.1	66.1	27.6	27.6	27.6	27.6	27.6
+Econ. motivated	1.5	1.5	1.5	1.5	1.5	6.0	6.0	6.0	6.0	6.0
Backlog - total	511.3	443.6	375.9	308.2	240.5	264.0	230.4	196.9	163.3	130.2
Improvement Benefits ($M)										
Potential	96.9	91.4	85.9	80.3	74.8	80.3	72.2	64.1	56.0	47.9
Obtained	1.5	1.5	1.5	1.5	1.5	0.7	0.7	0.7	0.7	0.7
Offset by E/M repl.	4.0	4.0	4.0	4.0	4.0	7.4	7.4	7.4	7.4	7.4
Backlog - total	91.4	85.9	80.3	74.8	69.3	72.2	64.1	56.0	47.9	39.8
Raising Benefits ($M)										
Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)										
Potential	27.2	25.4	23.5	21.7	19.9	20.0	19.1	18.2	17.4	16.5
Obtained	1.3	1.3	1.3	1.3	1.3	0.4	0.4	0.4	0.4	0.4
Offset by E/M repl.	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Backlog - total	25.4	23.5	21.7	19.9	18.1	19.1	18.2	17.4	16.5	15.6
Capacity Expansion Benefits ($M)										
Potential	9.2	9.2	9.1	9.0	9.0	13.0	11.0	9.0	7.0	5.0
Obtained	0.1	0.1	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	1.7	1.7	1.7	1.7	1.7
Backlog - total	9.2	9.1	9.0	9.0	8.9	11.0	9.0	7.0	5.0	3.0
Strengthening Benefits ($M)										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential	60.5	56.8	53.2	49.5	45.9	47.3	42.1	36.9	31.7	26.4
Obtained	0.2	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	3.5	3.5	3.5	3.5	3.5	5.2	5.2	5.2	5.2	5.2
Backlog - total	56.8	53.2	49.5	45.9	42.2	42.1	36.9	31.7	26.4	21.2
Benefits of MR&R ($M)										
Potential	7.9	7.8	7.7	7.7	7.6	8.0	7.9	7.8	7.7	7.6
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Backlog - total	7.8	7.7	7.7	7.6	7.5	7.9	7.8	7.7	7.6	7.5
Average Benefit/Cost ratios										
Overall	3.360	3.360	3.360	3.360	3.360	2.557	2.557	2.557	2.557	2.557
Replacement	3.460	3.460	3.460	3.460	3.460	2.489	2.489	2.489	2.489	2.489
Improvement	0.964	0.964	0.964	0.964	0.964	0.952	0.952	0.952	0.952	0.952
Raising	---	---	---	---	---	---	---	---	---	---
Widening	0.958	0.958	0.958	0.958	0.958	0.958	0.958	0.958	0.958	0.958
Capacity Expansion	1.159	1.159	1.159	1.159	1.159	0.960	0.960	0.960	0.960	0.960
Strengthening	0.983	0.983	0.983	0.983	0.983	0.885	0.885	0.885	0.885	0.885
MR&R	3.105	3.105	3.105	3.105	3.105	3.088	3.088	3.088	3.088	3.088
Benefit/Cost cutoff ratio (federally eligible work only)	1.135	1.135	1.135	1.135	1.135	1.135	1.135	1.135	1.135	1.135

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Average network condition measures										
Sufficiency rating	78.37	78.52	78.68	78.83	78.99	78.13	78.12	78.12	78.11	78.10
Health index	88.91	89.03	89.16	89.28	89.41	88.39	88.49	88.60	88.70	88.81
Bridge population distribution by deck rating (numbers of bridges)										
Deck rating 9	1858	1629	1400	1170	941	712	694	676	659	641
Deck rating 8	2804	2849	2893	2938	2982	3027	3182	3336	3491	3645
Deck rating 7	532	781	1030	1278	1527	1776	1655	1534	1412	1291
Deck rating 6	67	83	99	114	130	146	162	178	195	211
Deck rating 5	1428	1220	1012	805	597	389	355	321	288	254
Deck rating 4	2341	2318	2294	2271	2247	2224	2024	1824	1623	1423
Deck rating 3	452	593	734	875	1016	1157	1339	1520	1702	1883
Deck rating 2	25	35	45	55	65	75	95	114	134	153
Deck rating 1	0	0	0	1	1	1	2	3	4	5
Deck rating 0	1	1	1	1	1	1	1	1	1	1
Deck rating N	2827	2827	2827	2827	2827	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)										
Superstructure rating 9	3616	3710	3804	3898	3992	4086	4114	4142	4170	4198
Superstructure rating 8	160	144	127	111	94	78	122	166	209	253
Superstructure rating 7	110	109	109	108	108	107	93	80	66	53
Superstructure rating 6	2129	1923	1716	1510	1303	1097	995	892	790	687
Superstructure rating 5	1855	1884	1914	1943	1973	2002	1969	1936	1904	1871
Superstructure rating 4	1728	1780	1832	1885	1937	1989	1985	1981	1977	1973
Superstructure rating 3	225	270	316	361	407	452	530	608	687	765
Superstructure rating 2	18	21	23	26	28	31	33	35	36	38
Superstructure rating 1	1	1	1	1	1	1	2	3	4	5
Superstructure rating 0	1	1	1	0	0	0	0	0	0	0
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)										
Substructure rating 9	5300	5382	5463	5545	5626	5708	5715	5722	5728	5735
Substructure rating 8	121	115	109	102	96	90	140	190	239	289
Substructure rating 7	321	287	252	218	183	149	145	141	136	132
Substructure rating 6	2468	2371	2273	2176	2078	1981	1821	1661	1501	1341

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Substructure rating 5	544	611	679	746	814	881	993	1106	1218	1331
Substructure rating 4	959	946	933	919	906	893	868	843	818	793
Substructure rating 3	85	89	93	96	100	104	124	145	165	186
Substructure rating 2	13	12	11	9	8	7	7	7	8	8
Substructure rating 1	8	8	8	7	7	7	7	6	6	5
Substructure rating 0	1	1	1	0	0	0	0	0	0	0
Substructure rating N	2515	2515	2515	2515	2515	2515	2515	2515	2515	2515
Culvert population distribution by rating (numbers of culverts)										
Culvert rating 9	1223	1222	1221	1220	1219	1218	1216	1213	1211	1208
Culvert rating 8	3	9	14	20	25	31	34	37	41	44
Culvert rating 7	51	42	33	24	15	6	5	4	2	1
Culvert rating 6	694	658	622	586	550	514	456	399	341	284
Culvert rating 5	415	440	465	491	516	541	578	615	651	688
Culvert rating 4	74	89	104	119	134	149	164	179	195	210
Culvert rating 3	29	29	29	29	29	29	34	39	44	49
Culvert rating 2	1	1	1	2	2	2	3	4	5	6
Culvert rating 1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844
Bridge population distribution by sufficiency rating (number of bridges)										
SR > 80% (Good)	6504	6543	6582	6622	6661	6700	6709	6718	6728	6737
50% < SR <=80% (Fair)	4075	4048	4020	3993	3965	3938	3893	3848	3803	3758
SR <=50% (Poor)	1756	1744	1732	1721	1709	1697	1733	1769	1804	1840
Structurally deficient and functionally obsolete bridges										
Number of bridges	5153	5226	5300	5373	5447	5520	5538	5556	5573	5591
Percent of deck area	36.50	37.44	38.37	39.30	40.23	40.64	41.02	41.41	41.80	42.19
Structurally deficient bridges										
Number of bridges	3849	3977	4105	4234	4362	4490	4546	4601	4657	4712
Percent of deck area	26.44	27.83	29.21	30.60	31.98	32.94	33.52	34.09	34.67	35.25
Functionally obsolete bridges										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $2500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Number of bridges	1304	1249	1194	1140	1085	1030	992	954	917	879
Percent of deck area	10.06	9.61	9.16	8.70	8.25	7.70	7.51	7.32	7.12	6.93
Good structural condition										
Number of bridges	4894	4982	5071	5159	5248	5336	5385	5435	5484	5534
Percent of deck area	49.76	50.41	51.07	51.72	52.37	52.35	52.91	53.47	54.03	54.59
Fair structural condition										
Number of bridges	3585	3371	3157	2942	2728	2514	2409	2304	2198	2093
Percent of deck area	22.20	20.49	18.77	17.06	15.34	13.45	12.57	11.69	10.81	9.92
Poor structural condition										
Number of bridges	3856	3982	4108	4233	4359	4485	4541	4597	4652	4708
Percent of deck area	26.45	27.83	29.21	30.59	31.96	32.92	33.50	34.07	34.65	35.23

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

20-YEAR TOTALS:

Total budget available over 20 years: $12000M

	Work Done ($M)	Work Done (bridges)	User Benefits Obtained ($M)
Total	11983.7		2359.9
Replacement	8007.4	2510	2333.1
Struct/Func. motivated (S/F)	5997.0	2335	2145.7
Economically motivated (E/M)	2010.4	175	187.4
Improvement	144.8	298	20.4
Raising	0.0	0	0.0
Widening	111.1	246	15.2
Capacity Expansion	16.2	26	2.8
Strengthening	17.5	26	2.4
MR&R	3847.7		6.4
Federal MR&R	3847.7		-
Local MR&R	0.0		-
(not included in the total)			

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cumulative work done ($M)											
Total work	600.0	1199.9	1799.9	2399.9	2999.9	3599.8	4199.7	4799.5	5399.4	5999.3	
S/F motivated	533.0	1066.1	1599.1	2132.2	2665.2	3075.8	3486.3	3896.9	4307.4	4718.0	
+Econ. motivated	66.9	133.9	200.8	267.7	334.6	524.0	713.3	902.6	1092.0	1281.3	
Replacement	305.5	610.9	916.4	1221.8	1527.3	1798.1	2068.9	2339.7	2610.4	2881.2	
S/F motivated	238.5	477.1	715.6	954.1	1192.6	1274.1	1355.6	1437.0	1518.5	1599.9	
+Econ. motivated	66.9	133.9	200.8	267.7	334.6	524.0	713.3	902.6	1092.0	1281.3	
Improvement	1.0	2.0	3.0	4.0	5.0	6.4	7.8	9.1	10.5	11.8	
Raising	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Widening	1.0	1.9	2.9	3.8	4.8	6.0	7.2	8.4	9.6	10.7	
Capacity Expansion	---	---	0.1	0.1	0.1	0.2	0.3	0.4	0.5	0.6	
Strengthening	---	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.4	0.4	
Federally Eligible MR&R	293.5	587.1	880.6	1174.1	1467.7	1795.5	2123.4	2451.2	2779.1	3106.9	
Cumulative work done (number of bridges)											
Replacement	135	272	411	552	693	732	772	815	859	904	
S/F motivated	128	258	390	524	658	688	719	753	788	824	
+Econ. motivated	7	14	21	28	35	44	53	62	71	80	
Improvement	2	6	11	16	25	28	31	34	39	50	
Raising	---	---	---	---	---	---	---	---	---	---	
Widening	2	5	9	13	19	22	25	28	32	40	
Capacity Expansion	---	1	2	3	5	5	5	5	5	7	
Total structurally/functionally (S/F) motivated annual needs and work ($M)											
S/F motivated needs	11408	10697	9985	9273	8561	11254	10677	10101	9525	8948	
Total work done	600	600	600	600	600	600	600	600	600	600	
S/F motivated	533	533	533	533	533	411	411	411	411	411	
+Econ. motivated	67	67	67	67	67	189	189	189	189	189	
Backlog - total	10697	9985	9273	8561	7850	10677	10101	9525	8948	8372	
Replacement ($M)											
S/F motivated needs	5926.1	5687.5	5449.0	5210.5	4971.9	7302.5	7221.0	7139.6	7058.1	6976.7	
Total work done	305.5	305.5	305.5	305.5	305.5	270.8	270.8	270.8	270.8	270.8	
S/F motivated	238.5	238.5	238.5	238.5	238.5	81.5	81.5	81.5	81.5	81.5	
+Econ. motivated	66.9	66.9	66.9	66.9	66.9	189.3	189.3	189.3	189.3	189.3	
Backlog - total	5687.5	5449.0	5210.5	4971.9	4733.4	7221.0	7139.6	7058.1	6976.7	6895.2	
Improvement ($M)											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Needs		352.5	343.1	333.7	324.4	315.0	339.7	333.8	327.9	321.9	316.0
Work done		1.0	1.0	1.0	1.0	1.0	1.4	1.4	1.4	1.4	1.4
Offset by E/M repl.		8.4	8.4	8.4	8.4	8.4	4.6	4.6	4.6	4.6	4.6
Backlog - total		343.1	333.7	324.4	315.0	305.7	333.8	327.9	321.9	316.0	310.0
Raising ($M)											
Needs		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Widening ($M)											
Needs		184.5	180.8	177.1	173.3	169.6	188.9	187.1	185.2	183.4	181.6
Work done		1.0	1.0	1.0	1.0	1.0	1.2	1.2	1.2	1.2	1.2
Offset by E/M repl.		2.8	2.8	2.8	2.8	2.8	0.6	0.6	0.6	0.6	0.6
Backlog - total		180.8	177.1	173.3	169.6	165.8	187.1	185.2	183.4	181.6	179.8
Capacity Expansion ($M)											
Needs		15.3	15.3	15.3	15.2	15.2	17.8	17.7	17.6	17.5	17.4
Work done		0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		15.3	15.3	15.2	15.2	15.2	17.7	17.6	17.5	17.4	17.3
Strengthening ($M)											
Needs		152.3	146.7	141.2	135.6	130.0	132.8	128.8	124.8	120.8	116.7
Work done		0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Offset by E/M repl.		5.6	5.6	5.6	5.6	5.6	4.0	4.0	4.0	4.0	4.0
Backlog - total		146.7	141.2	135.6	130.0	124.4	128.8	124.8	120.8	116.7	112.7
Federally Eligible MR&R ($M)											
Needs		5129.9	4666.0	4202.1	3738.2	3274.3	3611.5	3122.6	2633.6	2144.7	1655.8
Work done		293.5	293.5	293.5	293.5	293.5	327.8	327.8	327.8	327.8	327.8
Offset by E/M repl.		170.4	170.4	170.4	170.4	170.4	161.1	161.1	161.1	161.1	161.1
Backlog - total		4666.0	4202.1	3738.2	3274.3	2810.4	3122.6	2633.6	2144.7	1655.8	1166.9
Maintenance ($M)											
Needs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		---	---	---	---	---	---	---	---	---	---

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Replacement (number of bridges)											
S/F motivated needs	2039	1913	1786	1656	1526	2174	2146	2117	2086	2054	
Total work done	135	137	139	141	141	39	40	43	44	45	
S/F motivated	128	130	132	134	134	30	31	34	35	36	
+Econ. motivated	7	7	7	7	7	9	9	9	9	9	
Backlog - total	1913	1786	1656	1526	1394	2146	2117	2086	2054	2021	
Improvement (number of bridges)											
Needs	707	687	661	632	597	600	595	590	582	570	
Work done	2	4	5	5	9	3	3	3	5	11	
Offset by E/M repl.	18	22	24	30	35	2	2	5	7	16	
Backlog - total	687	661	632	597	553	595	590	582	570	543	
Raising (number of bridges)											
Needs	1	1	1	1	1	1	1	1	1	1	
Work done	0	0	0	0	0	0	0	0	0	0	
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0	
Backlog - total	1	1	1	1	1	1	1	1	1	1	
Widening (number of bridges)											
Needs	445	436	424	410	393	402	399	396	392	386	
Work done	2	3	4	4	6	3	3	3	4	8	
Offset by E/M repl.	7	9	10	13	15	0	0	1	2	7	
Backlog - total	436	424	410	393	372	399	396	392	386	371	
Capacity Expansion (number of bridges)											
Needs	23	23	22	21	20	26	26	26	26	26	
Work done	0	1	1	1	2	0	0	0	0	2	
Offset by E/M repl.	0	0	0	0	1	0	0	0	0	0	
Backlog - total	23	22	21	20	17	26	26	26	26	24	
Strengthening (number of bridges)											
Needs	238	227	214	200	183	171	169	167	163	157	
Work done	0	0	0	0	1	0	0	0	1	1	
Offset by E/M repl.	11	13	14	17	19	2	2	4	5	9	
Backlog - total	227	214	200	183	163	169	167	163	157	147	

Total User Benefits ($M)

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential, S/F motivated		2414.0	2040.9	1667.8	1294.6	921.5	722.3	659.4	596.5	533.6	484.9
Total obtained		333.3	333.3	333.3	333.3	333.3	44.3	44.3	44.3	44.3	44.3
By S/F motivated work		320.2	320.2	320.2	320.2	320.2	27.3	27.3	27.3	27.3	27.3
+Econ. motivated work		39.8	39.8	39.8	39.8	39.8	18.5	18.5	18.5	18.5	18.5
Offset of S/F		39.8	39.8	39.8	39.8	39.8	18.5	18.5	18.5	18.5	18.5
Excess over offset		---	---	---	---	---	---	---	---	---	---
Backlog - total		2040.9	1667.8	1294.6	921.5	548.4	659.4	596.5	533.6	484.9	437.6
Benefits of S/F motivated replacements ($M)											
Potential		2067.1	1734.9	1402.7	1070.5	738.3	553.3	509.9	466.4	423.0	393.8
Total obtained		332.2	332.2	332.2	332.2	332.2	43.5	43.5	43.5	43.5	43.5
S/F motivated		319.1	319.1	319.1	319.1	319.1	26.4	26.4	26.4	26.4	26.4
+Econ. motivated		13.1	13.1	13.1	13.1	13.1	17.0	17.0	17.0	17.0	17.0
Backlog - total		1734.9	1402.7	1070.5	738.3	406.1	509.9	466.4	423.0	393.8	365.9
Improvement Benefits ($M)											
Potential		337.6	297.4	257.2	217.1	176.9	162.0	143.2	124.4	105.6	86.8
Obtained		0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3
Offset by E/M repl.		39.8	39.8	39.8	39.8	39.8	18.5	18.5	18.5	18.5	18.5
Backlog - total		297.4	257.2	217.1	176.9	136.7	143.2	124.4	105.6	86.8	68.0
Raising Benefits ($M)											
Potential		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)											
Potential		25.5	24.6	23.7	22.7	21.8	24.0	23.6	23.3	22.9	22.5
Obtained		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Offset by E/M repl.		0.6	0.6	0.6	0.6	0.6	0.1	0.1	0.1	0.1	0.1
Backlog - total		24.6	23.7	22.7	21.8	20.8	23.6	23.3	22.9	22.5	22.2
Capacity Expansion Benefits ($M)											
Potential		3.8	3.7	3.7	3.6	3.6	5.5	5.5	5.4	5.4	5.4
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		3.7	3.7	3.6	3.6	3.6	5.5	5.4	5.4	5.4	5.4
Strengthening Benefits ($M)											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

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5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential		308.3	269.1	229.9	190.7	151.5	132.4	114.0	95.6	77.2	58.8
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		39.2	39.2	39.2	39.2	39.2	18.4	18.4	18.4	18.4	18.4
Backlog - total		269.1	229.9	190.7	151.5	112.3	114.0	95.6	77.2	58.8	40.5
Benefits of MR&R ($M)											
Potential		9.2	8.5	7.8	7.1	6.3	7.0	6.3	5.7	5.0	4.4
Obtained		0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Backlog - total		8.5	7.8	7.1	6.3	5.6	6.3	5.7	5.0	4.4	3.7
Average Benefit/Cost ratios											
Overall		4.342	4.342	4.342	4.342	4.342	3.245	3.245	3.245	3.245	3.245
Replacement		5.205	5.205	5.205	5.205	5.205	4.219	4.219	4.219	4.219	4.219
Improvement		1.180	1.180	1.180	1.180	1.180	1.054	1.054	1.054	1.054	1.054
Raising		---	---	---	---	---	---	---	---	---	---
Widening		1.166	1.166	1.166	1.166	1.166	1.049	1.049	1.049	1.049	1.049
Capacity Expansion		1.851	1.851	1.851	1.851	1.851	1.116	1.116	1.116	1.116	1.116
Strengthening		1.078	1.078	1.078	1.078	1.078	1.048	1.048	1.048	1.048	1.048
MR&R		3.454	3.454	3.454	3.454	3.454	2.449	2.449	2.449	2.449	2.449
Benefit/Cost cutoff ratio (federally eligible work only)		1.076	1.076	1.076	1.076	1.076	1.135	1.135	1.135	1.135	1.135

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Average network condition measures											
Sufficiency rating	80.39	79.62	79.87	80.11	80.35	80.59	80.27	80.37	80.47	80.57	80.67
Health index	87.79	86.95	87.44	87.93	88.42	88.91	88.79	89.41	90.02	90.64	91.26
Bridge population distribution by deck rating (numbers of bridges)											
Deck rating 9	0	0	276	552	828	1104	1380	1465	1550	1634	1719
Deck rating 8	139	139	469	799	1130	1460	1790	2133	2476	2819	3162
Deck rating 7	5593	5593	4511	3430	2348	1267	185	335	485	636	786
Deck rating 6	462	462	720	978	1236	1494	1752	1420	1088	757	425
Deck rating 5	2760	2760	2707	2653	2600	2546	2493	2187	1880	1574	1267
Deck rating 4	586	586	811	1036	1261	1486	1711	1732	1754	1775	1797
Deck rating 3	5	5	43	81	118	156	194	229	265	300	336
Deck rating 2	1	1	1	1	2	2	2	5	9	12	16
Deck rating 1	0	0	0	0	0	0	0	0	0	0	0
Deck rating 0	3	3	3	2	2	1	1	1	1	1	1
Deck rating N	2786	2786	2794	2802	2811	2819	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)											
Superstructure rating 9	0	0	504	1008	1512	2016	2520	2901	3282	3662	4043
Superstructure rating 8	301	301	251	201	152	102	52	84	117	149	182
Superstructure rating 7	6229	6229	5215	4200	3186	2171	1157	943	728	514	299
Superstructure rating 6	363	363	993	1623	2253	2883	3513	3134	2755	2375	1996
Superstructure rating 5	2589	2589	2326	2062	1799	1535	1272	1362	1452	1542	1632
Superstructure rating 4	350	350	523	696	870	1043	1216	1286	1357	1427	1498
Superstructure rating 3	9	9	29	49	69	89	109	126	144	161	179
Superstructure rating 2	1	1	1	2	2	3	3	6	8	11	13
Superstructure rating 1	0	0	0	0	0	0	0	0	0	0	0
Superstructure rating 0	1	1	1	1	1	1	1	1	1	1	1
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)											
Substructure rating 9	0	0	712	1424	2135	2847	3559	4130	4701	5272	5843
Substructure rating 8	264	264	223	182	142	101	60	78	95	113	130
Substructure rating 7	6773	6773	5819	4865	3911	2957	2003	1645	1287	928	570
Substructure rating 6	212	212	652	1091	1531	1970	2410	2275	2141	2006	1872

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Substructure rating 5	2299	2299	2047	1795	1542	1290	1038	916	795	673	552
Substructure rating 4	258	258	339	420	502	583	664	688	712	735	759
Substructure rating 3	9	9	20	30	41	51	62	65	68	71	74
Substructure rating 2	26	26	24	23	21	20	18	17	15	14	12
Substructure rating 1	1	1	2	2	3	3	4	5	5	6	6
Substructure rating 0	2	2	2	2	2	2	2	2	2	1	1
Substructure rating N	2491	2491	2496	2501	2505	2510	2515	2515	2515	2515	2515
Culvert population distribution by rating (numbers of culverts)											
Culvert rating 9	0	0	18	36	53	71	89	358	627	897	1166
Culvert rating 8	123	123	106	89	72	55	38	31	24	18	11
Culvert rating 7	1328	1328	1189	1050	911	772	633	515	397	279	161
Culvert rating 6	958	958	1014	1070	1127	1183	1239	1104	970	835	701
Culvert rating 5	23	23	105	186	268	349	431	414	397	379	362
Culvert rating 4	56	56	54	52	50	48	46	51	56	60	65
Culvert rating 3	2	2	4	7	9	12	14	17	19	22	24
Culvert rating 2	0	0	0	0	0	0	0	0	0	0	0
Culvert rating 1	1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844
Bridge population distribution by sufficiency rating (number of bridges)											
SR > 80% (Good)	6552	6552	6635	6718	6800	6883	6966	6949	6932	6916	6899
50% < SR <=80% (Fair)	4512	4512	4407	4302	4198	4093	3988	3968	3948	3929	3909
SR <=50% (Poor)	1271	1271	1293	1315	1337	1359	1381	1418	1454	1491	1527
Structurally deficient and functionally obsolete bridges											
Number of bridges	3277	3277	3488	3699	3909	4120	4331	4385	4440	4494	4549
Percent of deck area	26.09	25.84	27.45	29.06	30.67	32.28	33.66	33.32	32.97	32.62	32.28
Structurally deficient bridges											
Number of bridges	1041	1041	1411	1781	2150	2520	2890	2964	3038	3112	3186
Percent of deck area	11.46	11.35	13.76	16.18	18.59	21.00	23.25	22.84	22.43	22.02	21.61
Functionally obsolete bridges											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Number of bridges	2236	2236	2077	1918	1759	1600	1441	1421	1402	1382	1363
Percent of deck area	14.63	14.49	13.69	12.89	12.08	11.28	10.41	10.47	10.54	10.61	10.67
Good structural condition											
Number of bridges	5263	5263	4870	4477	4084	3691	3298	3821	4345	4868	5392
Percent of deck area	39.45	39.07	38.04	37.01	35.97	34.94	33.68	38.82	43.96	49.11	54.25
Fair structural condition											
Number of bridges	6029	6029	6048	6067	6087	6106	6125	5531	4937	4344	3750
Percent of deck area	48.86	48.39	47.19	45.99	44.80	43.60	42.11	37.57	33.03	28.49	23.95
Poor structural condition											
Number of bridges	1043	1043	1417	1791	2164	2538	2912	2982	3053	3123	3194
Percent of deck area	11.69	11.58	14.00	16.42	18.85	21.27	23.52	23.06	22.59	22.13	21.66

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cumulative work done ($M)										
Total work	6599	7198	7798	8398	8997	9594	10192	10789	11386	11984
S/F motivated	5281	5844	6407	6970	7533	8021	8509	8997	9485	9973
+Econ. motivated	1318	1354	1391	1428	1464	1573	1683	1792	1901	2010
Replacement	3388	3895	4402	4908	5415	5934	6452	6971	7489	8007
S/F motivated	2070	2540	3011	3481	3951	4360	4769	5179	5588	5997
+Econ. motivated	1318	1354	1391	1428	1464	1573	1683	1792	1901	2010
Improvement	31	49	68	87	105	113	121	129	137	145
Raising	0	0	0	0	0	0	0	0	0	0
Widening	27	43	59	74	90	94	99	103	107	111
Capacity Expansion	1	2	2	2	3	6	8	11	14	16
Strengthening	3	5	7	10	12	13	14	15	16	17
Federally Eligible MR&R	3181	3256	3330	3405	3479	3553	3627	3700	3774	3848
Cumulative work done (number of bridges)										
Replacement	1079	1257	1436	1615	1797	1935	2074	2215	2362	2510
S/F motivated	991	1161	1332	1503	1677	1804	1932	2062	2198	2335
+Econ. motivated	88	96	104	112	120	131	142	153	164	175
Improvement	81	116	155	199	244	251	259	267	280	298
Raising	---	---	---	---	---	---	---	---	---	---
Widening	70	102	135	172	209	215	221	227	235	246
Capacity Expansion	7	8	9	10	12	13	15	17	21	26
Total structurally/functionally (S/F) motivated annual needs and work ($M)										
S/F motivated needs	10461	9736	9010	8284	7559	9860	9223	8586	7949	7313
Total work done	600	600	600	600	600	597	597	597	597	597
S/F motivated	563	563	563	563	563	488	488	488	488	488
+Econ. motivated	37	37	37	37	37	109	109	109	109	109
Backlog - total	9736	9010	8284	7559	6833	9223	8586	7949	7313	6676
Replacement ($M)										
S/F motivated needs	8092.1	7621.9	7151.6	6681.4	6211.1	7961.3	7552.1	7142.9	6733.7	6324.6
Total work done	506.8	506.8	506.8	506.8	506.8	518.4	518.4	518.4	518.4	518.4
S/F motivated	470.2	470.2	470.2	470.2	470.2	409.2	409.2	409.2	409.2	409.2
+Econ. motivated	36.6	36.6	36.6	36.6	36.6	109.3	109.3	109.3	109.3	109.3
Backlog - total	7621.9	7151.6	6681.4	6211.1	5740.9	7552.1	7142.9	6733.7	6324.6	5915.4
Improvement ($M)										

All Performance Measures by Year

5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Needs	349.4	321.8	294.2	266.5	238.9	238.3	218.2	198.1	178.0	157.9
Work done	18.7	18.7	18.7	18.7	18.7	7.9	7.9	7.9	7.9	7.9
Offset by E/M repl.	9.0	9.0	9.0	9.0	9.0	12.2	12.2	12.2	12.2	12.2
Backlog - total	321.8	294.2	266.5	238.9	211.2	218.2	198.1	178.0	157.9	137.8
Raising ($M)										
Needs	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Widening ($M)										
Needs	199.3	180.1	160.9	141.7	122.5	115.2	108.1	101.1	94.0	87.0
Work done	15.9	15.9	15.9	15.9	15.9	4.1	4.1	4.1	4.1	4.1
Offset by E/M repl.	3.3	3.3	3.3	3.3	3.3	2.9	2.9	2.9	2.9	2.9
Backlog - total	180.1	160.9	141.7	122.5	103.3	108.1	101.1	94.0	87.0	79.9
Capacity Expansion ($M)										
Needs	32.7	31.9	31.2	30.4	29.7	37.0	31.7	26.4	21.0	15.7
Work done	0.4	0.4	0.4	0.4	0.4	2.7	2.7	2.7	2.7	2.7
Offset by E/M repl.	0.3	0.3	0.3	0.3	0.3	2.7	2.7	2.7	2.7	2.7
Backlog - total	31.9	31.2	30.4	29.7	28.9	31.7	26.4	21.0	15.7	10.3
Strengthening ($M)										
Needs	117.1	109.5	101.8	94.1	86.4	85.8	78.1	70.4	62.7	55.0
Work done	2.3	2.3	2.3	2.3	2.3	1.1	1.1	1.1	1.1	1.1
Offset by E/M repl.	5.4	5.4	5.4	5.4	5.4	6.6	6.6	6.6	6.6	6.6
Backlog - total	109.5	101.8	94.1	86.4	78.8	78.1	70.4	62.7	55.0	47.3
Federally Eligible MR&R ($M)										
Needs	2019.8	1792.0	1564.1	1336.3	1108.5	1660.4	1452.8	1245.2	1037.6	830.0
Work done	74.5	74.5	74.5	74.5	74.5	73.7	73.7	73.7	73.7	73.7
Offset by E/M repl.	153.3	153.3	153.3	153.3	153.3	133.9	133.9	133.9	133.9	133.9
Backlog - total	1792.0	1564.1	1336.3	1108.5	880.7	1452.8	1245.2	1037.6	830.0	622.4
Maintenance ($M)										
Needs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---

All Performance Measures by Year

5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Replacement (number of bridges)										
S/F motivated needs	2545	2380	2214	2044	1874	2357	2231	2104	1976	1844
Total work done	175	178	179	179	182	138	139	141	147	148
S/F motivated	167	170	171	171	174	127	128	130	136	137
+Econ. motivated	8	8	8	8	8	11	11	11	11	11
Backlog - total	2380	2214	2044	1874	1702	2231	2104	1976	1844	1710
Improvement (number of bridges)										
Needs	587	542	491	431	362	333	317	300	280	248
Work done	31	35	39	44	45	7	8	8	13	18
Offset by E/M repl.	14	16	21	25	29	9	9	12	19	26
Backlog - total	542	491	431	362	288	317	300	280	248	204
Raising (number of bridges)										
Needs	1	1	1	1	1	1	1	1	1	1
Work done	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0
Backlog - total	1	1	1	1	1	1	1	1	1	1
Widening (number of bridges)										
Needs	394	357	317	274	225	199	189	179	167	151
Work done	30	32	33	37	37	6	6	6	8	11
Offset by E/M repl.	7	8	10	12	14	4	4	6	8	10
Backlog - total	357	317	274	225	174	189	179	167	151	130
Capacity Expansion (number of bridges)										
Needs	36	36	35	34	33	43	42	40	38	32
Work done	0	1	1	1	2	1	2	2	4	5
Offset by E/M repl.	0	0	0	0	1	0	0	0	2	5
Backlog - total	36	35	34	33	30	42	40	38	32	22
Strengthening (number of bridges)										
Needs	156	148	138	122	103	90	85	80	74	64
Work done	1	2	5	6	6	0	0	0	1	2
Offset by E/M repl.	7	8	11	13	14	5	5	6	9	11
Backlog - total	148	138	122	103	83	85	80	74	64	51

Total User Benefits ($M)

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential, S/F motivated	558.3	489.6	420.9	352.3	283.6	271.7	235.9	200.0	164.2	128.4
Total obtained	65.0	65.0	65.0	65.0	65.0	29.4	29.4	29.4	29.4	29.4
By S/F motivated work	62.3	62.3	62.3	62.3	62.3	24.7	24.7	24.7	24.7	24.7
+Econ. motivated work	3.7	3.7	3.7	3.7	3.7	6.4	6.4	6.4	6.4	6.4
Offset of S/F	3.7	3.7	3.7	3.7	3.7	6.4	6.4	6.4	6.4	6.4
Excess over offset	---	---	---	---	---	---	---	---	---	---
Backlog - total	489.6	420.9	352.3	283.6	214.9	235.9	200.0	164.2	128.4	93.5
Benefits of S/F motivated replacements ($M)										
Potential	473.0	410.4	347.9	285.4	222.8	207.4	179.0	150.6	122.2	93.8
Total obtained	62.5	62.5	62.5	62.5	62.5	28.4	28.4	28.4	28.4	28.4
S/F motivated	59.8	59.8	59.8	59.8	59.8	23.7	23.7	23.7	23.7	23.7
+Econ. motivated	2.7	2.7	2.7	2.7	2.7	4.7	4.7	4.7	4.7	4.7
Backlog - total	410.4	347.9	285.4	222.8	160.3	179.0	150.6	122.2	93.8	66.3
Improvement Benefits ($M)										
Potential	79.8	73.8	67.8	61.7	55.7	59.0	51.7	44.4	37.1	29.8
Obtained	2.4	2.4	2.4	2.4	2.4	1.0	1.0	1.0	1.0	1.0
Offset by E/M repl.	3.6	3.6	3.6	3.6	3.6	6.3	6.3	6.3	6.3	6.3
Backlog - total	73.8	67.8	61.7	55.7	49.6	51.7	44.4	37.1	29.8	22.5
Raising Benefits ($M)										
Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)										
Potential	25.1	22.4	19.6	16.8	14.1	12.8	11.9	11.0	10.1	9.3
Obtained	2.0	2.0	2.0	2.0	2.0	0.4	0.4	0.4	0.4	0.4
Offset by E/M repl.	0.7	0.7	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5
Backlog - total	22.4	19.6	16.8	14.1	11.3	11.9	11.0	10.1	9.3	8.4
Capacity Expansion Benefits ($M)										
Potential	9.2	9.1	8.9	8.8	8.6	12.4	10.3	8.2	6.1	3.9
Obtained	0.1	0.1	0.1	0.1	0.1	0.4	0.4	0.4	0.4	0.4
Offset by E/M repl.	0.1	0.1	0.1	0.1	0.1	1.7	1.7	1.7	1.7	1.7
Backlog - total	9.1	8.9	8.8	8.6	8.4	10.3	8.2	6.1	3.9	1.8
Strengthening Benefits ($M)										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential	45.4	42.3	39.2	36.1	33.0	33.8	29.5	25.2	20.9	16.6
Obtained	0.3	0.3	0.3	0.3	0.3	0.1	0.1	0.1	0.1	0.1
Offset by E/M repl.	2.8	2.8	2.8	2.8	2.8	4.2	4.2	4.2	4.2	4.2
Backlog - total	42.3	39.2	36.1	33.0	29.9	29.5	25.2	20.9	16.6	12.3
Benefits of MR&R ($M)										
Potential	5.5	5.4	5.3	5.2	5.1	5.3	5.2	5.0	4.9	4.8
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Backlog - total	5.4	5.3	5.2	5.1	5.0	5.2	5.0	4.9	4.8	4.7
Average Benefit/Cost ratios										
Overall	2.617	2.617	2.617	2.617	2.617	2.320	2.320	2.320	2.320	2.320
Replacement	2.608	2.608	2.608	2.608	2.608	2.230	2.230	2.230	2.230	2.230
Improvement	0.952	0.952	0.952	0.952	0.952	0.945	0.945	0.945	0.945	0.945
Raising	---	---	---	---	---	---	---	---	---	---
Widening	0.950	0.950	0.950	0.950	0.950	0.919	0.919	0.919	0.919	0.919
Capacity Expansion	0.968	0.968	0.968	0.968	0.968	0.983	0.983	0.983	0.983	0.983
Strengthening	0.964	0.964	0.964	0.964	0.964	0.948	0.948	0.948	0.948	0.948
MR&R	3.087	3.087	3.087	3.087	3.087	3.052	3.052	3.052	3.052	3.052
Benefit/Cost cutoff ratio (federally eligible work only)	1.135	1.135	1.135	1.135	1.135	1.135	1.135	1.135	1.135	1.135

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Average network condition measures										
Sufficiency rating	79.20	79.54	79.87	80.21	80.55	79.69	79.89	80.08	80.28	80.47
Health index	90.09	90.37	90.65	90.93	91.21	90.14	90.37	90.61	90.84	91.07
Bridge population distribution by deck rating (numbers of bridges)										
Deck rating 9	1804	1625	1446	1268	1089	910	864	818	771	725
Deck rating 8	3505	3572	3640	3707	3775	3842	3987	4133	4278	4424
Deck rating 7	936	1123	1311	1498	1686	1873	1788	1704	1619	1535
Deck rating 6	93	111	129	146	164	182	199	215	232	248
Deck rating 5	961	831	701	570	440	310	303	296	289	282
Deck rating 4	1818	1748	1678	1609	1539	1469	1323	1176	1030	883
Deck rating 3	371	469	568	666	765	863	972	1081	1191	1300
Deck rating 2	19	27	34	42	49	57	69	82	94	107
Deck rating 1	0	0	0	1	1	1	2	3	3	4
Deck rating 0	1	1	1	1	1	1	1	1	0	0
Deck rating N	2827	2827	2827	2827	2827	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)										
Superstructure rating 9	4424	4534	4645	4755	4866	4976	5003	5030	5057	5084
Superstructure rating 8	214	193	172	152	131	110	159	209	258	308
Superstructure rating 7	85	91	97	104	110	116	103	90	78	65
Superstructure rating 6	1617	1429	1240	1052	863	675	620	565	510	455
Superstructure rating 5	1722	1745	1768	1790	1813	1836	1773	1709	1646	1582
Superstructure rating 4	1568	1600	1631	1663	1694	1726	1717	1709	1700	1692
Superstructure rating 3	196	233	269	306	342	379	441	503	564	626
Superstructure rating 2	16	18	19	21	22	24	25	26	26	27
Superstructure rating 1	0	0	0	1	1	1	2	3	3	4
Superstructure rating 0	1	1	1	0	0	0	0	0	0	0
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)										
Substructure rating 9	6414	6504	6594	6684	6774	6864	6870	6876	6882	6888
Substructure rating 8	148	144	139	135	130	126	179	232	285	338
Substructure rating 7	212	199	187	174	162	149	149	149	150	150
Substructure rating 6	1737	1644	1550	1457	1363	1270	1168	1066	964	862

All Performance Measures by Year

5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Substructure rating 5	430	484	538	591	645	699	759	819	878	938
Substructure rating 4	783	752	721	690	659	628	601	573	546	518
Substructure rating 3	77	77	77	78	78	78	88	98	108	118
Substructure rating 2	11	9	8	6	5	3	3	4	4	5
Substructure rating 1	7	6	5	5	4	3	3	3	3	3
Substructure rating 0	1	1	1	0	0	0	0	0	0	0
Substructure rating N	2515	2515	2515	2515	2515	2515	2515	2515	2515	2515
Culvert population distribution by rating (numbers of culverts)										
Culvert rating 9	1435	1433	1432	1430	1429	1427	1424	1421	1419	1416
Culvert rating 8	4	11	17	24	30	37	40	44	47	51
Culvert rating 7	43	36	28	21	13	6	5	4	2	1
Culvert rating 6	566	537	508	478	449	420	375	329	284	238
Culvert rating 5	345	363	382	400	419	437	466	494	523	551
Culvert rating 4	70	83	96	110	123	136	149	162	174	187
Culvert rating 3	27	27	27	26	26	26	30	33	37	40
Culvert rating 2	0	0	0	1	1	1	2	3	4	5
Culvert rating 1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844
Bridge population distribution by sufficiency rating (number of bridges)										
SR > 80% (Good)	6882	6964	7046	7127	7209	7291	7331	7371	7411	7451
50% < SR <=80% (Fair)	3889	3848	3806	3765	3723	3682	3626	3571	3515	3460
SR <=50% (Poor)	1564	1524	1483	1443	1402	1362	1378	1393	1409	1424
Structurally deficient and functionally obsolete bridges										
Number of bridges	4603	4600	4596	4593	4589	4586	4584	4583	4581	4580
Percent of deck area	31.31	31.73	32.14	32.55	32.96	32.88	33.07	33.25	33.44	33.63
Structurally deficient bridges										
Number of bridges	3260	3314	3367	3421	3474	3528	3559	3590	3622	3653
Percent of deck area	20.78	21.49	22.20	22.91	23.61	23.96	24.42	24.89	25.35	25.81
Functionally obsolete bridges										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Number of bridges	1343	1286	1229	1172	1115	1058	1025	992	960	927
Percent of deck area	10.53	10.23	9.94	9.64	9.35	8.92	8.64	8.37	8.10	7.82
Good structural condition										
Number of bridges	5915	6020	6124	6229	6333	6438	6490	6541	6593	6644
Percent of deck area	58.24	59.03	59.81	60.60	61.38	61.25	61.93	62.62	63.30	63.98
Fair structural condition										
Number of bridges	3156	3000	2843	2687	2530	2374	2291	2208	2126	2043
Percent of deck area	19.03	17.93	16.83	15.73	14.63	13.33	12.48	11.64	10.79	9.94
Poor structural condition										
Number of bridges	3264	3316	3368	3419	3471	3523	3554	3585	3617	3648
Percent of deck area	20.78	21.49	22.19	22.89	23.60	23.94	24.40	24.86	25.32	25.79

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

20-YEAR TOTALS:

Total budget available over 20 years: $14000M

	Work Done ($M)	Work Done (bridges)	User Benefits Obtained ($M)
Total	13979.3		2410.9
Replacement	9730.9	3000	2374.3
Struct/Func. motivated (S/F)	7174.5	2795	2181.9
Economically motivated (E/M)	2556.4	205	192.4
Improvement	221.8	410	28.7
Raising	0.0	0	0.0
Widening	164.7	333	20.1
Capacity Expansion	20.6	32	3.5
Strengthening	36.4	45	5.1
MR&R	4047.3		7.9
Federal MR&R	4047.3		-
Local MR&R	0.0		-
(not included in the total)			

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cumulative work done ($M)											
Total work	699.5	1399.0	2098.5	2798.0	3497.5	4197.5	4897.5	5597.5	6297.5	6997.5	
S/F motivated	629.9	1259.8	1889.7	2519.6	3149.5	3568.1	3986.7	4405.3	4823.9	5242.5	
+Econ. motivated	69.6	139.2	208.8	278.4	348.0	629.4	910.8	1192.2	1473.5	1754.9	
Replacement	387.9	775.7	1163.6	1551.4	1939.3	2300.6	2661.9	3023.2	3384.5	3745.8	
S/F motivated	318.3	636.5	954.8	1273.0	1591.3	1671.2	1751.1	1831.1	1911.0	1990.9	
+Econ. motivated	69.6	139.2	208.8	278.4	348.0	629.4	910.8	1192.2	1473.5	1754.9	
Improvement	3.9	7.9	11.8	15.7	19.6	21.4	23.2	24.9	26.7	28.4	
Raising	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Widening	2.5	5.0	7.5	9.9	12.4	13.8	15.1	16.5	17.9	19.2	
Capacity Expansion	0.5	1.0	1.5	2.0	2.5	2.5	2.5	2.5	2.5	2.5	
Strengthening	0.9	1.9	2.8	3.8	4.7	5.1	5.5	5.9	6.3	6.7	
Federally Eligible MR&R	308.2	616.4	924.6	1232.9	1541.1	1878.0	2214.9	2551.9	2888.8	3225.7	
Cumulative work done (number of bridges)											
Replacement	167	336	506	679	853	896	942	990	1038	1088	
S/F motivated	158	318	479	643	808	839	873	909	945	983	
+Econ. motivated	9	18	27	36	45	57	69	81	93	105	
Improvement	8	16	25	38	60	62	65	68	76	89	
Raising	---	---	---	---	---	---	---	---	---	---	
Widening	7	14	21	31	46	48	51	54	61	70	
Capacity Expansion	1	2	4	6	10	10	10	10	10	11	
Total structurally/functionally (S/F) motivated annual needs and work ($M)											
S/F motivated needs	11408	10564	9720	8875	8031	10234	9642	9050	8458	7866	
Total work done	700	700	700	700	700	700	700	700	700	700	
S/F motivated	630	630	630	630	630	419	419	419	419	419	
+Econ. motivated	70	70	70	70	70	281	281	281	281	281	
Backlog - total	10564	9720	8875	8031	7186	9642	9050	8458	7866	7274	
Replacement ($M)											
S/F motivated needs	5926.1	5607.8	5289.5	4971.3	4653.0	6587.6	6507.6	6427.7	6347.8	6267.9	
Total work done	387.9	387.9	387.9	387.9	387.9	361.3	361.3	361.3	361.3	361.3	
S/F motivated	318.3	318.3	318.3	318.3	318.3	79.9	79.9	79.9	79.9	79.9	
+Econ. motivated	69.6	69.6	69.6	69.6	69.6	281.4	281.4	281.4	281.4	281.4	
Backlog - total	5607.8	5289.5	4971.3	4653.0	4334.8	6507.6	6427.7	6347.8	6267.9	6187.9	
Improvement ($M)											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Needs		352.5	338.7	324.9	311.1	297.2	319.9	313.4	306.9	300.5	294.0
Work done		3.9	3.9	3.9	3.9	3.9	1.8	1.8	1.8	1.8	1.8
Offset by E/M repl.		9.9	9.9	9.9	9.9	9.9	4.7	4.7	4.7	4.7	4.7
Backlog - total		338.7	324.9	311.1	297.2	283.4	313.4	306.9	300.5	294.0	287.5
Raising ($M)											
Needs		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Widening ($M)											
Needs		184.5	179.0	173.4	167.8	162.2	179.7	177.7	175.7	173.8	171.8
Work done		2.5	2.5	2.5	2.5	2.5	1.4	1.4	1.4	1.4	1.4
Offset by E/M repl.		3.1	3.1	3.1	3.1	3.1	0.6	0.6	0.6	0.6	0.6
Backlog - total		179.0	173.4	167.8	162.2	156.7	177.7	175.7	173.8	171.8	169.8
Capacity Expansion ($M)											
Needs		15.3	14.8	14.3	13.8	13.3	17.8	17.8	17.8	17.8	17.7
Work done		0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		14.8	14.3	13.8	13.3	12.8	17.8	17.8	17.8	17.7	17.7
Strengthening ($M)											
Needs		152.3	144.6	136.9	129.1	121.4	122.1	117.6	113.2	108.7	104.2
Work done		0.9	0.9	0.9	0.9	0.9	0.4	0.4	0.4	0.4	0.4
Offset by E/M repl.		6.8	6.8	6.8	6.8	6.8	4.1	4.1	4.1	4.1	4.1
Backlog - total		144.6	136.9	129.1	121.4	113.7	117.6	113.2	108.7	104.2	99.7
Federally Eligible MR&R ($M)											
Needs		5129.9	4617.5	4105.2	3592.9	3080.6	3326.5	2820.9	2315.4	1809.8	1304.3
Work done		308.2	308.2	308.2	308.2	308.2	336.9	336.9	336.9	336.9	336.9
Offset by E/M repl.		204.1	204.1	204.1	204.1	204.1	168.6	168.6	168.6	168.6	168.6
Backlog - total		4617.5	4105.2	3592.9	3080.6	2568.3	2820.9	2315.4	1809.8	1304.3	798.7
Maintenance ($M)											
Needs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		---	---	---	---	---	---	---	---	---	---

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Replacement (number of bridges)											
S/F motivated needs	2039	1883	1725	1565	1404	1919	1890	1861	1829	1795	
Total work done	167	169	170	173	174	43	46	48	48	50	
S/F motivated	158	160	161	164	165	31	34	36	36	38	
+Econ. motivated	9	9	9	9	9	12	12	12	12	12	
Backlog - total	1883	1725	1565	1404	1241	1890	1861	1829	1795	1759	
Improvement (number of bridges)											
Needs	707	678	644	605	557	551	545	536	526	511	
Work done	8	8	9	13	22	2	3	3	8	13	
Offset by E/M repl.	21	26	30	35	36	4	6	7	7	10	
Backlog - total	678	644	605	557	499	545	536	526	511	488	
Raising (number of bridges)											
Needs	1	1	1	1	1	1	1	1	1	1	
Work done	0	0	0	0	0	0	0	0	0	0	
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0	
Backlog - total	1	1	1	1	1	1	1	1	1	1	
Widening (number of bridges)											
Needs	445	430	413	394	369	369	366	361	356	347	
Work done	7	7	7	10	15	2	3	3	7	9	
Offset by E/M repl.	8	10	12	15	15	1	2	2	2	3	
Backlog - total	430	413	394	369	339	366	361	356	347	335	
Capacity Expansion (number of bridges)											
Needs	23	22	21	19	17	26	26	26	26	26	
Work done	1	1	2	2	4	0	0	0	0	1	
Offset by E/M repl.	0	0	0	0	1	0	0	0	0	0	
Backlog - total	22	21	19	17	12	26	26	26	26	25	
Strengthening (number of bridges)											
Needs	238	225	209	191	170	155	152	148	143	137	
Work done	0	0	0	1	3	0	0	0	1	3	
Offset by E/M repl.	13	16	18	20	20	3	4	5	5	7	
Backlog - total	225	209	191	170	147	152	148	143	137	127	

Total User Benefits ($M)

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential, S/F motivated		2414.0	2022.8	1631.6	1240.5	849.3	627.4	567.6	507.8	455.6	411.8
Total obtained		349.5	349.5	349.5	349.5	349.5	42.1	42.1	42.1	42.1	42.1
By S/F motivated work		335.5	335.5	335.5	335.5	335.5	25.1	25.1	25.1	25.1	25.1
+Econ. motivated work		41.6	41.6	41.6	41.6	41.6	17.8	17.8	17.8	17.8	17.8
Offset of S/F		41.6	41.6	41.6	41.6	41.6	17.8	17.8	17.8	17.8	17.8
Excess over offset		---	---	---	---	---	---	---	---	---	---
Backlog - total		2022.8	1631.6	1240.5	849.3	458.1	567.6	507.8	455.6	411.8	368.0
Benefits of S/F motivated replacements ($M)											
Potential		2067.1	1719.6	1372.1	1024.5	677.0	472.8	431.7	390.5	357.0	331.9
Total obtained		347.5	347.5	347.5	347.5	347.5	41.1	41.1	41.1	41.1	41.1
S/F motivated		333.5	333.5	333.5	333.5	333.5	24.2	24.2	24.2	24.2	24.2
+Econ. motivated		14.0	14.0	14.0	14.0	14.0	17.0	17.0	17.0	17.0	17.0
Backlog - total		1719.6	1372.1	1024.5	677.0	329.5	431.7	390.5	357.0	331.9	306.8
Improvement Benefits ($M)											
Potential		337.6	295.0	252.4	209.8	167.2	149.3	131.3	113.2	95.2	77.2
Obtained		1.0	1.0	1.0	1.0	1.0	0.4	0.4	0.4	0.4	0.4
Offset by E/M repl.		41.6	41.6	41.6	41.6	41.6	17.7	17.7	17.7	17.7	17.7
Backlog - total		295.0	252.4	209.8	167.2	124.6	131.3	113.2	95.2	77.2	59.1
Raising Benefits ($M)											
Potential		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)											
Potential		25.5	24.2	22.8	21.5	20.2	21.9	21.5	21.2	20.9	20.5
Obtained		0.7	0.7	0.7	0.7	0.7	0.3	0.3	0.3	0.3	0.3
Offset by E/M repl.		0.7	0.7	0.7	0.7	0.7	0.1	0.1	0.1	0.1	0.1
Backlog - total		24.2	22.8	21.5	20.2	18.8	21.5	21.2	20.9	20.5	20.2
Capacity Expansion Benefits ($M)											
Potential		3.8	3.6	3.5	3.4	3.2	5.5	5.5	5.5	5.5	5.5
Obtained		0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		3.6	3.5	3.4	3.2	3.1	5.5	5.5	5.5	5.5	5.5
Strengthening Benefits ($M)											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential		308.3	267.1	226.0	184.9	143.8	121.9	104.2	86.5	68.8	51.2
Obtained		0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Offset by E/M repl.		40.9	40.9	40.9	40.9	40.9	17.6	17.6	17.6	17.6	17.6
Backlog - total		267.1	226.0	184.9	143.8	102.7	104.2	86.5	68.8	51.2	33.5
Benefits of MR&R ($M)											
Potential		9.2	8.2	7.2	6.1	5.1	5.3	4.6	4.0	3.4	2.7
Obtained		1.0	1.0	1.0	1.0	1.0	0.6	0.6	0.6	0.6	0.6
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Backlog - total		8.2	7.2	6.1	5.1	4.0	4.6	4.0	3.4	2.7	2.1
Average Benefit/Cost ratios											
Overall		4.202	4.202	4.202	4.202	4.202	2.950	2.950	2.950	2.950	2.950
Replacement		4.838	4.838	4.838	4.838	4.838	3.494	3.494	3.494	3.494	3.494
Improvement		1.071	1.071	1.071	1.071	1.071	1.021	1.021	1.021	1.021	1.021
Raising		---	---	---	---	---	---	---	---	---	---
Widening		1.095	1.095	1.095	1.095	1.095	1.012	1.012	1.012	1.012	1.012
Capacity Expansion		1.067	1.067	1.067	1.067	1.067	1.297	1.297	1.297	1.297	1.297
Strengthening		1.008	1.008	1.008	1.008	1.008	1.044	1.044	1.044	1.044	1.044
MR&R		3.436	3.436	3.436	3.436	3.436	2.376	2.376	2.376	2.376	2.376
Benefit/Cost cutoff ratio (federally eligible work only)		1.002	1.002	1.002	1.002	1.002	1.010	1.010	1.010	1.010	1.010

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Average network condition measures											
Sufficiency rating	80.39	79.36	79.90	80.45	81.00	81.55	81.37	81.52	81.68	81.83	81.98
Health index	87.79	86.65	87.45	88.26	89.06	89.86	89.86	90.55	91.24	91.93	92.62
Bridge population distribution by deck rating (numbers of bridges)											
Deck rating 9	0	0	422	844	1267	1689	2111	2012	1913	1813	1714
Deck rating 8	139	139	563	987	1410	1834	2258	2611	2964	3316	3669
Deck rating 7	5593	5593	4520	3446	2373	1299	226	494	763	1031	1300
Deck rating 6	462	462	642	823	1003	1184	1364	1118	872	627	381
Deck rating 5	2760	2760	2637	2515	2392	2270	2147	1849	1552	1254	957
Deck rating 4	586	586	717	849	980	1112	1243	1234	1226	1217	1209
Deck rating 3	5	5	36	66	97	127	158	185	212	240	267
Deck rating 2	1	1	1	1	0	0	0	3	6	8	11
Deck rating 1	0	0	0	0	0	0	0	0	0	0	0
Deck rating 0	3	3	3	2	2	1	1	1	1	1	1
Deck rating N	2786	2786	2794	2802	2811	2819	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)											
Superstructure rating 9	0	0	675	1350	2024	2699	3374	3712	4050	4387	4725
Superstructure rating 8	301	301	249	196	144	91	39	88	137	187	236
Superstructure rating 7	6229	6229	5168	4107	3046	1985	924	751	578	406	233
Superstructure rating 6	363	363	942	1521	2101	2680	3259	2855	2451	2047	1643
Superstructure rating 5	2589	2589	2287	1985	1683	1381	1079	1183	1287	1392	1496
Superstructure rating 4	350	350	494	637	781	924	1068	1136	1204	1271	1339
Superstructure rating 3	9	9	26	44	61	79	96	111	126	142	157
Superstructure rating 2	1	1	1	2	2	3	3	6	8	11	13
Superstructure rating 1	0	0	0	0	0	0	0	0	0	0	0
Superstructure rating 0	1	1	1	1	1	1	1	1	1	1	1
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)											
Substructure rating 9	0	0	971	1943	2914	3886	4857	5368	5880	6391	6903
Substructure rating 8	264	264	221	177	134	90	47	74	101	127	154
Substructure rating 7	6773	6773	5729	4685	3641	2597	1553	1268	982	697	411
Substructure rating 6	212	212	560	908	1257	1605	1953	1781	1609	1438	1266

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Substructure rating 5	2299	2299	1997	1695	1393	1091	789	694	599	503	408
Substructure rating 4	258	258	315	372	428	485	542	554	566	579	591
Substructure rating 3	9	9	19	28	38	47	57	60	63	66	69
Substructure rating 2	26	26	24	22	20	18	16	15	13	12	10
Substructure rating 1	1	1	2	2	3	3	4	5	5	6	6
Substructure rating 0	2	2	2	2	2	2	2	2	2	1	1
Substructure rating N	2491	2491	2496	2501	2505	2510	2515	2515	2515	2515	2515
Culvert population distribution by rating (numbers of culverts)											
Culvert rating 9	0	0	28	56	83	111	139	453	766	1080	1393
Culvert rating 8	123	123	108	92	77	61	46	39	33	26	20
Culvert rating 7	1328	1328	1187	1046	906	765	624	506	388	271	153
Culvert rating 6	958	958	1007	1057	1106	1156	1205	1042	879	717	554
Culvert rating 5	23	23	103	183	262	342	422	389	355	322	288
Culvert rating 4	56	56	53	51	48	46	43	48	53	57	62
Culvert rating 3	2	2	4	6	7	9	11	13	15	18	20
Culvert rating 2	0	0	0	0	0	0	0	0	0	0	0
Culvert rating 1	1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844
Bridge population distribution by sufficiency rating (number of bridges)											
SR > 80% (Good)	6552	6552	6711	6871	7030	7190	7349	7332	7314	7297	7279
50% < SR <=80% (Fair)	4512	4512	4361	4210	4058	3907	3756	3744	3732	3720	3708
SR <=50% (Poor)	1271	1271	1263	1255	1246	1238	1230	1259	1289	1318	1348
Structurally deficient and functionally obsolete bridges											
Number of bridges	3277	3277	3397	3517	3637	3757	3877	3912	3946	3981	4015
Percent of deck area	26.09	25.75	26.61	27.47	28.33	29.20	29.79	29.25	28.71	28.17	27.63
Structurally deficient bridges											
Number of bridges	1041	1041	1319	1597	1874	2152	2430	2475	2519	2564	2608
Percent of deck area	11.46	11.31	12.76	14.20	15.65	17.09	18.37	17.74	17.10	16.46	15.83
Functionally obsolete bridges											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Number of bridges	2236	2236	2078	1920	1763	1605	1447	1437	1427	1417	1407
Percent of deck area	14.63	14.44	13.86	13.27	12.69	12.10	11.42	11.51	11.61	11.71	11.80
Good structural condition											
Number of bridges	5263	5263	5048	4833	4617	4402	4187	4721	5254	5788	6321
Percent of deck area	39.45	38.94	39.68	40.41	41.15	41.89	42.25	47.49	52.73	57.98	63.22
Fair structural condition											
Number of bridges	6029	6029	5963	5897	5830	5764	5698	5123	4548	3974	3399
Percent of deck area	48.86	48.23	46.30	44.37	42.43	40.50	38.23	33.86	29.48	25.10	20.73
Poor structural condition											
Number of bridges	1043	1043	1324	1606	1887	2169	2450	2491	2532	2574	2615
Percent of deck area	11.69	11.54	12.99	14.45	15.90	17.35	18.63	17.94	17.26	16.57	15.88

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cumulative work done ($M)										
Total work	7697	8397	9096	9796	10496	11192	11889	12586	13283	13979
S/F motivated	5898	6554	7210	7866	8522	9102	9683	10263	10843	11423
+Econ. motivated	1799	1842	1886	1930	1974	2090	2207	2323	2440	2556
Replacement	4333	4920	5508	6095	6682	7292	7902	8511	9121	9731
S/F motivated	2534	3078	3622	4165	4709	5202	5695	6188	6681	7174
+Econ. motivated	1799	1842	1886	1930	1974	2090	2207	2323	2440	2556
Improvement	58	87	117	146	175	185	194	203	212	222
Raising	0	0	0	0	0	0	0	0	0	0
Widening	44	68	93	117	142	146	151	155	160	165
Capacity Expansion	3	3	4	4	4	7	11	14	17	21
Strengthening	11	16	20	25	30	31	32	34	35	36
Federally Eligible MR&R	3309	3392	3476	3559	3643	3723	3804	3885	3966	4047
Cumulative work done (number of bridges)										
Replacement	1289	1492	1699	1908	2118	2291	2464	2640	2819	3000
S/F motivated	1176	1371	1570	1771	1973	2134	2295	2459	2626	2795
+Econ. motivated	113	121	129	137	145	157	169	181	193	205
Improvement	135	185	237	290	349	357	365	375	391	410
Raising	---	---	---	---	---	---	---	---	---	---
Widening	111	155	200	246	295	301	307	313	322	333
Capacity Expansion	11	11	11	11	13	15	17	20	26	32
Total structurally/functionally (S/F) motivated annual needs and work ($M)										
S/F motivated needs	8802.4	8007.7	7213.0	6418.3	5623.6	7057.8	6325.0	5592.2	4859.4	4126.6
Total work done	699.7	699.7	699.7	699.7	699.7	696.7	696.7	696.7	696.7	696.7
S/F motivated	655.9	655.9	655.9	655.9	655.9	580.1	580.1	580.1	580.1	580.1
+Econ. motivated	43.7	43.7	43.7	43.7	43.7	116.6	116.6	116.6	116.6	116.6
Backlog - total	8007.7	7213.0	6418.3	5623.6	4828.9	6325.0	5592.2	4859.4	4126.6	3393.8
Replacement ($M)										
S/F motivated needs	6854.1	6310.6	5767.0	5223.5	4680.0	5561.3	5068.2	4575.0	4081.8	3588.6
Total work done	587.3	587.3	587.3	587.3	587.3	609.7	609.7	609.7	609.7	609.7
S/F motivated	543.5	543.5	543.5	543.5	543.5	493.2	493.2	493.2	493.2	493.2
+Econ. motivated	43.7	43.7	43.7	43.7	43.7	116.6	116.6	116.6	116.6	116.6
Backlog - total	6310.6	5767.0	5223.5	4680.0	4136.4	5068.2	4575.0	4081.8	3588.6	3095.5
Improvement ($M)										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Needs	326.3	282.0	237.8	193.5	149.3	130.2	109.5	88.7	68.0	47.2
Work done	29.4	29.4	29.4	29.4	29.4	9.3	9.3	9.3	9.3	9.3
Offset by E/M repl.	14.9	14.9	14.9	14.9	14.9	11.5	11.5	11.5	11.5	11.5
Backlog - total	282.0	237.8	193.5	149.3	105.0	109.5	88.7	68.0	47.2	26.5
Raising ($M)										
Needs	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0.1
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Backlog - total	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0.1	---
Widening ($M)										
Needs	189.2	159.6	130.0	100.5	70.9	52.8	45.1	37.4	29.6	21.9
Work done	24.5	24.5	24.5	24.5	24.5	4.6	4.6	4.6	4.6	4.6
Offset by E/M repl.	5.1	5.1	5.1	5.1	5.1	3.1	3.1	3.1	3.1	3.1
Backlog - total	159.6	130.0	100.5	70.9	41.3	45.1	37.4	29.6	21.9	14.2
Capacity Expansion ($M)										
Needs	32.7	31.0	29.3	27.6	25.9	31.8	26.7	21.6	16.4	11.3
Work done	0.3	0.3	0.3	0.3	0.3	3.3	3.3	3.3	3.3	3.3
Offset by E/M repl.	1.4	1.4	1.4	1.4	1.4	1.9	1.9	1.9	1.9	1.9
Backlog - total	31.0	29.3	27.6	25.9	24.3	26.7	21.6	16.4	11.3	6.2
Strengthening ($M)										
Needs	104.1	91.1	78.1	65.1	52.1	45.3	37.4	29.6	21.8	14.0
Work done	4.6	4.6	4.6	4.6	4.6	1.4	1.4	1.4	1.4	1.4
Offset by E/M repl.	8.4	8.4	8.4	8.4	8.4	6.5	6.5	6.5	6.5	6.5
Backlog - total	91.1	78.1	65.1	52.1	39.1	37.4	29.6	21.8	14.0	6.2
Federally Eligible MR&R ($M)										
Needs	1622.0	1415.1	1208.2	1001.3	794.3	1366.2	1147.4	928.5	709.6	490.7
Work done	83.4	83.4	83.4	83.4	83.4	81.0	81.0	81.0	81.0	81.0
Offset by E/M repl.	123.5	123.5	123.5	123.5	123.5	137.9	137.9	137.9	137.9	137.9
Backlog - total	1415.1	1208.2	1001.3	794.3	587.4	1147.4	928.5	709.6	490.7	271.8
Maintenance ($M)										
Needs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Replacement (number of bridges)										
S/F motivated needs	2153	1963	1770	1575	1377	1742	1584	1424	1262	1100
Total work done	201	203	207	209	210	173	173	176	179	181
S/F motivated	193	195	199	201	202	161	161	164	167	169
+Econ. motivated	8	8	8	8	8	12	12	12	12	12
Backlog - total	1963	1770	1575	1377	1178	1584	1424	1262	1100	934
Improvement (number of bridges)										
Needs	530	464	392	314	231	179	161	140	116	82
Work done	46	50	52	53	59	8	8	10	16	19
Offset by E/M repl.	20	22	26	30	32	10	13	14	18	26
Backlog - total	464	392	314	231	140	161	140	116	82	37
Raising (number of bridges)										
Needs	1	1	1	1	1	1	1	1	1	1
Work done	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	1
Backlog - total	1	1	1	1	1	1	1	1	1	---
Widening (number of bridges)										
Needs	357	306	251	192	132	93	82	70	57	40
Work done	41	44	45	46	49	6	6	6	9	11
Offset by E/M repl.	10	11	14	14	14	5	6	7	8	10
Backlog - total	306	251	192	132	69	82	70	57	40	19
Capacity Expansion (number of bridges)										
Needs	36	36	35	34	33	40	38	36	33	25
Work done	0	0	0	0	2	2	2	3	6	6
Offset by E/M repl.	0	1	1	1	1	0	0	0	2	5
Backlog - total	36	35	34	33	30	38	36	33	25	14
Strengthening (number of bridges)										
Needs	136	121	105	87	65	45	40	33	25	16
Work done	5	6	7	7	8	0	0	1	1	2
Offset by E/M repl.	10	10	11	15	17	5	7	7	8	10
Backlog - total	121	105	87	65	40	40	33	25	16	4

Total User Benefits ($M)

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential, S/F motivated	469.0	399.3	329.6	259.9	190.2	166.5	134.8	103.1	72.7	43.6
Total obtained	64.6	64.6	64.6	64.6	64.6	26.0	26.0	26.0	26.0	26.0
By S/F motivated work	61.2	61.2	61.2	61.2	61.2	21.9	21.9	21.9	21.9	21.9
+Econ. motivated work	5.1	5.1	5.1	5.1	5.1	5.8	5.8	5.8	5.8	5.8
Offset of S/F	5.1	5.1	5.1	5.1	5.1	5.8	5.8	5.8	5.8	5.8
Excess over offset	---	---	---	---	---	---	---	---	---	---
Backlog - total	399.3	329.6	259.9	190.2	121.5	134.8	103.1	72.7	43.6	16.0
Benefits of S/F motivated replacements ($M)										
Potential	395.5	334.2	272.9	211.6	150.2	127.1	102.2	77.4	53.9	31.7
Total obtained	61.3	61.3	61.3	61.3	61.3	24.9	24.9	24.9	24.9	24.9
S/F motivated	57.9	57.9	57.9	57.9	57.9	20.8	20.8	20.8	20.8	20.8
+Econ. motivated	3.4	3.4	3.4	3.4	3.4	4.1	4.1	4.1	4.1	4.1
Backlog - total	334.2	272.9	211.6	150.2	89.9	102.2	77.4	53.9	31.7	11.0
Improvement Benefits ($M)										
Potential	70.3	62.1	53.8	45.6	37.4	36.7	29.9	23.2	16.4	9.7
Obtained	3.3	3.3	3.3	3.3	3.3	1.1	1.1	1.1	1.1	1.1
Offset by E/M repl.	4.9	4.9	4.9	4.9	4.9	5.6	5.6	5.6	5.6	5.6
Backlog - total	62.1	53.8	45.6	37.4	29.1	29.9	23.2	16.4	9.7	2.9
Raising Benefits ($M)										
Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)										
Potential	23.0	19.4	15.9	12.3	8.7	6.3	5.3	4.3	3.2	2.2
Obtained	2.7	2.7	2.7	2.7	2.7	0.4	0.4	0.4	0.4	0.4
Offset by E/M repl.	0.9	0.9	0.9	0.9	0.9	0.6	0.6	0.6	0.6	0.6
Backlog - total	19.4	15.9	12.3	8.7	5.1	5.3	4.3	3.2	2.2	1.2
Capacity Expansion Benefits ($M)										
Potential	9.2	9.0	8.8	8.5	8.3	11.7	9.6	7.4	5.3	3.1
Obtained	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5	0.5
Offset by E/M repl.	0.2	0.2	0.2	0.2	0.2	1.6	1.6	1.6	1.6	1.6
Backlog - total	9.0	8.8	8.5	8.3	8.0	9.6	7.4	5.3	3.1	1.0
Strengthening Benefits ($M)										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential	38.1	33.6	29.2	24.8	20.4	18.7	15.1	11.5	7.9	4.3
Obtained	0.6	0.6	0.6	0.6	0.6	0.2	0.2	0.2	0.2	0.2
Offset by E/M repl.	3.8	3.8	3.8	3.8	3.8	3.4	3.4	3.4	3.4	3.4
Backlog - total	33.6	29.2	24.8	20.4	15.9	15.1	11.5	7.9	4.3	0.7
Benefits of MR&R ($M)										
Potential	3.1	3.0	2.9	2.8	2.7	2.7	2.6	2.5	2.4	2.3
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Backlog - total	3.0	2.9	2.8	2.7	2.5	2.6	2.5	2.4	2.3	2.1
Average Benefit/Cost ratios										
Overall	2.140	2.140	2.140	2.140	2.140	2.148	2.148	2.148	2.148	2.148
Replacement	2.072	2.072	2.072	2.072	2.072	2.042	2.042	2.042	2.042	2.042
Improvement	0.934	0.934	0.934	0.934	0.934	0.942	0.942	0.942	0.942	0.942
Raising	---	---	---	---	---	---	---	---	---	---
Widening	0.931	0.931	0.931	0.931	0.931	0.911	0.911	0.911	0.911	0.911
Capacity Expansion	0.895	0.895	0.895	0.895	0.895	0.987	0.987	0.987	0.987	0.987
Strengthening	0.953	0.953	0.953	0.953	0.953	0.939	0.939	0.939	0.939	0.939
MR&R	3.041	3.041	3.041	3.041	3.041	3.041	3.041	3.041	3.041	3.041
Benefit/Cost cutoff ratio (federally eligible work only)	1.010	1.010	1.010	1.010	1.010	1.010	1.010	1.010	1.010	1.010

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Average network condition measures										
Sufficiency rating	80.23	80.77	81.32	81.86	82.41	81.48	81.87	82.26	82.66	83.05
Health index	91.14	91.57	92.00	92.42	92.85	91.62	91.99	92.36	92.73	93.10
Bridge population distribution by deck rating (numbers of bridges)										
Deck rating 9	1615	1512	1409	1307	1204	1101	1051	1001	952	902
Deck rating 8	4022	4137	4252	4368	4483	4598	4717	4835	4954	5072
Deck rating 7	1568	1631	1695	1758	1822	1885	1852	1818	1785	1751
Deck rating 6	135	155	176	196	217	237	249	261	272	284
Deck rating 5	659	585	511	437	363	289	292	295	299	302
Deck rating 4	1200	1131	1062	992	923	854	772	691	609	528
Deck rating 3	294	336	378	420	462	504	533	561	590	618
Deck rating 2	14	19	24	29	34	39	41	43	46	48
Deck rating 1	0	0	0	0	0	0	1	1	2	2
Deck rating 0	1	1	1	1	1	1	1	1	0	0
Deck rating N	2827	2827	2827	2827	2827	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)										
Superstructure rating 9	5063	5195	5327	5460	5592	5724	5771	5818	5864	5911
Superstructure rating 8	285	248	212	175	139	102	166	230	295	359
Superstructure rating 7	60	75	90	104	119	134	121	107	94	80
Superstructure rating 6	1239	1081	923	766	608	450	417	384	352	319
Superstructure rating 5	1600	1603	1606	1608	1611	1614	1539	1465	1390	1316
Superstructure rating 4	1407	1420	1433	1447	1460	1473	1450	1427	1405	1382
Superstructure rating 3	172	203	234	264	295	326	360	394	427	461
Superstructure rating 2	16	17	17	18	18	19	17	16	14	13
Superstructure rating 1	0	0	0	1	1	1	1	2	2	3
Superstructure rating 0	1	1	1	0	0	0	0	0	0	0
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)										
Substructure rating 9	7414	7506	7598	7689	7781	7873	7900	7927	7953	7980
Substructure rating 8	181	177	174	170	167	163	209	255	302	348
Substructure rating 7	126	133	140	148	155	162	162	162	163	163
Substructure rating 6	1094	1017	941	864	788	711	656	600	545	489

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Substructure rating 5	313	347	381	414	448	482	499	515	532	548
Substructure rating 4	603	556	510	463	417	370	336	303	269	236
Substructure rating 3	72	69	65	62	58	55	54	54	53	53
Substructure rating 2	9	8	6	5	3	2	2	2	2	2
Substructure rating 1	7	6	5	4	3	2	2	2	1	1
Substructure rating 0	1	1	1	0	0	0	0	0	0	0
Substructure rating N	2515	2515	2515	2515	2515	2515	2515	2515	2515	2515
Culvert population distribution by rating (numbers of culverts)										
Culvert rating 9	1707	1705	1704	1702	1701	1699	1696	1693	1691	1688
Culvert rating 8	13	20	26	33	39	46	49	52	56	59
Culvert rating 7	35	29	22	16	9	3	3	2	2	1
Culvert rating 6	391	371	352	332	313	293	262	230	199	167
Culvert rating 5	255	265	275	286	296	306	326	346	367	387
Culvert rating 4	67	78	89	99	110	121	128	135	143	150
Culvert rating 3	22	22	22	21	21	21	24	27	31	34
Culvert rating 2	0	0	0	1	1	1	2	3	3	4
Culvert rating 1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844
Bridge population distribution by sufficiency rating (number of bridges)										
SR > 80% (Good)	7262	7390	7518	7645	7773	7901	7978	8055	8133	8210
50% < SR <=80% (Fair)	3696	3632	3569	3505	3442	3378	3327	3277	3226	3176
SR <=50% (Poor)	1377	1313	1249	1184	1120	1056	1029	1003	976	950
Structurally deficient and functionally obsolete bridges										
Number of bridges	4050	4000	3950	3901	3851	3801	3760	3719	3677	3636
Percent of deck area	26.46	26.35	26.25	26.14	26.03	25.46	25.45	25.44	25.43	25.42
Structurally deficient bridges										
Number of bridges	2653	2664	2675	2685	2696	2707	2691	2675	2660	2644
Percent of deck area	14.84	15.08	15.31	15.54	15.78	15.73	15.98	16.22	16.47	16.72
Functionally obsolete bridges										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $3500M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Number of bridges	1397	1336	1276	1215	1155	1094	1069	1043	1018	992
Percent of deck area	11.62	11.28	10.94	10.60	10.25	9.74	9.48	9.22	8.96	8.71
Good structural condition										
Number of bridges	6855	6972	7089	7207	7324	7441	7520	7600	7679	7759
Percent of deck area	66.87	67.77	68.67	69.57	70.47	70.10	70.89	71.69	72.49	73.29
Fair structural condition										
Number of bridges	2824	2698	2571	2445	2318	2192	2128	2065	2001	1938
Percent of deck area	15.97	15.31	14.64	13.97	13.31	12.41	11.73	11.04	10.35	9.66
Poor structural condition										
Number of bridges	2656	2665	2674	2684	2693	2702	2686	2670	2655	2639
Percent of deck area	14.84	15.07	15.30	15.53	15.76	15.71	15.96	16.20	16.45	16.70

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $4000M
BRIDGES: All Bridges; on and off NHS

20-YEAR TOTALS:

Total budget available over 20 years: $16000M

	Work Done ($M)	Work Done (bridges)	User Benefits Obtained ($M)
Total	14584.4		2402.7
Replacement	10157.4	3031	2364.8
Struct/Func. motivated (S/F)	7296.7	2816	2173.0
Economically motivated (E/M)	2860.7	215	191.8
Improvement	235.1	425	29.3
Raising	0.3	1	0.0
Widening	171.5	345	20.3
Capacity Expansion	22.6	33	3.6
Strengthening	40.8	46	5.4
MR&R	4214.5		8.5
Federal MR&R	4214.5		-
Local MR&R	0.0		-
(not included in the total)			

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $4000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cumulative work done ($M)											
Total work	799.3	1598.6	2398.0	3197.3	3996.6	4796.6	5596.6	6396.6	7196.6	7996.5	
S/F motivated	717.8	1435.5	2153.3	2871.1	3588.8	4063.8	4538.7	5013.7	5488.6	5963.6	
+Econ. motivated	81.6	163.1	244.7	326.2	407.8	732.8	1057.8	1382.9	1707.9	2032.9	
Replacement	468.6	937.3	1405.9	1874.5	2343.1	2800.6	3258.1	3715.6	4173.1	4630.6	
S/F motivated	387.1	774.2	1161.2	1548.3	1935.4	2067.8	2200.3	2332.8	2465.2	2597.7	
+Econ. motivated	81.6	163.1	244.7	326.2	407.8	732.8	1057.8	1382.9	1707.9	2032.9	
Improvement	8.2	16.5	24.7	32.9	41.1	44.8	48.5	52.1	55.8	59.4	
Raising	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.3	
Widening	6.1	12.1	18.2	24.2	30.3	33.0	35.7	38.4	41.1	43.8	
Capacity Expansion	0.5	1.0	1.5	2.0	2.5	2.5	2.5	2.5	2.5	2.5	
Strengthening	1.7	3.4	5.0	6.7	8.4	9.3	10.2	11.1	12.0	12.9	
Federally Eligible MR&R	323.0	645.9	968.9	1291.8	1614.8	1953.6	2292.5	2631.3	2970.1	3309.0	
Cumulative work done (number of bridges)											
Replacement	205	410	617	824	1033	1087	1142	1198	1255	1315	
S/F motivated	195	390	587	784	983	1024	1066	1109	1153	1200	
+Econ. motivated	10	20	30	40	50	63	76	89	102	115	
Improvement	17	36	59	86	119	124	131	141	154	171	
Raising	---	---	---	---	---	---	---	---	---	1	
Widening	16	33	52	74	98	103	110	119	129	140	
Capacity Expansion	1	2	4	6	10	10	10	10	10	11	
Total structurally/functionally (S/F) motivated annual needs and work ($M)											
S/F motivated needs	11408	10432	9455	8479	7502	9042	8407	7773	7139	6504	
Total work done	799	799	799	799	799	800	800	800	800	800	
S/F motivated	718	718	718	718	718	475	475	475	475	475	
+Econ. motivated	82	82	82	82	82	325	325	325	325	325	
Backlog - total	10432	9455	8479	7502	6526	8407	7773	7139	6504	5870	
Replacement ($M)											
S/F motivated needs	5926.1	5539.0	5151.9	4764.8	4377.7	5751.7	5619.2	5486.8	5354.3	5221.8	
Total work done	468.6	468.6	468.6	468.6	468.6	457.5	457.5	457.5	457.5	457.5	
S/F motivated	387.1	387.1	387.1	387.1	387.1	132.5	132.5	132.5	132.5	132.5	
+Econ. motivated	81.6	81.6	81.6	81.6	81.6	325.0	325.0	325.0	325.0	325.0	
Backlog - total	5539.0	5151.9	4764.8	4377.7	3990.7	5619.2	5486.8	5354.3	5221.8	5089.4	
Improvement ($M)											

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

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5yr PERIOD BUDGET: $4000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Needs		352.5	331.7	311.0	290.3	269.6	286.0	276.5	267.0	257.5	248.0
Work done		8.2	8.2	8.2	8.2	8.2	3.7	3.7	3.7	3.7	3.7
Offset by E/M repl.		12.5	12.5	12.5	12.5	12.5	5.9	5.9	5.9	5.9	5.9
Backlog - total		331.7	311.0	290.3	269.6	248.9	276.5	267.0	257.5	248.0	238.5
Raising ($M)											
Needs		0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0.1
Work done		0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0.1	---
Widening ($M)											
Needs		184.5	175.0	165.5	156.0	146.4	160.1	156.1	152.0	147.9	143.8
Work done		6.1	6.1	6.1	6.1	6.1	2.7	2.7	2.7	2.7	2.7
Offset by E/M repl.		3.5	3.5	3.5	3.5	3.5	1.4	1.4	1.4	1.4	1.4
Backlog - total		175.0	165.5	156.0	146.4	136.9	156.1	152.0	147.9	143.8	139.8
Capacity Expansion ($M)											
Needs		15.3	14.8	14.3	13.8	13.3	17.8	17.8	17.8	17.8	17.7
Work done		0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		14.8	14.3	13.8	13.3	12.8	17.8	17.8	17.8	17.7	17.7
Strengthening ($M)											
Needs		152.3	141.6	130.9	120.2	109.6	107.9	102.5	97.1	91.7	86.4
Work done		1.7	1.7	1.7	1.7	1.7	0.9	0.9	0.9	0.9	0.9
Offset by E/M repl.		9.0	9.0	9.0	9.0	9.0	4.5	4.5	4.5	4.5	4.5
Backlog - total		141.6	130.9	120.2	109.6	98.9	102.5	97.1	91.7	86.4	81.0
Federally Eligible MR&R ($M)											
Needs		5129.9	4561.2	3992.5	3423.8	2855.2	3004.3	2511.7	2019.2	1526.7	1034.2
Work done		323.0	323.0	323.0	323.0	323.0	338.8	338.8	338.8	338.8	338.8
Offset by E/M repl.		245.7	245.7	245.7	245.7	245.7	153.7	153.7	153.7	153.7	153.7
Backlog - total		4561.2	3992.5	3423.8	2855.2	2286.5	2511.7	2019.2	1526.7	1034.2	541.7
Maintenance ($M)											
Needs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total		---	---	---	---	---	---	---	---	---	---

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $4000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Replacement (number of bridges)											
S/F motivated needs	2039	1849	1657	1464	1271	1681	1645	1606	1565	1523	
Total work done	205	205	207	207	209	54	55	56	57	60	
S/F motivated	195	195	197	197	199	41	42	43	44	47	
+Econ. motivated	10	10	10	10	10	13	13	13	13	13	
Backlog - total	1849	1657	1464	1271	1075	1645	1606	1565	1523	1479	
Improvement (number of bridges)											
Needs	707	661	611	555	490	467	458	445	424	399	
Work done	17	19	23	27	33	5	7	10	13	17	
Offset by E/M repl.	29	31	33	38	44	4	6	11	12	16	
Backlog - total	661	611	555	490	413	458	445	424	399	366	
Raising (number of bridges)											
Needs	1	1	1	1	1	1	1	1	1	1	
Work done	0	0	0	0	0	0	0	0	0	1	
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0	
Backlog - total	1	1	1	1	1	1	1	1	1	---	
Widening (number of bridges)											
Needs	445	418	389	357	320	310	304	294	280	265	
Work done	16	17	19	22	24	5	7	9	10	11	
Offset by E/M repl.	11	12	13	15	17	1	3	5	5	7	
Backlog - total	418	389	357	320	279	304	294	280	265	247	
Capacity Expansion (number of bridges)											
Needs	23	22	21	19	17	26	26	26	26	26	
Work done	1	1	2	2	4	0	0	0	0	1	
Offset by E/M repl.	0	0	0	0	1	0	0	0	0	0	
Backlog - total	22	21	19	17	12	26	26	26	26	25	
Strengthening (number of bridges)											
Needs	238	220	200	178	152	130	127	124	117	107	
Work done	0	1	2	3	5	0	0	1	3	4	
Offset by E/M repl.	18	19	20	23	26	3	3	6	7	9	
Backlog - total	220	200	178	152	121	127	124	117	107	94	

Total User Benefits ($M)

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $4000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential, S/F motivated	2414.0	2005.8	1597.6	1189.4	781.2	542.2	471.5	402.6	349.0	295.4
Total obtained	364.6	364.6	364.6	364.6	364.6	53.1	53.1	53.1	53.1	53.1
By S/F motivated work	349.0	349.0	349.0	349.0	349.0	36.6	36.6	36.6	36.6	36.6
+Econ. motivated work	43.6	43.6	43.6	43.6	43.6	17.5	17.5	17.5	17.5	17.5
Offset of S/F	43.6	43.6	43.6	43.6	43.6	17.5	17.5	17.5	17.5	17.5
Excess over offset	---	---	---	---	---	---	---	---	---	---
Backlog - total	2005.8	1597.6	1189.4	781.2	373.0	471.5	402.6	349.0	295.4	241.8
Benefits of S/F motivated replacements ($M)										
Potential	2067.1	1705.5	1343.9	982.2	620.6	402.8	350.6	300.2	265.1	230.0
Total obtained	361.6	361.6	361.6	361.6	361.6	52.1	52.1	52.1	52.1	52.1
S/F motivated	346.0	346.0	346.0	346.0	346.0	35.6	35.6	35.6	35.6	35.6
+Econ. motivated	15.6	15.6	15.6	15.6	15.6	16.5	16.5	16.5	16.5	16.5
Backlog - total	1705.5	1343.9	982.2	620.6	259.0	350.6	300.2	265.1	230.0	194.8
Improvement Benefits ($M)										
Potential	337.6	292.4	247.2	202.0	156.9	135.9	117.9	99.9	81.8	63.8
Obtained	1.7	1.7	1.7	1.7	1.7	0.6	0.6	0.6	0.6	0.6
Offset by E/M repl.	43.5	43.5	43.5	43.5	43.5	17.4	17.4	17.4	17.4	17.4
Backlog - total	292.4	247.2	202.0	156.9	111.7	117.9	99.9	81.8	63.8	45.8
Raising Benefits ($M)										
Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)										
Potential	25.5	23.5	21.6	19.6	17.6	18.5	17.9	17.2	16.5	15.9
Obtained	1.3	1.3	1.3	1.3	1.3	0.4	0.4	0.4	0.4	0.4
Offset by E/M repl.	0.7	0.7	0.7	0.7	0.7	0.3	0.3	0.3	0.3	0.3
Backlog - total	23.5	21.6	19.6	17.6	15.6	17.9	17.2	16.5	15.9	15.2
Capacity Expansion Benefits ($M)										
Potential	3.8	3.6	3.5	3.4	3.2	5.5	5.5	5.5	5.5	5.5
Obtained	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	3.6	3.5	3.4	3.2	3.1	5.5	5.5	5.5	5.5	5.5
Strengthening Benefits ($M)										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

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BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Potential		308.3	265.2	222.1	179.1	136.0	111.8	94.5	77.2	59.8	42.5
Obtained		0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2
Offset by E/M repl.		42.8	42.8	42.8	42.8	42.8	17.2	17.2	17.2	17.2	17.2
Backlog - total		265.2	222.1	179.1	136.0	93.0	94.5	77.2	59.8	42.5	25.1
Benefits of MR&R ($M)											
Potential		9.2	7.9	6.5	5.1	3.7	3.5	3.0	2.5	2.1	1.6
Obtained		1.3	1.3	1.3	1.3	1.3	0.4	0.4	0.4	0.4	0.4
Offset by E/M repl.		0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Backlog - total		7.9	6.5	5.1	3.7	2.3	3.0	2.5	2.1	1.6	1.1
Average Benefit/Cost ratios											
Overall		4.071	4.071	4.071	4.071	4.071	2.661	2.661	2.661	2.661	2.661
Replacement		4.584	4.584	4.584	4.584	4.584	2.891	2.891	2.891	2.891	2.891
Improvement		1.025	1.025	1.025	1.025	1.025	0.980	0.980	0.980	0.980	0.980
Raising		---	---	---	---	---	0.891	0.891	0.891	0.891	0.891
Widening		1.031	1.031	1.031	1.031	1.031	0.976	0.976	0.976	0.976	0.976
Capacity Expansion		1.067	1.067	1.067	1.067	1.067	1.297	1.297	1.297	1.297	1.297
Strengthening		0.989	0.989	0.989	0.989	0.989	0.992	0.992	0.992	0.992	0.992
MR&R		3.400	3.400	3.400	3.400	3.400	2.370	2.370	2.370	2.370	2.370
Benefit/Cost cutoff ratio (federally eligible work only)		1.002	1.002	1.002	1.002	1.002	1.010	1.010	1.010	1.010	1.010

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All Performance Measures by Year

5yr PERIOD BUDGET: $4000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Average network condition measures											
Sufficiency rating	80.39	79.08	79.86	80.63	81.40	82.17	82.05	82.27	82.49	82.71	82.92
Health index	87.79	86.36	87.43	88.51	89.58	90.66	90.75	91.46	92.17	92.88	93.59
Bridge population distribution by deck rating (numbers of bridges)											
Deck rating 9	0	0	558	1115	1673	2230	2788	2496	2204	1912	1620
Deck rating 8	139	139	603	1067	1532	1996	2460	2867	3274	3680	4087
Deck rating 7	5593	5593	4520	3446	2373	1299	226	570	915	1259	1604
Deck rating 6	462	462	602	742	883	1023	1163	966	769	573	376
Deck rating 5	2760	2760	2585	2411	2236	2062	1887	1607	1327	1046	766
Deck rating 4	586	586	639	691	744	796	849	843	837	832	826
Deck rating 3	5	5	31	57	82	108	134	155	177	198	220
Deck rating 2	1	1	1	1	0	0	0	2	4	7	9
Deck rating 1	0	0	0	0	0	0	0	0	0	0	0
Deck rating 0	3	3	3	2	2	1	1	1	1	1	1
Deck rating N	2786	2786	2794	2802	2811	2819	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)											
Superstructure rating 9	0	0	812	1624	2437	3249	4061	4345	4629	4913	5197
Superstructure rating 8	301	301	247	193	138	84	30	92	153	215	276
Superstructure rating 7	6229	6229	5131	4033	2936	1838	740	601	462	323	184
Superstructure rating 6	363	363	900	1437	1973	2510	3047	2636	2226	1815	1405
Superstructure rating 5	2589	2589	2252	1914	1577	1239	902	1027	1152	1277	1402
Superstructure rating 4	350	350	474	598	721	845	969	1032	1095	1158	1221
Superstructure rating 3	9	9	25	42	58	75	91	104	117	131	144
Superstructure rating 2	1	1	1	1	2	2	2	5	8	10	13
Superstructure rating 1	0	0	0	0	0	0	0	0	0	0	0
Superstructure rating 0	1	1	1	1	1	1	1	1	1	1	1
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)											
Substructure rating 9	0	0	1153	2307	3460	4614	5767	6213	6660	7106	7553
Substructure rating 8	264	264	219	174	128	83	38	72	106	140	174
Substructure rating 7	6773	6773	5651	4528	3406	2283	1161	944	727	511	294
Substructure rating 6	212	212	497	782	1067	1352	1637	1450	1262	1075	887

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FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Substructure rating 5	2299	2299	1971	1643	1316	988	660	576	491	407	322
Substructure rating 4	258	258	304	349	395	440	486	491	496	502	507
Substructure rating 3	9	9	18	26	35	43	52	56	59	63	66
Substructure rating 2	26	26	24	22	19	17	15	14	13	11	10
Substructure rating 1	1	1	1	2	2	3	3	4	4	5	5
Substructure rating 0	2	2	2	2	1	1	1	1	1	1	1
Substructure rating N	2491	2491	2496	2501	2505	2510	2515	2515	2515	2515	2515
Culvert population distribution by rating (numbers of culverts)											
Culvert rating 9	0	0	35	70	105	140	175	526	877	1227	1578
Culvert rating 8	123	123	108	92	77	61	46	40	34	29	23
Culvert rating 7	1328	1328	1186	1044	903	761	619	500	381	263	144
Culvert rating 6	958	958	1003	1048	1093	1138	1183	997	810	624	437
Culvert rating 5	23	23	102	180	259	337	416	370	324	277	231
Culvert rating 4	56	56	53	50	47	44	41	46	50	55	59
Culvert rating 3	2	2	4	5	7	8	10	12	14	15	17
Culvert rating 2	0	0	0	0	0	0	0	0	0	0	0
Culvert rating 1	1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844
Bridge population distribution by sufficiency rating (number of bridges)											
SR > 80% (Good)	6552	6552	6781	7010	7238	7467	7696	7685	7673	7662	7650
50% < SR <=80% (Fair)	4512	4512	4315	4117	3920	3722	3525	3512	3499	3487	3474
SR <=50% (Poor)	1271	1271	1240	1208	1177	1145	1114	1138	1162	1187	1211
Structurally deficient and functionally obsolete bridges											
Number of bridges	3277	3277	3310	3343	3377	3410	3443	3470	3497	3525	3552
Percent of deck area	26.09	25.67	25.57	25.48	25.39	25.30	24.94	24.54	24.14	23.75	23.35
Structurally deficient bridges											
Number of bridges	1041	1041	1237	1433	1628	1824	2020	2060	2100	2140	2180
Percent of deck area	11.46	11.27	11.65	12.03	12.41	12.79	13.02	12.53	12.03	11.54	11.05
Functionally obsolete bridges											

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BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	Base	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Number of bridges	2236	2236	2073	1911	1748	1586	1423	1410	1397	1385	1372
Percent of deck area	14.63	14.39	13.92	13.45	12.98	12.51	11.91	12.01	12.11	12.21	12.31
Good structural condition											
Number of bridges	5263	5263	5193	5123	5053	4983	4913	5434	5955	6476	6997
Percent of deck area	39.45	38.81	41.32	43.83	46.35	48.86	50.83	55.63	60.44	65.25	70.06
Fair structural condition											
Number of bridges	6029	6029	5901	5774	5646	5519	5391	4832	4273	3714	3155
Percent of deck area	48.86	48.06	45.53	43.00	40.46	37.93	35.02	30.93	26.85	22.76	18.68
Poor structural condition											
Number of bridges	1043	1043	1241	1438	1636	1833	2031	2069	2107	2145	2183
Percent of deck area	11.69	11.50	11.85	12.19	12.54	12.88	13.08	12.58	12.07	11.56	11.05

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $4000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cumulative work done ($M)										
Total work	8611	9225	9839	10454	11068	11771	12474	13178	13881	14584
S/F motivated	6534	7105	7676	8246	8817	9398	9980	10561	11142	11724
+Econ. motivated	2077	2120	2164	2207	2251	2373	2495	2617	2739	2861
Replacement	5129	5627	6126	6624	7123	7730	8337	8943	9550	10157
S/F motivated	3052	3507	3962	4417	4872	5357	5842	6327	6812	7297
+Econ. motivated	2077	2120	2164	2207	2251	2373	2495	2617	2739	2861
Improvement	85	111	137	163	188	198	207	216	226	235
Raising	0	0	0	0	0	0	0	0	0	0
Widening	64	85	105	125	146	151	156	161	166	171
Capacity Expansion	3	3	4	4	4	8	12	15	19	23
Strengthening	18	23	28	33	38	39	39	40	40	41
Federally Eligible MR&R	3399	3490	3580	3671	3761	3852	3943	4033	4124	4214
Cumulative work done (number of bridges)										
Replacement	1487	1662	1839	2017	2197	2359	2525	2692	2860	3031
S/F motivated	1364	1531	1700	1870	2042	2192	2346	2501	2657	2816
+Econ. motivated	123	131	139	147	155	167	179	191	203	215
Improvement	204	239	275	315	361	369	379	389	404	425
Raising	1	1	1	1	1	1	1	1	1	1
Widening	170	201	232	265	302	308	315	322	332	345
Capacity Expansion	11	11	11	12	14	16	19	22	27	33
Total structurally/functionally (S/F) motivated annual needs and work ($M)										
S/F motivated needs	6949.9	6272.5	5595.0	4917.5	4240.0	5474.0	4740.2	4006.4	3272.5	2538.7
Total work done	614.3	614.3	614.3	614.3	614.3	703.3	703.3	703.3	703.3	703.3
S/F motivated	570.6	570.6	570.6	570.6	570.6	581.4	581.4	581.4	581.4	581.4
+Econ. motivated	43.6	43.6	43.6	43.6	43.6	121.9	121.9	121.9	121.9	121.9
Backlog - total	6272.5	5595.0	4917.5	4240.0	3562.5	4740.2	4006.4	3272.5	2538.7	1804.9
Replacement ($M)										
S/F motivated needs	5346.0	4891.2	4436.4	3981.7	3526.9	4163.9	3678.9	3193.8	2708.8	2223.8
Total work done	498.4	498.4	498.4	498.4	498.4	606.9	606.9	606.9	606.9	606.9
S/F motivated	454.8	454.8	454.8	454.8	454.8	485.0	485.0	485.0	485.0	485.0
+Econ. motivated	43.6	43.6	43.6	43.6	43.6	121.9	121.9	121.9	121.9	121.9
Backlog - total	4891.2	4436.4	3981.7	3526.9	3072.1	3678.9	3193.8	2708.8	2223.8	1738.8
Improvement ($M)										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $4000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Needs	276.6	238.6	200.6	162.6	124.6	109.3	89.8	70.2	50.7	31.1
Work done	25.8	25.8	25.8	25.8	25.8	9.4	9.4	9.4	9.4	9.4
Offset by E/M repl.	12.2	12.2	12.2	12.2	12.2	10.2	10.2	10.2	10.2	10.2
Backlog - total	238.6	200.6	162.6	124.6	86.6	89.8	70.2	50.7	31.1	11.5
Raising ($M)										
Needs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---
Widening ($M)										
Needs	159.2	134.8	110.4	86.1	61.7	48.0	39.7	31.4	23.2	14.9
Work done	20.4	20.4	20.4	20.4	20.4	5.2	5.2	5.2	5.2	5.2
Offset by E/M repl.	4.0	4.0	4.0	4.0	4.0	3.1	3.1	3.1	3.1	3.1
Backlog - total	134.8	110.4	86.1	61.7	37.3	39.7	31.4	23.2	14.9	6.6
Capacity Expansion ($M)										
Needs	32.7	31.0	29.2	27.5	25.8	31.8	26.4	20.9	15.4	9.9
Work done	0.4	0.4	0.4	0.4	0.4	3.6	3.6	3.6	3.6	3.6
Offset by E/M repl.	1.4	1.4	1.4	1.4	1.4	1.9	1.9	1.9	1.9	1.9
Backlog - total	31.0	29.2	27.5	25.8	24.0	26.4	20.9	15.4	9.9	4.4
Strengthening ($M)										
Needs	84.8	72.9	60.9	49.0	37.1	29.5	23.7	17.9	12.1	6.3
Work done	5.0	5.0	5.0	5.0	5.0	0.6	0.6	0.6	0.6	0.6
Offset by E/M repl.	6.9	6.9	6.9	6.9	6.9	5.2	5.2	5.2	5.2	5.2
Backlog - total	72.9	60.9	49.0	37.1	25.2	23.7	17.9	12.1	6.3	0.6
Federally Eligible MR&R ($M)										
Needs	1327.3	1142.6	957.9	773.2	588.5	1200.8	971.5	742.3	513.1	283.8
Work done	90.5	90.5	90.5	90.5	90.5	90.6	90.6	90.6	90.6	90.6
Offset by E/M repl.	94.2	94.2	94.2	94.2	94.2	138.6	138.6	138.6	138.6	138.6
Backlog - total	1142.6	957.9	773.2	588.5	403.8	971.5	742.3	513.1	283.8	54.6
Maintenance ($M)										
Needs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Work done	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $4000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Replacement (number of bridges)										
S/F motivated needs	1781	1618	1454	1288	1121	1449	1299	1148	995	842
Total work done	172	175	177	178	180	162	166	167	168	171
S/F motivated	164	167	169	170	172	150	154	155	156	159
+Econ. motivated	8	8	8	8	8	12	12	12	12	12
Backlog - total	1618	1454	1288	1121	949	1299	1148	995	842	686
Improvement (number of bridges)										
Needs	407	356	301	244	179	145	134	117	96	65
Work done	33	35	36	40	46	8	10	10	15	21
Offset by E/M repl.	18	20	21	25	26	3	7	11	16	22
Backlog - total	356	301	244	179	107	134	117	96	65	22
Raising (number of bridges)										
Needs	0	0	0	0	0	0	0	0	0	0
Work done	0	0	0	0	0	0	0	0	0	0
Offset by E/M repl.	0	0	0	0	0	0	0	0	0	0
Backlog - total	---	---	---	---	---	---	---	---	---	---
Widening (number of bridges)										
Needs	269	231	191	150	104	77	69	59	46	29
Work done	30	31	31	33	37	6	7	7	10	13
Offset by E/M repl.	8	9	10	13	13	2	3	6	7	9
Backlog - total	231	191	150	104	54	69	59	46	29	7
Capacity Expansion (number of bridges)										
Needs	36	36	35	34	32	40	38	35	32	25
Work done	0	0	0	1	2	2	3	3	5	6
Offset by E/M repl.	0	1	1	1	1	0	0	0	2	5
Backlog - total	36	35	34	32	29	38	35	32	25	14
Strengthening (number of bridges)										
Needs	102	89	75	60	43	28	27	23	18	11
Work done	3	4	5	6	7	0	0	0	0	2
Offset by E/M repl.	10	10	10	11	12	1	4	5	7	8
Backlog - total	89	75	60	43	24	27	23	18	11	1

Total User Benefits ($M)

All Performance Measures by Year

5yr PERIOD BUDGET: $4000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential, S/F motivated	311.5	266.2	220.8	175.5	130.1	120.0	93.8	67.8	43.6	20.3
Total obtained	41.2	41.2	41.2	41.2	41.2	21.6	21.6	21.6	21.6	21.6
By S/F motivated work	38.8	38.8	38.8	38.8	38.8	17.8	17.8	17.8	17.8	17.8
+Econ. motivated work	4.1	4.1	4.1	4.1	4.1	4.6	4.6	4.6	4.6	4.6
Offset of S/F	4.1	4.1	4.1	4.1	4.1	4.6	4.6	4.6	4.6	4.6
Excess over offset	---	---	---	---	---	---	---	---	---	---
Backlog - total	266.2	220.8	175.5	130.1	85.1	93.8	67.8	43.6	20.3	3.1
Benefits of S/F motivated replacements ($M)										
Potential	253.8	215.2	176.6	138.0	99.4	89.5	69.0	48.7	30.1	12.4
Total obtained	38.6	38.6	38.6	38.6	38.6	20.6	20.6	20.6	20.6	20.6
S/F motivated	36.2	36.2	36.2	36.2	36.2	16.8	16.8	16.8	16.8	16.8
+Econ. motivated	2.4	2.4	2.4	2.4	2.4	3.8	3.8	3.8	3.8	3.8
Backlog - total	215.2	176.6	138.0	99.4	61.1	69.0	48.7	30.1	12.4	1.0
Improvement Benefits ($M)										
Potential	56.0	49.3	42.7	36.1	29.5	29.2	23.7	18.1	12.6	7.0
Obtained	2.6	2.6	2.6	2.6	2.6	1.0	1.0	1.0	1.0	1.0
Offset by E/M repl.	4.0	4.0	4.0	4.0	4.0	4.5	4.5	4.5	4.5	4.5
Backlog - total	49.3	42.7	36.1	29.5	22.8	23.7	18.1	12.6	7.0	1.5
Raising Benefits ($M)										
Potential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backlog - total	---	---	---	---	---	---	---	---	---	---
Widening Benefits ($M)										
Potential	17.8	15.0	12.3	9.6	6.9	5.2	4.3	3.4	2.4	1.5
Obtained	1.9	1.9	1.9	1.9	1.9	0.4	0.4	0.4	0.4	0.4
Offset by E/M repl.	0.8	0.8	0.8	0.8	0.8	0.5	0.5	0.5	0.5	0.5
Backlog - total	15.0	12.3	9.6	6.9	4.2	4.3	3.4	2.4	1.5	0.5
Capacity Expansion Benefits ($M)										
Potential	9.2	9.0	8.7	8.5	8.2	11.7	9.5	7.4	5.2	3.1
Obtained	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.6	0.6	0.6
Offset by E/M repl.	0.2	0.2	0.2	0.2	0.2	1.6	1.6	1.6	1.6	1.6
Backlog - total	9.0	8.7	8.5	8.2	7.9	9.5	7.4	5.2	3.1	0.9
Strengthening Benefits ($M)										

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $4000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Potential	28.9	25.3	21.6	18.0	14.3	12.3	9.8	7.4	4.9	2.5
Obtained	0.6	0.6	0.6	0.6	0.6	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	3.0	3.0	3.0	3.0	3.0	2.4	2.4	2.4	2.4	2.4
Backlog - total	25.3	21.6	18.0	14.3	10.7	9.8	7.4	4.9	2.5	0.1
Benefits of MR&R ($M)										
Potential	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8
Obtained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset by E/M repl.	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Backlog - total	1.6	1.5	1.4	1.3	1.1	1.1	1.0	0.9	0.8	0.7
Average Benefit/Cost ratios										
Overall	2.039	2.039	2.039	2.039	2.039	2.158	2.158	2.158	2.158	2.158
Replacement	1.922	1.922	1.922	1.922	1.922	2.045	2.045	2.045	2.045	2.045
Improvement	0.922	0.922	0.922	0.922	0.922	0.932	0.932	0.932	0.932	0.932
Raising	---	---	---	---	---	---	---	---	---	---
Widening	0.917	0.917	0.917	0.917	0.917	0.906	0.906	0.906	0.906	0.906
Capacity Expansion	0.920	0.920	0.920	0.920	0.920	0.976	0.976	0.976	0.976	0.976
Strengthening	0.943	0.943	0.943	0.943	0.943	0.885	0.885	0.885	0.885	0.885
MR&R	2.997	2.997	2.997	2.997	2.997	2.992	2.992	2.992	2.992	2.992
Benefit/Cost cutoff ratio (federally eligible work only)	1.010	1.010	1.010	1.010	1.010	1.010	1.010	1.010	1.010	1.010

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $4000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Average network condition measures										
Sufficiency rating	81.48	81.93	82.39	82.84	83.30	82.25	82.69	83.14	83.58	84.02
Health index	92.42	92.80	93.17	93.55	93.93	92.61	93.02	93.43	93.84	94.25
Bridge population distribution by deck rating (numbers of bridges)										
Deck rating 9	1328	1246	1164	1081	999	917	897	876	856	835
Deck rating 8	4494	4637	4781	4924	5068	5211	5298	5384	5471	5557
Deck rating 7	1948	1951	1955	1958	1962	1965	1935	1905	1876	1846
Deck rating 6	179	195	210	226	241	257	261	265	270	274
Deck rating 5	486	442	398	354	310	266	281	296	312	327
Deck rating 4	820	761	702	643	584	525	478	430	383	335
Deck rating 3	241	259	277	296	314	332	324	317	309	302
Deck rating 2	11	16	20	25	29	34	33	32	31	30
Deck rating 1	0	0	0	0	0	0	0	1	1	2
Deck rating 0	1	1	1	1	1	1	1	1	0	0
Deck rating N	2827	2827	2827	2827	2827	2827	2827	2827	2827	2827
Bridge population distribution by superstructure rating (numbers of bridges)										
Superstructure rating 9	5481	5592	5703	5813	5924	6035	6092	6150	6207	6265
Superstructure rating 8	338	296	253	211	168	126	176	225	275	324
Superstructure rating 7	45	68	92	115	139	162	144	127	109	92
Superstructure rating 6	994	859	724	590	455	320	307	293	280	266
Superstructure rating 5	1527	1521	1515	1508	1502	1496	1417	1338	1259	1180
Superstructure rating 4	1284	1302	1320	1337	1355	1373	1347	1321	1296	1270
Superstructure rating 3	157	188	219	250	281	312	343	373	404	434
Superstructure rating 2	16	16	17	17	18	18	16	14	11	9
Superstructure rating 1	0	0	0	1	1	1	1	2	2	3
Superstructure rating 0	1	1	1	0	0	0	0	0	0	0
Superstructure rating N	2492	2492	2492	2492	2492	2492	2492	2492	2492	2492
Bridge population distribution by substructure rating (numbers of bridges)										
Substructure rating 9	7999	8072	8145	8219	8292	8365	8393	8421	8448	8476
Substructure rating 8	208	204	200	195	191	187	230	273	315	358
Substructure rating 7	77	97	117	136	156	176	177	178	179	180
Substructure rating 6	700	644	588	531	475	419	389	359	330	300

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $4000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Substructure rating 5	238	256	275	293	312	330	328	326	324	322
Substructure rating 4	512	467	423	378	334	289	251	214	176	139
Substructure rating 3	70	66	62	59	55	51	49	47	45	43
Substructure rating 2	9	8	6	5	3	2	2	2	2	2
Substructure rating 1	6	5	4	3	2	1	1	1	0	0
Substructure rating 0	1	1	1	0	0	0	0	0	0	0
Substructure rating N	2515	2515	2515	2515	2515	2515	2515	2515	2515	2515

Culvert population distribution by rating (numbers of culverts)

Culvert rating 9	1929	1926	1923	1920	1917	1914	1911	1908	1904	1901
Culvert rating 8	17	24	31	37	44	51	55	58	62	65
Culvert rating 7	25	20	16	11	7	2	2	2	1	1
Culvert rating 6	251	238	225	211	198	185	165	146	126	107
Culvert rating 5	185	189	193	198	202	206	217	228	240	251
Culvert rating 4	64	73	83	92	102	111	116	120	125	129
Culvert rating 3	19	19	19	20	20	20	23	26	28	31
Culvert rating 2	0	0	0	1	1	1	2	3	3	4
Culvert rating 1	1	1	1	1	1	1	1	1	1	1
Culvert rating 0	0	0	0	0	0	0	0	0	0	0
Culvert rating N	9844	9844	9844	9844	9844	9844	9844	9844	9844	9844

Bridge population distribution by sufficiency rating (number of bridges)

SR > 80% (Good)	7639	7740	7841	7943	8044	8145	8218	8291	8364	8437
50% < SR <=80% (Fair)	3461	3414	3368	3321	3275	3228	3189	3150	3110	3071
SR <=50% (Poor)	1235	1180	1126	1071	1017	962	928	894	861	827

Structurally deficient and functionally obsolete bridges

Number of bridges	3579	3543	3507	3472	3436	3400	3361	3323	3284	3246
Percent of deck area	22.50	22.36	22.21	22.07	21.93	21.40	21.30	21.19	21.09	20.98

Structurally deficient bridges

Number of bridges	2220	2230	2241	2251	2262	2272	2254	2236	2218	2200
Percent of deck area	10.34	10.47	10.60	10.73	10.85	10.79	10.92	11.05	11.18	11.31

Functionally obsolete bridges

BRIDGE NETWORK PERFORMANCE ANALYSIS REPORT

All Performance Measures by Year

5yr PERIOD BUDGET: $4000M
BRIDGES: All Bridges; on and off NHS

FORECAST PERIOD	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Number of bridges	1359	1313	1267	1220	1174	1128	1107	1087	1066	1046
Percent of deck area	12.16	11.89	11.62	11.35	11.08	10.61	10.38	10.14	9.91	9.67
Good structural condition										
Number of bridges	7518	7614	7710	7807	7903	7999	8073	8148	8222	8297
Percent of deck area	73.37	74.11	74.85	75.59	76.33	75.69	76.47	77.26	78.05	78.84
Fair structural condition										
Number of bridges	2596	2491	2386	2280	2175	2070	2014	1957	1901	1844
Percent of deck area	14.30	13.83	13.37	12.90	12.44	11.76	11.20	10.64	10.08	9.52
Poor structural condition										
Number of bridges	2221	2230	2239	2248	2257	2266	2248	2230	2212	2194
Percent of deck area	10.33	10.46	10.58	10.71	10.83	10.76	10.89	11.02	11.16	11.29

APPENDIX D:
Individual County Breakdown

Local Agency Bridge **Condition**

County Number	County Name	Total							
		Number of Bridges	Deck Area (ft^2)	%Good (Count)	%Fair (Count)	%Poor (Count)	%Good (Area)	%Fair (Area)	%Poor (Area)
County # 1	Alameda	206	2,024,740	53%	32%	15%	39%	33%	28%
County # 3	Alpine	10	10,907	20%	60%	20%	18%	57%	25%
County # 5	Amador	41	89,626	37%	39%	24%	45%	35%	21%
County # 7	Butte	295	882,883	30%	62%	8%	26%	61%	13%
County # 9	Calaveras	69	124,186	45%	45%	10%	43%	52%	5%
County # 11	Colusa	149	376,985	46%	41%	13%	42%	50%	8%
County # 13	Contra Costa	305	1,763,181	64%	25%	11%	47%	34%	19%
County # 15	Del Norte	27	114,613	56%	33%	11%	74%	22%	5%
County # 17	El Dorado	89	235,039	40%	52%	8%	47%	51%	2%
County # 19	Fresno	489	1,434,521	42%	53%	6%	38%	56%	6%
County # 21	Glenn	171	414,731	53%	40%	7%	49%	35%	16%
County # 23	Humboldt	168	627,279	36%	52%	12%	35%	56%	9%
County # 25	Imperial	131	368,037	24%	55%	21%	18%	53%	29%
County # 27	Inyo	34	48,358	47%	47%	6%	56%	42%	2%
County # 29	Kern	295	1,952,749	66%	23%	11%	54%	30%	17%
County # 31	Kings	99	262,567	52%	44%	4%	32%	61%	7%
County # 33	Lake	80	177,568	35%	51%	14%	20%	69%	11%
County # 35	Lassen	65	120,570	28%	57%	15%	30%	54%	16%
County # 37	Los Angeles	1,474	15,511,045	74%	21%	5%	59%	34%	7%
County # 39	Madera	156	793,817	44%	39%	17%	55%	34%	11%
County # 41	Marin	111	316,831	62%	27%	11%	61%	29%	10%
County # 43	Mariposa	53	58,612	51%	28%	21%	52%	29%	19%
County # 45	Mendocino	137	431,546	36%	53%	11%	34%	55%	10%
County # 47	Merced	314	897,150	38%	49%	14%	39%	49%	12%
County # 49	Modoc	50	78,763	72%	22%	6%	71%	25%	4%
County # 51	Mono	13	19,373	54%	31%	15%	49%	31%	20%
County # 53	Monterey	144	806,522	42%	50%	8%	42%	41%	17%
County # 55	Napa	107	430,447	50%	41%	9%	35%	45%	20%
County # 57	Nevada	58	201,123	31%	47%	22%	34%	36%	29%
County # 59	Orange	526	5,282,207	71%	23%	6%	55%	31%	14%
County # 61	Placer	181	1,158,212	55%	42%	3%	59%	39%	2%
County # 63	Plumas	92	253,413	13%	83%	4%	24%	74%	1%

Local Agency Bridge **Condition**

County Number	County Name	Total							
		Number of Bridges	Deck Area (ft^2)	%Good (Count)	%Fair (Count)	%Poor (Count)	%Good (Area)	%Fair (Area)	%Poor (Area)
County # 65	Riverside	462	4,127,618	65%	29%	6%	49%	44%	7%
County # 67	Sacramento	448	3,477,860	76%	21%	3%	57%	39%	3%
County # 69	San Benito	47	158,721	51%	38%	11%	58%	24%	18%
County # 71	San Bernardino	499	3,163,294	51%	37%	12%	36%	46%	18%
County # 73	San Diego	542	4,511,383	65%	29%	6%	30%	59%	12%
County # 75	San Francisco	27	391,571	59%	37%	4%	59%	39%	2%
County # 77	San Joaquin	330	1,908,966	60%	32%	9%	51%	33%	16%
County # 79	San Luis Obispo	202	692,477	60%	35%	4%	56%	41%	3%
County # 81	San Mateo	144	1,440,606	50%	35%	15%	32%	48%	20%
County # 83	Santa Barbara	190	729,845	57%	35%	8%	47%	35%	18%
County # 85	Santa Clara	475	3,318,173	59%	31%	9%	49%	35%	16%
County # 87	Santa Cruz	101	536,818	37%	37%	27%	46%	36%	18%
County # 89	Shasta	284	1,149,443	58%	36%	5%	39%	56%	5%
County # 91	Sierra	32	41,034	16%	59%	25%	17%	61%	23%
County # 93	Siskiyou	177	476,525	55%	38%	7%	53%	43%	3%
County # 95	Solano	205	888,596	68%	30%	2%	56%	42%	1%
County # 97	Sonoma	443	1,426,707	47%	44%	9%	43%	43%	15%
County # 99	Stanislaus	245	1,341,886	31%	58%	11%	29%	47%	24%
County # 101	Sutter	90	408,495	41%	42%	17%	45%	39%	16%
County # 103	Tehama	304	881,373	43%	48%	9%	51%	38%	11%
County # 105	Trinity	98	268,925	45%	45%	10%	46%	49%	5%
County # 107	Tulare	406	1,198,204	51%	42%	6%	48%	46%	6%
County # 109	Tuolumne	55	209,808	36%	60%	4%	26%	48%	26%
County # 111	Ventura	192	1,135,947	76%	20%	4%	51%	33%	15%
County # 113	Yolo	126	572,210	59%	34%	7%	36%	49%	14%
County # 115	Yuba	76	221,107	41%	55%	4%	40%	58%	2%

Estimated Detail Local Agency Needs Summary (page 1 of 3)

County Name	Number of Bridges	On-System Bridges	Off-System Bridges	County Average Age	County Average Sufficiency Rating	County Structures with 50 ≤ SR ≤ 80	County Structures with SR < 50	Percent of Structures with 50 ≤ SR ≤ 80	Percent of Structures with SR < 50	Total Bridge Need	Total On-System Need	Total Off-System Need	Number of Bridge Replacements	Total Bridge Replacement Cost	Number of Bridge Rehabilitations	Total Bridge Rehabilitation Cost	Number of Bridge Widen	Total Bridge Widen Cost	Number of Scour	Total Bridge Scour Cost	Number of Bridge Seismic Retrofits	Total Bridge Seismic Retrofit Cost
	EA	EA	EA	Years	SR	EA	EA	Percent	Percent	Million	Million	Million	EA	Million	EA	Million	EA	Million	EA	Million	EA	Million
Alameda	206	146	60	51	78	65	23	32%	11%	78	313	19	16	203	40	67	25	43	5	9	2	10
Alpine	10	5	5	52	68	4	3	40%	30%	68	2	1	1	2	1	0	1	0	0	0	0	0
Amador	41	14	27	61	66	18	9	44%	22%	66	6	13	6	9	11	3	10	6	0	0	0	0
Butte	295	129	166	66	71	133	51	45%	17%	71	118	79	16	109	62	17	58	44	23	23	0	0
Calaveras	69	32	37	62	70	25	17	36%	25%	70	17	15	6	12	11	2	14	14	4	1	0	0
Colusa	149	34	115	52	82	37	11	25%	7%	82	24	14	5	5	22	6	6	23	7	3	0	0
Contra Costa	305	204	101	47	81	99	17	32%	6%	81	113	15	4	52	46	30	33	37	2	2	3	6
Del Norte	27	10	17	43	79	9	3	33%	11%	79	1	4	1	2	6	1	1	1	1	1	0	0
El Dorado	89	37	52	59	66	35	24	39%	27%	66	7	39	7	10	16	3	33	27	0	0	0	0
Fresno	489	220	269	61	76	205	47	42%	10%	76	74	59	12	22	73	19	52	61	32	26	0	0
Glenn	171	48	123	69	73	74	23	43%	13%	73	83	66	11	114	21	3	18	22	11	6	0	0
Humboldt	168	62	106	55	69	64	41	38%	24%	69	58	121	13	80	44	12	47	68	9	11	1	6
Imperial	131	63	68	62	74	50	20	38%	15%	74	41	19	10	45	11	6	6	5	0	0	1	1
Inyo	34	14	20	53	80	12	2	35%	6%	80	0	4	2	2	7	1	1	1	0	0	0	0
Kern	295	189	106	47	83	84	11	28%	4%	83	135	19	7	41	35	51	21	36	3	5	2	21
Kings	99	33	66	57	82	32	1	32%	1%	82	8	8	1	1	9	5	4	9	1	1	0	0
Lake	80	23	57	54	72	39	9	49%	11%	72	7	30	5	10	22	4	13	13	7	8	0	0
Lassen	65	17	48	49	73	29	7	45%	11%	73	3	17	4	10	8	1	8	5	1	1	0	0
Los Angeles	1,474	1,143	331	57	84	460	39	31%	3%	84	784	119	15	205	196	218	197	403	3	8	6	59
Madera	156	33	123	49	81	36	17	23%	11%	81	15	32	11	27	14	8	9	8	2	1	0	0

Estimated Detail Local Agency Needs Summary (page 2 of 3)

County Name	Number of Bridges	On-System Bridges	Off-System Bridges	County Average Age	County Average Sufficiency Rating	County Structures with 50 ≤ SR ≤ 80	County Structures with SR < 50	Percent of Structures with 50 ≤ SR ≤ 80	Percent of Structures with SR < 50	Total Bridge Need	Total On-System Need	Total Off-System Need	Number of Bridge Replacements	Total Bridge Replacement Cost	Number of Bridge Rehabilitations	Total Bridge Rehabilitation Cost	Number of Bridge Widen	Total Bridge Widen Cost	Number of Scour	Total Bridge Scour Cost	Number of Bridge Seismic Retrofits	Total Bridge Seismic Retrofit Cost
	EA	EA	EA	Years	SR	EA	EA	Percent	Percent	Million	Million	Million	EA	Million	EA	Million	EA	Million	EA	Million	EA	Million
Marin	111	69	42	66	72	50	15	45%	14%	72	23	21	8	22	10	2	23	14	6	4	0	0
Mariposa	53	18	35	61	68	20	13	38%	25%	68	2	25	6	12	16	3	15	11	0	0	0	0
Mendocino	137	35	102	52	70	65	26	47%	19%	70	28	83	6	19	38	10	52	58	7	15	1	4
Merced	314	131	183	57	75	155	23	49%	7%	75	44	54	9	22	77	21	19	15	12	25	1	14
Modoc	50	23	27	53	86	13	2	26%	4%	86	1	2	1	1	3	1	1	0	2	1	0	0
Mono	13	6	7	60	74	5	2	38%	15%	74	3	2	2	4	0	0	1	1	0	0	0	0
Monterey	144	34	110	56	67	55	38	38%	26%	67	70	153	7	76	35	25	47	110	1	4	0	0
Napa	107	59	48	65	73	41	19	38%	18%	73	55	29	12	38	14	12	25	27	2	8	0	0
Nevada	58	22	36	55	73	19	10	33%	17%	73	13	21	6	14	9	4	8	15	0	0	0	0
Orange	526	427	99	48	83	163	26	31%	5%	83	112	42	4	18	57	72	66	64	0	0	0	0
Placer	181	98	83	49	77	54	26	30%	14%	77	19	30	4	6	19	6	32	30	4	5	0	0
Plumas	92	14	78	59	71	50	12	54%	13%	71	0	46	0	0	25	4	20	31	9	10	0	0
Riverside	462	319	143	39	86	103	18	22%	4%	86	220	31	11	39	45	60	33	52	7	35	4	65
Sacramento	448	287	161	46	82	120	21	27%	5%	82	188	27	4	23	38	31	44	114	5	46	0	0
San Benito	47	29	18	49	69	14	14	30%	30%	69	37	11	5	39	11	2	11	7	0	0	0	0
San Bernardino	499	407	92	54	76	134	92	27%	18%	76	364	23	36	201	89	77	53	77	3	14	5	7
San Diego	542	353	189	45	85	141	14	26%	3%	85	172	89	6	90	65	68	52	64	2	17	1	22
San Francisco	27	20	7	56	75	14	3	52%	11%	75	12	1	0	0	8	4	8	9	0	0	0	0
San Joaquin	330	163	167	55	81	93	27	28%	8%	81	175	30	8	92	50	36	38	59	9	18	0	0
San Luis Obispo	202	91	111	55	75	80	26	40%	13%	75	45	47	8	21	43	9	52	44	6	14	0	0

Estimated Detail Local Agency Needs Summary (page 3 of 3)

County Name	Number of Bridges	On-System Bridges	Off-System Bridges	County Average Age	County Average Sufficiency Rating	County Structures with 50 ≤ SR ≤ 80	County Structures with SR < 50	Percent of Structures with 50 ≤ SR ≤ 80	Percent of Structures with SR < 50	Total Bridge Need	Total On-System Need	Total Off-System Need	Number of Bridge Replacements	Total Bridge Replacement Cost	Number of Bridge Rehabilitations	Total Bridge Rehabilitation Cost	Number of Bridge Widen	Total Bridge Widen Cost	Number of Scour	Total Bridge Scour Cost	Number of Bridge Seismic Retrofits	Total Bridge Seismic Retrofit Cost
	EA	EA	EA	Years	SR	EA	EA	Percent	Percent	Million	Million	Million	EA	Million	EA	Million	EA	Million	EA	Million	EA	Million
San Mateo	144	95	49	58	72	67	27	47%	19%	72	427	40	21	49	29	53	26	364	1	1	0	0
Santa Barbara	190	120	70	45	80	65	13	34%	7%	80	59	19	6	7	25	12	25	29	3	14	1	16
Santa Clara	475	312	163	53	78	168	47	35%	10%	78	199	32	12	86	74	69	68	63	8	9	0	0
Santa Cruz	101	42	59	59	65	43	24	43%	24%	65	58	63	17	52	28	12	28	40	5	7	1	9
Shasta	284	96	188	55	78	109	26	38%	9%	78	21	82	7	27	43	10	54	52	10	11	0	0
Sierra	32	9	23	53	68	17	7	53%	22%	68	12	9	1	10	15	3	8	9	0	0	0	0
Siskiyou	177	52	125	50	79	49	17	28%	10%	79	14	38	9	18	36	7	21	19	6	4	0	0
Solano	205	103	102	42	85	54	9	26%	4%	85	29	8	4	9	19	9	10	8	1	3	1	9
Sonoma	443	217	226	56	75	199	47	45%	11%	75	207	146	21	84	71	32	100	157	21	38	3	40
Stanislaus	245	104	141	72	71	127	31	52%	13%	71	144	57	8	42	70	37	43	60	13	28	1	18
Sutter	90	25	65	58	73	33	17	37%	19%	73	32	16	10	11	11	3	10	10	2	25	0	0
Tehama	304	104	200	60	72	124	59	41%	19%	72	112	146	20	154	40	7	66	63	24	27	0	0
Trinity	98	29	69	42	78	33	10	34%	10%	78	3	26	4	5	22	6	12	14	5	2	0	0
Tulare	406	112	294	65	76	171	31	42%	8%	76	36	52	7	28	57	15	44	39	11	6	0	0
Tuolumne	55	15	40	66	66	23	15	42%	27%	66	10	17	3	10	19	5	22	11	2	1	0	0
Ventura	192	119	73	51	83	59	7	31%	4%	83	96	6	1	60	14	13	20	26	1	3	0	0
Yolo	126	34	92	60	77	44	13	35%	10%	77	30	28	5	23	16	8	16	21	3	5	0	0
Yuba	76	31	45	63	71	25	17	33%	22%	71	6	26	2	3	16	3	20	22	2	2	0	0
Total Sum:	**12,339**																					

Note: Detailed estimations are extracted from statewide needs global analysis. Actual individual bridge needs within a county provided here is an approximation with possible variation of ±25%.