ARIZONA DEPARTMENT OF TRANSPORTATION

JUNE 2025

Transportation Asset Management Plan

Arizona Department of Transportation

Transportation Asset Management Plan

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Respectfully Submitted:

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Section 1 Executive Summary

Arizona's economic competitiveness, quality of life, and travel safety depend on the effective management of the State's highway assets. This risk-based Transportation Asset Management Plan (AMP) outlines a systematic approach for maintaining and improving the Arizona Department of Transportation's (ADOT) bridges and pavements. The goal is to develop data-driven investment strategies to achieve a state of good repair (SOGR) over the life cycle of these assets, using asset management principles. These asset management practices ensure that ADOT can maintain a reliable and efficient transportation network, ultimately enhancing Arizona's economic competitiveness, quality of life, and the safety of the traveling public.

The development of the 2025 ADOT AMP focused on creating implementation strategies that integrate seamlessly into the planning to programming (P2P) process, align closely with the Five-Year Transportation Facilities Construction Program, and support State Transportation Improvement Plan (STIP) development. The objective is to deliver the investment strategies planned in this AMP as closely as possible, ensuring alignment with the AMP's goals while addressing challenges in planning, programming, and project delivery. Throughout the development of this AMP, the Asset Management Team collaborated with various stakeholders to establish a consensus-driven process that supports these strategies.

The implementation approach aims to achieve the following objectives:

- Enhance visibility across the agency
- Track major changes to minimize their impact on planned investments
- Ensure that AMP investment strategies are fully integrated into programming processes

1.1 Asset Management Objectives

This AMP is a comprehensive blueprint for extending the life of Arizona's highway system while maintaining reliable performance and minimizing long-term costs. The AMP supports ADOT's mission, vision, and values outlined in the 2025–2029 Strategic Plan.

ADOT's objectives for transportation asset management are to:

- Develop a collaborative process that integrates the efforts of all stakeholders, including data managers, engineers, planners, financial specialists, and executives, in managing ADOT's transportation assets.
- Maintain a safe and reliable level of service that can be efficiently sustained over the life cycle of network assets, ensuring a SOGR.
- Factor risk, resilience, and weather adaptation into asset management planning.

- Communicate financial needs for maintaining the highway system in a SOGR to transportation stakeholders.
- Provide information and technical assistance to local jurisdictions to support their management of National Highway System (NHS) bridges and pavements.
- Use Arizona Management System (AMS) principles and practices to improve transparency, accountability, and decision-making in managing ADOT's transportation assets.

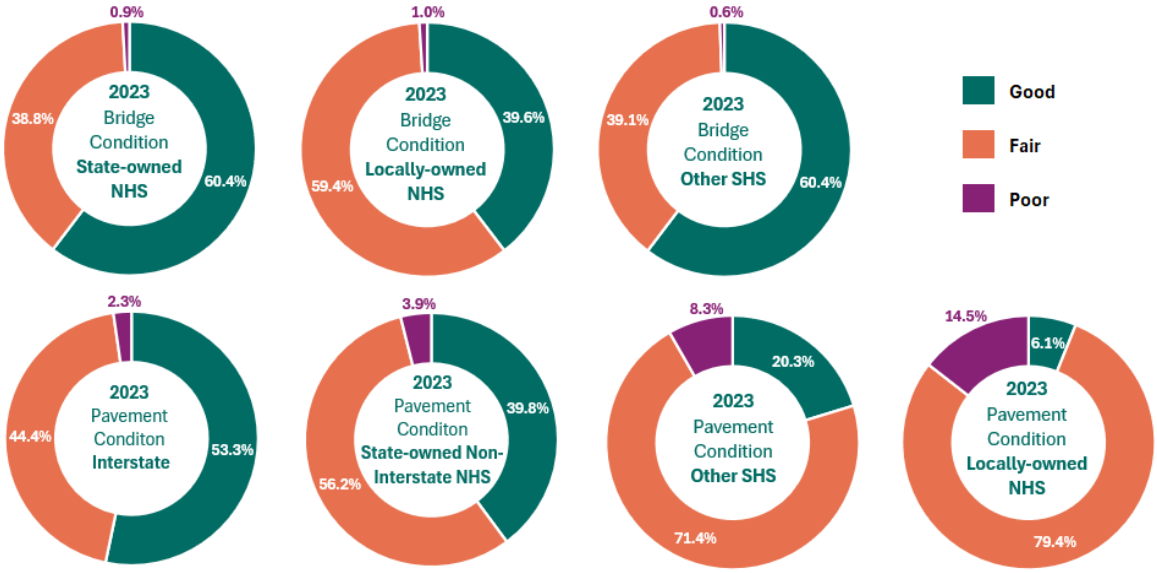
1.2 Factors Influencing Infrastructure Management

Arizona's continued population growth and aging infrastructure present significant challenges for the state's highway assets. The projected increase in traffic, particularly from commercial trucks, will accelerate pavement and bridge deterioration, requiring substantial investment in maintenance and rehabilitation. Approximately 50 percent of bridges and 63 percent of pavements on the State Highway System (SHS) are over 50 years old, with many approaching the end of their service life by 2034. Additionally, rising treatment costs from 2021 for both bridges and pavements—up to 416 percent for bridge treatments and 230 percent for pavement treatments—compound the issue. While ADOT meets federal performance targets, projections indicate the risk of falling short on pavement conditions, especially on the Interstate network, if funding remains flat. ADOT plans to address these challenges by increasing investments in low-cost preservation treatments and exploring alternative funding allocations to maintain performance levels.

1.3 Asset Inventory and Condition

ADOT owns and operates all bridges and culverts on the SHS, as well as most of the structures on the NHS. Local governments are responsible for the remaining bridges and culverts on the NHS. This AMP covers a total of 5,112 bridges, of which 3,282 are located on the NHS. It also covers 21,578 lane miles of pavement owned and managed by both ADOT and local agencies. The Arizona NHS constitutes about 60 percent of the SHS, and ADOT is responsible for maintaining all pavement on the SHS, including the state-owned NHS. Most of these assets are currently in Good or Fair condition, as shown on **Figure 1-1**.

Figure 1-1 | **2023 Bridge and Pavement Condition**



1.4 Federal Performance Targets and State of Good Repair

As required by the federal performance management rules for NHS bridges and pavements (23 Code of Federal Regulations (CFR) 490.105), ADOT has formally established performance targets based on current and historical conditions and projected funding. These targets comprise two bridge and four pavement measures as shown in **Table 1-1**.

Table 1-1 | **ADOT Bridge and Pavement Performance Targets**

Performance Measures	2023 Target (%)	2023 Performance (%)	2025 Target (%)
Percent of NHS bridges classified as in Good condition	52.0	59.0	52.0
Percent of NHS bridges classified as in Poor condition	4.0	0.9	4.0
Percent of Interstate pavements in Good condition	44.0	53.3	44.0
Percent of Interstate pavements in Poor condition	2.0	2.3	4.5
Percent of non-Interstate NHS pavements in Good condition	28.0	32.0	28.0
Percent of non-Interstate NHS pavements in Poor condition	6.0	6.1	10.0

Key: NHS = National Highway System

ADOT's SOGR for bridges and pavements establishes a safe and reliable level of service that can be efficiently sustained over the life cycle of network assets. The SOGR is expressed as targets that represent an acceptable level of performance at the end of the 10-year life of the AMP. As assets age, an increased rate of deterioration is inevitable and difficult to manage with limited funding. At ADOT, insufficient transportation revenues have necessitated both the shifting of

resources from highway expansion to asset preservation and the establishment of realistic SOGR targets that reflect the declining condition of the SHS's bridges and pavements (see **Table 1-2**).

Table 1-2 | **Desired Long-Term State of Good Repair for Bridges and Pavements**

Asset Class	Network	Minimum % Good/Fair	Maximum % Poor
Bridges	NHS	96	4
	State Highway System	96	4
Pavements	Interstates	95	5
	Other NHS – State Maintained	90	10
	Other NHS – Locally Maintained	-	-
	Non-NHS – High Volume	90	10
	Non-NHS – Low Volume	85	15

1.5 Risk Management

ADOT maintains the Asset Management Risk Register that identifies risks, assigns ratings, defines ownership, and provides a high-level overview of recommended mitigation strategies. While this AMP focuses on bridges and pavements, risk analysis also considers other assets within the transportation network. This AMP identifies 35 risks, with 15 categorized as high or very high priority.

Risks Categorized as "Very High" Include:

- Failure to deliver the investment strategies outlined in the AMP
- Inadequate funding to maintain the existing system in a SOGR
- Changing legislation
- Extreme weather trends
- Construction/materials price volatility

Per 23 CFR Part 667, ADOT is providing an update on three locations where pavement and bridge assets have been repeatedly damaged by emergency events, along with mitigation measures undertaken to prevent impacts from future events. These locations are:

- State Route (SR) 89A, Mileposts (MPs) 375 to 399. Erosion due to storm events.
- SR 88, MPs 197 to 240. Damaged drainage infrastructure.
- US 89, MPs 422 to 432. Multiple fires resulted in increased stormwater runoff, damaging drainage and roadway structures.

No new repeated emergency events were identified in calendar year 2024.

1.6 Life Cycle Scenarios

Life cycle planning (LCP) is a systematic process that identifies the most effective options to preserve or improve the condition of an entire asset class or across multiple asset classes, at the minimum practical cost. The LCP analysis evaluates various combinations of work types—maintenance, preservation, rehabilitation, and reconstruction—over the entire life cycle of assets in the network to compare the impact of different investment strategies on asset condition and system performance. The analysis was conducted using AASHTOWare BrM 6.0 Bridge Management System (BrM) and the Deighton dTIMS Pavement Management System (PMS) software.

Bridge LCP Scenarios

- **Bridge Group Allocation:** This allocation maintains bridges at a steady-state condition based on actual expenditures and condition data.
- **BrM Allocation:** Emphasizes preservation treatments by focusing on keeping bridges in Good condition with minimal cost.

Pavement LCP Scenarios

- **Baseline:** This scenario reflects ADOT's historical practices, with approximately 12 percent of pavement funding allocated to preservation activities, while most the funding is directed toward rehabilitation and reconstruction.
- **dTIMS Optimization:** This scenario utilizes decision trees to select the most cost-effective treatments for managing the pavement network, aiming to maximize the cost-benefit ratio.
- **Increased Heavy Preservation:** This scenario follows the Pavement Section and the 2023 Long-Range Transportation Plan's recommendation to increase heavy preservation treatments to a realistically implementable level, aligned with ADOT's project development and programming processes.

1.7 Investment Strategies

Based on the expected funding available for managing pavements and bridges over the next 10 years, the results of the LCP, and consideration of risks, ADOT has identified investment strategies for preserving the performance of bridges and pavements to maintain a SOGR.

1.7.1 Recommended Bridge Investment Strategy

The most cost-effective strategy focuses on low-cost preservation treatments to maximize asset life, allowing funding to be spread across more assets. However, state law requires annual updates to the Five-Year Facilities Construction Program, which limits flexibility in the early years. To balance these constraints, ADOT selected a scenario that preserves the early years of the program while maintaining the target allocation for preservation, rehabilitation, and

reconstruction. Due to significant bridge construction inflation over the past four years, some funding has been redirected from preservation to ensure essential projects proceed. ADOT's long-term goal is to return to the preservation-focused approach outlined in the 2021 AMP.

Table 1-3 and **Table 1-4** show the annual planned investment, SOGR target, and projected condition at the beginning of 2034 for the planned investment strategy.

Table 1-3 | **Planned Bridge Annual Investment by ADOT Over the 10-year Period from FY 2025-FY 2034 ($Millions)**

Year ($Millions)	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	Total
NHS (INCLUDING STATE AND LOCAL NHS)											
Initial Construction	265.7	0.0	0.0	23.5	0.0	0.0	0.0	0.0	0.0	0.0	289.2
Maintenance	3.3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	25.8
Preservation	2.0	15.1	0.3	0.0	0.8	8.4	8.4	8.4	8.4	8.4	60.2
Rehabilitation	26.8	5.1	20.1	13.2	9.3	13.5	13.5	13.5	13.5	13.5	142.0
Reconstruction	28.6	111.0	64.9	55.8	20.0	10.5	10.5	10.5	10.5	10.5	332.7
Total NHS	326.4	133.7	87.7	95.0	32.6	34.9	34.9	34.9	34.9	34.9	849.9
State Highway System (INCLUDING NHS AND NON-NHS)											
Initial Construction	322.6	0.0	85.0	28.8	0.0	0.0	0.0	0.0	0.0	0.0	436.4
Maintenance	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	35.5
Preservation	2.0	15.1	0.3	2.1	8.8	12.0	12.0	12.0	12.0	12.0	88.3
Rehabilitation	49.8	14.1	20.1	18.1	23.3	27.0	27.0	27.0	27.0	27.0	260.4
Reconstruction	235.6	180.9	64.9	113.8	27.9	21.0	21.0	21.0	21.0	21.0	728.0
Total SHS	614.0	213.6	173.7	166.3	63.5	63.5	63.5	63.5	63.5	63.5	1,548.6

Key: FY = fiscal year, NHS = National Highway System, SHS = State Highway System

Table 1-4 | **Projected Bridge Conditions at the Beginning of 2034**

	Percentage of Good Bridge Sq. Ft.		Percentage of Poor Bridge Sq. Ft.	
	TARGET MINIMUM % GOOD/FAIR	PROJECTED % GOOD/FAIR (YEAR 10)	TARGET % POOR	PROJECTED % POOR (YEAR 10)
National Highway System	96.0	97.1	4.0	2.9
State Highway System	96.0	96.3	4.0	3.9

Key: sq. ft. = square feet

Since bridge planning is a long-term process, consistency between AMP investment strategies and actual expenditures for each work type is generally maintained. However, to improve the current process, a fourfold strategy is presented below:

- **Multiyear Planning:** The Bridge Group and P2P process will create a fully loaded four-year bridge rehabilitation and reconstruction plan aligned with the AMP strategy. The Asset Management Team will collaborate with the Bridge Group to review funding for preservation, rehabilitation, and reconstruction.
- **Planning-Level Scoping:** The Bridge Group will define projects and ensure accurate scope, schedule, and budget estimates at the planning level. This ensures alignment with the AMP bridge investment strategy for the analysis period.
- **Program Review for Funding Sources:** The Asset Management Team will identify bridges funded by sources outside the bridge subprogram. These projects, often related to expansion, will be included in the bridge investment strategy.
- **Early Project Development:** The Bridge Group will prepare backup projects for each work type to replace canceled or moved projects, ensuring program continuity.

1.7.2 Recommended Pavement Investment Strategy

The evaluation of various investment strategies indicated that ADOT was at risk of exceeding the Federal Highway Administration (FHWA) minimum condition of 5 percent of Interstate pavements in Poor condition by the end of the analysis period. This triggered the evaluation of additional investment strategies to meet federal requirements for the interstates, while maintaining the remainder of the NHS and SHS transportation networks in the best condition possible. Therefore, the investment strategy focuses on shifting the risk from the high-priority networks in the NHS to the lower-priority non-NHS networks included in this AMP. To achieve this, four key strategies will be implemented:

- Three-Subprogram Approach
- Increased Preservation Treatments
- Interstate Focus
- Focused Low-Volume Management

Table 1-5 and **Table 1-6** show the annual planned investment, SOGR target, and projected condition at the beginning of 2034 for the recommended investment strategy.

Table 1-5 | **Planned Pavement Annual Investment by ADOT Over the 10-Year Period from FY 2025-2034 ($Millions)**

Year ($Millions)	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	Total
NHS (EXCLUDING LOCAL NHS)											
Initial Construction	1,653.9	351.5	206.2	312.9	212.2	0.0	0.0	0.0	0.0	0.0	2,736.7
Maintenance	17.1	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	233.1
Preservation	52.7	20.2	30.4	30.8	37.6	44.4	44.4	44.4	44.4	44.4	394.0
Rehabilitation	493.8	330.9	312.0	321.2	293.9	284.8	284.8	284.8	284.8	284.8	3,175.7
Reconstruction	0.0	0.0	0.0	27.3	55.5	0.0	0.0	0.0	0.0	0.0	82.8
Total NHS	**2,217.5**	**726.7**	**572.6**	**716.2**	**623.2**	**353.2**	**353.2**	**353.2**	**353.2**	**353.2**	**6,622.3**
Other Highway System (NON-NHS)											
Initial Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance	2.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	29.4
Preservation	23.3	30.6	21.7	32.6	37.1	41.7	41.7	41.7	41.7	41.7	353.6
Rehabilitation	77.9	60.4	78.0	30.2	18.0	71.2	71.2	71.2	71.2	71.2	620.5
Reconstruction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Non-NHS	**103.7**	**94.0**	**102.7**	**65.8**	**58.1**	**115.9**	**115.9**	**115.9**	**115.9**	**115.9**	**1,003.5**
Total Pavement Spending	**2,321.1**	**820.6**	**675.3**	**782.0**	**681.3**	**469.1**	**469.1**	**469.1**	**469.1**	**469.1**	**7,625.8**

Key: FY = fiscal year; NHS = National Highway System

Table 1-6 | **Projected Pavement Conditions at the Beginning of 2034**

		% Good Pavement Miles		% Poor Pavement Miles	
	CLASS CATEGORY	**TARGET MINIMUM % GOOD/FAIR**	**PROJECTED % GOOD/FAIR (YEAR 10)**	**TARGET MAXIMUM % POOR**	**PROJECTED % POOR (YEAR 10)**
NHS	Interstate	>95	95.3	<5	4.7
	Non-interstate NHS (State)	>90	78.2	<10	21.8
Non – NHS	High Volume	>90	79.7	<10	20.3
	Low Volume	>85	47.6	<15	52.4
MINIMUM Check: Percentage of interstates in Poor condition:				**4.7**	**Target: <= 5**

1.8 Local Public Agency Engagement

There are 39 local public agencies (LPAs) that manage 1,618 lane miles of pavement and 235 bridges on the NHS. ADOT continues to engage LPAs in developing a collaborative plan for information exchange and performance target setting to meet federal requirements. This engagement aims to raise awareness among LPAs about the AMP, its contents, and the analyses used to develop it, while providing information on recommended investments in LPA-owned NHS assets to maintain them at or above target condition. In 2025, a workshop was held with LPA representatives to support the following activities:

- Coordination of asset inventory, condition data, funding, and investment information
- Identification of projects for the STIP

1.9 Continuous Improvement

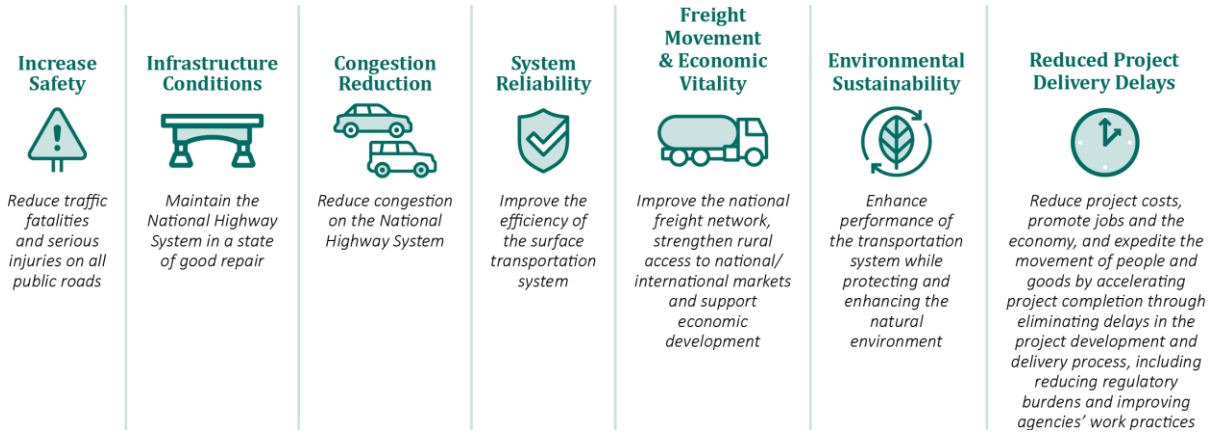
Based on the current state of transportation asset management (TAM) at ADOT and the gaps identified in TAM practice during the development of this document, the following opportunities for improvement have been identified for consideration:

- Review and update the BrM configuration, including network policy, treatment costs, and decision trees as needed. Additionally, update bridge deterioration models using the latest bridge condition inspection data. Once these models are updated, ADOT will continue calibrating its life cycle analysis to enhance the candidate project selection process. The PMS deterioration models, decision trees, and treatment costs were updated prior to this AMP update.
- Continue integrating the AMP process into the Long-Range Transportation Plan (LRTP), planning, and other processes. This includes working closely with various internal stakeholders to implement the strategies outlined in this AMP to support proposed investment strategies.
- Develop a process to effectively track regional and local expenditures within the NHS system. This process should include a clear methodology for capturing projects, their respective work types, and expenditures related to pavements or bridges. ADOT is currently developing an updated electronic STIP that will enable this information to be captured. It should also enable accurate reporting for the consistency determination and help identify any gaps or areas for improvement in the allocation of funds within the NHS system.
- Evaluate the benefits and applications of bridge and pavement preservation treatments to ensure their effective use.
- Collaborate with LPAs, including regional and metropolitan planning organizations (MPOs), to encourage and facilitate their participation in future AMP updates.
- Develop strategies to incorporate other highway asset classes into the AMP to enhance management practices.

Section 2 Introduction

Federal legislation has established seven national transportation system performance goal areas, as shown on **Figure 2-1**. TAM regulations associated with the *Infrastructure Conditions* goal require the development of a risk-based AMP covering NHS bridges and pavements. As defined in legislation, asset management is a strategic and systematic process of operating, maintaining and improving physical assets, with a focus on both engineering and economic analyses based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation and replacement actions that will achieve and sustain a desired SOGR over the life cycle of assets at the minimum practical cost.

Figure 2-1 | **National Transportation System Goal Areas**



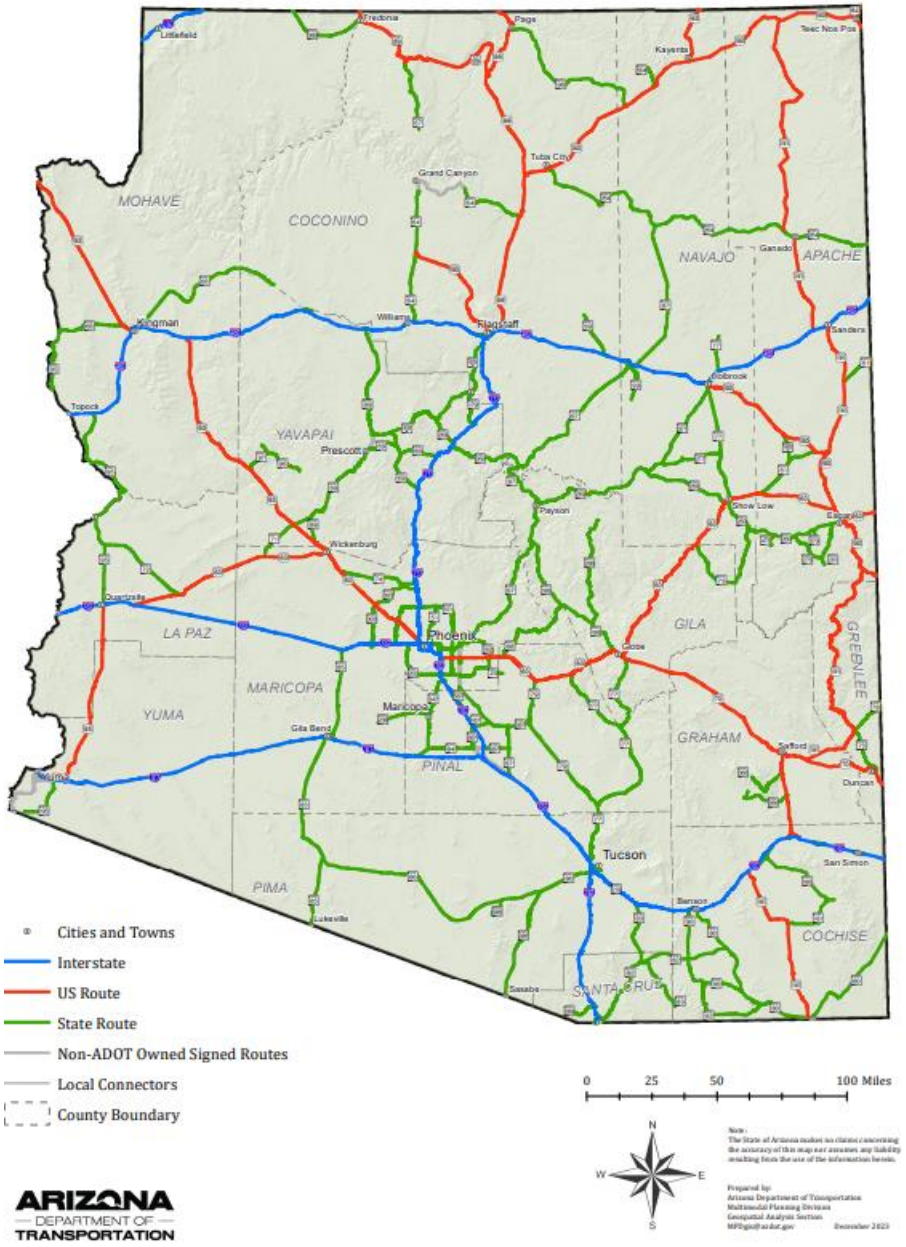
The required components of the AMP are:

- Asset management objectives
- A summary description of NHS bridge and pavement conditions
- Performance measures and targets for asset condition
- Risk management analysis
- A financial plan
- LCP
- Performance gap analysis
- Investment strategies

ADOT has elected to exceed the federal requirements for an AMP by including all the bridges and pavements on the Arizona SHS (**Figure 2-2**) and the NHS (**Figure 2-3**) in the AMP to align it with current state bridge and pavement management practices. Combined, these systems represent more than 21,000 lane miles and approximately 5,000 bridges. The NHS, developed by the U.S. Department of Transportation in conjunction with local, state, and MPOs, includes the Interstate Highway System and other roads important to the nation's

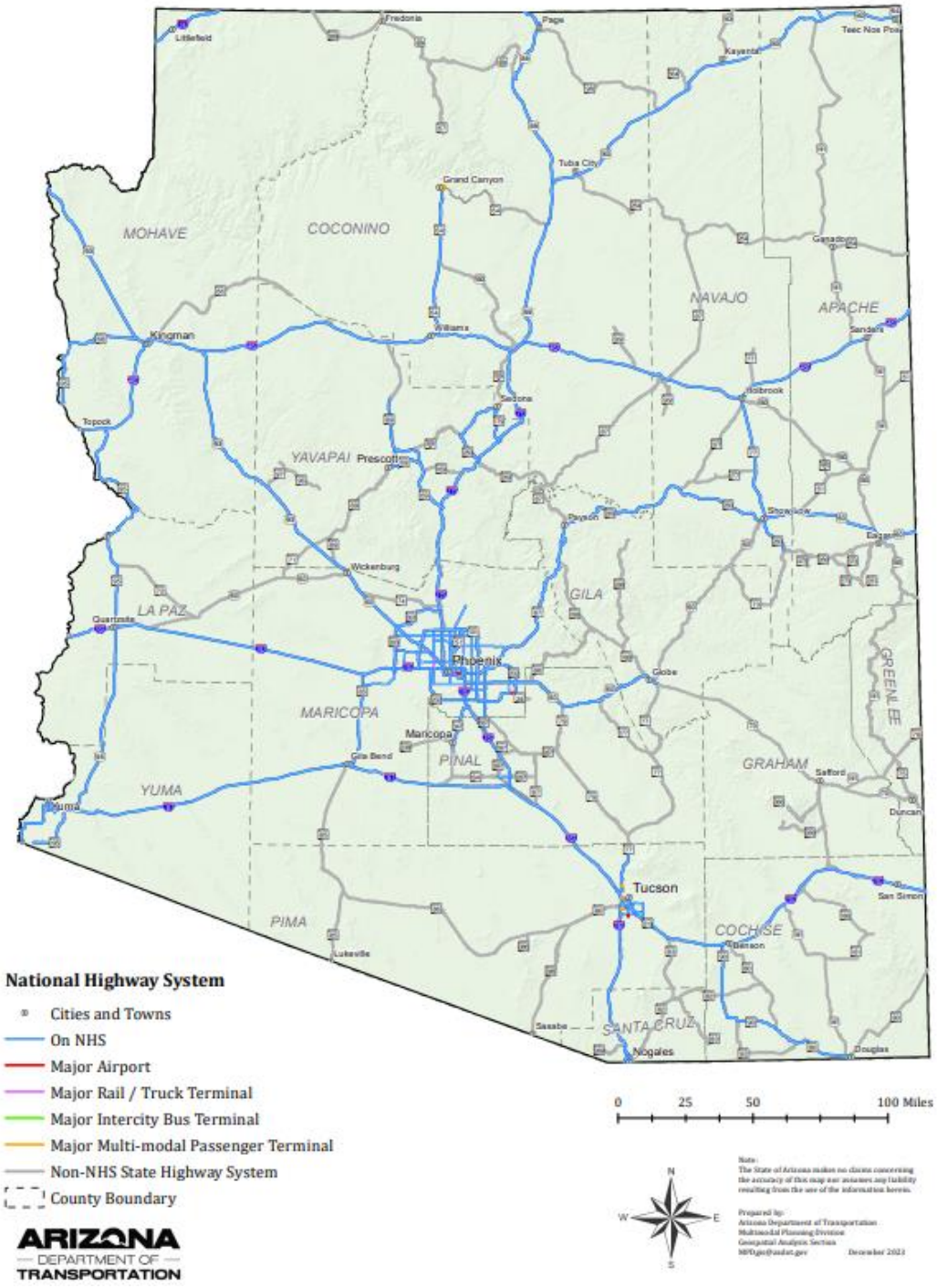
economy, defense, and mobility. Most of the NHS is part of the SHS. In Arizona, a small portion of the NHS routes are owned and operated by LPAs. Unless otherwise specified, references to the NHS in this report will include both the state and local portions.

Figure 2-2 | **Arizona State Highway System**



Source: 2023 Edition ADOT MAP Book
Link: azdot.gov/sites/default/files/2025-03/2023-ADOT-Map-Book.pdf

Figure 2-3 | **National Highway System in Arizona**



Source: 2023 Edition ADOT MAP Book.
Link: azdot.gov/sites/default/files/2025-03/2023-ADOT-Map-Book.pdf

The AMP covers a 10-year planning horizon, although some analyses extend beyond this period to support the development of ADOT's LRTP.

2.1 Asset Management Objectives

ADOT is responsible for the construction, operation, and management of the SHS, which includes more than 21,000 lane miles and about 5,000 bridges and has a historical value of about $25 billion. Over 50 percent of ADOT's bridge and pavement infrastructure will reach the end of its design life over the next 10 years. With proper preservation treatments, the life of this infrastructure can be extended. However, as Arizona's highway system ages, the resources needed to maintain it will increase. This makes identifying and implementing strategies that preserve existing assets while controlling costs essential to sustaining a balanced, fiscally sound state highway program.

This AMP is a comprehensive blueprint for extending the life of Arizona's highway system while maintaining reliable performance and minimizing long-term costs. The AMP supports ADOT's mission, vision, and values as outlined in the 2025–2029 Strategic Plan (**Figure 2-4**).

Figure 2-4 | **ADOT's Mission, Vision, and Values**

*Source: ADOT website. Link: **azdot.gov/about***

ADOT's objectives for TAM are to:

- Develop a collaborative process that integrates the efforts of all stakeholders, including data managers, engineers, planners, financial specialists, and executives, in managing ADOT's transportation assets.
- Maintain a safe and reliable level of service that can be efficiently sustained over the life cycle of network assets, ensuring a SOGR.
- Factor risk, resilience, and weather adaptation into asset management planning.
- Communicate financial needs for maintaining the highway system in a SOGR to transportation stakeholders.
- Provide information and technical assistance to local jurisdictions to support their management of NHS bridges and pavements.
- Use AMS principles and practices to improve transparency, accountability, and decision-making in managing ADOT's transportation assets.

2.2 Asset Management Oversight and Operating Structure

Developing and implementing TAM within ADOT is a major undertaking and requires involving staff throughout the agency. **Table 2-1** lists the committees responsible for the implementation of this effort. Although the asset management program is led and facilitated by the Multimodal Planning Division (MPD), numerous specialists from ADOT's planning, data management, risk management, finance, and other areas also participated in developing this AMP, as needed.

Table 2-1 | **ADOT Asset Management Committees**

Committee	Purpose	Membership
Asset Management Steering Committee	Sets the general direction for the AMP, including ensuring that TAM is integrated across the appropriate levels of the organization; approval of policies, programs, processes and performance targets necessary for the implementation of TAM; approval of the final AMP.	• Deputy Director for Transportation (State Engineer) • MPD Director • Infrastructure Delivery and Operations Division Director • Secretary (Transportation Asset Manager and/or Assistant Director for MPD)
Asset Management Working Group	Supports the implementation of the AMP, including developing performance measures and state targets to be reviewed for approval by the steering committee; identifies and prioritizes risks to ADOT's transportation infrastructure; recommends changes to policies, procedures and processes to improve TAM at ADOT; ensures different groups and sections within ADOT work together to accomplish the development and	• Transportation Asset Manager, Facilitator • Federal Highway Administration Arizona – Division Representative • Infrastructure Delivery and Operations Division Director • Assistant Director for MPD • Deputy State Engineer – Operations • Deputy State Engineer – Design

Committee	Purpose	Membership
	implementation of the AMP; reviews the draft AMP.	• Federal Aid Administrator – Financial Management Services • Bridge Group Manager • Pavement Management Section Manager
Asset Management Technical Teams	Supports the development of performance targets and the AMP; uses bridge and pavement management systems to perform gap and life cycle analysis that covers a range of funding scenarios; identifies investment strategies for the cost-effective management of these assets; assists with the development of the AMP.	**BRIDGE TECHNICAL TEAM** • Transportation Asset Manager, Facilitator • Assistant Asset Manager • State Bridge Engineer • Assistant State Bridge Engineer – Design • Assistant State Bridge Engineer – Operations • Bridge Management Systems Engineer • Financial Management Services Staff • Multimodal Planning Staff **PAVEMENT TECHNICAL TEAM** • Transportation Asset Manager, Facilitator • State Maintenance Engineer • Assistant Asset Manager • Pavement Management Engineer • Pavement Design Engineer • Financial Management Services Staff • Multimodal Planning Staff

Key: ADOT = Arizona Department of Transportation; AMP = Asset Management Plan; MPD = Multimodal Planning Division; TAM = Transportation Asset Management

2.3 Asset Management and the Planning Process

Over the last two decades, long-range transportation planning in Arizona has evolved from an emphasis on individual projects to a focus on policy to improve the overall transportation system performance. ADOT's 2050 LRTP uses performance measures and data-driven analyses to evaluate different investment scenarios to recommend the most effective allocation of resources for the expansion, modernization, and preservation of Arizona's highway system. To channel these high-level investment choices into the selection of specific projects, ADOT relies on the P2P process, which combines performance criteria with professional judgment to select and prioritize projects for ADOT's Five-Year Transportation Facilities Construction Program and the STIP.

The ability to implement performance-based planning is enhanced by improvements in collecting asset condition data, combined with the availability of sophisticated analytical tools that model future asset performance. Together, these developments make it feasible to evaluate a range of asset management planning scenarios to identify one that best meets

agency goals at a minimum practical cost. This AMP provides the analytical basis to support both high-level resource allocation decisions in LRTP updates and the development of asset-specific investment strategies to guide project selection under the P2P process. Over time, the incorporation of AMP findings in ADOT's performance-based planning process is expected to improve accountability and decision-making by:

- Providing feedback on progress toward performance targets; and
- Increasing transparency by showing how data and analysis inform funding recommendations.

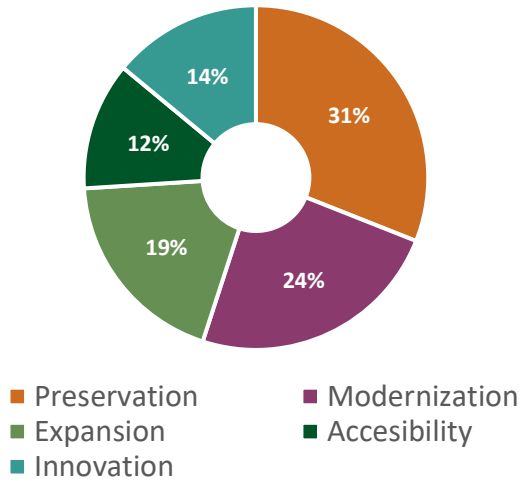
Local governments that own and operate NHS bridges and pavements are also involved in asset management planning through participation in the development of metropolitan transportation plans (MTPs) and transportation improvement programs (TIPs), and/or by working directly with ADOT to incorporate asset improvement projects in the STIP. ADOT has worked with Arizona's MPOs to develop a planning agreement that identifies how data collection, performance targets, and asset management planning will be coordinated and how each party will contribute. A template of the planning agreement is presented in **Appendix A**.

2.4 Public Support for Highway Preservation

Throughout ADOT's 2050 LRTP development, the ADOT worked collaboratively with various Arizona stakeholders, including MPOs and councils of government (COGs), Arizona Tribes, and Arizona residents. ADOT implemented an extensive public involvement process that included outreach sessions, workshops, a dedicated plan website, and the use of social media. These stakeholders played a key role in guiding and shaping the LRTP and were a significant consideration when formulating recommended investment choices. As illustrated on **Figure 2-5,** Arizona's citizens place the highest priority on preserving and maintaining the existing highway system.[1]

[1] Source: ADOT 2050 Long-Range Transportation Plan. Link: adot2050plan.com/

Figure 2-5 | **Public Investment Priorities Results**



2.5 Arizona Management System

AMS is a people-centered, results-driven approach to continuously improving state government, focusing on customer service, transparency, and accountability to the citizens of Arizona. AMS uses the principles of Lean Management to enable state government to operate effectively and efficiently by understanding customer needs, identifying problems, improving processes, and measuring results.

Arizona's AMP aligns well with this performance-based approach. This document outlines the resources needed to preserve both bridge and pavement assets, supporting the achievement of agency and national performance targets cost-effectively. The AMP is a living document that will be updated at least every four years, or with significant changes in any aspect of the asset management program. Initial and ongoing improvements to ADOT's Asset Management Program will utilize AMS principles, practices, and tools. The AMS can be viewed here: **ams.az.gov**.

In 2025, the deterioration models, treatment decision trees, and treatment costs in the PMS were updated. Additionally, the risk management section of the AMP was updated to place a greater emphasis on implementation and weather risks. The 2025 AMP focuses on implementing the proposed investment strategies to improve alignment with actual expenditures. Progress made in collaboration with internal stakeholders, including P2P, programming, and executives, led to recommendations on how these investment strategies will be delivered. These updates and improvements enable the agency to develop informed, data-driven investment strategies and performance targets.

Section 3 Asset Inventory and Condition

3.1 Introduction

ADOT regularly performs condition inspections of state-owned and, in some cases, locally owned roadway assets. This section summarizes the inventory and the condition of Arizona's SHS and NHS bridges and pavements.

3.2 Bridge Assets

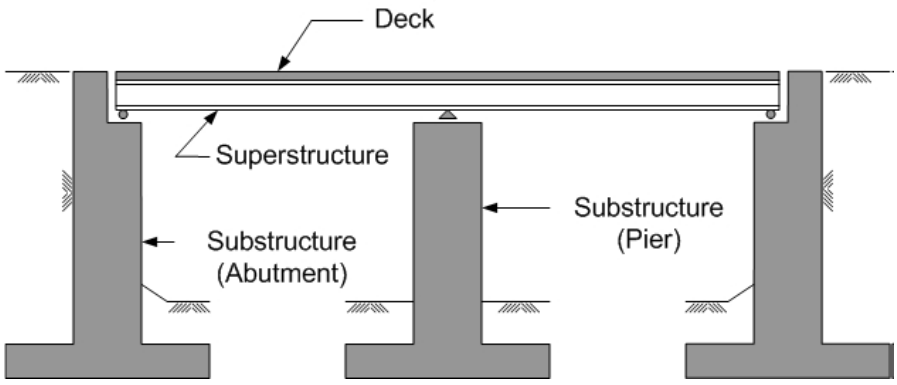
3.2.1 Bridge Data Management

ADOT inspects most of Arizona's publicly owned bridges, including all the bridges on the SHS and most of the bridges owned or operated by local governments. Routine bridge inspections occur every two years and include an assessment of the condition of a bridge's primary components: deck, superstructure, and substructure (**Figure 3-1**).

Culverts with openings measuring 20 feet along the centerline of the road are considered bridge structures and are inspected every four years. Culverts in Arizona are typically either a reinforced concrete box structure that supports the pavement (**Figure 3-2**), or steel or concrete pipes (**Figure 3-3**).

All bridge and culvert inspections are performed in accordance with ADOT's bridge inspection guidelines, which comply with the National Bridge Inspection Standards. ADOT's bridge inspection guidelines are referenced in **Appendix A**. These guidelines, along with bridge inspector training for ADOT staff and consultants, ensure consistent inspections that yield accurate and reliable data.

Figure 3-1 | **Schematic Bridge Elevation View**



Source: U.S. Department of Transportation 2012; FHWA Publication No. NHI 12-049

Figure 3-2 | **Box Culvert**

Figure 3-3 | **Pipe Culvert**

ADOT performs bridge inspections for all jurisdictions except Maricopa County Department of Transportation (DOT). **Appendix A** references an intergovernmental agreement between the State of Arizona and Maricopa County outlining bridge inspection standards, protocols, and coordination. For an agency to perform its bridge inspections, it must demonstrate compliance with the National Bridge Inspection Standards and submit quarterly progress reports and an annual electronic National Bridge Inventory (NBI) record to the ADOT. Border bridges with California and Nevada are inspected by Caltrans or the Nevada DOT under intergovernmental agreements with Arizona.

3.2.2 Monitoring Bridge Condition

The NBI component rating system is used to assess bridge general condition for deck, superstructure, and substructure. The culvert condition rating is based on the same scale, but rather than a component rating, there is one rating for the entire culvert. This rating system features a scale from 0 to 9. Each structure is assigned a Good, Fair, or Poor-condition designation (**Figure 3-4**) based on the lowest scoring component.

Figure 3-4 | **National Bridge Inventory Bridge Rating Scale**

These categories are defined as follows:

- **Good**. Primary structural components exhibit a range from no problems to some minor deterioration.
- **Fair.** Primary structural components are sound but may have deficiencies such as minor concrete deterioration (i.e., cracking, spalling, and scaling) or scour (i.e., erosion around piers or abutments caused by flowing water).

- **Poor.** Advanced deterioration, scour, or seriously affected primary structural components (**Figure 3-5** to **Figure 3-7**). Bridges in Poor condition need repair in addition to maintenance and monitoring and may be programmed for rehabilitation or replacement. The Poor-condition label does not necessarily mean that a bridge is unsafe. Bridges that are considered unsafe are closed until they can be repaired or replaced.

Figure 3-5 | **Cracking and Spalling on a Bridge Deck**

Figure 3-6 | **Scour at a Bridge Pier**

Figure 3-7 | **Scaling on a Bridge Deck**

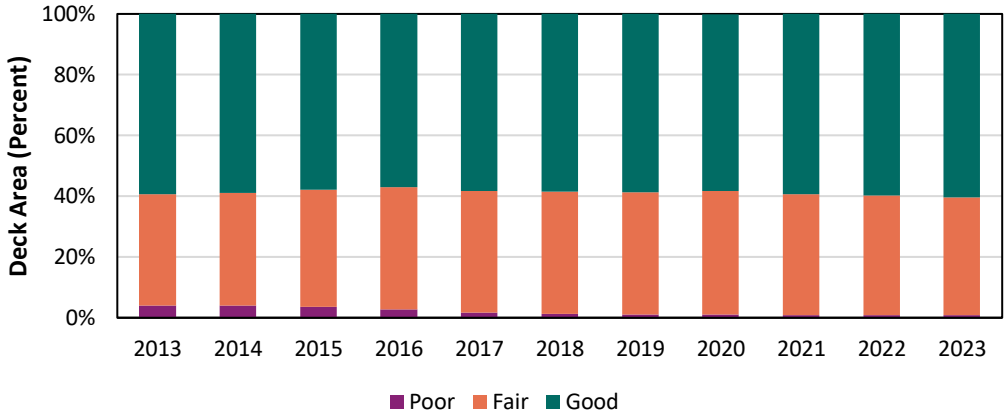
In addition to evaluating bridges at the component level, in 2014, ADOT began collecting more detailed element-level data during bridge inspections. Examples of bridge elements are railing, deck wearing surface, deck slab, expansion joint, bearing, column, and abutment. Element-level inspection data enables improved forecasting of deterioration and life cycle costs, which can result in better treatment selection.

Figure 3-8 shows the condition of Arizona's NHS bridges over the past 11 years. The number of bridges in Poor condition has steadily decreased over the past few years, driven by increased spending during this period, including bridge replacements associated with expansion projects.

Currently, more than 60 percent (by deck area) of the bridges on the Arizona SHS and NHS are in Good condition. As of 2023, less than one percent of Arizona's bridges are classified as Poor, placing it among the top states with the fewest Poor condition bridges. This is largely

due to Arizona's temperate climate and ADOT's focus on rehabilitating or replacing Poor-condition bridges.

Figure 3-8 | **State-Owned National Highway System Bridge Condition**



3.2.3 Bridge Inventory and Condition

ADOT owns and operates all the bridges and culverts on the SHS, and most of these structures on the NHS. Local governments own and operate the remaining bridges and culverts on the NHS. This AMP covers a total of 5,112 bridges, of which 3,282 are on the NHS. **Table 3-1** shows the breakdown of the bridge inventory included in this AMP by bridge network, and **Table 3-2** shows a breakdown of the locally owned NHS bridges. Each table also shows bridge condition as a percentage of deck area.

Table 3-1 | **2023 Arizona Highway System Bridges**

Bridge Owner	Number of Bridges	Bridge Deck Area (square feet) †	Good (%)	Fair (%)	Poor (%)
State-owned NHS Bridges	3,047	33,025,024	60.4	38.8	0.9
Locally owned NHS Bridges	235	2,320,940	39.6	59.4	1.0
Total NHS Bridges	3,282	35,345,964	59.0	40.1	0.9
Total Other SHS Bridges	1,830	13,256,445	60.4	39.1	0.6
Total Bridges Covered in the AMP	**5,112**	**48,602,409**	**59.4**	**39.8**	**0.8**

Source: ADOT 2023
*Notes: * Includes culverts with openings measuring 20 feet along the centerline of the road.*
† System-wide bridge condition ratings are reported by deck area to account for the variance in bridge size throughout the state.
Key: AMP = Asset Management Plan; NHS = National Highway System; SHS = State Highway System

Table 3-2 | **2023 Locally Owned National Highway System Bridges**

Bridge Owner	Number of Bridges	Bridge Deck Area (square feet)	Good (%)	Fair (%)	Poor (%)
Fountain Hills	1	3,300	100	0	0
Glendale	7	130,155	82.6	17.4	0
Goodyear	2	9,368	100	0	0
Marana	9	31,868	100	0	0
Maricopa Co	7	151,136	98.4	1.6	0
Mesa	9	182,430	12.3	87.7	0
Paradise Valley	1	2,176	100	0	0
Peoria	2	66,876	0	100	0
Phoenix	53	720,516	27.6	69.3	3.2
Pima Co	40	299,140	25.7	74.3	0
Scottsdale	16	93,008	45.2	54.8	0
Sierra Vista	4	13,872	55.9	44.1	0
Surprise	2	6,186	0	100	0
Tempe	2	9,400	0	100	0
Tucson	78	530,258	49.3	50.7	0
Yavapai Co	1	25,226	0	100	0
Yuma City	1	45,552	0	100	0
Total	**235**	**2,320,467**	**39.6**	**59.4**	**1.0**

3.3 Pavement Assets

3.3.1 Pavement Data Management

Historically, ADOT has performed annual pavement condition evaluations for state highways using in-house staff and equipment. ADOT used the FHWA Highway Performance Monitoring System (HPMS) Field Manual (2016) methodology to collect pavement data. Local governments were expected to collect pavement condition data for the NHS routes they own. However, ADOT was unable to consistently obtain this data. To resolve this problem, beginning in 2017, ADOT hired a contractor to perform automated pavement data collection for the entire SHS and the locally owned NHS. It is ADOT's intent to continue to collect pavement data for locally owned NHS routes in future years. This data will be made available to local NHS asset owners for their use. All data collected using the automated method is subject to a rigorous quality control review by ADOT's Pavement Management Section. A Data Quality Management Plan outlining pavement data collection and processing standards and procedures is available in **Appendix A**.

ADOT's pavement inventory consists of asphalt, concrete, and composite pavements. Each pavement type has a different life cycle and is managed differently. Descriptions are provided in **Table 3-3**.

Table 3-3 | **Pavement Type**

Pavement Type	Management
Asphalt	Constructed with petroleum-based bituminous materials and is commonly referred to as flexible pavement. More than 90 percent of the pavement on the SHS is asphalt. It can last 50+ years if properly maintained with periodic preservation and rehabilitation treatments.
Concrete	Consists of Portland cement concrete and is commonly referred to as rigid pavement. It may be constructed with or without joints to control cracking. Concrete pavement may or may not be reinforced with steel. Most of the concrete pavement on the SHS is jointed and unreinforced and can last 60+ years.
Composite	Consists of a foundation of concrete pavement overlaid with a 1-inch-thick open-graded asphalt rubber friction course. ADOT's open-graded asphalt has a high amount of air voids making the pavement water permeable and contains ground tire rubber to reduce road noise. Due to the high cost of pavement overlays, ADOT has begun removing the overlays and diamond grinding the concrete pavement below, resulting in a gradual decrease of composite pavements over time.

Key: ADOT = Arizona Department of Transportation; SHS = State Highway System

3.3.2 Pavement Condition Assessment Summary

Asphalt and composite pavement conditions are evaluated using three metrics: International Roughness Index (IRI), percent cracking, and rutting. Concrete pavement condition is evaluated using IRI, percent cracking, and faulting metrics. A description of these metrics is presented in **Table 3-4**.

Table 3-4 | **Pavement Condition Rating Metrics**

Metric	Description	Example
International Roughness Index	International method for measuring the smoothness (or roughness) of pavements. This measure is strongly correlated to ride quality.	
Cracking	A fissure or discontinuity of the pavement surface not necessarily extending through the entire thickness of the pavement. Cracking is generally caused by repeated traffic loads or pavement shrinkage due to low temperatures.	
Rutting*	Surface depressions that run lengthwise, usually in the wheel path, in an asphalt pavement. Rutting results from permanent deformation of any of the pavement layers or the subgrade. It is usually caused by the consolidation or lateral movement of the pavement materials due to heavy traffic loads.	
Faulting*	An elevation difference between two concrete slabs typically caused by poor load transfer between slabs, slab settlement or movement induced by erosion of material beneath the slab.	

*Note: * Photos taken from the 2016 Highway Performance Monitoring System Field Manual*

If the condition for all three applicable metrics is Good, then the pavement section is rated in Good condition. If two or more metrics are rated Poor, then the pavement section is rated in

Poor condition. All other rating combinations are Fair condition. **Table 3-5** shows the federal thresholds for these metrics.

Table 3-5 | **Federal Thresholds for Pavement Rating Metrics**

Condition Rating	Good	Fair	Poor
International Roughness Index (inches per mile)	<95	95-170	>170
Cracking (percent)	<5	5-20 (asphalt)	>20 (asphalt)
		5-15 (jointed concrete)	>15 (jointed concrete)
		5-10 (continuously reinforced concrete)	>10 (continuously reinforced concrete)
Rutting (inches)	<0.20	0.20 - 0.40	>0.40
Faulting (inches)	<0.10	0.10 - 0.15	>0.15

ADOT makes a significant investment in maintaining Interstate pavements. Historically, Interstate pavements have been in Good condition. The condition data shown on **Figure 3-9** and **Figure 3-10** covers the period from 2017 to 2023 due to the transition to automated data collection in 2017. Pre-2017 data is not comparable to the automated data since it was collected using a different method.

Figure 3-9 | **Interstate National Highway System Pavement Condition**

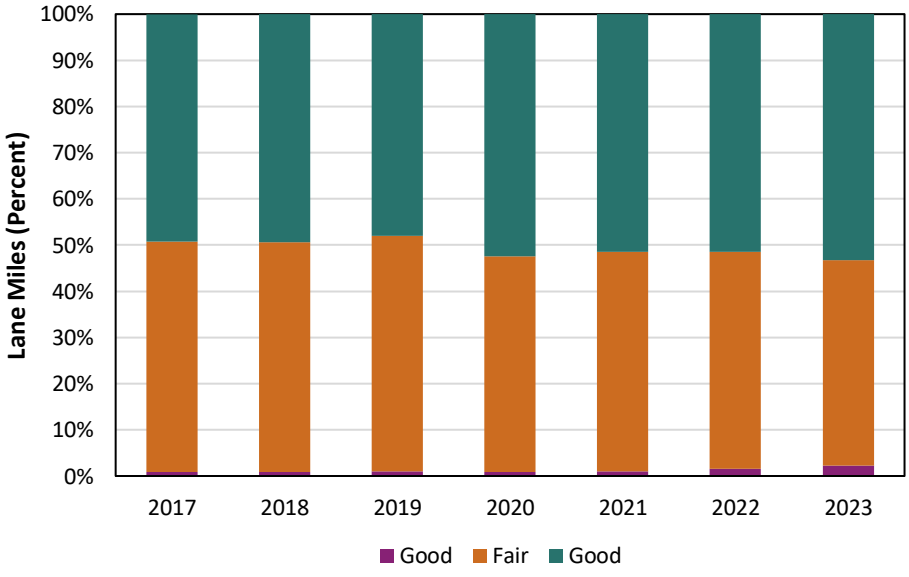


Figure 3-10 | **Non-Interstate National Highway System Pavement Condition**

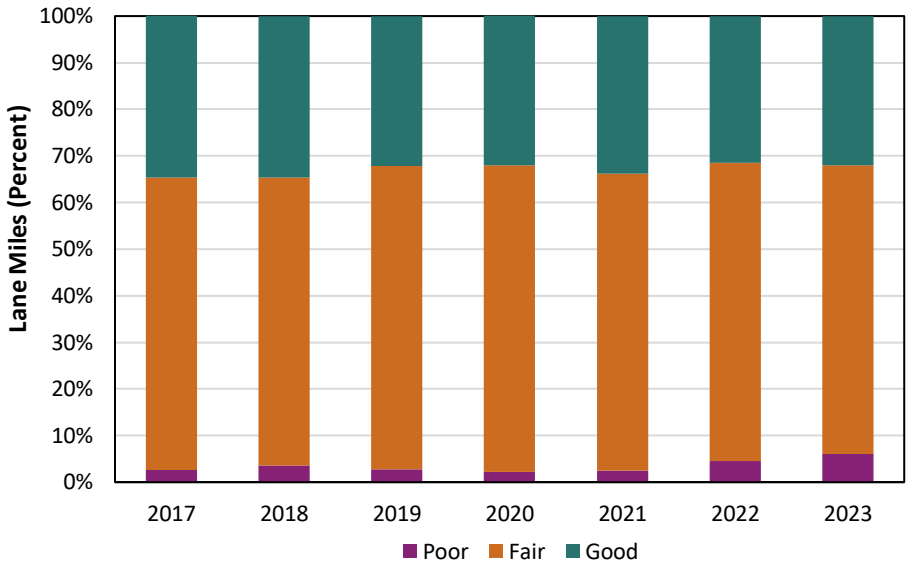


Figure 3-9 shows that more than 50 percent of the Interstate pavements have remained in Good condition over the past four years. There has been a slight increase in Poor condition, rising from 1 percent to just over 2 percent during the same period. Arizona's non-Interstate NHS pavements receive less funding than the Interstates, resulting in greater deterioration due to lower investment levels, as presented on **Figure 3-10**.

3.3.3 Pavement Inventory and Condition Summary

This AMP covers 21,578 lane miles of pavement, owned and managed by ADOT and local agencies. The Arizona NHS represents about 60 percent of the SHS. ADOT maintains all the pavement on the SHS, which includes the state-owned NHS. Local, tribal, and other government entities own and maintain pavement on about 13 percent of the NHS. The estimated 2023 lane miles for paved roads by asset category are shown in **Table 3-6** with the breakdown of the locally owned portion shown in **Table 3-7**. Each table also shows pavement condition as a percentage of lane miles.

As shown, slightly more than 50 percent of the Interstate pavements are classified as Good. Approximately 2 percent (2.3 percent) of Interstate pavements, 5 percent (4.6 percent) of ADOT-owned non-interstate NHS pavements, and 8 percent (8.3 percent) of Other SHS are classified as Poor. Locally owned NHS pavements are mostly in Fair condition, with approximately 15 percent (14.5 percent) in Poor condition.

Table 3-6 | **2023 Lane Mile Breakdown and Condition for Paved Roads**

Pavement Asset Category	Total Lane Miles	Good (%)	Fair (%)	Poor (%)
Interstate	5,237	53.3	44.4	2.3
State-Owned, Non-Interstate NHS	6,257	39.8	56.2	3.9
Locally Owned NHS	1,618	6.1	79.5	14.5
Total NHS Pavements	**13,112**	**40.9**	**54.4**	**4.6**
High Volume State-owned non-NHS (>= 5,000)*	1,620	26.2	68.6	5.2
Low Volume State-owned non-NHS (< 5,000)*	6,846	19.0	72.0	9.0
Other SHS Pavements	**8,466**	**20.3**	**71.4**	**8.3**
Total Pavements Covered in AMP	**21,578**			

*Note: *Average Annual Daily Traffic*

Key: AMP = Asset Management Plan; NHS = National Highway System; SHS = State Highway System

Table 3-7 | **2023 Locally Owned National Highway System Pavements**

Local Owner	Total Lane Miles	Good (%)	Fair (%)	Poor (%)
Bureau of Indian Affairs	10.2	-	15.7	84.3
Buckeye	4.3	-	100.0	-
Cocopah Tribal Council	5.6	28.6	71.4	-
Carefree	0.4	-	-	100.0
Chandler	56.5	0.7	90.8	8.5
Casa Grande	15.2	15.8	84.2	-
Cave Creek	2.4	-	50.0	50.0
Douglas	4.8	-	40.3	59.7
El Mirage	3.1	65.0	35.0	-
Flagstaff	9.5	9.6	90.4	-
Fountain Hills	21.1	8.5	89.1	2.4
Grand Canyon Airport Authority	0.6	-	100.0	-
Grand Canyon Nationa Park	18.9	47.5	52.5	-
Glendale	14.8	8.6	87.4	4.0
Goodyear	64.7	8.4	69.4	22.2
Kingman	14.3	25.1	74.9	-
Litchfield Park	5.1	47.5	52.5	-
Mesa	64.8	-	76.8	23.2
Maricopa County Department of Transportation	81.1	7.0	89.0	4.0
Peoria	22.6	17.7	54.8	27.4
Phoenix	614.8	1.1	81.9	16.9

Local Owner	Total Lane Miles	Good (%)	Fair (%)	Poor (%)
Pima County Department of Transportation	29.4	6.8	74.7	18.5
Prescott	2.9	52.0	48.0	-
Paradise Valley	20.0	2.0	82.3	15.7
Quartzite	7.5	-	68.0	32.0
San Luis	155.5	13.0	75.7	11.3
Scottsdale	8.6	-	95.4	4.6
Somerton	12.8	-	91.2	8.8
Salt River Indian Community	1.1	-	100.0	-
Surprise	32.0	5.6	94.4	-
Tempe	64.2	-	71.1	28.9
Tucson	118.5	6.7	81.3	11.9
Williams	1.9	-	100.0	-
Yuma	54.1	1.6	88.9	9.6
Yuma County Public Works	74.3	22.6	72.0	5.4
Total Locally Owned	**1,618**	**6.1**	**79.4**	**14.5**

3.4 Asset Performance Measures and Targets

In this AMP, performance measures and targets for managing bridges and pavements are the foundation for assessment, analysis, and planning. ADOT utilizes both short- and long-term performance metrics. The short-term metrics are federally required, while the long-term metrics are used to quantify the goal of achieving a SOGR for the SHS over 10 years. ADOT has developed dashboards to present bridge and pavement conditions interactively. These dashboards can be accessed on ADOT's Performance Management site.[2]

3.4.1 Federal Performance Measures – Bridges and Pavements

The federal performance management rules for bridges and pavements (23 CFR Part 490.105) require state DOTs to establish targets for six pavement and bridge measures of Good and Poor condition. In addition, the rule sets the following minimum condition requirements:

- The percentage of Interstate pavement lane miles in Poor condition shall not exceed 5 percent.
- The percentage of the deck area of NHS bridges classified in Poor condition shall not exceed 10 percent.

In 2021, ADOT formally adopted two- and four-year performance targets for the applicable bridge and pavement performance measures, based on current and historical conditions. Two-year performance was reported in September 2024, and ADOT missed the two-year

[2] ADOT's Performance Management
azdot.gov/planning/transportation-programs/performance-management

Poor-condition pavement targets for the Interstates and the non-Interstate NHS. In 2024, ADOT amended its Poor-condition targets. **Table 3-8** presents updated targets based on refined LCP processes using the improved management systems.

Table 3-8 | **ADOT Bridge and Pavement Performance Targets**

Performance Measure	2023 Target (%)	2023 Performance (%)	2025 Target (%)
Percent of NHS bridges classified as in Good condition	52.0	59.0	52.0
Percent of NHS bridges classified as in Poor condition	4.0	0.9	4.0
Percent of Interstate pavements in Good condition	44.0	53.3	44.0
Percent of Interstate pavements in Poor condition	2.0	2.3	4.5
Percent of non-Interstate NHS pavements in Good condition	28.0	32	28.0
Percent of non-Interstate NHS pavements in Poor condition	6.0	6.1	10.0

Key: NHS = National Highway System

3.4.2 State of Good Repair

ADOT's goal is to maintain the highway system in a SOGR. This concept is interpreted at both the asset and network levels.

- At the asset level, a SOGR means that the asset provides the desired level of service and is in sufficient condition to enable cost-effective maintenance and preservation.
- At the network level, a SOGR means a performance level that can be sustained at minimal long-term cost to the agency and to road users. This requires that maintenance and preservation are applied consistently and strategically, that risks are managed, and that performance deficiencies are corrected in a timely manner.

3.4.2.1 Bridges

ADOT considers its NHS bridge and culvert inventory to be in excellent condition, at the current level of 59.0 percent Good and 0.9 percent Poor. As ADOT's bridge inventory ages, the overall system condition is expected to decline, and ADOT's long-term performance targets consider this. The aging bridge inventory includes some large bridges, which are expected to deteriorate from Good to Fair condition in the coming years and have a proportionately large effect on overall system condition. Given the objectives listed previously and the age of the bridge network, ADOT has set 10-year targets of 96 percent Good/Fair and 4 percent Poor to maintain a SOGR (**Table 3-9**).

Table 3-9 | **Desired Long-Term State of Good Repair for Bridges**

Bridge Class	Minimum % Good/Fair	Maximum % Poor
National Highway System	>96	<4
State Highway System	>96	<4

3.4.2.2 Pavements

Limited funding has caused ADOT to prioritize pavements that carry high traffic volumes and are important for commerce and mobility. To accomplish this, the NHS was subdivided into three pavement classes (Interstates, Other NHS State-maintained routes, and Other NHS-Locally maintained routes); the non-NHS routes were subdivided into two pavement classes (high- and low-volume routes). **Table 3-10** presents the desired pavement SOGR for each pavement class, except the locally maintained class. This class accounts for such a small percentage of the total NHS that its performance is not expected to impact the NHS's desired long-term target. ADOT is in the process of engaging these agencies to develop a collaborative plan for data exchange and performance target setting that satisfies federal requirements.

Table 3-10 | **Desired Long-Term State of Good Repair for Pavements**

Pavement Class	Minimum % Good/Fair	Maximum % Poor
Interstates	>95	<5
Other NHS – State Maintained	>90	<10
Other NHS – Locally Maintained	-	-
Non-NHS – High Volume	>90	<10
Non-NHS – Low Volume	>85	<15

Key: NHS = National Highway System

Section 4 Risk Management

4.1 Overview

FHWA defines risk as ***"the positive or negative effect of uncertainty or variability on agency objectives."***

Risk management is defined as "the processes and framework for managing potential risks, including identifying, analyzing, evaluating, and addressing the risks to assets and system performance." (23 CFR Part 515.5) This section describes ADOT's risk policy and procedure, risk management process, and risk mitigation plans for high-priority risks for the entire state system (NHS and non-NHS). Additionally, this section summarizes an assessment of pavements and bridges repeatedly damaged by emergency events.

4.2 Risk Policy and Procedure

The foundation of risk-based asset management is an agency commitment to adopt policies and procedures that support the identification, analysis, and treatment of risks. A risk-based asset management process has many benefits, including the following:

- Reduce crisis management by anticipating likely risks and developing strategies to avoid or mitigate them.
- Enable risk to be factored into the selection of an asset improvement alternative or investment option.
- Identify the positive aspects of risk so the agency can prepare to benefit from potential opportunities.
- Aid communication with stakeholders regarding the risks and uncertainties associated with different asset management solutions, including "no action" alternatives.
- Facilitate the assignment of risk management duties to the appropriate parties.
- Help make the case for allocating adequate resources to asset preservation in a transportation plan or program.

In 2018, ADOT developed its first Asset Management Risk Register. Building upon this foundation, ADOT holds asset management risk workshops as part of its AMP updates at least every four years. These workshops are attended by key agency stakeholders, including subject matter experts who identify risks in the management of agency assets, as well as individuals who were involved in the initial development of the Asset Management Risk Register. Four risk workshops have been held to date, with the 2025 workshop being the most recent. The outcome of this workshop is described below.

4.3 Risk Management Process

ADOT followed the basic risk framework identified in the FHWA guidance document titled "Incorporating Risk Management into Transportation Asset Management Plans." The process was implemented during a risk workshop with technical staff from different parts of the agency. The framework includes six components:

- **Establish the Context**. Identifying risk management objectives based on agency asset management goals and targets.
- **Risk Identification**. Identifying risks to highway assets, including facilities that are repeatedly damaged by emergency events.
- **Risk Analysis**. Estimating the magnitude of risk impacts by assessing the likelihood and consequence of each risk identified.
- **Risk Evaluation**. Prioritizing risks based on the combination of likelihood and consequence.
- **Manage Risks**. Preparing a response and mitigation plan, focusing on top priority risks and repeated emergency events.
- **Monitor Risks**. Assigning risks to a risk owner who is responsible for managing and monitoring the risk on a regular basis. ADOT holds periodic risk workshops to evaluate existing risks and identify emerging risks.

ADOT desires risk-based asset management to:

- Be comprehensive.
- Be easy to understand.
- Prioritize risks.
- Identify long-term vulnerabilities.
- Identify strategies for the prevention and avoidance of risks.
- Inform decision-making.
- Identify the appropriate party to manage the risks.
- Monitor top priority risks.
- Aid in the prioritization of projects in the STIP.
- Support communication regarding asset management with stakeholders, including the public.

To be comprehensive, this plan considers several categories of risk (**Table 4-1**).

Table 4-1 | **Risk Type**

Risk Type	Effect
Agency	Risk to the agency that affects the implementation of the strategic goals of the asset management plan. Examples include changes in leadership, legislative actions, unfunded mandates, and the ability to convey the importance of asset management to decision-makers and the public.
Financial	The availability of adequate funding or the accurate prediction of future funding needed to implement the AMP. Examples include inflation, unexpected funding shortfalls, solvency of the Highway Trust Fund, financial markets, interest rate increases and inaccurate predictions in financial plans.
Program	Affects the ability to deliver a program of projects in a timely manner and meet performance targets. Risks may include the inability to effectively manage data, the loss of institutional knowledge via attrition, competing spending priorities, inaccurate cost estimates and construction/materials price volatility.
Asset	Affects individual assets, such as structural deterioration and obsolescence. Asset risks include flooding, landslides, hazardous materials spills, collisions with bridge elements and assets that do not meet changing design standards.
Project	Associated with projects to restore or replace individual assets. Project risks include cost factor uncertainty, traffic delays, lengthy detours and project delays caused by environmental, utilities, right-of-way, geotechnical, procurement, scope creep and intergovernmental agreements.
Activity/Operation	Associated with activities like routine maintenance, including slow or inadequate response to damaged assets (e.g., pothole or guardrail repair) or weather events (e.g., clearing blocked drainage structures, repairing scour-weakened bridge foundations or risks to workers such as heat and fires).

4.3.1 Risk Register

A risk register is an easy to understand and commonly used tool to identify, evaluate and prioritize risks. Using a risk register, the significance and priority of a risk event (R) is determined by considering both the seriousness of the consequences (C) if the event occurs and the likelihood (L) that it will occur; in other words, L x C = R. A color-coded "heat" scale assists in the evaluation of risks (**Table 4-2**).

Table 4-2 | **Risk Rating Matrix – Heat Map**

	Consequence				
Likelihood	**Negligible (1)**	**Low (2)**	**Medium (3)**	**Very High (4)**	**Extreme (5)**
Almost Certain (5)	L (5)	M (10)	H (15)	VH (20)	VH (25)
Likely (4)	L (4)	M (8)	M (12)	H (16)	VH (20)
Possible (3)	L (3)	M (6)	M (9)	M (12)	H (15)
Unlikely (2)	L (2)	L (4)	M (6)	M (8)	M (10)
Rare (1)	L (1)	L (2)	L (3)	L (4)	L (5)

Note: ‡R = Risk Rating; categories include Low (1-6) = L, Medium (7-13) =M, High (14-19) =H, Very high (20-25) =VH

The risk register also contains a summary of response actions to address risks. The "Five Ts" is a commonly used approach to describing the standard response options for asset risk.

- **TREAT** means to take proactive action to prevent or mitigate risk. This approach can include a plan or a program to address specific risks, such as weather adaptation plan or a scour countermeasures program.
- **TOLERATE** means taking minimal measures to monitor and periodically reassess risks. It is adopted in response to risks with a low likelihood or consequence rating that the agency is willing to cope with, or that are difficult or not cost-effective to mitigate.
- **TERMINATE** means to discontinue an activity that leads to risk.
- **TRANSFER** means to pass on some or all the responsibility for managing a risk to another party.
- **TAKE ADVANTAGE** means to be prepared to capitalize on beneficial change or emerging opportunities.

The following risk register (**Table 4-3**), which was updated during the 2025 Asset Management Risk Workshop, contains the risks, ratings, risk owner, and a high-level summary of the recommended risk mitigations that were identified at the risk workshop along with a corresponding heat scale rating. Although this AMP focuses on bridges and pavements, the risk analysis was not limited to these assets. All the risks identified in the risk register could affect state-owned NHS and non-NHS routes. More detailed descriptions of the mitigations for the high and very high-priority risks (15) are presented beneath the risk register.

Table 4-3 | **Asset Management Risk Register**

Risk Category	Risk Event (Risk Owner)	L*	X	C†	=	R‡	Risk Mitigation	Heat Type
Agency	1. Failure to deliver the investment strategies outlined in the AMP (MPD)	5	x	5	=	25	AMP implementation strategies, including a process to improve the allocation of available funding to networks and work types, following existing subprograms and additional review steps in the planning and programming process.	**VERY HIGH**
	2. Inadequate funding to maintain the existing system in a SOGR (MPD, Asset Groups, FMS)	5	x	5	=	25	Identify funding gaps and investment strategies that could close those gaps in the AMP.	**VERY HIGH**
	3. Changing legislation (Government Relations)	5	x	4	=	20	Monitor proposed State and federal legislation and communicate impacts to management, the	**VERY HIGH**

Risk Category	Risk Event (Risk Owner)	L*	X	C†	=	R‡	Risk Mitigation	Heat Type
							Transportation Board, the governor, and legislature.	
	4. **Weather trends** (Environmental Planning, Districts)	4	X	4	=	20	Implementation of ADOT's Natural Hazard Risk Assessment Process.	**VERY HIGH**
	5. **Effectively communicating asset needs** (Asset Groups, MPD)	3	X	4	=	12	Share output of AMP with decision-makers; focus on long-term preservation needs.	**MEDIUM**
	6. **Impact of deteriorated infrastructure on public perception** (MPD, Communications)	5	X	2	=	10	Use AMP to communicate the connection between funding levels and asset deterioration over time. Share condition data with the public and describe asset preservation efforts undertaken by ADOT.	**MEDIUM**
	7. **Leadership changes** (ADOT)	4	X	2	=	8	Succession planning; standardizing and documenting regular processes; maintaining and updating Standard Operating Procedure documents to help inform new leadership.	**MEDIUM**
	8. **Ability to accurately forecast asset performance** (MPD, Asset Groups)	1	X	4	=	4	Refine data collection practices and periodically update bridge and pavement management system deterioration models, including treatment decision trees and treatment costs.	**LOW**
	9. **Expansion without new maintenance funding** (MPD, State Maintenance Engineer)	2	x	2	=	4	Periodically evaluate maintenance costs needed for highway expansion. Communicate impacts to the Transportation Board.	**LOW**
Financial	10. **Liability losses associated with assets** (Risk Management)	5	x	3	=	15	Self and supplemental Insurance; utilize liability loss data in decision-making.	**HIGH**

Risk Category	Risk Event (Risk Owner)	L*	X	C†	=	R‡	Risk Mitigation	Heat Type
	11. **Losses caused by third parties** (Risk Management)	5	x	3	=	15	Insurance loss recovery program for collisions involving assets.	HIGH
	12. **Changing interest rates and inflation** (FMS, MPD)	4	x	3	=	12	Prepare financial forecasts to monitor and adjust transportation program.	MEDIUM
	13. **Unfunded Mandates** (FMS, MPD)	3	x	4	=	12	Keep track of regulatory updates and provide comments to notices of proposed rulemaking.	MEDIUM
	14. **Viability of Revenue Sources** (FMS, MPD)	3	x	3	=	9	Prepare revenue forecasts, fiscally constrained programming, monitor and address.	MEDIUM
	15. **General Emergency Events** (FMS, MPD)	1	x	4	=	4	Adjust the program to the new fiscal reality, incorporate into the Continuity of Operations, and communicate with the Transportation Board, Governor, and Legislature.	LOW
Program	16. **Construction/materials price volatility** (FMS, Contracts and Specifications, PMG)	5	x	5	=	25	Price adjustments for volatile commodities – contingency fund. Parametric estimating process. Move projects to future years.	VERY HIGH
	17. **Competing spending priorities** (MPD, FMS)	5	x	3	=	15	P2P process to prioritize projects. Address in the Long-Range Transportation Plan.	HIGH
	18. **Staff attrition** (ADOT Executive Team, Human Resources)	5	x	3	=	15	Cross-training and succession planning. Hire more in-house staff.	HIGH
	19. **Lack of data governance for asset, GIS, and planning data** (MPD, ITG)	5	x	3	=	15	Create a strategic data management/governance plan that applies total systems thinking to the collection, management, analysis, dissemination and implementation of asset and GIS data to support the P2P process. Integrate	HIGH

Risk Category	Risk Event (Risk Owner)	L*	X	C†	=	R‡	Risk Mitigation	Heat Type
							this into an agency-wide data governance plan.	
	20. Obsolete infrastructure (Asset Groups, MPD)	3	x	3	=	9	Evaluate obsolete asset features during project scoping and recommend cost-effective improvements.	MEDIUM
	21. Ability to collect accurate asset and performance data (MPD)	2	x	3	=	6	Continue to improve data collection and quality control practices.	LOW
Project	22. **Geohazard mitigation delays caused by project bundling** (IDO)	5	x	3	=	15	Allocate separate project or program funding for geohazard mitigation.	HIGH
	23. **Scope creep and project cost uncertainty** (MPD, Project Review Board, PPAC, FMS)	5	x	2	=	10	Planning-level scoping to provide clear definition to the project needs. Control at Project Review Board and the Priority Planning Advisory Committee.	MEDIUM
Asset	24. **Flood damage including scour** (Bridge Group, Environmental Planning)	4	x	5	=	20	Statewide scour evaluation; scour counter measures program. Use ADOT Natural Hazard Risk Assessment Process.	VERY HIGH
	25. **Collision damage to bridges** (Bridge Group, Risk Management)	3	x	5	=	15	Raise low bridges. ADOT to seek reimbursements from responsible parties.	HIGH
	26. **Non-permitted overweight load-related damage** (MPD, ECD)	5	x	3	=	15	More weigh-in-motion infrastructure; increased resources for enforcement; awareness training for enforcement officers and border liaisons	HIGH
	27. **Permitted overweight load-related damage** (ECD, Asset Groups)	4	x	3	=	12	Monitor impacts of overweight loads and adjust permitting accordingly.	MEDIUM
	28. **Lack of redundant routes if an asset fails** (Districts)	2	x	5	=	10	Update emergency detour plans; electronic signage; identify vulnerable assets and maintain in Good condition. Flex lanes.	MEDIUM

Risk Category	Risk Event (Risk Owner)	L*	X	C†	=	R‡	Risk Mitigation	Heat Type
	29. **Landslides and/or slope failures** (Geotechnical Section)	2	x	5	=	10	Identify unstable areas, remediate storm water infiltration, re-contour or stabilize slopes, install monitoring devices.	**MEDIUM**
	30. **Rock Fall and geohazards** (Geotechnical Section, District Maintenance)	4	x	3	=	12	Expand the use of the GIS database to map geohazard locations of concern. Program rockfall projects as needed.	**MEDIUM**
	31. **Subsidence due to groundwater pumping** (IDO)	3	x	2	=	6	Account for this in design, and corridor studies. Expand the use of the GIS database to map subsidence locations of concern.	**LOW**
	32. **Retaining Wall Failures** (Geotechnical Section)	1	x	5	=	5	Screen wall products in the Product Evaluation Program. Perform routine retaining wall inspections and maintenance, identify failing walls, initiate repair, or replacement projects.	**LOW**
	33. **Events inside tunnels resulting in loss of service** (Bridge Group)	1	x	5	=	5	Routine, comprehensive tunnel inspections and maintenance. Replace obsolete lighting. Emergency response plan.	**LOW**
	34. **Failure of small (<20 feet in length) culverts** (MPD)	1	x	5	=	5	Statewide small culvert evaluation, consider culvert upgrades when developing pavement projects.	**LOW**
Activity/ Operations	35. **Inadequate maintenance budget** (FMS, State Maintenance Engineer)	5	x	5	=	25	Defer maintenance, inform legislators of impacts.	**VERY HIGH**

*Notes: *L = Likelihood; categorized as Rare (1), Unlikely (2), Possible (3), Likely (4), Almost certain (5)*

†C = Consequence; categorized as Negligible (1), Low (2), Medium (3), Very high (4), Extreme (5)

‡R = Risk Rating; categories include Low (1-6), Medium (7-13), High (14-19), Very high (20-25)

Key: ADOT = Arizona Department of Transportation; AMP = Asset Management Plan; ECD =Enforcement and Compliance Division; FMS = Financial Management Services; GIS = Geographic Information System; IDO = Infrastructure and Delivery operations ; ITG = Information Technology Group; MPD =Multimodal Planning Division; P2P = Planning to Programming; PMG = Project Management Group; PPAC = Priority Planning Advisory Committee; SOGR = State of Good Repair.

4.3.2 Mitigation for High-Priority Risks

Many of the risks identified are known to the agency and have formal or informal strategies in place for mitigation. Others were identified as part of this risk analysis effort. The risk register will be included in the ADOT Risk Register hosted in the BOLD planning software. The ADOT Risk Register is reviewed with the business units; therefore, the TAM Plan Risk Register will be updated concurrently when the other agency risks are reviewed. ADOT's risk mitigation strategies for high-priority risks are provided in the following subsections.

4.3.2.1 High-Priority Agency Risks

Failure to Deliver the Investment Strategies Outlined in the AMP

Failure to develop and implement an AMP can result in penalties that significantly reduce federal funding designated for pavement and bridge maintenance. For this reason, the 2025 ADOT AMP focuses on establishing implementation strategies that can be integrated into the P2P process, closely aligned with the Five-Year Transportation Facilities Construction Program, and supportive of STIP development. The implementation approach aims to achieve the following:

- Increase visibility across the agency.
- Track major changes to minimize their impact on the proposed investment.
- Ensure AMP investment strategies are comprehensively integrated into current programming processes.

The implementation strategy for pavements and bridges is described in detail in **Section 8.9** .

Inadequate Preservation Funding for the Existing System

SHS bridges and pavements are aging, making them costlier to maintain. At the same time, the highway system continues to expand, adding to the costs of maintaining the system. The resources available for preservation have not kept up with needs, resulting in an increasing amount of deterioration of SHS bridges and pavements. To address this issue, ADOT increased its investment to preserve Arizona's highway assets in the 2050 LRTP. This recommendation will be implemented during this AMP cycle.

Changing Legislation

The Government Relations Office is responsible for the coordination and oversight of ADOT legislative initiatives, rules, and policies. The office provides a proactive process through which ADOT communicates with and serves Arizona's congressional senators and representatives, state legislators, governor's office and the people of Arizona to ensure the priority of ADOT's mission is reflected in state and federal legislation, rules, and policies.

During Federal and State legislative sessions, the office tracks bills and informs ADOT's executive team of issues that may affect the agency. The office works closely with ADOT staff to gather information to assist the governor's office and legislators in assessing the impacts of proposed legislation/rules on the agency, highway system or revenues available for

transportation purposes. Identifying potential legislative issues early provides the agency with an opportunity to comment. Impacts of legislation on resources and policies that affect the asset management program, and the implementation of investment strategies, are important to monitor and address.

Weather Trends

Section 4.5 describes resilience and weather adaptability programs, along with key initiatives developed in recent years. Major stressors to the transportation infrastructure system include the following:

- **Heat**. By 2080, the number of days exceeding 100 degrees Fahrenheit annually in low desert areas is expected to double. Impacts include pavement deformation, shorter construction windows, heat-related safety issues for workers and the public, and increased dust storms. Wildfires are also more likely, and burned areas may lead to runoff that overwhelms drainage structures. Benefits include fewer freeze-thaw impacts on pavement and less snow removal needed in the high country.

- **Precipitation**. Annual weather patterns are expected to be more variable, potentially including more intense individual precipitation events that could damage or overwhelm drainage systems and pump stations. Saturated soil also raises the risk of rockfalls and landslides.

4.3.2.2 High-Priority Financial Risks

Liability Losses Associated with Assets

ADOT's Fiscal Year (FY) *2024 Comprehensive Financial Report* states that:

> *"The Department is exposed to various risks of loss related to torts; thefts of, damage to, and destruction of assets; errors and omissions; injuries to employees; and natural disasters. The Department is a participant in the State's self-insurance program and, in the opinion of the Department's management, any unfavorable outcomes from these claims and actions would be covered by the self-insurance program. Accordingly, the Department has no risk of loss beyond adjustments to future years' premium payments to the State's self-insurance program. All estimated losses for unsettled claims and actions of the State are determined on an actuarial basis and are included in the State of Arizona's Annual Comprehensive Financial Report."*

Note that while premiums paid to the state's self-insurance program have not increased in recent years, transportation liability losses have caused the state's insurers to increase retention amounts (deductibles) and premiums for excess coverage.

Losses Caused by Third Parties

One way to reduce direct property loss (state highway items not covered by the state's self-insurance program) is to increase the amount recovered from the responsible party (**Table 4-4**). In 2014, ADOT initiated an effort to improve the recovery process and increase the insurance recovery rate. This process improvement has led to an average recovery rate of approximately 75 percent over the last four years, up from an average of 60 percent. Notably, there has been a steady increase in losses caused by third parties in recent years.

Table 4-4 | **Insurance Recovery Metrics**

Year	Recoveries ($)	Repairs ($)	Recovery Rate (%)
FY 2021	4,785,835	7,863,494	61
FY 2022	7,471,023	9,699,804	77
FY 2023	9,090,317	9,518,530	96
FY 2024	6,428,939	10,155,628	63
AVERAGE	**6,944,029**	**9,309,364**	**75**

Key: FY = fiscal year

4.3.2.3 High-Priority Program Risks

Construction/Materials Price Volatility

ADOT has developed a methodology to produce a construction cost index to evaluate construction cost inflation annually, to aid in short- and long-term planning for resource allocation to the construction program. Construction contractors can adjust volatile commodities, like asphalt, if the market price varies from the bid price by a specified percentage. This eliminates the need to adjust bids to hedge price volatility. ADOT monitors construction and materials prices so that programming adjustments can be made to adapt to volatile prices. ADOT maintains a contingency fund that can be used to adjust for short-term price volatility. Additionally, ADOT has developed a parametric cost estimating process that adjusts planning-level costs for future inflation to enable more accurate programming of projects.

Competing Spending Priorities

The state and federal governments have numerous spending priorities, which can cause transportation funding to be diverted to other purposes. These diversions can have a significant impact on a transportation agency's ability to maintain its assets. ADOT monitors changes in funding and communicates the impacts on the governor and the State Transportation Board. This AMP provides a data-driven strategic process that prioritizes investment strategies to achieve and sustain ADOT's desired SOGR, serving as mitigation of this risk.

Staff Attrition

In recent years, ADOT has been increasingly relying on consultants and contractors to perform certain duties. At the same time, the agency continues to lose highly experienced engineers and other professional staff to retirement or external opportunities. This has diminished institutional knowledge and reduced the number of potential candidates available for promotion into management positions.

To address this issue, ADOT has initiated a succession development plan that prepares individuals for possible promotion to positions of increased responsibility. The elements of the plan include providing one-on-one coaching, management training classes, and cross-

functional training to provide opportunities for employees to move up in the agency, improving retention and knowledge transfer.

In August 2023, ADOT launched a new self-directed first-year experience program. The program provides essential resources, logistical information, and support tools to get new employees up to speed and working faster. Supervisors can sync up with employees participating in the program to mentor them and monitor their progress. This program has improved the retention of new employees.

Lack of Overarching Data Management/Governance for Asset, Geographic Information System, and Planning Data

Accurate, accessible, and easily digestible data underpins successful asset/performance management and short- and long-range planning. Data supporting asset management and planning at ADOT, including inventory, condition, and planning data, is stored in separate systems with limited integration and multiple data owners, who often employ unique legacy methods for maintaining their data. The lack of an overarching data management and governance framework increases the chance of inconsistent data quality, with implications for decisions made throughout the asset management and planning process. To operate at peak efficiency, asset management software needs to consume geospatial data from an enterprise linear referencing system (LRS). Implementation and monitoring of performance metrics also rely on LRS-based analysis. The Asset Management Team, the Geographic Information System (GIS) Section, and the Data Management Section work with data owners to integrate the collection, management, analysis, dissemination, and implementation of asset and GIS data, which is compatible with ADOT's data policies.

4.3.2.4 High-Priority Asset Risks

Flood Damage Including Scour

Scour around bridge piers can lead to bridge failure if not addressed. In 1992, as a result of bridges lost due to scour during the 1970s and 1980s, a statewide scour evaluation work plan was developed for all bridges located over waterways. Inspections during the 1990s identified several hundred bridges at high risk of scour. Many of these bridges were constructed before 1980, when the adoption of more stringent design criteria improved scour resistance. In the mid-1990s, a subprogram was set up to implement scour countermeasures for high-risk bridges; however, this subprogram no longer exists. Since then, ongoing inspections have identified additional bridges at high risk for scour. ADOT plans to use Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) funding to perform scour projects in future years.

Culverts are susceptible to blockage, which can result in flooding or roadway washout. Steel pipe culverts can corrode, which can affect the structural integrity of the pipe. The FY 2024 level of service evaluation rated drainage structure conditions with a "C" grade (need for improvement). To address this issue, $4.3 million was approved by the legislature in the FY 2025 state budget to repair culverts. The program began by repairing the most severely affected culverts, starting with 75 percent blockage and/or 50 percent rusting.

In 2016, ADOT completed a statewide pump condition assessment project, revealing that little was known about the factors contributing to pump unit and station failures. This information is crucial for making cost-effective, strategic investments in maintenance and rehabilitation to ensure future reliability. While pumping station operators possess valuable tacit knowledge about the causes and effects of pump failures through their experience maintaining the equipment, there is limited understanding of how factors such as age, design, hardware condition, and environmental conditions impact performance.

To address this knowledge gap, ADOT developed a dynamic reliability analysis decision-support tool in 2019. This tool has enabled real-time monitoring of pump station equipment and environmental conditions, assisting in prioritizing maintenance, rehabilitation, and replacement projects. The long-term goal of the web-based tool is to reduce costs associated with pump maintenance and rehabilitation while increasing reliability by identifying hardware that needs servicing before failure occurs.

Operators and planners can input various scenarios, including monthly precipitation, event day precipitation, manufacturer, date of last installation, number of components, condition rating, control system issues, and engine performance. The tool then outputs the probability of failure for each pumping station, allowing users to explore how changes to input data affect prioritization calculations.

In 2024, PROTECT funding was allocated to advance the next phase of the project, which includes installing pump station connectivity—conduit, fiber, and termination panels. This $2 million project will significantly enhance ADOT's ability to monitor storm activity in real time, complementing the decision-support tool.

In addition to these efforts, ADOT has also implemented gravity drainage systems as an alternative stormwater management solution for aging infrastructure. This system replaced four pump stations built along Phoenix freeways in 1964, which were designed to move excess water after storms. Proposition 400 allocated $49.5 million for the construction of this drainage system. This updated system includes new pipelines and stormwater retention basins, better managing significant storm events.

Collision Damage to Bridges

Vehicle collisions with bridges happen several times per year. Occasionally, these collisions result in partial or complete bridge closures, sometimes affecting both the crossroad and mainline. Since many highways in Arizona lack redundant routes, these closures can cause lengthy delays. ADOT's bridge clearances are clearly posted, and almost all the collisions are the result of driver error. ADOT mitigates this by seeking reimbursement from at-fault third parties for damage to bridges subject to collision.

Regularly updated emergency detour plans are an important way to mitigate the impacts of road closures. Raising low bridges also could reduce the opportunity for collisions and is considered in the project scoping process.

Non-permitted Overweight Loads

The maximum weight limit for trucks (five axles or greater) in Arizona is 80,000 pounds without a special permit. Per an ADOT research study in 2006[3]:

> *"The overloaded truck, whether legal or illegal, contributes to premature pavement fatigue. Pavement deterioration accelerates with axle weight, the number of axle loadings and the spacing within axle groups. The axle loads and spacing on trucks also affect the design and fatigue life of bridges. Steel bridges and pre-stressed concrete spans, if overloaded, are susceptible to fatigue."*

Because fatigue from the repeated stress of overweight trucks can shorten the life of bridges and pavements, it is important to ensure that truckers comply with the weight limit. There are numerous opportunities for trucks to "run heavy" without proper permits, and a low chance of identification when the following occurs:

- Port of entry facilities are closed
- Trucks enter the state where there are no ports of entry
- Inspection queues at ports get too long, and trucks are waved past
- Trucks "run" by ports without stopping for inspection
- Trucks unload some of the cargo at the border to cross separately, as sometimes occurs with car trailers
- Truck trips originate within the state

A cost-effective way to detect unpermitted overweight trucks is the installation of weigh-in-motion (WIM) stations in the roadway. WIM stations measure the weight of a truck as it passes over a device on the pavement. Unlike ports of entry, WIM stations operate 24 hours a day, every day of the year. Data from WIM stations indicate that approximately 7 percent to 10 percent of the trucks on Arizona highways operate overweight. In recent years, ADOT expanded and upgraded WIM stations with the latest law enforcement-grade Piezo-quartz sensors for improved accuracy. ADOT operates WIM stations at 27 locations. Some locations have dual scales for a total of 46 WIM scales.

The weight measured at the WIM station is confirmed on a static scale before a citation is issued. ADOT also operates 20 permanent scales at various locations and portable scales that can be placed at other rest areas and other locations to detect overweight vehicles that bypassed the port of entry or originated in Arizona.

4.3.2.5 High-Priority Project Risks

Delays in Geohazard Mitigation Implementation

ADOT monitors geohazards and identifies mitigations to prevent severe consequences. However, mitigation implementation is managed with other projects that can potentially result in lengthy delays while projects move through approvals and procurement. Managing

[3] Source: Estimating the Cost of Overweight Vehicle Travel on Arizona Highways. Final Report 528. **https://apps.azdot.gov/ADOTLibrary/publications/project_reports/PDF/AZ528.pdf**

and mitigating this risk can be accomplished by allocating separate funding through a geohazard subprogram or individual geohazard projects that can be accelerated.

4.3.2.6 High-Priority Activity/Operations Risks

Inadequate Maintenance Budget

There are more than 250 maintenance activities routinely needed to keep over 21,000 lane miles of Arizona highways open for business. The maintenance area most susceptible to inadequate funding is the pavement surface treatment program. Deteriorated roadway surfaces require higher-cost restoration work to re-establish the structural integrity and capacity of the pavement system.

To mitigate this, the Arizona Legislature provided $36.1 million for surface treatments in FY 2021, and this funding is expected to continue for the foreseeable future. Additionally, ADOT's pavement investment strategy will gradually increase the percentage of funding devoted to these restoration treatments over the course of the AMP planning horizon.

4.4 Incorporation of Risk into Life Cycle Analysis and the Financial Plan

Specific risks to bridges and pavements, such as scour and expansive-contracting soils, were incorporated into the LCP analysis and are discussed in **Section 6**. Uncertainties regarding predictions of future transportation funding are described in the financial plan in **Section 5**.

4.5 Resilience and Adaptation to Exceptional Weather Events

ADOT has developed a comprehensive Adaptation Program that integrates risk-based strategies into transportation planning and asset management. The program addresses the challenges of exceptional weather events, measurable weather trends (especially as it relates to precipitation and direct effects of increased surface temperatures), and aging infrastructure, transitioning asset management from a decentralized, project-based focus to an enterprise-wide approach covering administration, technology adoption, planning, programming, design, construction, operations, and maintenance.

To address these concerns, ADOT conducted the Preliminary Study of Climate Adaptation for the Statewide Transportation System in Arizona (March 2013) and the Extreme Weather Vulnerability Assessment (January 2015). These studies recommended systematically integrating weather risks into the AMP and incorporating cost-effective adaptation strategies. Building on these findings, ADOT published the Asset Management, Extreme Weather, and Proxy Indicators Infrastructure Resilience Report (March 2020).

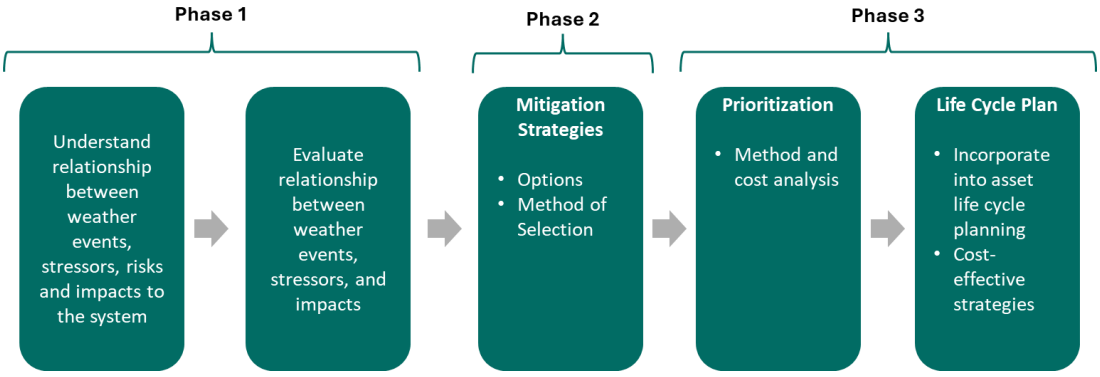
The initiative's goal is to integrate weather risks and adaptation strategies into the asset management process. It aims to assess weather trends, such as heat and precipitation, that impact transportation infrastructure, and to develop proxy indicators to manage these

effects. The project enhances Arizona's transportation system by identifying vulnerable assets, implementing adaptation strategies, and incorporating them into the overall asset management framework.

The project follows a risk-based management process to identify stressors that pose the greatest threats to ADOT's transportation system. Through LCP of roadway assets, ADOT is addressing stressors such as intense precipitation, system flooding, wildfires, wildfire-induced flooding, drought-related dust storms, rockfall, slope failures, and increased surface temperatures. GIS is utilized to support data-driven decision-making and integrate scientific evidence into transportation management practices.

The methodology is structured across three phases as shown on **Figure 4-1**. Phase 1 uses GIS tools to identify high-risk areas and analyze factors such as Federal Emergency Management Agency Flood Hazard Zones and U.S. Geological Survey soil groups. Root causes are determined through research, input from ADOT engineers and maintenance teams, and historical experiences. Phases 2 and 3 focus on integrating mitigation strategies into the asset life cycle—planning, design, maintenance, and operations. The completion of these phases fully integrates risk modeling and LCP with asset management.

Figure 4-1 | **Agency Adaptation Program Approach**



ADOT developed an agency Resilience Improvement Plan (RIP) that met FHWA criteria to begin utilizing PROTECT funds (2023). In 2024, ADOT and FHWA collaborated to develop the standardized PROTECT funding authorization package. Additionally, ADOT incorporated adaptation into the 2050 LRTP.

Through the State of Arizona Transportation Board process, ADOT gained approval to establish a PROTECT subprogram (2024). MPD also incorporated PROTECT eligible projects into the annual P2P process to align with this new subprogram. With these efforts in place, ADOT can reduce its project-level state funding share by 10 percent (7 percent from the RIP and 3 percent from the LRTP). To date, approximately $25 million in PROTECT funds have been programmed for design, engineering, or construction projects.

Table 4-5 summarizes key initiatives from preliminary studies and Phase 1 of the Agency Adaptability Program Approach.

Table 4-5 | **Adaptation Program Key Initiatives**

ADOT GIS Hazards Map	The ADOT GIS Hazards Map integrates various data layers to enhance Arizona's transportation infrastructure. It includes information on flood risks, drought, wildfires, dust storms, and geohazards. The map supports decision-making by providing real-time data feeds and infrastructure details, such as bridges and culverts, helping ADOT mitigate risks associated with weather and natural hazards.
ADOT Climate Engineering Assessment for Transportation Assets	The Climate Engineering Assessment for Transportation Assets evaluates climate-related risks to Arizona's transportation infrastructure, focusing on vulnerabilities like heat and flooding. It develops adaptation strategies integrates them into ADOT's asset management practices.
ADOT/USGS Partnership	The 5-Year ADOT/USGS Partnership, initiated in 2019, aimed to enhance flood risk management and improve Arizona's infrastructure reliability. The collaboration used advanced technologies like light detection and ranging, drones, and streamgages to collect hydrological data. Notable projects include the Laguna Creek Bridge Scour Remediation pilot. This partnership has gained national recognition and shared methods with other USGS offices.
2019 Pump Station Reliability Tool Pilot Project	The 2019 Pump Station Reliability Tool Pilot Project enhances the reliability of ADOT's pump stations, particularly during exceptional weather events. ADOT developed a dynamic reliability analysis tool for real-time monitoring of pump station equipment and environmental conditions. This tool helps prioritize maintenance, rehabilitation, and replacement projects, identifying hardware that needs servicing before failure, and evaluates performance under various precipitation scenarios.
Geohazard Management Plan	The Geohazard Management Plan, developed between 2010 and 2015, addresses risks from geotechnical features affecting roadways and structures. The plan aims to identify, assess, and mitigate geohazard-related risks, including landslides and rockfalls. It incorporates monitoring strategies, and preventive measures into asset management practices to ensure infrastructure stability and safety.
Roadside Vegetation Management Guidelines	In March 2018, ADOT published its Roadside Vegetation Management Guidelines, outlining best practices for managing vegetation along Arizona's highways. ADOT manages vegetation across 1,390 centerline miles of highways, focusing on traffic safety, infrastructure preservation, and maintaining native plant communities. The guidelines emphasize soil stabilization and erosion control, helping mitigate weather impacts, and promote revegetation to prevent erosion and provide environmental benefits.
P2P Process	The P2P Guidebook serves as another key entry point to improve infrastructure reliability at ADOT. It connects the LRTP to the Five-Year Construction Program. Several technical working groups are involved in the call-for-projects, including one focused on geohazards. The P2P process involves site visits and input from District personnel familiar with the specific location and its weather and natural hazard challenges.
PROTECT Subprogram	Through the State of Arizona Transportation Board process, ADOT gained approval to establish a PROTECT subprogram in 2024 to enhance the reliability of the state's transportation infrastructure.

Key: ADOT = Arizona Department of Transportation; GIS = Geographic Information System; P2P = Planning to Programming; USGS = U.S. Geological Survey

4.6 Facilities Repeatedly Damaged by Emergency Events

Moving Ahead for Progress in the 21st Century (MAP-21) regulations require that state DOTs "conduct statewide evaluations to determine if there are reasonable alternatives to roads, highways, and bridges that have required repair and reconstruction activities on two or more

occasions due to emergency events." The evaluations must include repeated emergency events on any road, highway, or bridge that occurred January 1, 1997, or later. The statewide evaluation for all NHS roads, highways, and bridges must have been completed by November 23, 2018. Beginning on November 23, 2020, a state DOT must prepare evaluations covering the affected portion of all other roads, highways, and bridges "prior to including any project relating to such facility in its STIP" (23 CFR Part 667). The statewide evaluation must be updated every four years. State DOTs must consider the results of the evaluations when developing an AMP and during preparation of the STIP.

ADOT identified three locations where repeated emergency events have occurred in the past years and where ongoing mitigation is being undertaken:

- SR 89A, MPs 375 to 399. Erosion due to storm events.
- SR 88, MPs 197 to 240. Damaged drainage infrastructure.
- US 89, MPs 422 to 432. Multiple fires resulted in increased stormwater runoff, damaging drainage and roadway structures.
- Summaries of each event are provided in **Appendix B**. Every January, ADOT performs an annual review to determine whether new eligible emergency events have occurred during the previous calendar year and if those events are repeated. No new repeated emergency events were identified for the calendar year 2024. Reviews will be continued on an annual basis, and relevant amendments will be included in future updates of the AMP.

Section 5 Financial Plan

5.1 Overview

This section provides a summary of ADOT's financial planning for the next 10 years, in accordance with the financial planning approach outlined in 23 CFR 515.7. It includes an overview of the estimated valuation for ADOT's pavement and bridge assets, historical funding sources and uses, and a 10-year estimate of projected funding that can be used for asset management and other activities. Additionally, this section includes estimated available funding for pavement and bridge preservation activities.

5.2 Asset Valuation

Under the Governmental Accounting Standards Board Statement No. 34, *Basic Financial Statements – and Management's Discussion and Analysis – for State and Local Governments (GASB 34),* as amended, ADOT reports asset valuations of its roads and bridges using the "modified approach." This approach allows asset values to be maintained without depreciation if the following required actions are undertaken:

- Maintain an asset management system that includes an up-to-date inventory of eligible infrastructure assets.
- Perform condition assessments of eligible assets and summarize the results using a measurement scale.
- Estimate the annual amount to maintain and preserve the assets at the condition level established and disclosed by ADOT each year.
- Document that assets are being preserved at or above the established condition level.
- The undepreciated value of ADOT's transportation infrastructure as of June 30, 2024, is provided in **Table 5-1.** These values are reported in the Comprehensive Annual Financial Report, which consolidates NHS and non-NHS assets at the state level. To estimate asset values for NHS and non-NHS for reporting purposes, the undepreciated values are allocated based on lane miles for pavements, deck area for bridges, and lane miles for the right-of-way. Additionally, under Generally Accepted Accounting Principles (GAAP), ADOT is required to report all asset values at historical cost. As part of the GAAP requirements, ADOT also reports the cost to maintain the infrastructure value (See **Section 8**).

Table 5-1 | **Undepreciated Asset Value of ADOT Transportation Infrastructure (YOE $Billions)**

	Pavement	Bridges	Right-of-Way	CIP	Total
SHS*	$6.27	$0.78	$1.70	$1.91	$10.66
NHS	$7.93	$1.95	$2.15	$2.67	$14.70
Total ADOT-Owned	**$14.20**	**$2.73**	**$3.85**	**$4.58**	**$25.36**

Note: Valuation method is pursuant to Governmental Accounting Standards Board Statement 34 (GASB 34).

**SHS excludes state-owned portions of the NHS.*

Key: CIP = Construction in Progress; NHS = National Highway System; SHS = State Highway System; YOE = Year of Expenditure

5.3 Long-Range Funding Plan

The long-range strategic direction outlined as part of the 2050 LRTP includes three investment categories: preservation, modernization, and expansion.

- **Preservation**. Spending to improve or sustain the condition of pavements and bridges in a SOGR.[4]
- **Modernization**. Spending to improve the safety and operations of the existing SHS through activities such as adding shoulders and implementing smart road technologies.
- **Expansion**. Improvements that add capacity to the SHS through new roads, adding lanes to existing highways, and constructing new interchanges.

In the 2050 LRTP, ADOT developed Recommended Investment Choices (RICs) that were data-driven and incorporated input from stakeholders and the public. The process centered on developing a series of Alternative Investment Choices (AICs) that represented different perspectives on how ADOT's resources could or should be allocated in the future. The AICs, in effect, served as data points to inform the development of the final RIC.

Table 5-2 presents the final RIC for the next 25 years for the Arizona SHS, as outlined in the 2050 LRTP. This equates to an average annual budget of approximately $2.5 billion statewide. More information on the capital needs, revenue forecast, and gap can be found in *Baseline and Projected Revenues,*[5] *Multimodal Gap and Investment Choice Analysis,*[6] and *Multimodal Needs*[7] reports listed in **Appendix A**.

[4] *Note that the preservation program should not be confused with the preservation work type, which describes specific treatments that extend asset service life (e.g., chip seals, deck overlays). These preservation treatments can be included in both modernization and expansion projects as well.*

[5] *2050 ADOT Long-Range Transportation Plan. Baseline and Projected Revenues.*

[6] *2050 ADOT Long-Range Transportation Plan. Multimodal Gap and Investment Choice Analysis.*

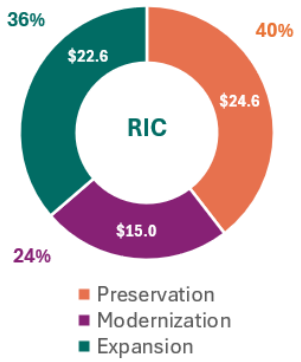
[7] *2050 ADOT Long-Range Transportation Plan. Multimodal Needs Analysis.*

Figure 5-1 shows the resulting allocations by investment category (expansion, modernization, preservation), which corresponds to the final RIC and indicates that 40 percent of the total is allocated to preservation. This aligns with the "Preserve and Upgrade" investment scenario philosophy outlined in the 2050 LRTP, which prioritizes a higher level of funding for the preservation of pavements and bridges.

Table 5-2 | **25-Year Statewide Recommended Investment Choices**

Investment Category	25-Year Need ($Billions)
Preservation	24.6
Modernization	15.0
Expansion	22.6
Total	**62.2**

Figure 5-1 | **Recommended Investment Choices Allocation by Investment Category**



ADOT is required to update the Statewide LRTP every five years. The State Transportation Board approved the 2050 LRTP in October 2023, following the last update in 2018. ADOT continues to monitor the impact of preservation investments on system performance and make recommendations to adjust the RIC during the next plan update, if warranted.

5.4 Funding Sources and Projections

ADOT relies on federal, state, and regional sources of funding to finance asset preservation. Local governments also have funding available for asset preservation on the NHS. Primary funding sources are listed below:

1. Federal Aid Highway Program (FAHP)
2. State Funding—Highway User Revenue Funds (HURF)
   - Motor Vehicle Fuel Tax
   - Motor Vehicle License Tax (VLT)
   - Motor Vehicle Registration Fee
   - Motor Carrier Tax
   - Motor Vehicle Operator License Fees and Miscellaneous Fees
2. Regional Funding—such as the Regional Area Road Fund (RARF) in Maricopa County and Regional Transportation Authority (RTA) funding in Pima County
3. Local Funding

5.4.1 Historical Funding by Source

Figure 5-2 shows the FY 2024 funding available for highway investments from the federal, state, and local funding sources described above. Total funding from all four funding types was approximately $2.3 billion. The State Highway Fund and Federal Aid Programs provided 75 percent of the available funding for highway investment. Note that the State Highway Fund is used for capital and operating purposes. **Table 5-3** presents the historical funding by type for highway investment in the past 10 years.

Figure 5-2 | **Fiscal Year 2024 Highway Available Funds by Source**

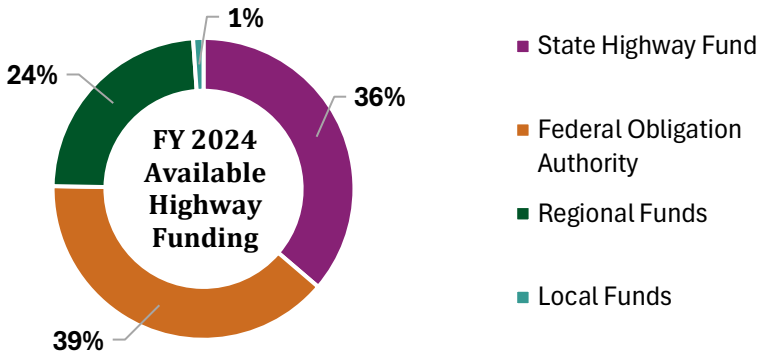


Table 5-3 | **Historical Revenues by Funding Type ($Millions)**

Fund Types and Sources	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
State Highway Fund	566	589	611	625	657	682	750	820	830	850
Federal Obligation Authority/1	714	767	758	696	701	750	713	886	870	877
Bridge Formula Program/2								38	38	38
Regional Funds										
*MAG (RARF)**	255	263	275	291	311	327	361	433	471	489
PAG (RTA)	59	80	80	23	79	64	64	64	64	64
TOTAL	**1,584**	**1,689**	**1,714**	**1,625**	**1,738**	**1,812**	**1,888**	**2,241**	**2,273**	**2,318**

Notes:

1/ Formula Federal Aid Obligation Authority, including National Highway Performance Program (NHPP) Exempt but not inclusive of August Redistribution.

2/Highway Infrastructure Program Bridge Formula Funding is a supplemental program under the Infrastructure Investment and Jobs Act (IIJA) Authorization Act. This funding is not guaranteed to continue after 2026, the last year of the Act.

** MAG (RARF) reported funding shown is 66 percent of the regional transportation excise tax.*

Key: FY = fiscal year; MAG = Maricopa Association of Governments; PAG = Pima Association of Governments; RARF= Regional Area Road Fund; RTA = Regional Transportation Authority

5.4.2 Federal Funding

ADOT's primary source of federal funding comes from the FAHP administered by FHWA, primarily funded through the Federal Highway Trust Fund. Funding under the FAHP is provided to states through a multi-step funding cycle that includes:

- **Multiyear authorization** by Congress of the funding for various highway programs.
- **Apportionment and allocation** of funds to the states each federal fiscal year (FFY) according to statutory formulas or, for some funding categories, through administrative action.
- **Obligation** of funds is the federal government's legal commitment to reimburse states for the federal share of a project's eligible costs.
- **Appropriations** by Congress specifying the amount of funds available for the year to liquidate obligations.
- **Program implementation** covers the programming and authorization phases.
- **Reimbursement** by the federal government of the eligible project costs.

The current multiyear program, Infrastructure Investment and Jobs Act (IIJA), was signed into law on November 15, 2021. It authorizes funding over a five-year period, from FFY 2022 to FFY 2026. The IIJA establishes apportionment formulas using such data as highway system mileage, lane miles, traffic volumes, and estimated federal fuel tax contributions following a similar approach as previous legislation.

The apportionments provided to states under IIJA are allocated to various categories, each defining eligible types of investment. The two largest funding categories are the National Highway Performance Program (NHPP) and Surface Transportation Block Grant Program (STBGP). Eligible uses in these categories include:

- **National Highway Performance Program (NHPP)**. Under the IIJA, this category combined the Interstate Maintenance Program, the NHS, and the Highway Bridge Replacement and Bridge Rehabilitation Program. NHPP is the primary federal funding source utilized for pavement and bridge preservation, but can only be used for routes on the NHS.
- **Surface Transportation Block Grant Program (STBGP)**. This is the most flexible of Federal transportation funds and may be used for a wide variety of highway, transit, or street projects, including pavement and bridge maintenance activities.

Both of these programs are intended to improve the nation's infrastructure, ensure safety, and enhance the efficiency and sustainability of the transportation network. Only NHPP and STBGP funds are eligible to be used for bridge and pavement preservation.

Table 5-4 shows ADOT federal funding for the remainder of the IIJA (FY 2026). For FY 2027 and beyond, funding levels are held constant, conservatively assuming no growth, to estimate federal aid beyond the IIJA. This table shows the estimated amount of funds eligible to be used by ADOT for asset management, although these funds may also be used for other transportation purposes.

Table 5-4 | **Estimated Federal Aid ($Millions)**

Federal Fiscal Year	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034
Federal Obligation Authority /1	863	880	880	880	880	880	880	880	880	880
NHPP	541	551	551	551	551	551	551	551	551	551
STBGP	227	231	231	231	231	231	231	231	231	231
Bridge Formula Program /2	38	38								
Total Eligible Amount /3	**901**	**918**	**880**	**880**	**880**	**880**	**880**	**880**	**880**	**880**

Notes:

1/ Formula Federal Aid Obligation Authority, including NHPP Exempt but not inclusive of August Redistribution.

2/ Highway Infrastructure Program Bridge Formula Funding is a supplemental program under the Infrastructure Investment and Jobs Act (IIJA). This funding is not guaranteed to continue after 2026, the last year of the Act.

3/ Federal Obligation Authority plus Bridge Formula Program

Key: NHPP = National Highway Performance Program; STBGP = Surface Transportation Block Grant Program

The FAHP is a reimbursement program. Once projects are authorized in advance by FHWA and federal funds are obligated, the federal government reimburses states for costs as they are incurred. With few exceptions, federal reimbursements must be matched with state or local funds. For most projects in Arizona, the federal share is 94.3 percent, and the state/local share is 5.7 percent.

5.4.3 State Funding

The state of Arizona taxes motor fuels and collects a variety of fees and charges relating to the registration and operation of motor vehicles on the state's public highways. These collections include gasoline and fuel-use taxes, motor carrier taxes, VLTs, motor vehicle registration fees, and other miscellaneous fees. These revenues are deposited in the HURF and are then distributed to the cities, towns, counties, and the State Highway Fund for other transportation-related purposes.

Figure 5-3 depicts HURF revenues by source for FY 2024, the most recently completed state fiscal year. As shown, fuel tax and VLT comprised 78 percent of total HURF revenues. **Table 5-5** shows historical HURF revenues by source for 10 years of state FY 2015 through FY 2024.

Figure 5-3 | **Fiscal Year 2024 Highway User Revenue Funds Revenue by Source**

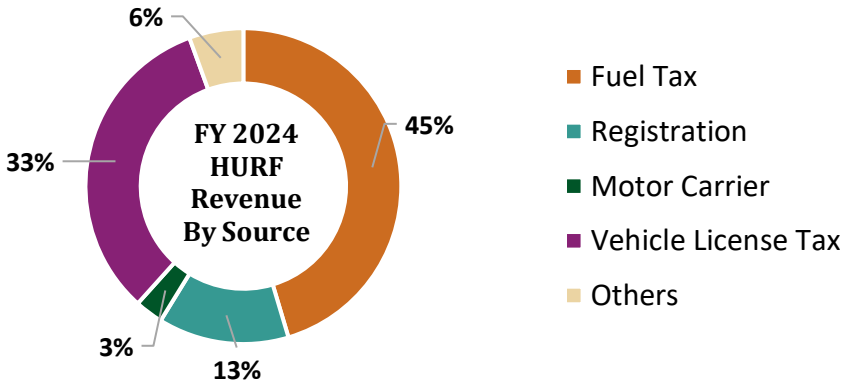


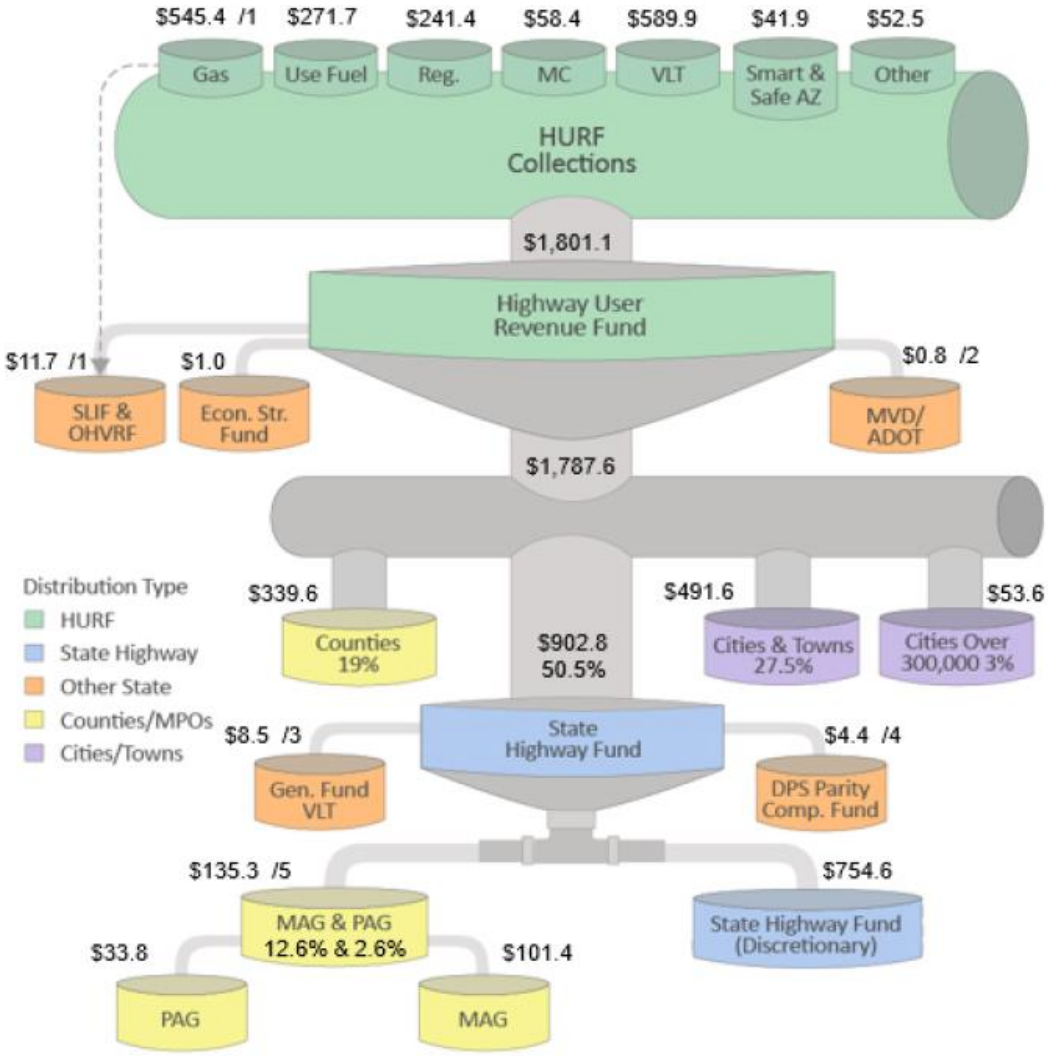
Table 5-5 | **Actual Highway User Revenue Fund Revenues by Source (FY 2015–2024, $Millions)**

Year	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Fuel Tax	655	688	706	729	750	733	755	795	785	817
Registration	169	174	178	181	193	191	220	236	243	241
Motor Carrier	57	58	58	58	62	37	49	56	54	52
Vehicle License Tax	370	396	422	445	469	473	551	543	567	590
Others	40	41	42	43	46	45	52	100	100	100
Total	**1,291**	**1,357**	**1,406**	**1,456**	**1,520**	**1,479**	**1,627**	**1,730**	**1,749**	**1,800**

Key: FY = fiscal year

HURF revenues are allocated and distributed by statute and through annual budget legislation. **Figure 5-4** shows actual HURF revenues and distributions for FY 2024, in which funding from all sources was $1.8 billion. Allocations and distributions from HURF are made to various stakeholders, such as the Department of Public Safety, Motor Vehicles Division, State Highway Fund, and cities, towns, and counties. The State Highway Fund is further allocated between Arizona's two largest MPOs, ADOT, and other transfers.

Figure 5-4 | **Fiscal Year 2024 Highway User Revenue Funds Revenue Distribution Flow ($Millions)**



Source: ADOT Financial Management Services
Notes:

/1. Arizona Revised Statutes 28-5926 and 28-5927 transfer 1.6 percent of gas tax revenues to the State Lake Improvement Fund and 0.55 percent of gas tax revenues to the Off-Highway Vehicle Recreation Fund. The $545.4 million of gas tax revenue is before of a total $11.7 million transferred to the above two funds.

/2. The appropriations from Highway User Revenue Funds (HURF) for operating expenses and authorized third-party programs are reflected net of any reversions from prior years.

/3. Laws 2011, 1st Regular Session, Chapter 28 (SB 1616) transfers from the State Highway Fund share of HURF VLT generated the difference in the two-year and five-year VLT to the state general fund, which totaled $3.6 million in FY 2024. Laws 2010, 7th Special Session, Chapter 12 (HB 2012) an amount equal to 90 percent of the fees collected under 28-4802 (A) and 60 percent of the fees collected under 28-4802 (B) shall be transferred from the State Highway Fund share of HURF VLT to the State General Fund which totaled $4.9 million in FY 2024.

/4. Per Arizona Revised Statutes 28-5808, 1.51 percent of the State Highway Fund share of HURF VLT is distributed to the Department of Public Safety Parity Compensation Fund.

/5. The 12.6 percent (statutory) and 2.6 percent (non-statutory) allocations from the State Highway Fund share of HURF distributions.

/6. Revenues to the State Highway Fund are reduced by the amount retained by Authorized Third Parties for the collection of VLT.

Since 1986, ADOT has estimated HURF revenues using a comprehensive regression-based econometric model. To deal with uncertainty regarding this estimate, ADOT introduced its risk analysis process in 1992. This process relies upon probability analysis and the independent evaluation of the model's variables by an expert panel of economists. This results in a series of forecasts with specified probabilities of occurrence, rather than a single or "best guess" estimate. More information about the HURF forecast can be found in the *Arizona Highway User Revenue Fund Forecasting Process & Results FY 2025–2034* in **Appendix A**.

ADOT's official September 2024 forecast for FY 2025–2034 HURF amounts to $21.3 billion with a compound growth rate of 3.1 percent. The official forecast incorporates the 50 percent confidence interval growth rates produced by the risk analysis process model for each year of the forecast except for FY 2025. The FY 2025 forecast of $1.5 billion was developed by ADOT staff using time series techniques, historical and projected growth rates, and recent legislative changes. **Table 5-6** presents the estimated HURF funds by category for FY 2025–2034.

Table 5-6 | **Highway User Revenue Funds Official Revenue Forecast with Category Details (FY 2025–2034, $Millions)**

State Fiscal Year	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034
Gasoline Tax	555	576	589	601	614	625	635	645	655	663
Use Fuel Tax	283	290	300	310	320	328	338	346	354	361
Motor Carrier Fee	60	64	66	68	70	71	73	75	77	79
Vehicle License Tax	608	640	665	690	715	741	768	795	823	851
Registration	250	249	254	259	264	269	274	279	285	290
Smart and Safe Arizona	43	50	54	57	59	62	64	66	68	70
Other	53	56	58	60	61	63	64	66	67	69
Total HURF	**1,852**	**1,925**	**1,986**	**2,044**	**2,103**	**2,159**	**2,216**	**2,273**	**2,329**	**2,382**
State Highway Fund	**913**	**951**	**981**	**1,010**	**1,039**	**1,067**	**1,096**	**1,124**	**1,151**	**1,178**

Source: Arizona Highway User Revenue Fund Forecasting Process & Results FY 2025-2034.

Key: FY = fiscal year; HURF = Highway User Revenue Funds

5.4.4 Regional and Local Funding

Several counties in the state collect taxes that support regional transportation needs. They include Maricopa, Pima, Pinal, and Gila Counties. Of these, Maricopa and Pima, which have the largest contributions to regional transportation needs, are described below.

5.4.4.1 Maricopa County

In November 2004, voters in Maricopa County approved a county excise tax for transportation purposes (Proposition 400), which primarily includes expansion and modernization but may include preservation projects on the NHS, although this is rare. The Arizona County RARF collects tax revenues. In 2004, Maricopa County voters approved a half-cent sales tax that sunsets after 20 years and, thus, is set to expire on December 31, 2025, unless extended. The gross receipts from the tax are collected by the Arizona Department of Revenue and split 66.7 percent to the Maricopa County RARF and 33.3 percent to the Public Transportation Fund.

In November 2024, voters in Maricopa County approved Proposition 479, an extension of the transportation excise tax for another 20 years (January 1, 2026, to December 31, 2045). This extension keeps the current half-cent rate but modifies the distribution of funds collected.

Like HURF revenue estimation approaches, since 1986, ADOT has used a comprehensive regression-based econometric model to estimate transportation excise tax revenues in Maricopa County. These revenues, which flow into the RARF, are the major funding source for the Maricopa County Freeway Program. To deal with uncertainty regarding this estimate, ADOT introduced its risk analysis process in 1992. This process relies upon probability analysis and the independent evaluation of the model's variables by an expert panel of economists. This results in a series of forecasts with specified probabilities of occurrence, rather than a single or "best guess" estimate. More information about the RARF forecast can be found in *Maricopa County Transportation Excise Tax Forecasting Process & Results* in **Appendix A**.

ADOT's September 2023 official forecast for FY 2024−2026 RARF revenue amounts to $2 billion with a compound growth rate of 4.9 percent. The official forecast result incorporates the 60 percent confidence interval growth rates produced by the risk analysis process model for each year of the forecast, except for FY 2024. The FY 2024 forecast of $745 million was developed by ADOT staff independently of the econometric model using time series techniques, historical growth rates, projected growth rates, and recent legislative changes. From this total forecast, 56.2 percent is used for freeways and other routes in the SHS, including capital expenses. Furthermore, 10.5 percent is allocated to arterials, including capital expenses and implementation studies. **Table 5-7** presents the estimated RARF funds (excluding the Public Transportation Fund), showing how they are expected to be subdivided from 2024 to 2026. This table also includes revenue projections for Proposition 479 from FY 2026–2034, available for freeway transportation projects.

Table 5-7 | **Regional Area Road Fund Available for Freeway Transportation Projects**

Fiscal Year	Freeways ($Million)
2025	430
2026 /1	403
2027	346
2028	362

Fiscal Year	Freeways ($Million)
2029	381
2030	400
2031	422
2032	444
2033	466
2034	492

Note: 1/ Prop 400 expires December 2025 (FY 2026), but Prop 479 takes effect January 2026. Therefore, FY 2026 projections reflect collections from both propositions.

5.4.4.2 Pima County

In Pima County, a $2.1 billion RTA plan was approved by Pima County voters on May 16, 2006. At the same time, voters approved a transaction privilege tax, or excise tax, to fund the 20-year plan. The RTA is managed by the Prima Association of Governments (PAG).

The half-cent sales tax collection began on July 1, 2006, and the tax is collected from the state-established RTA special taxing district within Pima County to deliver RTA projects. Some of the projects will be funded with RTA funds only, and other projects will be supplemented by regional funding. The current RTA plan is set to expire on June 30, 2026. To continue funding transportation projects beyond this date, the RTA is developing a new 20-year plan, known as "RTA Next," which includes a proposed extension of the half-cent sales tax. A voter referendum for this new plan and tax extension is tentatively scheduled for spring 2026. Assuming that the next tax is extended. The RTA funding allocated to roadway projects over the next 10 years is summarized in **Table 5-8**.

Table 5-8 | **Programmed Regional Transportation Authority Funds Allocated to Roadway Projects ($Millions)**

FY	RTA Funds($Million)
2025	122
2026	125
2027	128
2028	131
2029	135
2030	138
2031	142
2032	146
2033	150
2034	155

Note: RTA is set to expire in July 2026. A vote to re-establish the tax will take place next spring. Future funding projections are contingent upon the approval of a new excise tax.
Key: FY = fiscal year; RTA = Regional Transportation Authority

Regional funds from MAG, PAG (RARF and RTA, respectively), and other entities have generally been used to fund expansion projects (as opposed to preservation) pursuant to the

enabling language governing such funds. As a result, preservation projects in these regions are typically done with federal, state, and local funds.

5.4.5 Total Projected Funding Sources

Table 5-9 presents a summary of the projected revenues for each funding source described in the previous sections. The table shows that about $26.1 billion in funding would be available for investment in transportation-related projects over the next 10 years.

Table 5-9 | **Projected Revenue Available for Preservation and Other Transportation Purposes ($Millions)**

Fund Types and Sources	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034
Federal Obligation Authority	901	918	880	880	880	880	880	880	880	880
State Highway Fund*	913	951	981	1,010	1,039	1,067	1,096	1,124	1,151	1,178
Regional Funds	552	528	474	493	516	538	564	590	616	647
MAG (RARF)	430	403	346	362	381	400	422	444	466	492
PAG (RTA)	122	125	128	131	135	138	142	146	150	155
TOTAL	**2,366**	**2,397**	**2,335**	**2,383**	**2,435**	**2,485**	**2,540**	**2,594**	**2,647**	**2,705**

*Note: * Includes the allocation from State Highway Fund: Maricopa Association of Governments (MAG) (12.6 percent) and Prima Association of Governments (PAG) (2.6 percent).*

Key: FY = fiscal year; MAG = Maricopa Association of Governments; PAG = Prima Association of Governments; RARF = Regional Area Road Fund; RTA = Regional Transportation Authority

In addition to the capital funding shown in **Table 5-9**, ADOT's maintenance budget also provides some funding for non-capital preservation treatment activities. The budget is approved annually by the Arizona Legislature and can be difficult to forecast. The approved FY 2021 maintenance budget included $36.1 million for surface treatments. It is anticipated that pavement surface treatment funding will remain at FY 2021 levels in the foreseeable future.

5.4.6 Estimated Funds Available to be Programmed for Bridges and Pavements

Table 5-10 presents the estimated amount expected to be programmed for bridge and pavement preservation over the next 10 years, based on the federal, state, and regional funding forecasts presented in this section.

Table 5-10 | **Estimated Amounts of Funds identified in the Long Range Transportation Plan and State Maintenance for State Bridge and Pavement Preservation ($Millions)***

Fund Types and Sources	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034
Bridge LRTP	60	60	60	60	60	60	60	60	60	60
Bridge Maintenance	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Bridge Total	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**
Pavement LRTP	406	406	406	406	406	406	406	406	406	406
Pavement Maintenance	27	27	27	27	27	27	27	27	27	27
Pavement Legislative Appropriation**	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1
Pavement Total	**469.1**	**469.1**	**469.1**	**469.1**	**469.1**	**469.1**	**469.1**	**469.1**	**469.1**	**469.1**
Bridge and Pavement Total	**532.6**	**532.6**	**532.6**	**532.6**	**532.6**	**532.6**	**532.6**	**532.6**	**532.6**	**532.6**

*Notes: *This table does not include funding from expansion projects that improve existing bridges and pavements in addition to adding capacity.*

***Includes $36.1 million annually of State Line Item funds approved by the Arizona Legislature*

Key: FY = fiscal year; LRTP = Long-Range Transportation Plan

Section 6 Life Cycle Planning

6.1 Introduction

This section outlines the systematic approach ADOT uses to identify the most cost-effective strategies for maintaining and enhancing the condition of bridge and pavement assets through LCP. It introduces the analytical tools that support ADOT's pavement and bridge management decision-making, along with the multi-step process for conducting LCP analysis. The section also defines the work types—such as maintenance, preservation, rehabilitation, and reconstruction—used to develop investment strategies and the treatments within each category, including estimated costs for both bridge and pavement assets throughout their life cycle. Additionally, it presents the findings from the evaluated LCP scenarios, enabling a comparison of different investment strategies to assess their impact on asset condition and system performance over a defined analysis period.

6.2 Asset Performance and Transportation Goals

Bridges and pavements play a critical role in achieving the federal transportation system goals enumerated in 23 USC 150(b). Specifically:

- **Safety** – Maintaining bridge decks and pavements in Good condition helps reduce the risk of crashes caused by sudden maneuvers to avoid potholes. The ability of bridges to withstand natural or man-made hazards, such as flooding or over-height truck collisions, is also crucial for safety. Treatments that preserve pavement surface characteristics or reduce rutting can lower the likelihood of wet-weather accidents and hydroplaning.
- **Infrastructure Condition** – Bridges and pavements that are allowed to deteriorate beyond the point where maintenance or preservation is effective require significantly more expensive rehabilitation or replacement, making their condition a key driver of life cycle costs.
- **Congestion Reduction and System Reliability** – As bridge decks and pavements deteriorate, vehicles often travel at slower speeds, negatively impacting mobility. Mobility is also affected by work zone closures. ADOT's focus on increasing the use of preservation treatments will reduce the need for rehabilitation and reconstruction projects, which often result in longer work zone closures.
- **Freight Movement and Economic Vitality** – Efficient freight movement requires reliable roadways that are subject to minimal disruptions, including construction delays. At the same time, heavy truck traffic can increase deterioration rates, ultimately affecting system performance. A safe and effective transportation system is key to the economic vitality of a region.
- **Environmental Sustainability** – Slower traffic speeds, resulting from poor infrastructure conditions, contribute to greater vehicle emissions from idling and reduced fuel

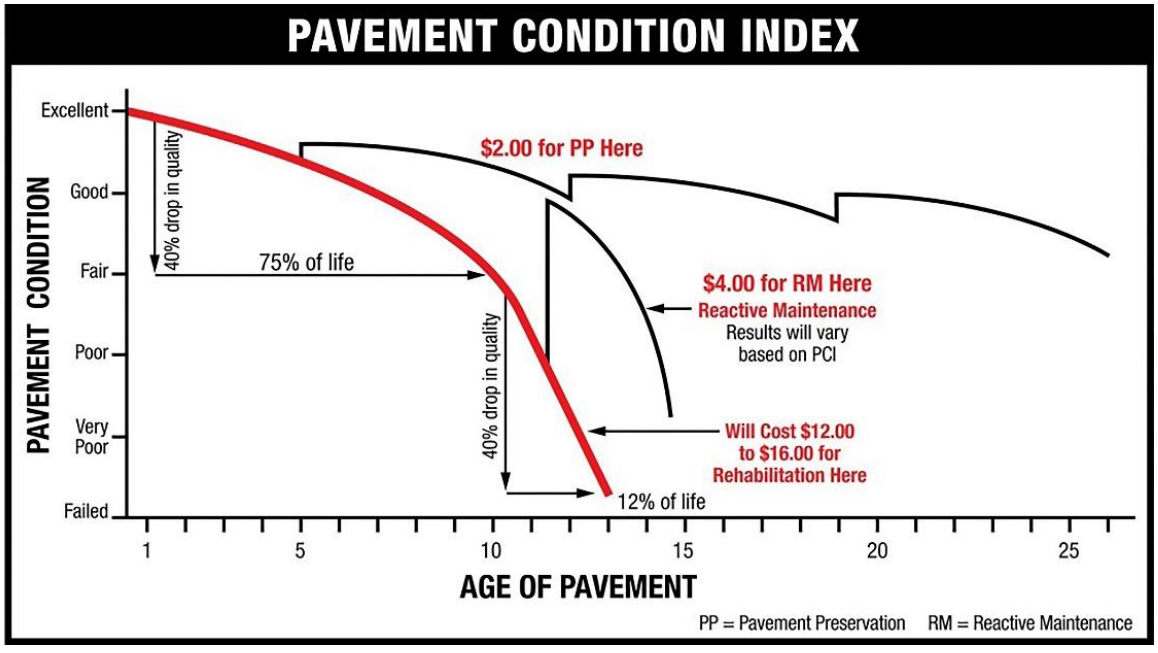
efficiency. Good condition roads have less rolling resistance and support higher speeds, leading to greater fuel efficiency and lower environmental impacts. Further linking environmental considerations and asset management can measurably improve the development of life cycle strategies.

- **Reduce Project Delivery Delays** – Preservation projects can be delivered more quickly and at a significantly lower cost than rehabilitation and reconstruction projects. Preservation projects also tend to require fewer road restrictions and closures. ADOT strives to coordinate its bridge and pavement preservation work with other needs on a corridor to reduce work zone traffic restrictions.

6.3 Life Cycle Planning at the Arizona Department of Transportation

Applying maintenance and preservation treatments while an asset is still in Good condition is the most cost-effective approach to maximizing its life cycle. This principle is illustrated by the Pavement Condition Index shown on **Figure 6-1,** which illustrates that consistent investment in preservation helps maintain a pavement in Good condition for a longer period and at a lower cost, compared to delaying until rehabilitation is necessary. Studies have shown that for every $2 spent on pavement preservation while it is in Good condition, $12 to $16 is spent on major rehabilitation or reconstruction when the original pavement deteriorates to Poor condition. This concept is equally applicable to the bridge LCP.

Figure 6-1 | **Illustration of the Cost-effectiveness of Pavement Preservation Treatments**



Source: International Slurry Seal Association (ISSA)

LCP enables ADOT to evaluate the trade-offs and benefits of incorporating various levels of preservation into its management strategy. This approach helps identify an optimal mix of treatments (i.e., preservation, rehabilitation, and reconstruction) that maximizes both performance and investment across an entire asset class, supporting the development of data-driven investment strategies aligned with agency objectives.

6.4 Life Cycle Planning Process

ADOT utilizes the BrM software for bridges and the Deighton Total Infrastructure Management System (dTIMS) software for pavements to support life cycle and investment planning. These management systems comply with the requirements outlined in 23 CFR 515.17 and are integral to a multi-step process for conducting LCP analysis:

- Form an LCP analysis team
- Select the asset classes and networks to be analyzed
- Establish performance targets that support a SOGR
- Use historical inspection data to develop models of asset deterioration rates
- Identify treatment costs and options for various states of asset deterioration
- Identify risks that could affect the assets, including changes in system demand
- Identify agency priorities for the selection and ranking of treatments
- Identify anticipated funding, constraints, inflation, and discount rates
- Develop asset management treatment strategies and funding scenarios to analyze with dTIMS and BrM software
- Use the analysis and professional judgment to identify the preferred strategy to carry forward in the planning process

The selected strategy informs investment decisions in the LRTP, the Five-Year Transportation Facilities Construction Program, and the STIP.

6.5 Risk in the Life Cycle Planning Process

Each step of the LCP process factors in risk:

- **Networks and asset classes:** The selection of networks and asset classes enables prioritization based on the relative risk impacts on different parts of the system.
- **Targets:** Targets address risk by defining acceptable performance levels, allowing for the identification of gaps that may lead to an underperforming network or management strategies that are not cost-effective or sustainable.

- **Deterioration models:** Annual and biannual condition assessments help detect excessive deterioration caused by weather, defects, or heavy use. Historical data used to develop and update models captures variations in deterioration rates due to these risks.
- **Treatment options and costs:** Different treatment options can be applied to different networks and asset classes depending on the relative importance and risks associated with each. Treatment cost comparisons enable the weighing of costs against benefits, including risk reduction.
- **Risk identification and agency priorities:** Bridge and pavement risks and priorities have been incorporated into cost-benefit and priority formulas in the BrM and PMS to prioritize strategies that reduce risks.
- **Available funding:** The evaluation of different funding and inflation scenarios enables financial risk and the risk of devoting insufficient resources to asset management to be considered during the development of investment strategies.
- **Professional judgment:** Professional judgment allows the consideration of risks that are not easily captured by the management system analysis, such as project delivery risks.

6.6 Bridge Life Cycle Planning

Arizona's bridges are subject to constant deterioration as they age. Most existing bridges on the SHS were originally designed with a 50-year lifespan. However, advancements in bridge materials and construction methods since 2007 have enabled ADOT to design bridges with a projected 75-year lifespan. With proper preservation efforts, bridges can last even longer than their intended lifespan.

Arizona's diverse climate makes it challenging to predict bridge asset lifespans due to significant variations in temperature and precipitation across the state. High-elevation areas often experience freeze-thaw cycles and heavy snowfall, accelerating wear. In contrast, low-elevation areas, which have the largest population centers and higher traffic and truck volumes, experience minimal rainfall and fewer freeze-thaw cycles, but the heavy traffic accelerates bridge deterioration. Hazards such as weather, deicing chemicals, heavy trucks, and accidents all contribute to the rate of decay.

Different parts of a bridge deteriorate at varying rates. For example, expansion joints wear out quickly, while decks experience moderate deterioration, and piers typically last much longer. These varying rates of deterioration influence the timing of maintenance and preservation activities required to maintain bridge performance. ADOT's bridge inspectors regularly monitor bridge conditions for necessary maintenance and preservation. Meanwhile, the bridge management team utilizes LCP to determine the best timing and treatments for bridges across the state.

These factors are closely tied to life cycle cost and risk management. Preservation work is chosen with the goal of mitigating deterioration and reducing long-term costs, while also minimizing disruptions to the public. ADOT regularly assesses the risks associated with both

natural and man-made hazards to evaluate the economic impact of bridge closures or restrictions on road users. The steps ADOT follows in its bridge LCP analysis are outlined in the following sections.

6.6.1 Analyzed Bridge Networks

Scenarios were developed for three overlapping networks, as follows:

- **State-owned bridges, including state-owned NHS bridges.** This network represents the complete set of bridges whose preservation is managed by ADOT, utilizing federal, state, and regional funding.
- **State-owned NHS bridges**. A subset of the previous network, this group represents bridges of national importance that are subject to federally required performance metrics and targets.
- **Locally owned NHS bridges**. A smaller network, this consists of bridges whose preservation is managed and funded by local agencies, often with federal and/or state assistance. The results of life cycle analysis for this network are presented in **Section 7** .

6.6.2 Bridge Performance Targets

In addition to the two- and four-year targets set for compliance with the Transportation Performance Management Rules (23 USC 150), a desired SOGR target was established (**Table 6-1**). The desired SOGR was used to compare the results of each LCP scenario, helping to evaluate the level of service achievable at the expected funding level over the analysis period.

Table 6-1 | **Desired State of Good Repair**

Bridge Class	Minimum % Good/Fair	Maximum % Poor
National Highway System	>96	<4
State Highway System	>96	<4

6.6.3 Bridge Deterioration Models

BrM software can analyze bridges at two levels of detail:

- **NBI components**. This is the deck, superstructure, substructure, and culvert 0-9 rating system that ADOT has used since 1995.
- **Association of State Highway and Transportation Officials (AASHTO) elements.** Bridges consist of more than 100 types of elements of varying functions and materials. Each element is rated on a scale of 1 (no defects) to 4 (severe defects). ADOT has been gathering condition data in this format since 2014. A subset of these elements is reported to the FHWA annually as a part of the NBI.

Currently, ADOT uses a bridge element deterioration model developed in 2016 for the National Bridge Investment Analysis System (NBIAS), a software tool employed by the FHWA for national bridge needs planning, as required for periodic reports to Congress. This model is based on bridge inspection data from 15 states, including Arizona. Since deterioration rates can

vary by climate, ADOT utilizes the version of this model that applies to hot and dry states, where deterioration occurs at a relatively slower rate.

The NBIAS model was developed using bridge element inspection data gathered under the 1997 AASHTO Guide for Commonly Recognized (CoRe) Structural Elements. Arizona bridge inspection data starting in 1999 was used to develop this deterioration model. Originally, the model was based on the 1997 element definitions; however, it was later converted to be compatible with the 2013 AASHTO Manual for Bridge Element Inspection, using a methodology developed by the Florida Department of Transportation. Review of the models by ADOT experts resulted in further adjustments to a few elements to slow the onset of deterioration, to better fit the Arizona experience.

To account for uncertainty in predicting bridge conditions, BrM software uses a predictive deterioration model to estimate the fraction of a population of elements in each condition state at any future point in time. Deterioration models are typically expressed in terms of the median number of years to transition from each condition state to the next-worse state. Since the models quantify year-to-year changes in condition, they can be developed using a relatively small amount of data, as little as two inspection cycles (four years). However, the models are more reliable if developed using data from more inspection cycles and if the data used to establish the models is exclusively from Arizona bridges. ADOT plans to revise its deterioration models before the next AMP.

6.6.4 Life Cycle Strategies

ADOT maintains a Bridge Preservation Program manual to guide the planning of work on existing bridges. ADOT also uses the FHWA Bridge Preservation Guide to support this purpose. The treatments documented in the ADOT manual can be categorized as follows:

- **Initial Construction**. Complete construction of a new bridge structure on a new alignment.
- **Reconstruction**. The removal of an existing bridge and the construction of a replacement bridge to serve the same alignment typically incurs an average cost of $1,500 per square foot in Arizona. Since replacements are often driven by traffic growth or other functional requirements, additional costs for bridge expansion and modifications to approach roads, both above and below the structure, are commonly incurred.
- **Rehabilitation**. Major work required to restore or enhance the structural integrity of a bridge, as well as improve its function, capacity, or safety, typically involves significant costs. On average, it may cost $350 per square foot to improve a Poor bridge to Fair condition, or $775 per square foot to elevate a bridge to Good condition. Rehabilitation treatments include:
  - Partial or complete replacement of deck or wearing surface
  - Partial or complete replacement of bridge railing
  - Retrofit of fatigue-prone steel details
  - Retrofit of fracture-critical members to add redundancy

  - Partial or complete replacement of superstructure
  - Bridge strengthening
  - Bridge widening
  - Bridge jacking to reset bearings or increase vertical clearance

- **Preservation**. Actions or strategies designed to prevent, delay, or reduce the deterioration of bridges or bridge elements typically incur costs of around $225 per square foot. Preservation treatments are listed below:
  - Seal or replace a leaking deck joint
  - Removal of deck joints where feasible
  - Rehabilitation or replacement of deck drains
  - Application of thin overlays on bridge decks
  - Installation of rigid deck overlays
  - Repair or restoration of major structural elements such as beams, piers, or culverts
  - Fiber-reinforced polymer wrap of structural elements
  - Painting of steel elements
  - Seismic retrofit of superstructure and/or substructure
  - Installation of scour countermeasures
  - Repair of slope paving
  - Deck sealing on a three- to five-year interval
- **Maintenance**. Condition-based or interval-based activities that do not require engineering or multiyear programming, usually determined by inspectors or local crews. These typically do not improve condition measures but serve to delay deterioration. Typical costs are in the range of $10 to $50 per square foot. Maintenance activities include:
  - Bridge cleaning on a one- to five-year interval
  - Lubrication of bearings and pins on a two- to five-year interval
  - Sealing of substructure caps and bearing seats on a three- to five-year interval
  - Apply protective coatings on beam ends on a 10 to 15-year interval or as needed
  - Repair of bridge rail deterioration or collision damage
  - Minor deck spall repairs or deck crack sealing as needed
  - Approach slab repairs or mudjacking
  - Cleaning of scuppers and expansion joints as needed
  - Arrest of steel fatigue cracks as needed

- Removal of channel or culvert debris as needed
- Cleaning of brush from under or around bridges as needed

ADOT considers bridge replacement as an alternative to rehabilitation when the estimated rehabilitation cost exceeds 60 percent of the replacement cost. The distinction between rehabilitation and preservation is primarily based on the severity of defects. Preservation work is programmed for bridges in generally Good structural condition to maintain Good condition at minimal cost. By strategically using preservation treatments, large costs are deferred, maximizing the benefit of the significant investment Arizonans make in their bridges and reducing overall costs in the long term.

ADOT has configured the BrM software to group individual treatment actions into preservation, rehabilitation, and reconstruction work types for bridge deck, superstructure, and substructure components, thereby limiting the number of treatment combinations that need to be analyzed. The BrM software performs a top-down analysis, starting with a general treatment for a given bridge element and, to increase efficiency, checks if other elements on the same bridge are eligible for treatment, allowing treatments to be combined into a single construction project. Since routine maintenance treatments and associated costs have not yet been integrated into ADOT's bridge management software, this treatment type was not included in the analysis. However, as maintenance activities typically do not improve condition levels, the absence of this information is not expected to impact the results of the analysis.

6.6.5 Risks to Bridges

Arizona bridges are subject to several primary risks:

- **Scour** – As discussed in **Section 4.3** , many older bridges over water are subject to scour impacts and have an increased risk of damage or failure.
- **Overloading** – Bridges that have fracture-critical elements or are posted with weight restrictions have an increased risk of damage or failure. Repeated loading with heavy vehicles can cause fatigue fractures.
- **Under-clearances** – Bridges that have lower vertical clearances than current design standards have an increased risk of damage from collisions.

BrM software factors in risk both by weighting certain risks for the purposes of prioritizing projects and by including risks in the calculation of the cost versus benefit for each project. This is discussed further in **Section 6.6.6** .

6.6.6 Bridge Management Objectives and Criteria

ADOT has integrated three bridge management objectives into the BrM software utility function as part of the LCP module: maximizing condition, minimizing life cycle costs, and managing risks.

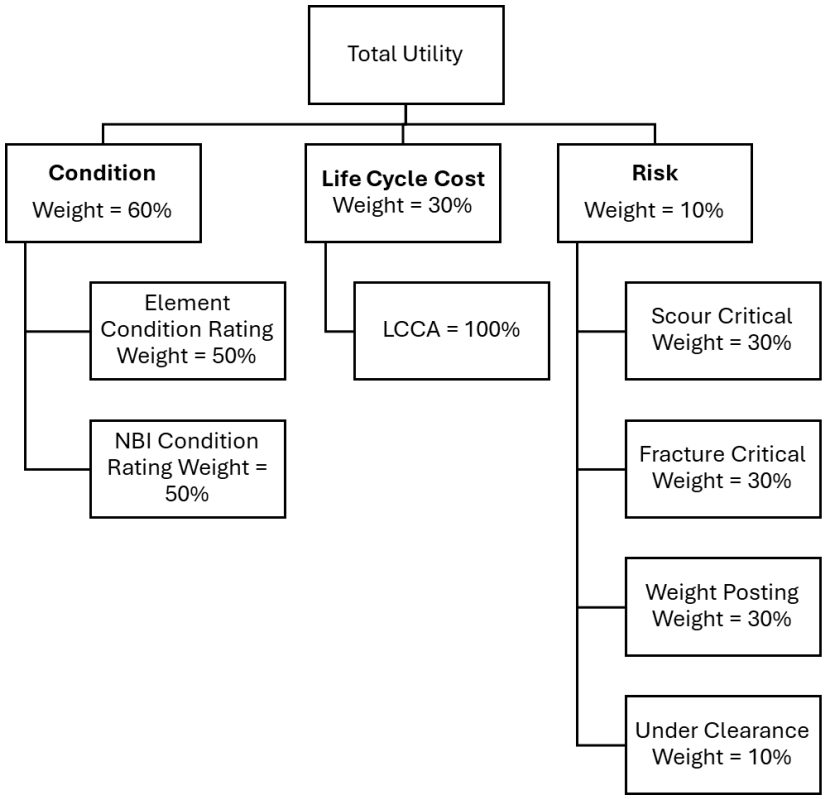
- **Maximizing Condition** – Condition is evaluated using two criteria: element-level ratings and NBI ratings.

- **Minimizing Life Cycle Costs** – Life cycle costs are assessed by identifying the treatment that results in the lowest long-term cost for a given condition state and age. This is determined through a net present value calculation over 50 years, using a 3 percent discount rate.
- **Managing Risk** – Risk is evaluated using four criteria: scour critical, fracture critical, weight posting, and under-clearances. This information is kept up to date in the BrM software.

These objectives, along with their supporting criteria, form the foundation for assessing the benefits of a project in relation to its costs. The total utility function in BrM software combines these objectives, evaluating the trade-offs between each to determine the most cost-effective and performance-optimized solutions. Each objective is assigned a weight on a 100-point scale based on its relative importance, as outlined on **Figure 6-2**.

This structured approach enables ADOT to prioritize bridge treatments and investments by balancing the desired condition improvements, life cycle costs, and risk management goals. By using the total utility function, the BrM software ensures that the selected strategies align with ADOT's long-term asset management priorities.

Figure 6-2 | **BrM Software Utility Tree with Weighting**



6.6.7 Bridge Life Cycle Planning Scenarios and Analysis

The LCP scenarios evaluated continue the work done in 2021, where the objective was to create a smooth and implementable transition from a reactive strategy to one focused on preservation treatments. Over the last four years, it was found that a predetermined allocation

was effective in maintaining bridge condition levels at a steady state under limited constraints. LCP scenarios are developed for each asset class based on expected and desired funding levels over a 10-year analysis period. ADOT evaluated the following two scenarios:

- **Bridge Group Allocation:** Building upon the 2021 life cycle analysis, and by tracking actual expenditures and condition data from the last four years, it was determined that an allocation of 20 percent for preservation, 45 percent for rehabilitation, and 35 percent for reconstruction effectively maintained bridges at a steady-state condition.
- **BrM Allocation:** This scenario emphasizes a heavy use of preservation treatments, as they generate the greatest total utility over the life cycle. It focuses on maintaining the importance of preservation treatments to prevent bridges from falling into Poor condition and extending their useful life with the least financial resources.

Table 6-2 summarizes the input parameters used in each of the two scenarios described above. The life cycle scenarios were run for the SHS, with a funding allocation representing an average of 60 percent allocated to the NHS. Since committed projects from the Five-Year Facilities Construction Program (FY 2025−2029) were incorporated into the analysis, there were variations in the annual funding levels for FY 2025−2029. After FY 2029, $53 million was used as the available funding for the remaining years in the analysis. For the Bridge Group allocation, the allocations were defined, while in the BrM Allocation Scenario, the system itself optimized the treatments over the time horizon. The life cycle analysis period was set at 20 years to better capture any performance gaps; however, this section focused only on the 10-year period starting in FY 2025.

Table 6-2 | **Bridge Life Cycle Planning Scenarios**

Life Cycle Scenario	BrM Allocation*	Bridge Group Allocation*
Annual funding Year <= 2029 ($Million)	*committed projects / annual funding varies*	*committed projects / annual funding varies*
Annual funding Year > 2029 ($Million)	53	53
Scope	SHS Bridges**	SHS Bridges**
Work Type Allocation Year > 2029		
Preservation	BrM maximizes total utility	20%
Rehabilitation		45%
Reconstruction		35%

*Note: * All scenarios include committed projects from the 2025–2029 STIP, supplemented by the Bridge Program project forecast.*

*** Life cycle scenario analysis was conducted for SHS bridges, with NHS/non-NHS outputs extracted from the results.*

Key: BrM = AASHTOWare BrM 6.0 Bridge Management System; NHS = National Highway System; SHS = State Highway System; STIP = State Transportation Improvement Plan

Figure 6-3 and **Figure 6-4** summarize the projected condition by deck area at the beginning of 2034 for the two scenarios evaluated. Of the two LCP scenarios, the BrM Allocation Scenario produced the best conditions for the SHS and NHS, with 55.0 percent and 57.7 percent, respectively, of deck area in Good condition by 2034. However, this scenario involved many small projects, which may not be realistic within the Arizona construction market. Additionally, the BrM Allocation Scenario does not account for indirect costs or work zone user costs, which, if included, would likely shift the optimal solution toward fewer, larger projects. ADOT is currently working on improving treatment costing to enhance the influence of these benefits in the total utility calculation. Furthermore, the BrM Allocation Scenario recommended very few bridge replacements. This is not realistic, since ADOT's bridge network has many bridges over 50 years old. The Bridge Group Allocation Scenario gradually replaces these older bridges to prevent a pile-up of Poor-condition bridges, which would be too expensive and difficult to replace all at once.

The performance of the Bridge Group Allocation Scenario was similar to the BrM Allocation Scenario, with 54.1 percent and 56.3 percent, respectively, for SHS and NHS. Both scenarios also demonstrated performance achieving a SOGR for the SHS and NHS.

Figure 6-3 | **State Highway System Bridges Projected Condition at the Beginning of 2034 for All Scenarios**

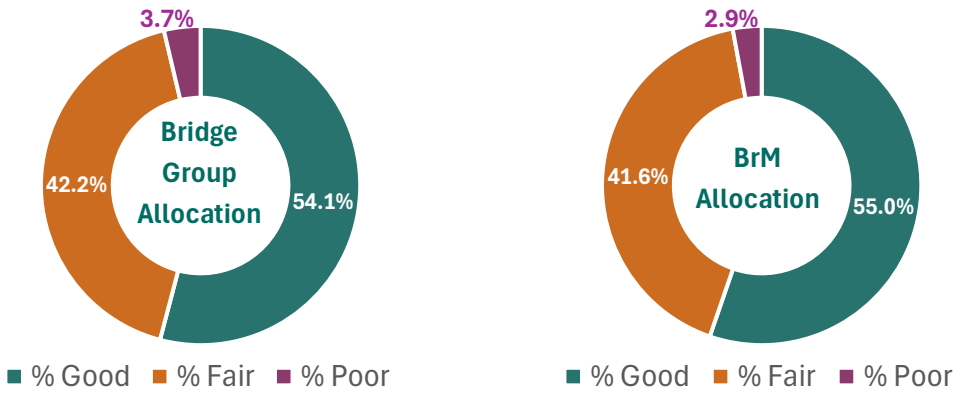


Figure 6-4 | **National Highway System Bridges Projected Condition at the Beginning of 2034 for All Scenarios**

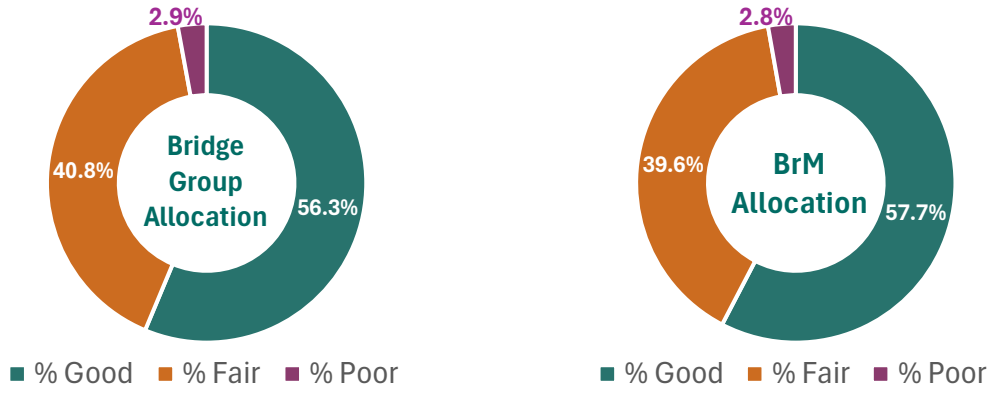


Figure 6-5 and **Figure 6-6** show the forecast of Good and Fair condition bridges by deck area over the next 10 years for the SHS and NHS for the two bridge LCP scenarios.

For the SHS and NHS, both scenarios show a decline in Good condition and an increase in Fair condition bridges. This is primarily driven by the aging of many of Arizona's largest bridges, which are newer than the average age of the inventory. All the scenarios investigated used funding projections deemed most realistic, based on estimates provided by asset owners and the ADOT finance group. It is expected that $60 million annually will be available to the bridge program, with $53 million allocated for preservation, rehabilitation, and reconstruction activities, and the remaining funds allocated to design and contingency. The Bridge Allocation LCP approach was concluded to represent a more realistic path to achieving a long-term SOGR, by incrementally replacing older bridges and being implementable and sensitive to market conditions. A key takeaway from the analysis is that near-term funding projections are sufficient to maintain a SOGR.

Figure 6-5 | **State Highway System Bridges Good and Fair Conditions Over the Next 10 Years for the Two Life Cycle Planning Scenarios**

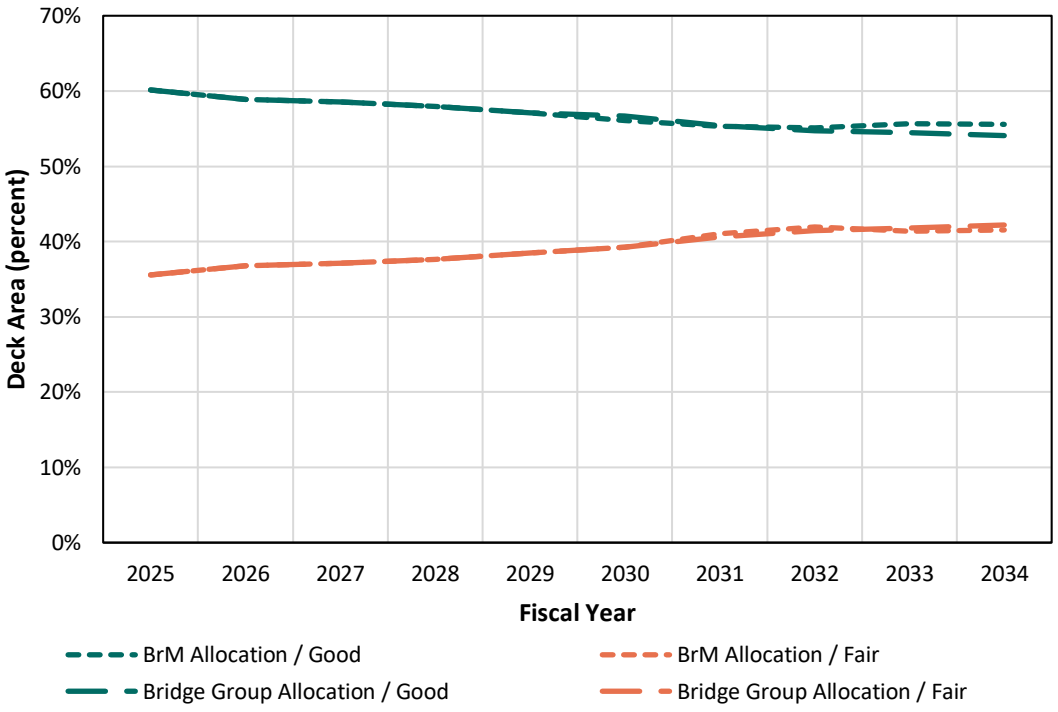
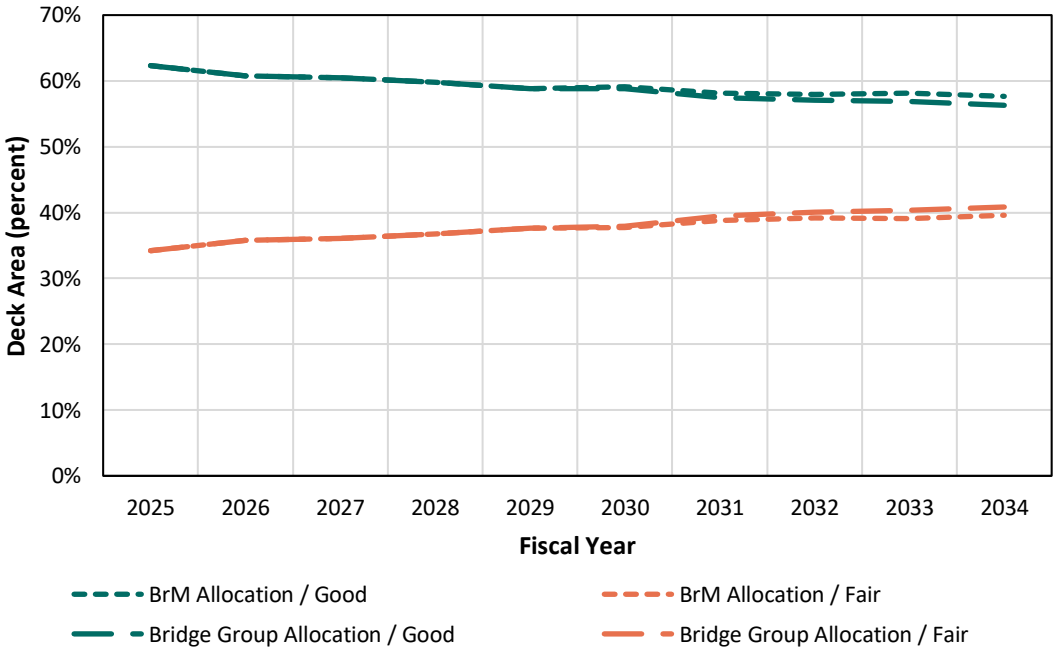


Figure 6-6 | **National Highway System Bridges Good and Fair Conditions Over the Next 10 Years for the Two Life Cycle Planning Scenarios**



6.7 Pavement Life Cycle Planning

As with bridges, pavements deteriorate with time based on a variety of factors:

- Traffic volumes and loads, including the effects of heavier truck traffic on pavement deterioration rates across the state.
- Lack of maintenance and preservation, due to a historical focus on addressing the pavements in the worst condition first.
- Weather conditions, reflecting the differences across the state in terms of daily temperature variations and freeze-thaw cycles as well as the potential fires on hot, dry days and individual precipitation events that may lead to flooding.
- Pavement age, recognizing that a significant percentage of the pavements on the state-maintained system have exceeded their design life and require extensive repairs.

Most flexible pavements are designed to last 20 years before major rehabilitation is required. However, the timely application of low-cost preservation treatments, such as chip seals, can slow deterioration and extend pavement life, reducing the frequency of major rehabilitation. From a long-term perspective, the most cost-effective approach to managing a pavement network involves a combination of planned maintenance, preservation, and rehabilitation activities to maintain pavement performance in Good condition for as long as possible. The steps ADOT undertook for pavement LCP analysis are outlined in the following sections.

6.7.1 Analyzed Pavement Networks

- To account for varying usage patterns, the highway system was subdivided into different pavement networks for analysis, as shown below. The applicable treatments depend on the usage pattern and importance of each network. The following networks are considered within the NHS and non-NHS systems:

- **NHS Pavements**
  - Interstates
  - Other state-owned NHS
  - Locally owned NHS (analyzed separately)
- **Non-NHS Pavements**
  - High volume
  - Low volume

6.7.2 Pavement Performance Targets

In addition to the two- and four-year targets set for compliance with the Transportation Performance Management Rules (23 USC 150), a desired SOGR target was established (**Table 6-3**) for each network. The desired SOGR was used to compare the results of each LCP scenario and assess the level of service achievable at the expected funding level. Since the locally owned

NHS network represents a small percentage of the total NHS, its performance is not expected to significantly impact the NHS's desired long-term target. However, ADOT has initiated a process to engage local NHS owners in developing a collaborative plan for data exchange and performance target setting that meets federal requirements. More information about ADOT's efforts to engage local NHS owners is provided in **Section 7** .

Table 6-3 | **Desired Long-Term State of Good Repair Target for Pavements**

Pavement Class	Minimum % Good/Fair	Maximum % Poor
Interstates	>95	<5
Other NHS – State Maintained	>90	<10
Other NHS – Locally Maintained	-	-
Non-NHS – High Volume	>90	<10
Non-NHS – Low Volume	>85	<15

Key: NHS = National Highway System

6.7.3 Pavement Deterioration Models

In 2017, ADOT began collecting pavement condition data using an automated system with 3D images (fully automated data collection and processing, with limited or minimal manual editing of automated results). This data does not correlate with pre-2017 historic pavement condition data, as the automated method differed from the previous manual approach. Therefore, it was decided to use only the data collected from the 2017-2019 annual pavement condition surveys to develop the empirical deterioration models for use in dTIMS. These surveys covered pavements of various ages, climate characteristics, and traffic conditions across the SHS, providing numerous data points to derive the deterioration models.

In 2024, when at least five years of automated pavement condition data had been collected, ADOT reviewed and updated its pavement deterioration models based on the expanded dataset. Initial findings showed accelerated deterioration rates compared to the earlier models. The unusually severe winter of 2022-2023 may have contributed to this increase in deterioration, and with more severe winters (i.e., heavier rain) predicted due to changing weather patterns, the new models may better reflect future conditions. ADOT will continue to monitor actual performance against predicted performance and update the models as necessary.

To develop the models, pavements were grouped into homogeneous families based on pavement type (e.g., concrete and asphalt), climate zones, traffic loads, and foundation quality. Statistical analysis of dependent variables (e.g., IRI, cracking, rutting, and faulting) and independent variables (e.g., traffic loads, age, and seasonal variation factors) was used to develop the deterioration models for each pavement family. The ADOT PMS Deterioration Curve Development Implementation Report outlines the methodology for establishing the deterioration models and is presented in **Appendix A**.

6.7.4 Life Cycle Strategies

ADOT employs a variety of treatments to address the needs of the state-maintained pavement network, including routine maintenance, preservation, major and minor rehabilitation, and reconstruction. ADOT's PMS is used to identify the most effective pavement treatments and their timing to optimize the pavement life cycle and reduce long-term costs. The following work type categories are used by ADOT:

- **Initial Construction**: Complete construction of pavement on a new alignment or a substantial expansion of an existing alignment.
- **Routine and Preventive Maintenance**: Maintenance includes treatments such as pothole repair. Maintenance activities are primarily intended to keep pavements operational. Maintenance is typically performed by ADOT District maintenance staff.
- **Preservation**: This category includes low-cost treatments applied to pavements in Good to Fair condition to slow the rate of deterioration and/or improve surface characteristics. Preservation treatments are not intended to add structure to the pavement. While this category includes a variety of treatments, the most common are fog seals, chip seals, friction courses, micro-surfacing, and cape seals. ADOT also incorporated scrub seals, specifically for low-volume roads, into the LCP analysis for this plan. The cost of treatments in this category ranges from $65,000 to $185,000 per lane mile.
- **Rehabilitation**: This category includes major rehabilitation activities that address surface deterioration and add structure to the existing pavement. Major rehabilitation treatments typically involve milling off the existing surface and replacing it with asphalt. These treatments are applied to pavements in Poor condition with significant deterioration. Traditionally, major rehabilitation has been the most common treatment used by ADOT. The average costs for treatments in this category typically range from $557,000 to $717,000 per lane mile.
- **Reconstruction:** Reconstruction is applied to a pavement when both the surface and underlying layers need to be replaced. Reconstruction is the most expensive of all the treatment options, so strategies that defer the need for this type of treatment help reduce life cycle costs. The average cost of reconstruction in Arizona averages $1.7 million per lane mile.
- The typical treatments included in each category are presented in **Table 6-4**. Not all treatment categories are applied across the entire SHS. For example, non-NHS routes are generally maintained with low-cost treatments due to limited funding for rehabilitation or reconstruction on this portion of the network. Decision trees within the dTIMS software are configured to determine the feasible treatment types for each pavement section based on its condition and other road features. This approach supports ADOT's analysis of various treatment strategies and their long-term impact on network conditions.

Table 6-4 | **Typical Treatments per Category**

Treatment Type Category	Typical Treatments	Typical Cost per Lane Mile (per ADOT)
Preservation	AC grinding / milling	$65,000 to $185,000
	Cape seal	
	Chip seal	
	Crack seal / fill	
	Fog seal / flush	
	Scrub seal	
	Friction course (Asphalt rubber – asphalt concrete friction course) / mill and fill or overlay of friction course	
	Micro surface	
	Portland cement concrete pavement (PCCP) cross-stitching	
	PCCP dowel-bar retrofit	
	PCCP diamond grinding	
	Slurry seal	
	Spot repair	
	Thin bonded overlay	
Rehabilitation	Major AC overlays	$557,000 to $717,000
	Mill and fill (existing AC)	
Reconstruction	Removal and replacement of existing roadway section	$1,700,000
	Spot reconstruction	

Key: AC = asphalt concrete; ADOT = Arizona Department of Transportation; PCCP = Portland cement concrete pavement

6.7.5 Risks to Pavements

Arizona pavements are subject to several risks:

- **Expansive-contractive soils (unstable subgrade)** – Some soils can swell significantly in the presence of water and shrink by a like amount when dry. This volume change adversely affects and shortens the life of pavements.
- **Flooding (unstable subgrade)** – Roadways that have insufficient drainage structures can be subject to flooding and washout that undermines all the road layers.
- **Overweight vehicles** – As mentioned in **Section 4.3** , overweight vehicles shorten bridge and pavement lifespans. This risk is addressed through enforcement.
- **Erosion and embankment failure** – This can include landslides and rockfall that may cause damage to the pavement or force the road to be closed for a period of time.

ADOT's Pavement and Geotechnical Sections reviewed each mile of the SHS for these risks and rated each risk identified for likelihood and consequence. The resulting risk scores were entered into the PMS for consideration in the benefit-cost calculations. If the risk associated with a pavement segment is addressed by the treatment considered, the full benefit of applying the treatment is used. If the risk is not addressed by the treatment, only a partial benefit is applied.

6.7.6 Pavement Management Benefit-Cost Analysis

ADOT's PMS uses a benefit-cost analysis to prioritize projects that are triggered using the treatment decision trees. Treatment decisions are based on many factors, such as pavement condition (e.g., cracking, IRI, rutting, and faulting), traffic, and life cycle strategies. The treatment prioritization process first converts pavement distress and performance metrics to a 0- to 25-point scale, then weights each distress and factor by its relative importance, summarized as follows:

- **Condition** – 75 percent - evaluated using the following criteria and weights:
  - Asphalt: IRI (25 percent), cracking (40 percent), and rutting (10 percent)
  - Concrete: IRI (25 percent), cracking (25 percent), and faulting (25 percent).
- **Risk** – 25 percent - calculated on a 1 to 25 scale (with 1 representing the lowest risk and 25 representing the highest risk), determined by multiplying the probability of failure and the consequence of failure (each rated on a 1 to 5 scale).

Treatment benefit is calculated as the area between the "do nothing" performance and the performance associated with the treatment application. The benefit area is multiplied by an average annual daily traffic factor to compute the overall benefit obtained from the treatment. The calculated benefit divided by the treatment cost represents the cost-benefit ratio, which is used to prioritize the suggested projects and treatment under constrained budgets.

6.7.7 Pavement Life Cycle Planning Scenarios and Analysis

ADOT developed three LCP scenarios that allocate different portions of the total funding across pavement preservation, rehabilitation, and reconstruction work types to evaluate performance at the end of the analysis period.

- **Baseline:** This scenario reflects ADOT's historical practices, with approximately 12 percent of pavement funding allocated to preservation activities, while most of the funding is directed toward rehabilitation and reconstruction.
- **dTIMS Optimization:** In this scenario, the PMS uses decision trees to select treatments that offer the highest cost-benefit ratio for managing the pavement network. Approximately 25 percent of the funding is allocated to preservation, with the remaining funds directed toward rehabilitation and reconstruction activities.
- **Increased Heavy Preservation:** This scenario reflects the ADOT Pavement Section's recommendation to increase heavy preservation treatments to a realistically

implementable level, aligned with ADOT's project development and programming processes. For the past several years, ADOT has dedicated $36.1 million annually to light preservation treatments, using funding established by the Arizona Legislature for this purpose. Additionally, ADOT has invested approximately $16 million annually in heavy preservation activities. Under this scenario, the annual investment in heavy preservation is increased from $16 million to $50 million, bringing the total preservation investment to about 19 percent of the total pavement funding.

Each scenario is based on the same total pavement funding of $442 million, with differences in the allocations to the various treatment categories. **Table 6-5** displays the percentage of the total pavement funding allocated to each treatment category for each scenario.

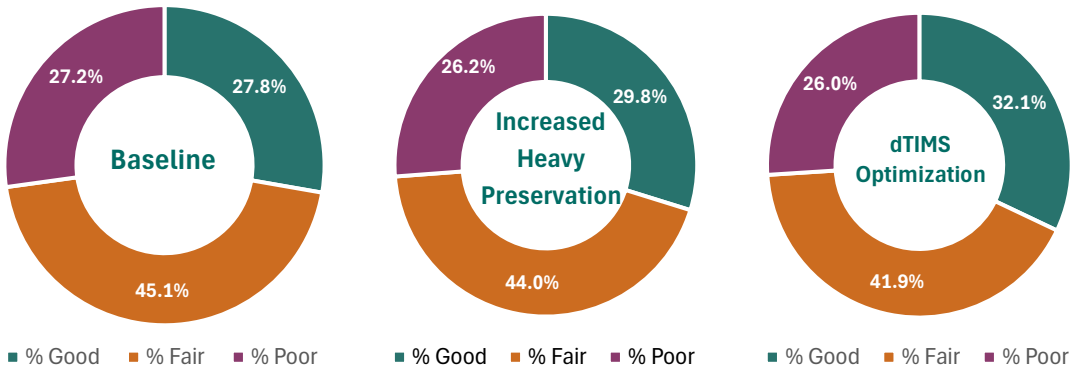
Table 6-5 | **Treatment Category Investment Levels for Life Cycle Planning Scenarios ($Million)**

Scenario	Light Preservation	Heavy Preservation	Major Rehabilitation	Reconstruction	Total ($Million)
Baseline	36.1	16.0	390.0	0	**442.1**
dTIMS Allocation	dTIMS decides	dTIMS decides	dTIMS decides	dTIMS decides	**442.1**
Increased Heavy Preservation	36.1	50.0	356	0	**442.1**

Key: dTIMS = Deighton Total Infrastructure Management System software

Figure 6-7 summarizes the projected pavement condition in 2034 for the three scenarios evaluated for the entire state-owned network.

Figure 6-7 | **State Highway System Pavement Projected Condition in 2034 for All Scenarios**

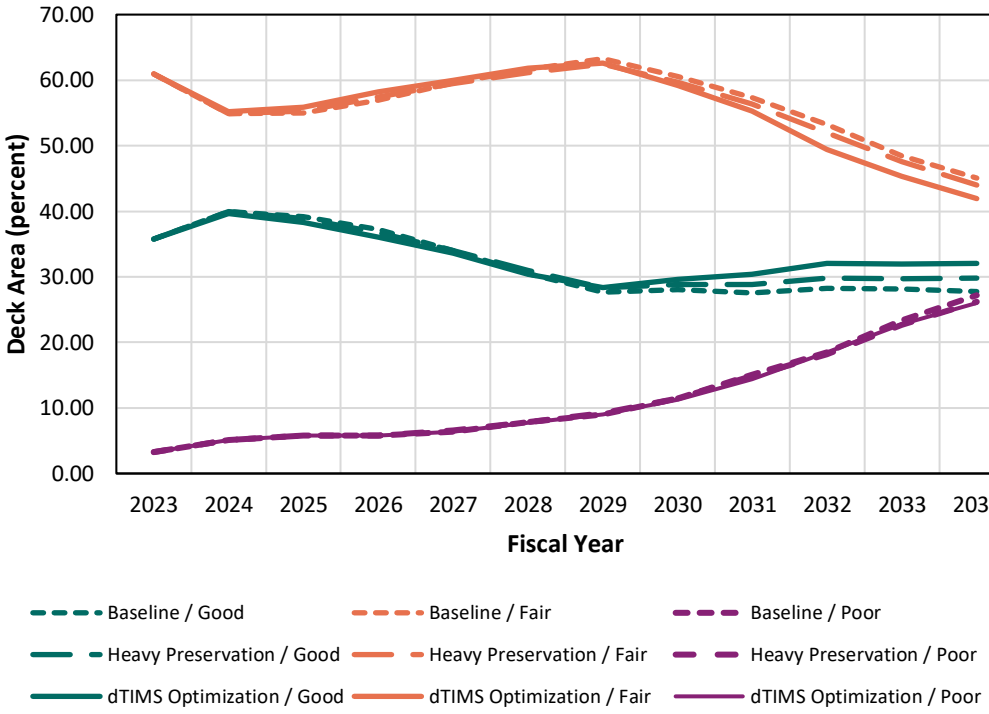


Of the three LCP scenarios evaluated, the dTIMS Optimization scenario produced the best conditions for the entire network, with 32.1 percent of lane miles in Good condition by 2034. In

contrast, the baseline scenario resulted in less favorable conditions, with 27.8 percent in Good condition and 27.2 percent in Poor condition after 10 years. The Increased Heavy Preservation scenario falls between the two, reflecting ADOT's effort to transition to a more proactive, preservation-focused approach.

Figure 6-8 shows the projected performance of Good and Fair pavements weighted by lane miles over the next 10 years for the entire pavement network for all three LCP scenarios.

Figure 6-8 | **Good and Fair Conditions for the Entire Pavement Network Over the Next 10 Years for All Three Scenarios**



All three scenarios show a decrease in both Good and Fair conditions. This is driven mainly by the projected funding, accelerated deterioration, and increased treatment costs, which have more than doubled in the last four years. Additional analyses were conducted for individual networks to better understand the distribution of the increase in Poor pavements. These analyses revealed that the low-volume roadway network and the Interstate network were seeing the largest increase in Poor pavements, with the Interstate network exceeding the federal ceiling of 5 percent Poor pavements by the end of the analysis period. **Table 6-6** shows the projected increases in the percentage of Poor pavements broken down by network. These analyses are discussed in more detail in **Section 8.7** , including strategies to mitigate and manage these trends.

Table 6-6 | **Increase in Percent Poor Pavement by Network for Heavy Preservation Scenario**

Network	2023 Condition^ (%)	2034 Predicted Condition (%)
Interstate	2.3	19.3

Network	2023 Condition^ (%)	2034 Predicted Condition (%)
Non-Interstate NHS	3.9	14.4
Non-NHS High Volume	5.2	14.1
Non-NHS Low Volume	9.0	45.4

Note: ^ Based on the 2023 Highway Performance Monitoring System submittal and ADOT's Pavement Dashboard (state-owned only).
Key: NHS = National Highway System

The projected conditions in the Heavy Preservation scenario support the ADOT Pavement Section's recommendations to increase preservation investments with a scenario that is realistically implementable in the context of ADOT's project development and programming processes. This strategy will allow ADOT to best manage pavement performance with the available funding, as shown on **Figure 6-8**.

Section 7 Local Public Agency Engagement

7.1 Overview

In the FHWA asset management Final Rule, 23 CFR 515, minimum requirements include developing a process for obtaining data from other NHS owners as follows:

> *"The processes established by State DOTs shall include a provision for the State DOT to obtain necessary data from other NHS owners in a collaborative and coordinated effort."*

If a state DOT, despite reasonable efforts, is unable to obtain data or reach an agreement with another NHS owner on implementing an investment strategy in the plan, the state DOT can provide an explanation in the documentation on AMP implementation provided under 23 CFR 515.13(b).

In addition, this provision (23 CFR 515.7(f)) is consistent with 23 CFR 450.208(a)(7), "Coordination of planning process activities," which requires state DOTs, in carrying out the statewide transportation planning process, to coordinate data collection and analysis with MPOs and public transportation operators to support statewide transportation planning and programming priorities and decisions.

It is important to note that the FHWA recognizes the need for MPO involvement and encourages their participation in the AMP development. However, since the asset management statute designates the state as the responsible entity, it is the state's responsibility to establish relationships with other asset owners to successfully develop its required AMP. If other NHS owners choose to develop their own AMPs, the involved entities should collaborate to determine how these plans will be integrated into the state DOT's NHS AMP.

Additionally, FHWA mandates that states coordinate with MPOs to the maximum extent practicable when establishing performance targets. MPOs can then decide whether to support these targets or develop their own, specific to their planning area.

In alignment with federal requirements, ADOT is currently engaging these agencies to create a collaborative plan for data exchange and performance target setting. This initiative will help ADOT develop statewide investment strategies that incorporate locally owned NHS assets in future AMP updates. This section outlines the LPAs in Arizona and summarizes ADOT's strategy for engaging LPAs to enhance TAM processes.

7.2 Local Public Agency National Highway System Ownership Summary

The NHS in Arizona includes 3,275 bridges, of which LPAs own 235. Similarly, the NHS includes 13,112 lane miles of pavement, of which 1,618 are owned by LPAs. Altogether, 39 local entities own these NHS assets. **Table 7-1** summarizes these local, tribal and other government entities and their corresponding NHS-locally owned assets.

Table 7-1 | **Arizona Local Public Agencies National Highway System Asset Ownership**

LPAs with NHS Ownership	Number of Bridges	Bridge Deck Area (square feet)	Total Pavement Lane Miles
Buckeye	-	-	4.2
Bureau of Indian Affairs*	-	-	10.2
Carefree	-	-	0.4
Casa Grande	-	-	15.7
Cave Creek	-	-	2.5
Cocopah Tribal Council	-	-	5.6
Chandler	-	-	56.5
Douglas	-	-	4.8
El Mirage	-	-	3.1
Flagstaff	-	-	9.5
Fountain Hills	1	3,300	21.1
Grand Canyon Airport Authority*	-	-	0.6
Grand Canyon National Park*	-	-	18.9
Glendale	7	130,155	64.7
Goodyear	2	9,368	18.2
Kingman	-	-	14.3
Litchfield Park	-	-	5.1
Marana	9	31,868	-
Maricopa County	7	151,136	81.1
Mesa	9	182,430	64.8
Paradise Valley	1	2,176	20.0
Peoria	2	66,876	22.6
Phoenix	53	720,516	614.8
Pima County	40	299,140	29.4
Prescott	-	-	2.9
Quartzite	-	-	7.5
Salt River Indian Community	-	-	1.1
San Luis	-	-	155.5
Scottsdale	16	93,008	8.6
Sierra Vista	4	13,872	-
Somerton	-	-	12.8
Surprise	2	6,186	32.0

LPAs with NHS Ownership	Number of Bridges	Bridge Deck Area (square feet)	Total Pavement Lane Miles
Tempe	2	9,400	64.2
Tucson	78	530,258	118.5
Williams	-	-	1.9
Yavapai Co	1	25,226	-
Yuma City	1	45,552	54.1
Yuma County Public Works	-	-	74.3
Total Locally Owned	**235**	**2,320,467**	**1,618**

*Note: * ADOT did not coordinate with these federal NHS owners because they own a small percentage of the total NHS assets which is not expected to affect ADOT's overall asset management and performance strategy.*

Key: LPA = Local Public Agency; NHS = National Highway System

7.3 Local Public Agency Engagement Strategy

The goal of the LPA Engagement Strategy is to raise awareness among LPAs about the AMP, the analysis used to develop its content, and the recommended investments necessary for the state to maintain NHS assets at or above the target condition. To support long-term collaboration, ADOT has developed the External Stakeholder Engagement Plan. This plan serves as a roadmap for coordination and cooperation between ADOT and local NHS owners in developing and implementing the AMP. It identifies key stakeholders, defines the required coordination, establishes communication channels, and includes an action plan for managing the engagement process.

Although locally owned assets represent a small portion of the NHS in Arizona, it is important that local owners actively participate in the AMP in several key areas. The goal of the LPA Engagement Strategy is to achieve the following objectives:

- Provide local inventory and condition data to local NHS owners to assist them in the management of these assets. Describe the coordination effort that ADOT engages MPOs and COGs in the development of performance targets for NHS bridges and pavements.
- Aid ADOT in identifying a fiscally constrained investment strategy for NHS assets.
- Identify recommended bridge and pavement projects for locally owned NHS assets to support maintaining the NHS in a SOGR.

Table 7-2 summarizes the engagement activities outlined in the plan.

Table 7-2 | **Local Public Agency Engagement Plan Activities**

Activity	Objective/Goal	Frequency
Stakeholder Workshop	Introduce stakeholders to the AMP and continue formal engagement and communication with LPAs	Every four years
TAM Data Coordination	Collect asset data from stakeholders and share data as needed	Every four years

Activity	Objective/Goal	Frequency
AMP Analysis Output and Target Communication	Share outputs from asset life cycle analyses and communicate performance targets	Every four years
AMP Implementation Updates	Provide updates to stakeholders and obtain input for the development of the AMP	Every four years

Key: AMP = Asset Management Plan; LPA = Local Public Agency; TAM = Transportation Asset Management

7.4 Local Public Agency Asset Life Cycle Planning Analysis

ADOT does not directly manage the resource allocation process for locally owned NHS assets. As a result, these locally owned assets were not included in the pavement and bridge life cycle strategies outlined in previous sections. While they represent a small portion of the total NHS, ADOT factors local NHS assets in the development of the federally required performance targets.

To assist local NHS asset owners, ADOT utilized the asset management systems to analyze their assets. ADOT evaluated various funding scenarios to determine the recommended investments that would allow the state to maintain NHS assets at or above target condition over the next 10 years. The LCP analysis for LPAs followed the processes described in **Section 6** . Using state deterioration models and the latest inspection data, ADOT was able to predict performance. Treatment decision trees based on ADOT's treatment strategies were then applied to identify optimal treatments for the network over 10 years. Different scenarios were evaluated to determine the most effective investment strategies for NHS-locally owned assets over the next decade. The bridge and pavement LCP scenarios are presented in the following sections.

7.4.1 Local Public Agency Bridge Life Cycle Scenarios and Strategy

ADOT evaluated various funding scenarios to determine the levels required to maintain the current condition of LPA bridges over the analysis period. In the LCP analysis, funding levels of $5 million, $10 million, and $15 million annually were evaluated. **Figure 7-1** through **Figure 7-3** show the forecasted conditions for the next 10 years under these scenarios, along with the projected conditions at the beginning of 2034. ADOT used the $10 million strategy to share results with the LPAs, as it results in reasonable conditions with the least amount of resources.

Figure 7-1 | **Projected Local Public Agency Bridge Conditions Over the Next 10 Years for the $5 Million Funding Scenario (percentage of bridges by deck area)**

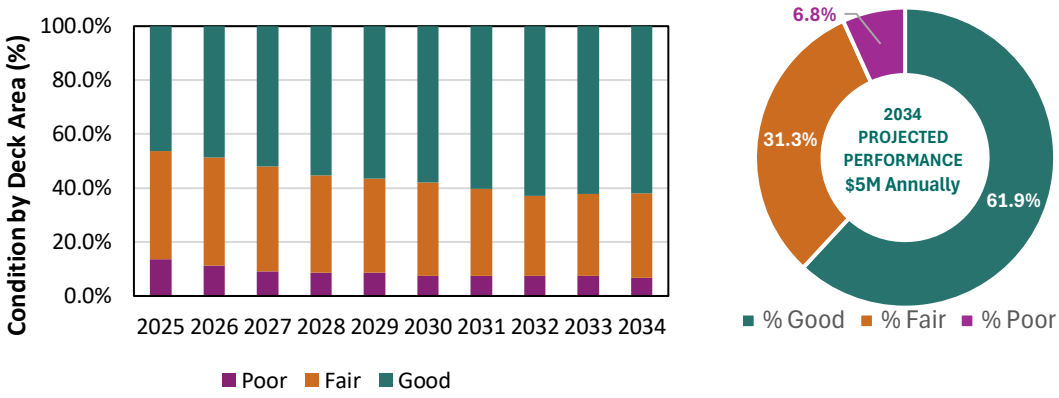


Figure 7-2 | **Projected Local Public Agency Bridge Conditions Over the Next 10 Years for the $10 Million Funding Scenario (percentage of bridges by deck area)**

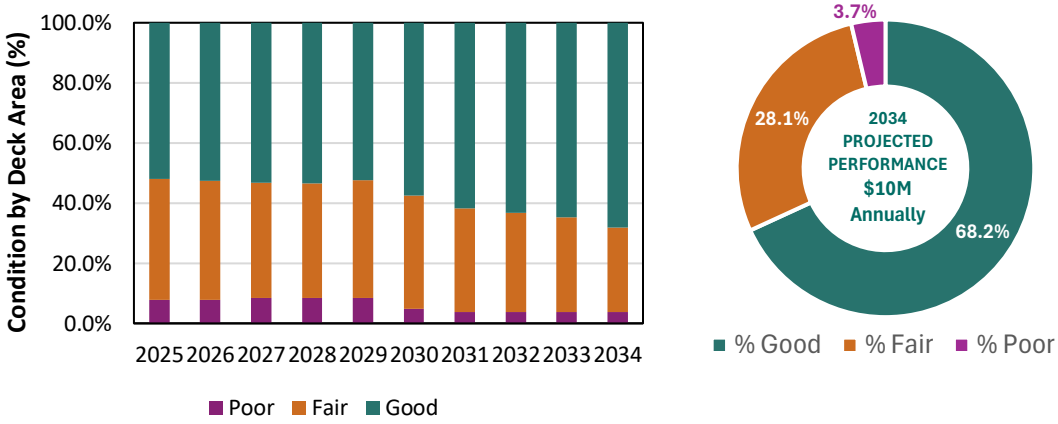
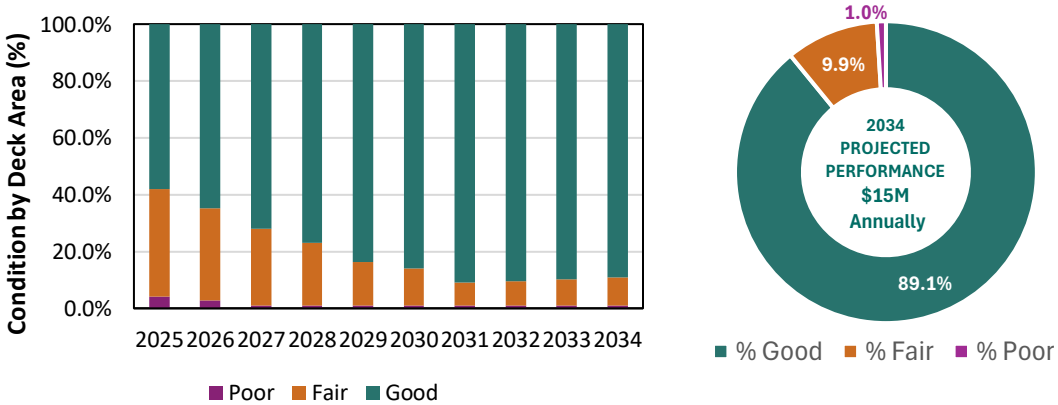


Figure 7-3 | **Projected Local Public Agency Bridge Conditions Over the Next 10 Years for the $15 Million Funding Scenario (percentage of bridges by deck area)**



7.4.2 Local Public Agency Pavement Life Cycle Scenarios and Strategy

To assess the impact of various levels of local investment on the locally owned NHS pavements, ADOT evaluated three funding scenarios: $37 million, $75 million, and $150 million annually.

Figure 7-4 through **Figure 7-6** show the forecast of conditions over 10 years for each funding scenario, along with the projected conditions at the beginning of 2034. The results show dramatically different conditions over 10 years. ADOT used the $150 million strategy to share results with the LPAs since it produced the best projected conditions.

Figure 7-4 | **Projected Local Public Agency Pavement Conditions Over the Next 10 Years for the $37 Million Funding Scenario (percentage of pavement by lane miles)**

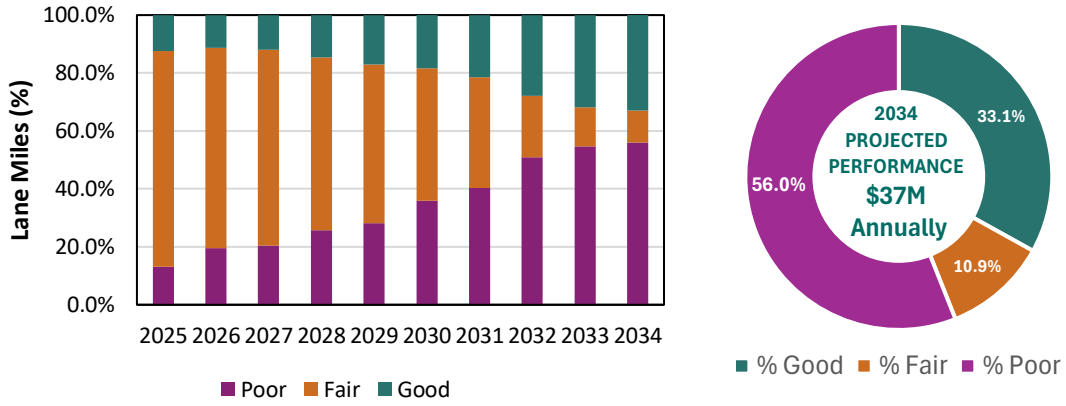


Figure 7-5 | **Projected Local Public Agency Pavement Conditions Over the Next 10 Years for the $75 Million Funding Scenario (percentage of pavement by lane miles)**

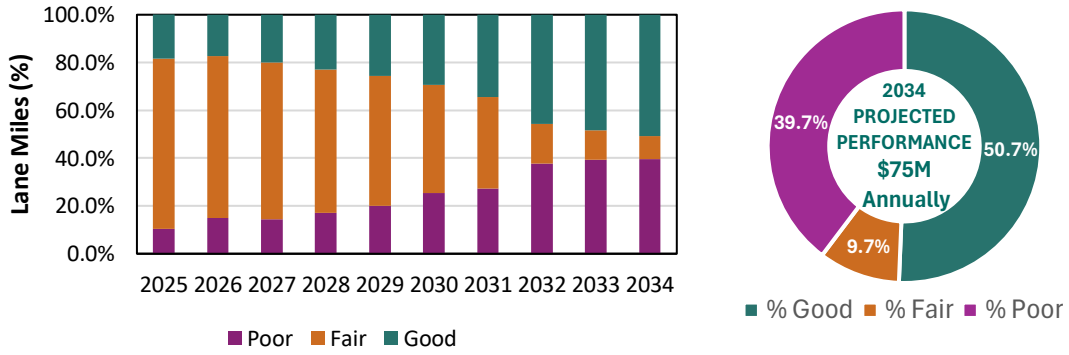
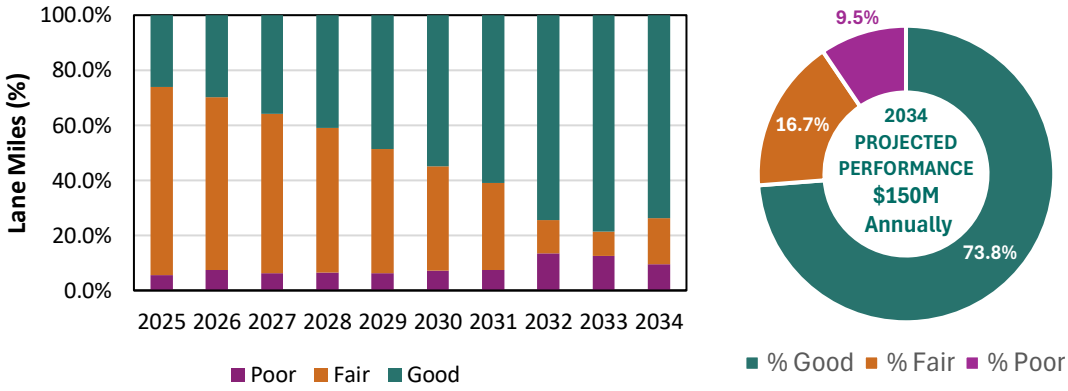


Figure 7-6 | **Projected Local Public Agency Pavement Conditions Over the Next 10 Years for the $150 Million Funding Scenario (percentage of pavement by lane miles)**



7.4.3 Recommended Candidate Projects

The selected LCP scenarios for NHS locally owned assets included a list of candidate projects generated by the bridge and PMSs. ADOT compiled a summary of recommended projects for each LPA, which was shared during the 2025 AMP Engagement Workshop, as detailed in the following section. An example of an LCP project recommendation is shown on Figure **7-7**. These recommendations were provided to inform future LPA programming activities, foster interest in ADOT's asset management initiatives, and support statewide efforts to meet performance and long-term targets. The complete set of LPA snapshots is provided in **Appendix C**.

Figure 7-7 | **Example of the Life Cycle Project Recommendation**

Transportation Asset Management Plan (AMP)

Phoenix Snapshot Cont.

ARIZONA DEPARTMENT OF TRANSPORTATION

Pavement Projects - Lifecycle Planning Analysis Output

Road Name ID	From Meaure	To Measure	Analysis Year	Treatment *
07 BASELINE RD-066.500-1	66.50	71.70	2	RR_4INCH_AC_FT
07 CACTUS RD-024.794-1	24.79	28.16	2	RR_4INCH_AC_FT
07 BUCKEYE RD-069.400-1	69.40	70.33	3	RR_3INCH_AC_FT
07 INDIAN SCHOOL RD-058.303-1	58.30	64.20	3	RR_4INCH_AC_FT
07 SKY HARBOR BLVD D-000.000-1	0.00	0.16	3	RR_3INCH_AC_FT
07 VAN BUREN ST-068.227-1	68.23	68.68	3	RR_4INCH_AC_FT
07 44TH ST-009.668-1	9.67	12.64	4	RR_4INCH_AC_FT
07 7TH ST-010.887-1	10.89	16.40	4	RR_4INCH_AC_FT
07 BASELINE RD-071.700-1	71.70	73.06	4	RR_4INCH_AC_FT
07 BELL RD-032.840-1	32.84	38.04	4	RR_4INCH_AC_FT
07 CAVE CREEK RD-015.300-1	15.30	17.61	4	RR_4INCH_AC_FT

7.5 Local Public Agency Engagement Workshop

ADOT convened LPA and MPO representatives, FHWA representatives, and key ADOT players across the state for the Initial Stakeholder Workshop, the first step in ADOT's LPA Engagement Plan. The workshop formally introduced stakeholders to the AMP and continued formal engagement and communication. The workshop was held virtually on June 12, 2025, and gathered 34 attendees representing 18 public agencies, including FHWA and ADOT (see **Appendix C** for list of attendees). The 1.5-hour workshop was intended to accomplish the following outcomes:

- Establish formal communication channels for data coordination, including asset inventory and condition data and financial information.
- Share LCP analyses results and recommend investment strategies to align with AMP federal requirements.

The workshop was facilitated by a team of ADOT's Asset Manager, ADOT pavement and bridge engineers, and representatives from the consultant team and FHWA. Key individuals, along with their responsibilities, are listed in **Table 7-3**.

Table 7-3 | **Asset Management Plan Stakeholder Engagement Workshop Key Players and Responsibilities**

Key Group	Members	Roles and Responsibilities
ADOT	• Thor Anderson (Asset Manager) • Maria Burton-Sunder (Assistant Asset Manager)	• Facilitated and led workshop • Provided bridge analysis for local NHS • Provided pavement analysis for local NHS •
Consultant Team	• Juan Diego Porras-Alvarado (WSP) • Richard Boadi (WSP)	• Supported Performance/Asset Manager to facilitate workshop • Led sections of the workshop • Developed communication materials for the workshop

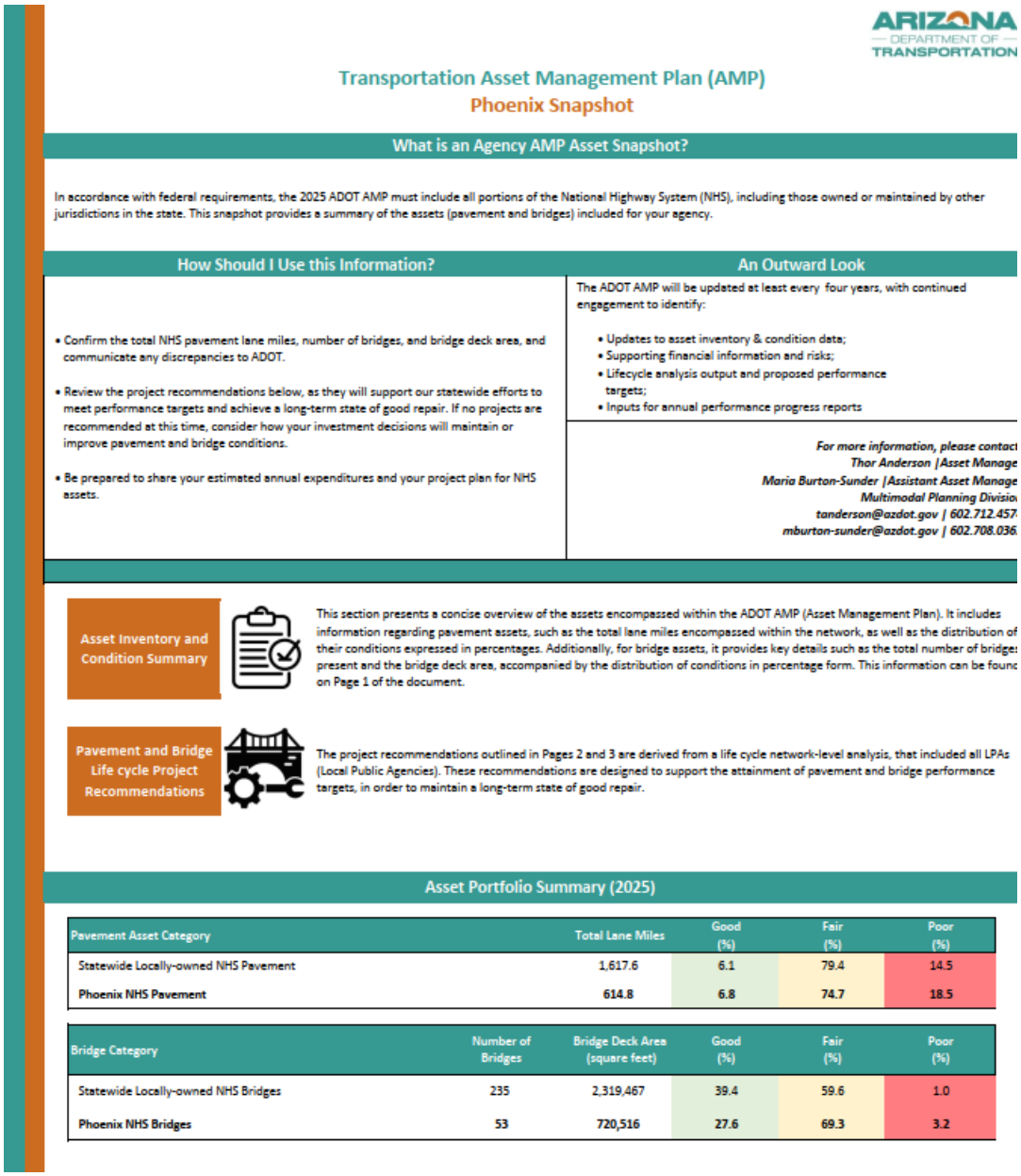
Key: ADOT = Arizona Department of Transportation; NHS = National Highway System; WSP = WSP USA Inc.

The content of the workshop was divided into five sections:

- Asset Management and Performance Regulations
- ADOT 2025 AMP Overview
- Bridge and Pavement Management Systems and Analysis Outputs
- Using the AMP and Analysis Outputs
- Future Stakeholder Engagement and Coordination

To finalize the workshop, ADOT distributed the Agency Asset Snapshot to each LPA as shown on **Figure 7-8** and **Appendix C**. These snapshots summarize the locally owned NHS assets included in the AMP and life cycle analysis recommendations. ADOT expects each LPA to confirm the total NHS assets, consider project recommendations, and identify actions for continued engagement to support AMP updates.

Figure 7-8 | **Example of an Agency Asset Snapshot**



ARIZONA DEPARTMENT OF TRANSPORTATION

Transportation Asset Management Plan (AMP)
Phoenix Snapshot

What is an Agency AMP Asset Snapshot?

In accordance with federal requirements, the 2025 ADOT AMP must include all portions of the National Highway System (NHS), including those owned or maintained by other jurisdictions in the state. This snapshot provides a summary of the assets (pavement and bridges) included for your agency.

How Should I Use this Information?

- Confirm the total NHS pavement lane miles, number of bridges, and bridge deck area, and communicate any discrepancies to ADOT.
- Review the project recommendations below, as they will support our statewide efforts to meet performance targets and achieve a long-term state of good repair. If no projects are recommended at this time, consider how your investment decisions will maintain or improve pavement and bridge conditions.
- Be prepared to share your estimated annual expenditures and your project plan for NHS assets.

An Outward Look

The ADOT AMP will be updated at least every four years, with continued engagement to identify:

- Updates to asset inventory & condition data;
- Supporting financial information and risks;
- Lifecycle analysis output and proposed performance targets;
- Inputs for annual performance progress reports

For more information, please contact
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Asset Inventory and Condition Summary

This section presents a concise overview of the assets encompassed within the ADOT AMP (Asset Management Plan). It includes information regarding pavement assets, such as the total lane miles encompassed within the network, as well as the distribution of their conditions expressed in percentages. Additionally, for bridge assets, it provides key details such as the total number of bridges present and the bridge deck area, accompanied by the distribution of conditions in percentage form. This information can be found on Page 1 of the document.

Pavement and Bridge Life cycle Project Recommendations

The project recommendations outlined in Pages 2 and 3 are derived from a life cycle network-level analysis, that included all LPAs (Local Public Agencies). These recommendations are designed to support the attainment of pavement and bridge performance targets, in order to maintain a long-term state of good repair.

Asset Portfolio Summary (2025)

Pavement Asset Category	Total Lane Miles	Good (%)	Fair (%)	Poor (%)
Statewide Locally-owned NHS Pavement	1,617.6	6.1	79.4	14.5
Phoenix NHS Pavement	**614.8**	**6.8**	**74.7**	**18.5**

Bridge Category	Number of Bridges	Bridge Deck Area (square feet)	Good (%)	Fair (%)	Poor (%)
Statewide Locally-owned NHS Bridges	235	2,319,467	39.4	59.6	1.0
Phoenix NHS Bridges	**53**	**720,516**	**27.6**	**69.3**	**3.2**

Transportation Asset Management Plan (AMP)

Phoenix Snapshot Cont.

ARIZONA DEPARTMENT OF TRANSPORTATION

Pavement Projects - Lifecycle Planning Analysis Output

Road Name ID	From Meaure	To Measure	Analysis Year	Treatment *
07 BASELINE RD-066.500-1	66.50	71.70	2	RR_4INCH_AC_FT
07 CACTUS RD-024.794-1	24.79	28.16	2	RR_4INCH_AC_FT
07 BUCKEYE RD-069.400-1	69.40	70.33	3	RR_3INCH_AC_FT
07 INDIAN SCHOOL RD-058.303-1	58.30	64.20	3	RR_4INCH_AC_FT
07 SKY HARBOR BLVD D-000.000-1	0.00	0.16	3	RR_3INCH_AC_FT
07 VAN BUREN ST-068.227-1	68.23	68.68	3	RR_4INCH_AC_FT
07 44TH ST-009.668-1	9.67	12.64	4	RR_4INCH_AC_FT
07 7TH ST-010.887-1	10.89	16.40	4	RR_4INCH_AC_FT
07 BASELINE RD-071.700-1	71.70	73.06	4	RR_4INCH_AC_FT
07 BELL RD-032.840-1	32.84	38.04	4	RR_4INCH_AC_FT
07 CAVE CREEK RD-015.300-1	15.30	17.61	4	RR_4INCH_AC_FT
07 3RD ST-010.933-1	10.93	11.72	5	RR_3INCH_AC_FT
07 7TH ST-005.301-1	5.30	10.89	5	RR_4INCH_AC_FT
07 BASELINE RD-061.420-1	61.42	66.50	5	RR_4INCH_AC_FT
07 INDIAN SCHOOL RD-053.042-1	53.04	58.30	5	RR_4INCH_AC_FT
07 SHEA BLVD-001.451-1	1.45	6.50	5	RR_4INCH_AC_FT
07 BELL RD-027.640-1	27.64	32.84	7	RR_4INCH_AC_FT
07 INDIAN SCHOOL RD-064.202-1	64.20	69.60	7	RR_4INCH_AC_FT
07 7TH ST-016.397-1	16.40	21.70	8	RR_4INCH_AC_FT
07 CAVE CREEK RD-010.000-1	10.00	15.30	8	RR_4INCH_AC_FT
07 SKY HARBOR BLVD 0-000.412-1	0.41	4.43	8	RR_4INCH_AC_FT
07 51ST AVE-007.522-1	7.52	12.60	9	RR_4INCH_AC_FT
07 THUNDERBIRD RD-010.046-1	10.05	17.85	9	RR_4INCH_AC_FT
07 3RD AVE-009.650-1	9.65	10.42	10	RR_3INCH_AC_FT
07 BELL RD-038.040-1	38.04	43.04	10	RR_4INCH_AC_FT
07 BUCKEYE RD-069.400-1	69.40	70.33	11	FOG_COAT
07 CAVE CREEK RD-005.000-1	5.00	10.00	11	RR_4INCH_AC_FT
07 SKY HARBOR BLVD D-000.000-1	0.00	0.16	11	FOG_COAT
07 51ST AVE-012.601-1	12.60	17.70	12	RR_4INCH_AC_FT
07 51ST AVE-022.800-1	22.80	27.70	12	RR_4INCH_AC_FT
07 TATUM BLVD-005.000-1	5.00	10.26	12	RR_4INCH_AC_FT

Note:

* See treatment definitions on the next page. More information on the locations can be found in the Dashboard, 'Pavement Condition', (select 'Detailed Pavement Rating', filter for RouteId. and click to find From/To Measure locations from the table) at: https://azdot.gov/maps.

7.6 Next Steps for National Highway System Owners

To continue to engage LPAs who own NHS assets and ensure their involvement in statewide asset management efforts. ADOT plans to provide asset owners with a snapshot of the NHS bridge and pavement inventory and conditions every four years. Additionally, ADOT will hold an LPA asset workshop every time the AMP is updated. ADOT will coordinate performance target development for NHS bridges and pavement with MPOs and COGs as required.

Section 8 Gap Analysis and Investment Strategies

8.1 Introduction

FHWA defines investment strategies as "a set of strategies derived from evaluating various funding levels to achieve State DOT targets for asset condition and system performance effectiveness at the minimum practicable cost while managing risks."[8] The development of investment strategies for ADOT's bridges and pavements was based on LCP analysis, an assessment of risks, anticipated available funding outlined in previous sections, performance gaps, and other factors discussed in this section.

8.2 Factors Influencing Projected Performance Gaps

8.2.1 Projected Traffic Growth

Arizona has experienced significant population growth over the past several decades. From 1970 to 2000, the state's population increased from 1.77 million to 5.13 million, reflecting a compound annual growth rate of 3.63 percent. Between 2002 and 2007, Arizona experienced some of the highest growth rates in the country, with an average annual increase of 2.56 percent. As of 2020, the population was estimated at approximately 7.28 million.

Looking ahead, Arizona's population is projected to continue growing. The ADOT 2050 LRTP anticipates that by 2055, the population will reach approximately 10.1 million. This growth is expected to be concentrated in the Phoenix and Tucson metropolitan areas, with the Sun Corridor region—encompassing Maricopa, Pinal, and Pima Counties—projected to account for nearly 85 percent of the state's population by that time.[9]

This continued population growth will lead to increased highway travel. **Table 8-1** shows the projected increase in daily vehicle miles traveled for the SHS (including the state-owned NHS) and locally owned NHS routes between 2023 and 2035.

Increased highway utilization, particularly by commercial trucks, accelerates the deterioration of pavements and bridge decks requiring more frequent maintenance, preservation, rehabilitation and reconstruction. Although traffic growth will be gradual, keeping up with impacts will require a substantial investment in infrastructure preservation; it also will make improvements to network-wide asset conditions more challenging.

[8] *Federal Highway Administration (FHWA). 2017b. Using a Life Cycle Planning Process to Support Asset Management-Interim Document.*

[9] *ADOT 2050 Long-Range Transportation Plan*

Table 8-1 | **2023 and Projected 2035 Daily Vehicle Miles Traveled**

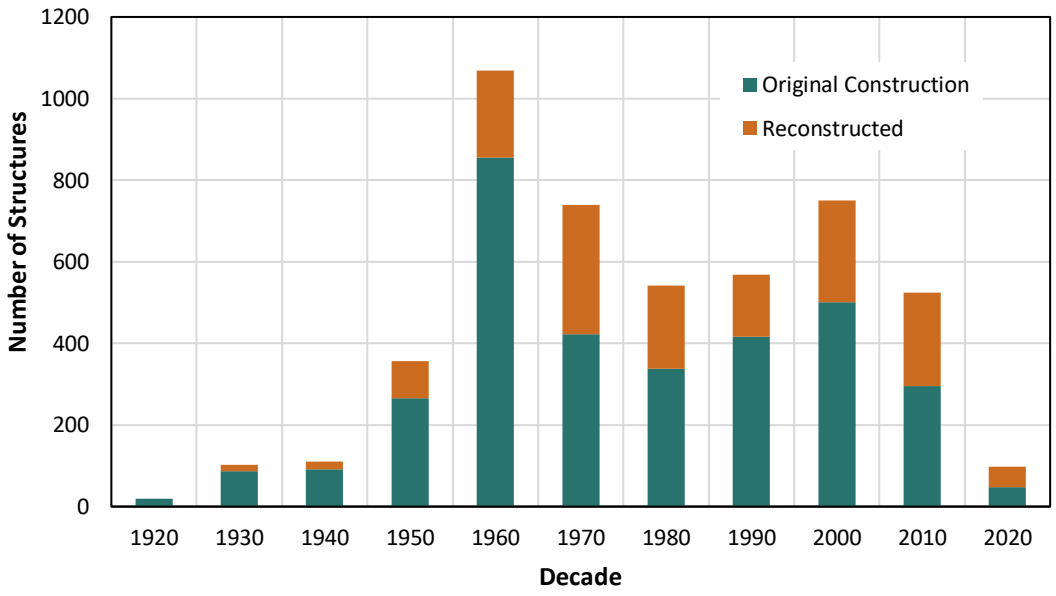
Network	2023 Vehicle Miles Traveled	2035 Vehicle Miles Traveled*	Percent Increase (%)
State Highway System	100,987,525	120,547,062	19.4
Locally owned NHS	10,474,558	12,599,256	20.3

*Note: *Projections from the Arizona Statewide Travel Demand Model 2023.*

8.2.2 Infrastructure Age

The advancing age of state highway assets is one of the primary challenges facing ADOT. Approximately 50 percent of the bridges on the SHS and the local NHS are more than fifty years old. By the end of the AMP planning horizon, over 60 percent of bridges will exceed this age (**Figure 8-1**). Until 2007, ADOT designed bridges with a 50-year lifespan; however, with proper maintenance, many of these bridges may last significantly longer. After 2007, new bridges were designed with a service life of 75 years. A significant number of structures are at risk. Of the approximately 2,600 bridges built before 1970, 1,318 have not been reconstructed and are expected to reach the end of their service life by the end of the AMP planning horizon (i.e., 2034). This could create a backlog that will be challenging to manage. The proposed investment strategy takes these issues into account.

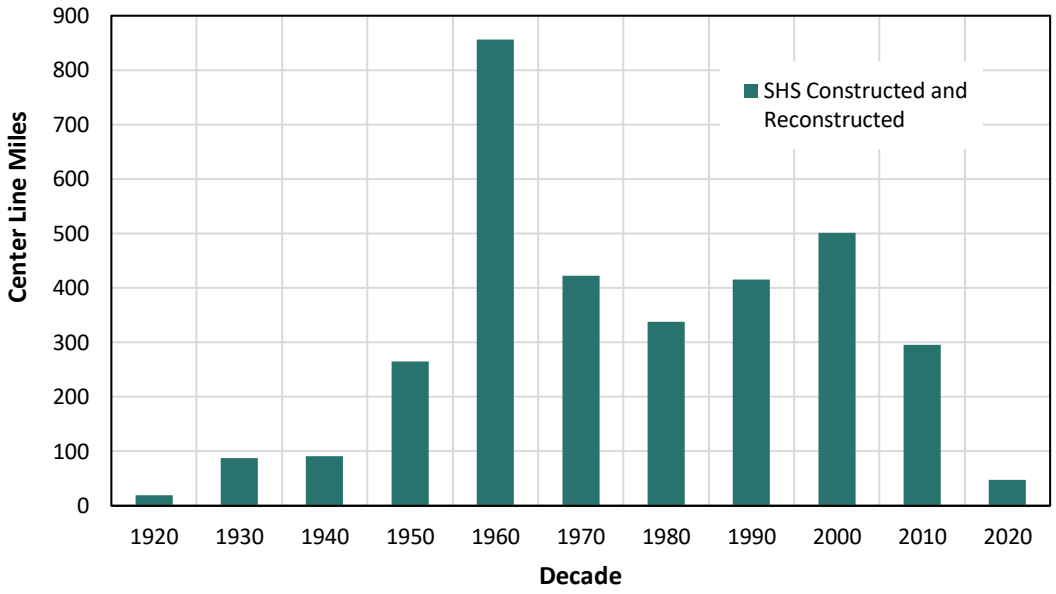
Figure 8-1 | **Bridge Construction and Reconstruction Dates (State Highway System and Local National Highway System)**



Approximately 63 percent of the pavements on the SHS are more than 50 years old; by the end of the AMP planning horizon, over 70 percent of pavements will exceed this age (**Figure** 8-2). Asphalt pavements are typically designed to last 20 years before requiring initial rehabilitation. Rehabilitation treatments generally last 10 to 15 years. However, preservation treatments can be applied during the 20-year design life to delay the need for rehabilitation by 7 to 15 years.

Since preservation treatments are significantly less expensive than rehabilitation treatments, using preservation methods to defer more costly treatments can be a highly cost-effective strategy.

Figure 8-2 | **Pavement Age (State Highway System)**



8.2.3 Treatment Costs

As shown in **Table 8-2** and **Table 8-3**, treatment costs for both bridge and pavement assets have increased significantly in recent years, impacting system performance and long-term financial planning. With funding expected to remain unchanged in the near future, the ability to deliver the same level of projects decreases, which will likely result in declining performance across bridge and pavement networks. Over the past four years, the total average increase in bridge treatment costs was 416 percent, while for pavements, the total increase was about 230 percent. These tables emphasize the critical importance of early investment in maintenance and preservation strategies, as they offer substantial long-term savings by preventing the need for more expensive rehabilitation and reconstruction.

Table 8-2 | **Bridge Treatment Costs: 2021 and 2025 Comparison**

Bridge Treatment	2021 Average $Cost/sq. ft.	2025 Average $Cost/sq. ft.	Percentage Increase (%)
Preservation	40	225	563
Rehabilitation	250	775	310
Reconstruction	400	1,500	375
Total Average Increase			**416**

Key: sq. ft. = square feet

Table 8-3 | **Pavement Treatment Costs: 2021 and 2025 Comparison**

Pavement Treatment	Average 2021 Cost per LM	Average 2025 Cost per /LM	Percentage Increase (%)
Preservation	$50,000	$125,000	250
Rehabilitation	$285,000	$635,000	225
Reconstruction	$820 Million	$1.7 Million	210
Total Average Increase			**230**

Key: LM = lane mile

8.3 Current Performance Gap Assessment

ADOT currently exceeds federal minimum conditions and meets statewide targets for bridge and pavement performance (**Table 8-4**). However, the LCP analysis indicates that ADOT is at risk of exceeding the FHWA condition minimum requirement of 5 percent Poor pavement on the Interstate network, based on current and projected budget allocations. In response, ADOT explored alternative strategies that allocate additional resources to the Interstate network while maintaining other networks in acceptable condition. These additional analyses provided realistic budget allocations, which will be discussed in more detail in **Section 8.7** . ADOT will continue to meet federal minimum condition requirements for bridge assets throughout the AMP planning horizon. The 2050 ADOT LRTP emphasizes repairing and preserving existing highway infrastructure and recommends an annual increase to approximately $50 million of pavement heavy preservation funding. This is expected to be implemented incrementally over three years, beginning in FY 2028, and will help ensure ADOT maintains performance levels that meet federal requirements.

Table 8-4 | **ADOT Bridge and Pavement Performance Targets**

Performance Target	2023 Target (%)	2023 Performance (%)	2025 Target (%)	2027 Target (%)*
Percent of NHS bridges classified as in Good condition	52	59.0	52	52
Percent of NHS bridges classified as in Poor condition	4	0.9	4	4
Percent of Interstate pavements in Good condition	44	53.3	44	44
Percent of Interstate pavements in Poor condition	2.0	2.3	4.5	4.5
Percent of non-Interstate NHS pavements in Good condition	28	32.0	28	28
Percent of non-Interstate NHS pavements in Poor condition	6	6.1	10	10

*Note: *Tentative*

ADOT exceeded its Interstate and non-Interstate NHS Poor-condition pavement targets in 2023. This was due to an unusually wet winter in 2022-2023. ADOT revised its Poor-condition pavement targets for both networks in its 2024 Transportation Performance Management Report to FHWA.

8.4 Risk Management Analysis

The following investment strategies were adopted by ADOT to address risks associated with bridges and pavements:

- **Scour Countermeasures Strategy**: ADOT plans to implement two to three bridge scour countermeasures projects on scour-critical bridges each year going forward utilizing PROTECT funding.
- **Infrastructure Resilience:** ADOT is taking several steps to invest in infrastructure resilience, including:
  - Improving infrastructure at locations with repeated emergency events to better withstand the effects of weather, such as upgrading the drainage infrastructure on highways that have experienced repeated flooding or washouts.
  - Implementing better tools for managing pump stations, including the Pump Station Reliability Tool.
  - Implementing Roadside Vegetation Management Guidelines to improve drainage and reduce erosion.
  - Creating improved design standards for weather, such as the Probabilistic Bridge Design Pilot Project.
- **Installation of Weigh-in-Motion (WIM) Stations:** ADOT utilizes scales and WIM stations to detect unpermitted overweight trucks that can damage bridges and pavements.
- **Increased Funding for Pavement Surface Treatments:** The 2050 LRTP recommended increasing the amount of funding spent on heavy preservation from $16 million to $50 million annually. ADOT intends to implement this recommendation by incrementally increasing program funding for pavement preservation treatments beginning in FY 2028.
- **Consideration of risk mitigation:** Bridge and pavement management systems factor risks into the benefit-cost/utility formulas.

Some of these funds (e.g., scour countermeasures fund) are ongoing and will continue until the risks are mitigated. Risks that are less likely are addressed through ADOT's P2P process.

8.5 Investment Strategies Methodology

Preserving the performance and condition of the state's transportation system requires a long-term financial plan that supports the implementation of the life cycle strategies documented

earlier in this AMP. Based on the expected funding available for managing pavements and bridges over the next 10 years, ADOT analyzed various combinations of investments in maintenance, preservation, rehabilitation, and reconstruction to assess their impact on future conditions. The selected strategies build on the results of the LCP described in **Section 6** and account for the risks documented in **Section 4** and the financial plan in **Section 5** .

The recommended strategies aim to ensure that no performance gaps occur over the AMP period and that ADOT achieves a SOGR for SHS bridge assets. With respect to pavements, ADOT's primary goal is to ensure that Interstate pavements do not exceed the 5 percent Poor condition over the AMP period. The resulting investment strategies reflect an increased focus on preservation activities and a shift away from the "worst-first" approach, continuing the strategy proposed in the previous AMP. This greater emphasis on low-cost preservation treatments slows asset deterioration, extends the useful life of assets, and defers the need for more costly rehabilitation treatments.

The process followed to identify a recommended investment strategy is described below.

- **Develop Life Cycle Planning Scenarios** – The AMP technical team provided long-term, fiscally constrained funding availability to asset managers, enabling the analysis of various treatment scenarios. These scenarios considered different maintenance, preservation, rehabilitation, and reconstruction combinations to achieve and sustain a SOGR over asset life cycles. The scenarios were evaluated based on their ability to meet performance targets, support national goals, and manage risks (see **Section 6** for more information).
  - **Address Performance Gaps –** A key factor in evaluating the LCP scenarios was identifying any performance gaps between desired and projected conditions. If gaps were found, ADOT explored several approaches to address them where possible, including:
    - Shifting resources
    - Lowering performance targets
    - Adjusting LCP strategies
    - Increasing risk tolerance, particularly for networks that have lower usage
    - Utilizing the results of the LCP analysis to seek additional funding to close gaps in the next LRTP update, which is currently scheduled to begin in the summer of 2025.
  - Additionally, the impacts on other performance areas were considered when selecting the best overall scenario to ensure a balanced approach.
- **Determine the Recommended Investment Strategy** – The AMP technical team worked closely with agency management to identify a strategy and funding levels for pavements and bridges that could realistically be implemented over the next 10 years. ADOT developed a fiscally constrained investment strategy that ensures no performance gaps

for bridges, while managing any performance gaps in pavement, thereby ensuring a sustainable path forward.

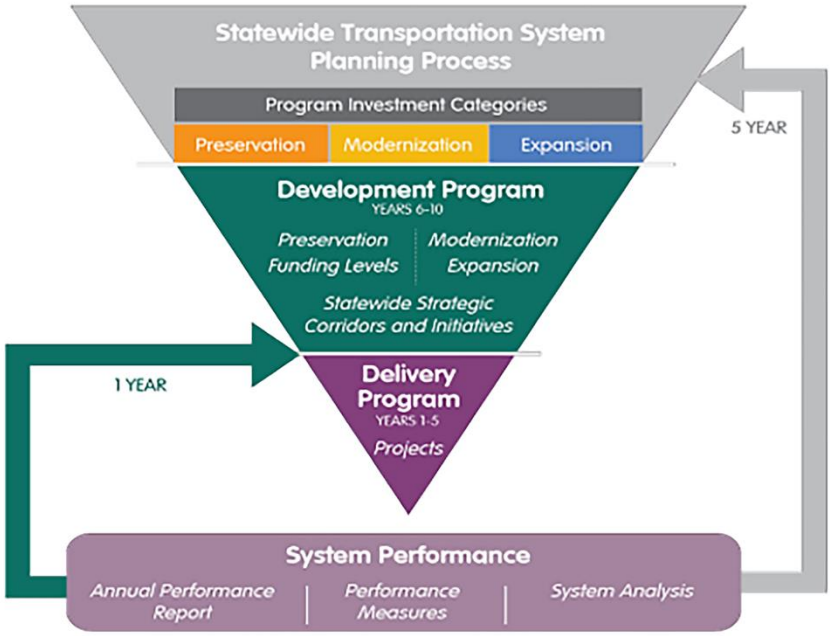
- **Integrate the Recommended Strategy into the Planning and Programming Process** – The recommended investment strategy is part of a broader framework of transportation performance management and performance-based planning and programming. In addition to addressing maintenance needs, safety, mobility, and commerce are critical transportation priorities considered during the long-range planning process. Given that transportation needs often exceed available funding, ADOT faces difficult decisions about how to allocate limited resources. To make the best decisions, ADOT has adopted a data-driven, performance-based approach (P2P) that aligns the state's LRTP goals, the ADOT Five-Year Transportation Facilities Construction Program, and the STIP.

The development of the 2025 AMP focused on establishing implementation strategies that can be integrated into the P2P process and support the development of the STIP. These strategies, outlined in the Bridge and Pavement Investment Strategies, are designed to more closely align the STIP with the recommendations from this AMP.

Planning documents such as the AMP, Freight Plan, and other major corridor studies inform the development of high-level investment recommendations in the LRTP. These documents support the achievement of performance targets by providing category-specific investment strategies, which are used to develop a package of projects for the Five-Year Transportation Facilities Construction Program and the STIP, as shown on **Figure 8-3**. For bridges and pavements, the recommended investment strategies in this AMP will serve as the primary basis for selecting and prioritizing projects throughout this process.

In addition to the planned investments for system preservation described in the following sections, additional funds are anticipated for initial construction projects. These projects are typically programmed to address safety and mobility issues, enhance overall network performance, and add capacity in areas experiencing population growth.

Figure 8-3 | **Linking Planning to Programming**



Source: Parsons Brinckerhoff 2014[10]

8.6 Bridge Investment Strategies

As part of the LCP scenarios, ADOT considered the following two LCP approaches over 10 years, utilizing the BrM to generate performance outputs:

- **Bridge Group Allocation:** An allocation was established for each work type based on LCP analysis from the 2021 AMP, which generates a steady-state condition.
- **BrM Allocation:** BrM selects treatments for each structure that maximizes the total utility of the bridge network over the analysis period, prioritizing small-scale preservation projects.

For each scenario considered, funding was allocated to determine whether the desired SOGR for bridges could be achieved. As a reminder, the desired SOGR for bridges was defined in terms of a targeted percentage of the network deck area in Good or Fair condition and a maximum allowable percentage of the network deck area in Poor condition.

8.6.1 Recommended Bridge Investment Strategy

The evaluation of various investment strategies led ADOT to select a planned program of investment that reflects the need for an implementable, balanced approach. This strategy realistically transitions to an increased focus on preservation treatments over a typical programming cycle, continuing the investment strategy proposed in the 2021 AMP. The recommended investment strategy aims to allocate 20 percent of available funds to

[10] Parsons Brinckerhoff. 2014. P2P Link Methodologies and Implementation Plan, June 2014.

preservation, ensuring bridges remain in Good condition and preventing deterioration to Fair condition. Additionally, there is an emphasis on rehabilitation and reconstruction to address the backlog created as the bridge inventory ages, working toward meeting the percentage-based Poor performance target. The past four years have seen a high level of bridge construction inflation. The result has been a need to divert funding from preservation treatments to rehabilitation and reconstruction to keep these important projects moving. However, ADOT's long-term goal is to return to the preservation approach identified in the 2021 AMP.

8.6.1.1 Predicted Conditions

The most cost-effective strategy typically emphasizes low-cost preservation treatments that maximize asset life, allowing funding to be spread across more network assets. However, state law requires ADOT to update the Five-Year Transportation Facilities Construction Program annually, focusing on updates during the later program years. As a result, the earlier years are established and not easily changed due to the extensive time required to plan, design, and implement bridge projects. To address these constraints, ADOT evaluated and selected a balanced scenario acknowledging that the Five-Year Transportation Facilities Construction Program had to be adjusted to account for a dramatic increase in bridge construction costs. This required a short-term adjustment to move preservation funding to cover cost increases of high-priority rehabilitation and reconstruction projects. Ultimately, the balanced scenario seeks to return to the preservation approach identified in the 2021 AMP, while meeting ADOT's bridge condition targets.

Figure 8-4 and Figure 8-5 show the forecast of conditions over 10 years under the funding scenario considered most likely with current sources, along with the projected conditions at the beginning of 2034.

Figure 8-4 | **Projected Bridge Conditions Over the Next 10 Years, State Highway System (percentage of bridges by deck area)**

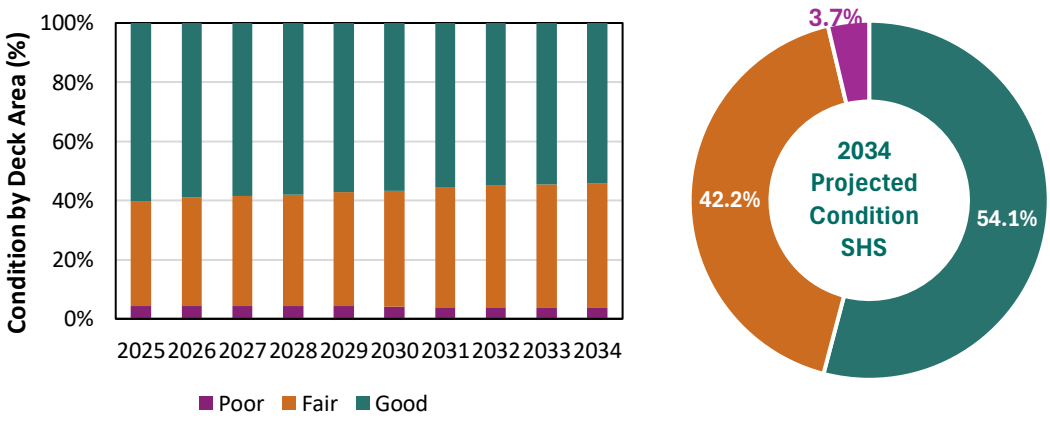
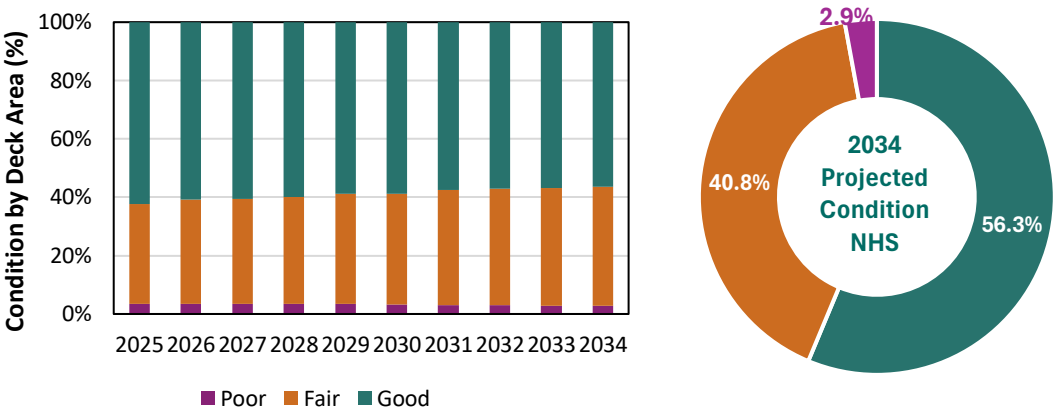


Figure 8-5 | **Projected Bridge Conditions Over the Next 10 years, National Highway System (percentage of bridges by deck area)**



For the SHS, the recommended scenario shows a decline in Good bridges from the current 60.1 percent to 54.1 percent, and an increase in Fair bridges from 35.3 percent to 42.2 percent over the next 10 years. For the NHS, this scenario shows a decline in Good bridges from the current 62.5 percent to 56.3 percent, and an increase in Fair bridges from 34.2 percent to 40.8 percent. Although the percentage of Poor condition bridges increased, it remains below our current performance target. This trend is primarily driven by the aging of many of Arizona's largest bridges. Additionally, the significant increase in treatment costs will reduce the capacity to deliver projects under the same funding availability. Despite these challenges, ADOT considers the 10-year projected performance to result in a SOGR for the bridge system, especially the NHS, as shown in **Table 8-5.**

Table 8-5 | **Projected Bridge Conditions at the Beginning of 2034**

	% Good Bridge (sq. ft.)		% Poor Bridge (sq. ft.)	
	TARGET MINIMUM % GOOD/FAIR	PROJECTED % GOOD/FAIR (YEAR 10)	TARGET % POOR	PROJECTED % POOR (YEAR 10)
NHS	96.0	97.1	4.0	2.9
State Highway System	96.0	96.3	4.0	3.9

Key: NHS = National Highway System; sq. ft. = square feet

8.6.1.2 Planned Ten-Year Bridge Investment

Using the annual funding levels and the planned breakdown of expenditures, **Table 8-6** shows the projected investments separately for the NHS and the SHS. Note that this table also includes initial construction funding, which is not accounted for in the scenario analysis. However, initial construction is expected to contribute to improving overall bridge system performance, since most expansion projects add capacity to existing facilities, which often involves bridge rehabilitation and reconstruction.

Table 8-6 | **Planned Bridge Annual Investment by ADOT Over the 10-year Period from FY 2025–2034 ($Millions)**

Year ($Millions)	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	Total
NHS (INCLUDING STATE AND LOCAL NHS)											
Initial Construction	265.7	0.0	0.0	23.5	0.0	0.0	0.0	0.0	0.0	0.0	289.2
Maintenance	3.3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	25.8
Preservation	2.0	15.1	0.3	0.0	0.8	8.4	8.4	8.4	8.4	8.4	60.2
Rehabilitation	26.8	5.1	20.1	13.2	9.3	13.5	13.5	13.5	13.5	13.5	142.0
Reconstruction	28.6	111.0	64.9	55.8	20.0	10.5	10.5	10.5	10.5	10.5	332.7
Total NHS	326.4	133.7	87.7	95.0	32.6	34.9	34.9	34.9	34.9	34.9	849.9
State Highway System (INCLUDING NHS AND NON-NHS)											
Initial Construction	322.6	0.0	85.0	28.8	0.0	0.0	0.0	0.0	0.0	0.0	436.4
Maintenance	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	35.5
Preservation	2.0	15.1	0.3	2.1	8.8	12.0	12.0	12.0	12.0	12.0	88.3
Rehabilitation	49.8	14.1	20.1	18.1	23.3	27.0	27.0	27.0	27.0	27.0	260.4
Reconstruction	235.6	180.9	64.9	113.8	27.9	21.0	21.0	21.0	21.0	21.0	728.0
Total SHS	614.0	213.6	173.7	166.3	63.5	63.5	63.5	63.5	63.5	63.5	1,548.6

Key: FY = fiscal year; NHS = National Highway System; SHS = State Highway System

8.6.2 Bridge Performance Gap Analysis

A comparison of the 10-year targeted bridge conditions and the conditions projected to be achieved by implementing the most likely bridge funding investment strategy was presented earlier in **Table 8-5.** As shown, ADOT is expected to achieve its desired SOGR over the 10-year analysis period, so no gap is expected in bridge conditions.

8.7 Pavement Investment Strategies

As discussed in the LCP section, ADOT is committing to increasing investments in maintenance and preservation activities to defer costly rehabilitation treatments and reduce the life cycle cost of managing the pavement network. Additionally, the agency explored alternative network-based investment strategies to identify the optimal funding level for each network to maximize performance with the available pavement funding. Two network-based strategies were considered. Each used the same total investment level based on the planned pavement funding of $442 million, and each was based on the Increased Heavy Preservation life cycle strategy, which allocates a total of $86 million to light and heavy preservation activities. The two investment strategies are described as follows:

- **Baseline Strategy** – This strategy is based on ADOT's historical work type investment allocations.
- **Increased Interstate Investment Strategy** – This strategy was developed to identify the required Interstate investment level to maintain the Interstate network below the Federal ceiling of 5 percent Poor pavement.

8.7.1 Recommended Pavement Investment Strategy

The evaluation of various investment strategies indicated that ADOT was at risk of exceeding the FHWA minimum condition of 5 percent of Interstate pavements in Poor condition by the end of the analysis period. This triggered the evaluation of additional investment strategies to meet federal requirements for the Interstates, while maintaining the remainder of the NHS and SHS networks in the best condition possible. This scenario required additional investment in the Intestate network. This led to the selection of a planned investment program that prioritized Interstate funding.

The resulting strategy achieves three primary objectives:

- ADOT will allocate additional resources to the Interstate network to ensure it remains below the federally mandated ceiling for pavements in Poor condition.
- Preservation investments will ultimately be increased to $86 million annually to optimize performance within the available budget.
- ADOT will introduce more preservation treatment options and strategies to keep the low-volume road network passable and safe.

8.7.1.1 Predicted Conditions

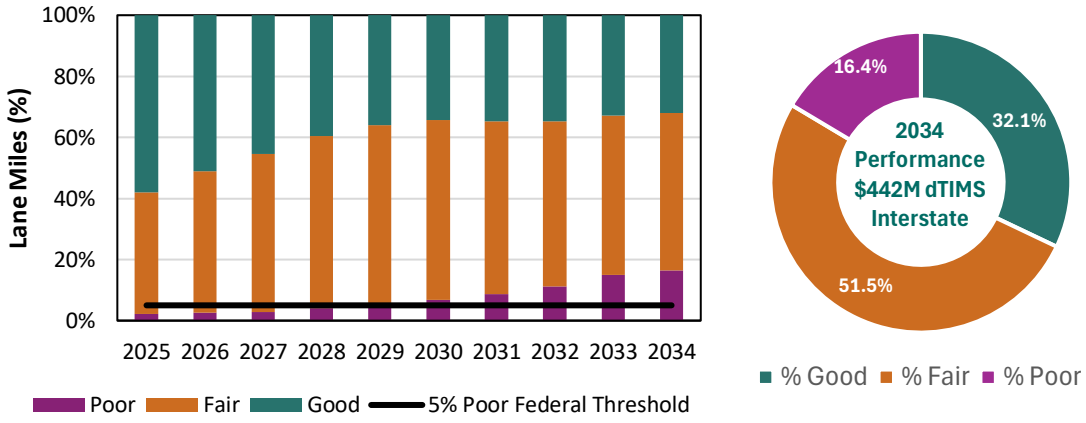
The pavement management software, dTIMS, was used to determine optimal funding allocation across treatment categories (or work types), including preservation, rehabilitation, and reconstruction. The optimized strategy recommended a $113 million investment in preservation; however, ADOT selected a more realistic and implementable investment level of $86 million for preservation. Since Arizona's pavements are relatively young, reconstruction projects are infrequent, and the recommended strategy contained little reconstruction spending.

ADOT has developed a new strategy to more cost-effectively maintain low-volume roads. The focus will be on extending the life of these roadways through preservation treatments such as cape seals, chip seals, micro-surfacing, and scrub seals on roads in Fair condition with traffic volumes less than 5,000 annual average daily traffic (AADT). Additionally, light rehabilitation treatments will be used on roads in Poor condition with traffic volumes between 4,000 and 5,000 AADT.

The initial LCP analysis, using traditional budget allocations by work-type networks, predicted that the percentage of Interstate pavements in Poor condition would exceed the federal ceiling of 5 percent by the end of the performance period. The dTIMS analysis identified an average

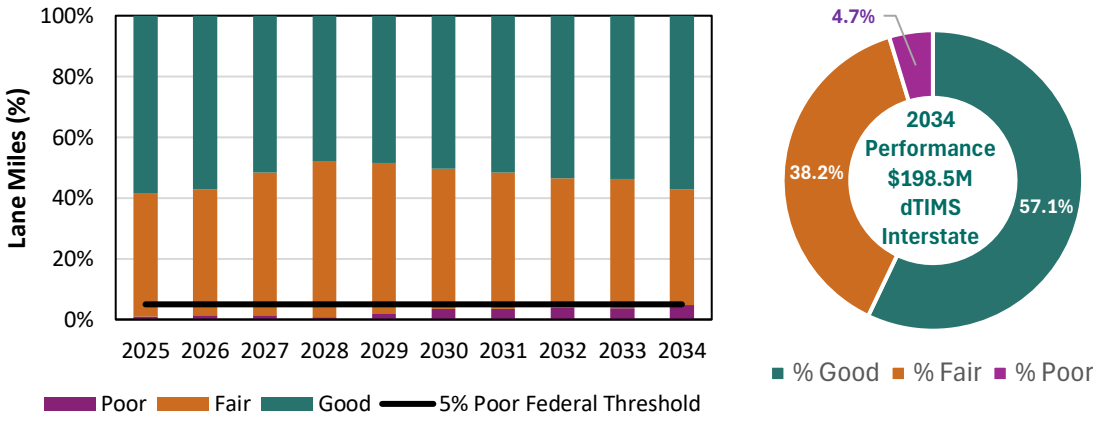
investment level of $101 annually for the Interstates. **Figure 8-6** illustrates the condition of the Interstate network under this spending amount.

Figure 8-6 | **Projected Pavement Conditions Over the Next 10 Years for National Highway System Interstates, with Traditional Budget Allocation (dTIMS Scenario)**



Additional Interstate budget allocations were analyzed to determine the level of investment needed to meet federal requirements for the percentage of pavement in Poor condition. The analysis results indicated that an investment of $198.5 million would allow ADOT to meet the FHWA minimum condition requirements on the Interstates, as shown on **Figure 8-7**.

Figure 8-7 | **Projected Pavement Conditions Over the Next 10 years for National Highway System Interstate Network with Increased Budget Allocation**



Additional analyses were conducted to assess the performance of the remaining networks since the additional funding for the Interstates described above required that funding be taken from the other networks. **Figure 8-8** through **Figure 8-10** show forecasted conditions over 10 years under the reallocated funding scenario for each pavement network, along with the projected conditions for 2034.

Figure 8-8 | **Projected Pavement Conditions Over the Next 10 Years for Non-Interstate National Highway System Network, with reduced Investment Level**

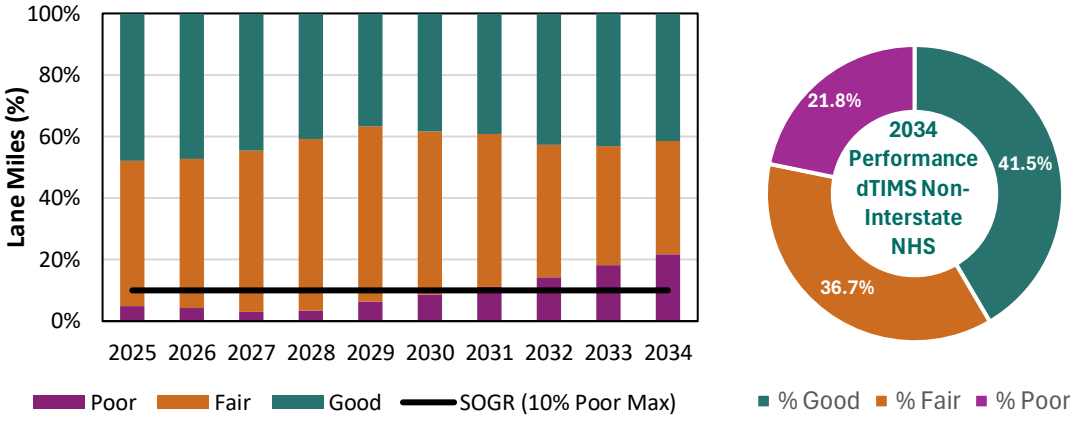


Figure 8-9 | **Projected Pavement Conditions Over the Next 10 Years for Non-National Highway System High-Volume Network, with Reduced Investment Levels**

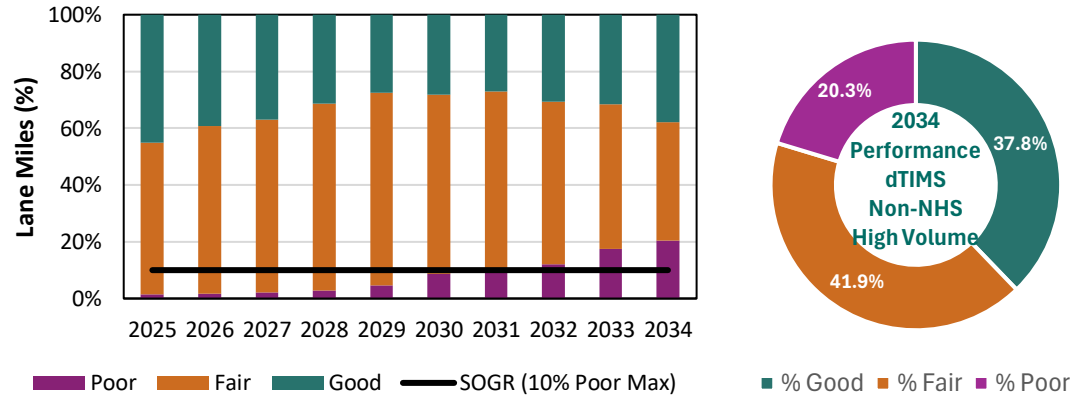
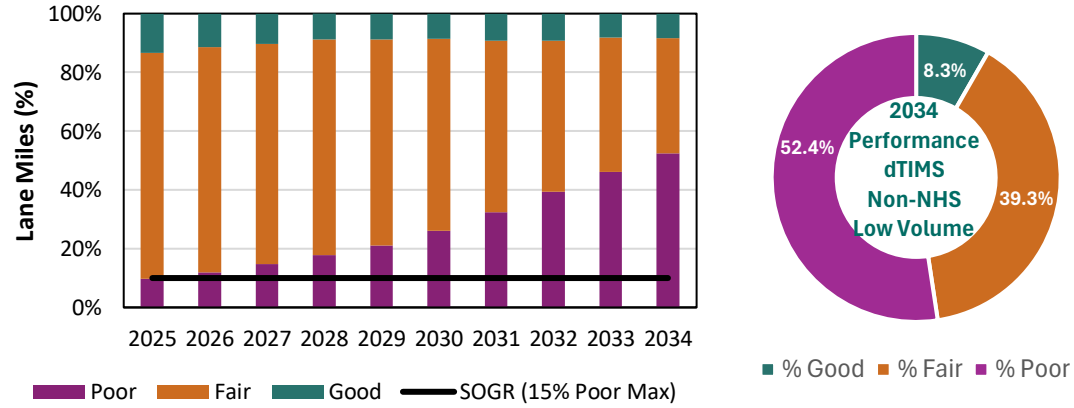


Figure 8-10 | **Projected Pavement Conditions Over the Next 10 Years for Non-National Highway System Low-Volume Network, with Reduced Investment Levels**



These results indicate that although the percentage of Poor pavement increases for the remaining networks that ADOT manages, the percentage of Good pavement is substantially maintained for each. This would allow ADOT to increase its investment in the Interstate network and still achieve the three primary performance objectives for all networks. **Table 8-7** outlines the recommended budget allocations for each network under this investment strategy.

Table 8-7 | **Allocation of Projected Funding Available Over 10 Years**

Pavement Category	Network	Percent of Funding Allocated Over 10 Years (%)	Total Amount Allocated Over 10 Years ($Millions)	Total Amount Allocated Over 10 Years for NHS and Non-NHS ($Millions)
NHS	Interstates	45.2	1,985	3,528
	Non-Interstate NHS (State)	35.1	1,543	
Non-NHS	High Volume	8.1	354	864
	Low Volume	11.6	510	
Totals		**100**	**4,392**	**4,392**

Note: These assumed budgets do not include $27 million per year for maintenance work, which was not considered in the LCP analysis.

Key: NHS = National Highway System

The implementation of the recommended 10-year investment strategy is expected to result in the projected conditions for 2034, as reflected in **Table 8-8**. As shown in the table and figures above, due to accelerated deterioration rates and significant increases in treatment costs, the investment strategy does not achieve the percentage of Good/Fair and Poor targets for the three non-Interstate pavement networks. However, throughout the 10 years, the Interstate pavement network is not expected to exceed the federal minimum condition target of 5 percent of Poor, thereby avoiding the associated penalties.

The LCP analysis assumed steady annual funding for the 10-year analysis period. However, available funding for bridges and pavements will be re-evaluated in the next LRTP, which is expected to begin in the summer of 2025. The result may be increased funding for these assets. The analysis in this AMP will be used to support decision-making in the LRTP.

The recommended investment strategy does achieve the following three primary objectives:

- Meeting federal requirements for the percentage of Poor pavement on the Interstate network
- Increasing the use of preservation treatments to maximize benefits within the available budget
- Maintaining the low-volume network in a safe condition

Table 8-8 | **Projected Pavement Conditions at the Beginning of 2034**

		% Good Pavement Miles		% Poor Pavement Miles	
	CLASS CATEGORY	**TARGET MINIMUM % GOOD/FAIR**	**PROJECTED % GOOD/FAIR (YEAR 10)**	**TARGET MAXIMUM % POOR**	**PROJECTED % POOR (YEAR 10)**
NHS	Interstate	>95	95.3	<5	4.7
	Non-interstate NHS (State)	>90	78.2	<10	21.8
Non – NHS	High Volume	>90	79.7	<10	20.3
	Low Volume	>85	47.6	<15	52.4
MINIMUM Check: Percentage of interstates in Poor condition:				**4.7**	**Target: <= 5**

Key: NHS – National Highway System

8.7.1.2 Planned 10-Year Pavement Investment

On an annual basis, the recommended pavement strategy reflects the distribution of investment in maintenance, preservation, rehabilitation, reconstruction, and new construction for the state-maintained system shown in **Table 8-9.** Note that this table also shows initial construction funding that is not included in the scenario analysis.

Table 8-9 | **Planned Pavement Annual Investment by ADOT Over the 10-Year Period from FY 2025–2034 ($Millions)**

Year ($Millions)	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	Total
NHS (EXCLUDING LOCAL NHS)											
Initial Construction	1,653.9	351.5	206.2	312.9	212.2	0.0	0.0	0.0	0.0	0.0	2,736.7
Maintenance	17.1	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	233.1
Preservation	52.7	20.2	30.4	30.8	37.6	44.4	44.4	44.4	44.4	44.4	394.0
Rehabilitation	493.8	330.9	312.0	321.2	293.9	284.8	284.8	284.8	284.8	284.8	3,175.7
Reconstruction	0.0	0.0	0.0	27.3	55.5	0.0	0.0	0.0	0.0	0.0	82.8
Total NHS	**2,217.5**	**726.7**	**572.6**	**716.2**	**623.2**	**353.2**	**353.2**	**353.2**	**353.2**	**353.2**	**6,622.3**
Other Highway System (NON-NHS)											
Initial Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance	2.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	29.4
Preservation	23.3	30.6	21.7	32.6	37.1	41.7	41.7	41.7	41.7	41.7	353.6
Rehabilitation	77.9	60.4	78.0	30.2	18.0	71.2	71.2	71.2	71.2	71.2	620.5
Reconstruction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Non-NHS	**103.7**	**94.0**	**102.7**	**65.8**	**58.1**	**115.9**	**115.9**	**115.9**	**115.9**	**115.9**	**1,003.5**
Total Pavement Spending	**2,321.1**	**820.6**	**675.3**	**782.0**	**681.3**	**469.1**	**469.1**	**469.1**	**469.1**	**469.1**	**7,625.8**

Key: FY = fiscal year; NHS = National Highway System

8.7.2 Pavement Performance Gap Analysis

A comparison of the 10-year targeted pavement conditions and the conditions projected to be achieved by implementing the recommended pavement investment strategy was presented in **Table 8-8**. As shown, ADOT is not expected to achieve its desired SOGR over the 10-year analysis period, except for the Interstate network. **Table 8-10** shows the anticipated performance gap for each pavement network. As previously mentioned, ADOT will evaluate additional funding strategies to close this gap in the next LRTP update.

Table 8-10 | **Projected Pavement Performance Gap at the Beginning in 2034**

		% Good Pavement Miles		Gap	% Poor Pavement Miles		Gap
	CLASS CATEGORY	TARGET MINIMUM % GOOD/FAIR	PROJECTED % GOOD/FAIR (YEAR 10)		TARGET MAXIMUM % POOR	PROJECTED % POOR (YEAR 10)	
NHS	Interstate	>95	95.3	-	<5	4.7	-
	Non-Interstate NHS (State)	>90	78.2	11.8	<10	21.8	11.8
Non – NHS	High-Volume	>90	79.7	10.3	<10	20.3	10.3
	Low-Volume	>85	47.6	37.4	<15	52.4	37.4
MINIMUM Check: Percentage of Interstates in Poor condition:					**4.7**	**Target: <= 5**	-

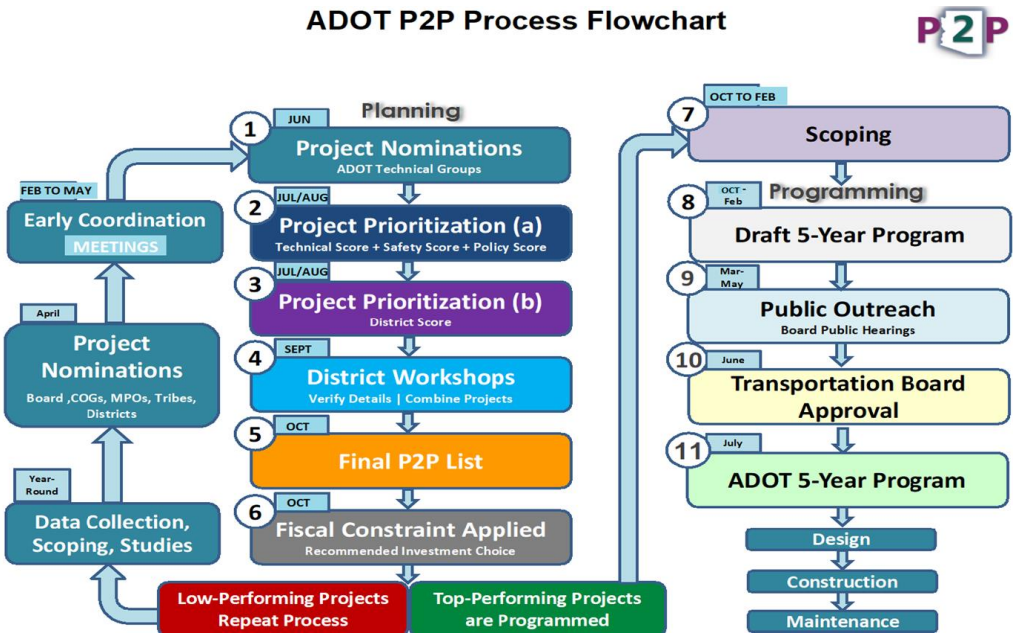
Key: NHS = National Highway System

8.8 System Performance and Planning to Programming

When selecting pavement and bridge improvement projects, ADOT uses an objective, data-driven approach to consider the needs within each performance area to maintain the overall performance of the transportation system. In addition to attention to asset needs, this involves considering safety, mobility, freight, economic vitality, and environmental sustainability objectives through ADOT's P2P process. This performance-based process connects ADOT's LRTP to the Five-Year Transportation Facilities Construction Program.

Under P2P, projects are selected for funding based on their contribution to the improvement of system performance when compared to other projects (**Figure 8-11)**. Projects are ranked by technical, safety, and policy scores. The P2P process also allows stakeholders such as transportation board members, regional planning organizations, and ADOT's construction districts an opportunity to provide input to the selection of projects. The output of the AMP investments strategies will be the basis of the technical score, which is the primary driver for selecting bridge and pavement projects. Freight and mobility are factored into the technical score.

Figure 8-11 | **ADOT's Planning to Programming Approach to System-Wide Investments**



8.9 Asset Management Plan Investment Strategy and Consistency

As discussed previously, the development of the 2025 AMP focused on establishing implementation strategies that can be integrated into the P2P process, closely aligned with the Five-Year Transportation Facilities Construction Program, and supportive of STIP development. The goal is to implement the investment strategies proposed in this AMP as closely as possible, ensuring alignment with the AMP's objectives while addressing challenges in planning, programming, and project delivery. During the development of this AMP, the Asset Management Team collaborated with various stakeholders to reach consensus on a systematic process that supports implementation strategies.

The implementation approach aims to achieve the following:

- Increase visibility across the agency
- Track major changes to minimize their impact on the proposed investment
- Ensure AMP investment strategies are comprehensively integrated into current programming processes

The following sections present the AMP implementation strategies for bridges and pavements.

8.9.1 Bridge Implementation Strategy

Since bridge planning is a long-term process, consistency between AMP investment strategies and actual expenditures for each work type is generally maintained. However, to improve the current process, the following fourfold strategy is recommended:

- **Multiyear Planning:** The Bridge Group and the P2P process will develop a fully loaded four-year bridge rehabilitation and reconstruction plan aligned with the AMP investment strategy. The Asset Management Team will work closely with the Bridge Group to ensure projects align with the AMP investment strategy. This includes reviewing funding for preservation, rehabilitation, and reconstruction. Once consensus is reached, the proposed plan will be approved by management and integrated into the AMP.

- **Planning-Level Scoping:** Once projects are defined, the Bridge Group will ensure accurate scope, schedule, and budget estimates for bridge projects at the planning level, ensuring the total planned dollars align with the AMP bridge investment strategy for the analysis period.

- **Program Review for Funding Sources:** The Asset Management Team will review the program to identify bridges funded by sources outside the bridge subprogram and incorporate them as part of the available funding in the bridge investment strategy. These projects are typically related to expansion projects and often translate to major rehabilitations or reconstructions.

- **Early Project Development:** The Bridge Group will prepare backup projects for each work type to replace any that are moved or canceled, ensuring program continuity.

8.9.2 Pavement Implementation Strategy

On the pavement side, the investment strategy focuses on shifting the risk from the high-priority networks in the NHS to the lower-priority non-NHS networks included in this AMP. To achieve this, four key strategies will be implemented:

- Three-Subprogram Approach
- Increased Preservation Treatments
- Interstate Focus
- Focused Low-Volume Management

8.9.2.1 Three-Subprogram Approach

Pavement projects present challenges in predicting long-term investments, especially beyond the first two years of the strategy. The primary reasons are as follows:

- **Pavement Deterioration:** Pavements deteriorate rapidly, making predicting necessary treatments more than two years ahead difficult.

- **Short Development Timeline:** Pavement projects typically have a short development time and are generally not planned more than two years in advance.

- **Contingency Funding:** ADOT sets aside substantial contingency funding for pavements in the later years of the Five-Year Transportation Facilities Construction Program to account for inflation and scope changes. Since this funding is not programmed, it is difficult to predict the specific network and work type allocations.

As a result, it is not feasible to determine how pavement projects will be allocated by network and work type beyond the first two years of the investment strategy.

To address these challenges, ADOT proposes allocating funding into three designated subprograms organized by network and work type. These subprograms will be based on the recommended investments identified in the AMP and will provide more predictable funding for pavement projects:

- NHS Pavement Rehabilitation and Reconstruction Treatments
- NHS Pavement Preservation Treatments
- Non-NHS Pavement Preservation, Rehabilitation, and Reconstruction Treatments

The funding for each subprogram will align with the network and work type recommendations in the AMP. NHS subprograms will be fully loaded with projects in the Five-Year Transportation Facilities Construction Program, which may require skipping certain projects on the P2P list to ensure alignment with the allocated funding. Contingency funding will be incorporated into the non-NHS subprogram. A sufficient number of non-NHS pavement projects will be developed to fully utilize this contingency funding if it is not required for cost increases or other reasons.

Since Arizona's pavements are relatively young, reconstruction projects are infrequent. For areas requiring reconstruction, the Asset Management Team will collaborate with the Pavement Management Section to identify projects and cost estimates for the investment strategies.

ADOT plans to implement this three-subprogram strategy in State FY 2028.

8.9.2.2 Increased Preservation Treatment Funding

Although increased funding for pavement preservation treatments was recommended in the 2021 AMP and the 20250 LRTP, this recommendation has not been implemented for the following reasons:

- Concerns about rapidly increasing preservation funding at the expense of rehabilitation projects.
- Concerns about maintaining flexibility in how the pavement funding is used.
- The funding in the first few years of the Five-Year Transportation Facilities Construction Program is accounted for and difficult to change.
- The amount of preservation funding recommended in the life cycle analysis was too much of a change for agency management to support over the four-year AMP cycle.

The AMP life cycle analysis recommended an increase in funding for preservation treatments from about 12 percent (current) to about 25 percent of total pavement expenditures. In the short term, ADOT could not support this rapid rate of increase, so a lower increase of about 19 percent preservation treatment funding was identified for this AMP cycle. This is the equivalent of about $50 million for heavy preservation treatments and $36 million for light preservation treatments annually. The increase in preservation funding will begin in state FY 2028 and will be incremental, increasing by about $11 million per year until the full amount of preservation funding is allocated. The preservation funding will be allocated 60 percent for the NHS and 40 percent for the non-NHS.

8.9.2.3 Interstate Focus

As discussed in **Section 8.7**, Interstate pavements are subject to a penalty if the Poor condition exceeds 5 percent. Currently, ADOT's Interstate Poor condition performance is around 2 percent. ADOT aims to maintain flexibility in how NHS pavement funding is allocated based on priorities identified through the P2P. However, if it is observed that the condition of Interstate pavements is deteriorating faster than anticipated, it will be crucial to take action to prevent the Poor condition from exceeding the penalty threshold.

ADOT intends to establish an internal target of 3 percent Poor on the Interstate pavements. If the annual condition survey reveals that the Interstate pavements have deteriorated above this internal target, then a mileage-based strategy will be used to restore the Interstate pavements below 3 percent Poor condition. The Pavement Management Section will identify a sufficient number of Interstate pavement treatments to bring the number of lane miles of Poor condition pavement under the 3 percent internal target. These projects will receive a higher priority in the P2P process. This will prevent the Interstate pavements from reaching the 5 percent Poor condition threshold.

8.9.2.4 Focus Low-Volume Roads

ADOT's pavement projects proposed for low-volume roads do not compete well in the P2P prioritization process because the selection process puts a heavy weight on traffic volumes. Therefore, low-volume roads are often neglected, and this network is seeing increasingly higher levels of Poor condition pavements.

ADOT has identified two solutions to help address this problem:

- **Scrub Seal/Chip Seal Treatment:** A new treatment has been added to the treatment decision tree to improve Fair condition roads in the Fair-Good category at low cost. This scrub seal/chip seal treatment can be applied to roads with less than 4,000 AADT.
- A new two-part treatment strategy that utilizes funding from the heavy preservation subprogram or district minor funds to implement spot repairs on low-volume roads in the Fair-Poor condition category in a single project. Then funding from the State Line Item would be used to enhance repaired roadways with a chip seal or a cape seal in a second project. This low-cost strategy will allow ADOT to efficiently combine funds from different funding sources that have different limitations to address roads that would otherwise not

be eligible for a typical surface treatment. It would also prevent these roads from falling into the Poor category and restore them to Good condition.

Section 9 Continuous Improvement

The AM process is continuous, with course corrections anticipated as an agency matures in its asset management practice. This document should be viewed as a living document, updated as ADOT continues to enhance its asset management and preservation activities, ultimately working toward a SOGR. As required by federal regulations, this AMP must be updated every four years with revised processes submitted for recertification. Additionally, FHWA will conduct an annual consistency determination to ensure the plan's implementation. Between AMP versions and the annual consistency determination, there will be opportunities to enhance ADOT's AM practices and ensure compliance with federal regulations.

Based on the current state of AM at ADOT and identified gaps during the development of this document, the following improvement opportunities have been outlined for consideration:

- Review and update the bridge and pavement management system configuration, including network policy, treatment costs, and decision trees as needed. Additionally, update bridge deterioration models using the latest bridge condition inspection data. Once these models are updated, ADOT will continue calibrating its life cycle analysis to enhance the candidate project selection process.
- Continue integrating the AMP process into the LRTP, planning, and other processes. This includes working closely with various internal stakeholders to implement the strategies outlined in this AMP to support proposed investment strategies.
- Develop a process to effectively track regional and local expenditures within the NHS system. This process should include a clear methodology for capturing projects, their respective work types, and expenditure related to pavements or bridges. It should also enable accurate reporting for the consistency determination and help identify any gaps or areas for improvement in the allocation of funds within the NHS system.
- Evaluate the benefits and applications of bridge and pavement preservation treatments to ensure their effective use.
- Collaborate with LPAs, including regional and MPOs, to encourage and facilitate their participation in future AMP updates.
- Develop strategies to incorporate other highway asset classes into the AMP to enhance management practices.
- ADOT will continue to focus on improving the management of bridge and pavement assets across both the NHS and SHS, with the overarching goal of achieving a sustained SOGR.

Section 10 Glossary of Terms

Asset — A physical component or resource related to the transportation infrastructure.

Asset class — A grouping of the same type of asset, such as bridges.

Asset management — A strategic and systematic process of operating, maintaining and improving physical assets, with a focus on engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation and replacement actions that will achieve and sustain a desired SOGR over the life cycle of the assets at minimum practicable cost (23 United States Code 101(a)(2)).

Bridge component — A major functional unit of a bridge (e.g., deck, superstructure, substructure).

Bridge element — A subcomponent of a bridge (e.g., expansion joint, girder).

Deterioration model — A mathematical model that predicts the future condition of an asset, if only minimal or routine maintenance is performed.

Expansion — Increasing transportation system traffic volume capacity by expanding a roadway or constructing a new transportation facility.

Long-Range Transportation Plan (LRTP) — Federal regulations (23 United States Code 135) require states to develop an LRTP that provides for the development and implementation of the intermodal transportation system. The plan must cover a minimum of 20 years and be developed in consultation with local governments and other parties within the state. ADOT's plan covers 25 years and is updated every 5 years.

Maintenance — Routine activities that maintain the functional condition of existing roadways.

Modernization — Improvements to address functional, safety and geometric deficiencies.

Performance (transportation asset) — The condition of an asset, specifically how well and safely it fulfills its intended function and lifespan.

Performance gap — The difference between an asset's current condition and the desired condition.

Preservation (Work Type) — A program of preventive maintenance that extends asset service life and maintains the functional condition of existing roadways. Repairs and minor rehabilitation that do not restore or enhance the structural capacity of an asset are also included in the category. The terms preventive maintenance or preservation treatments may be used to convey this meaning in the AMP.

Preservation (Planning) — For planning purposes, ADOT uses this term to describe all the activities and work types needed to maintain transportation infrastructure meeting the functional requirements of the as-built highway system. Often, this usage will be in conjunction with the terms modernization and expansion.

Preventive maintenance — Periodic maintenance that is applied when an asset is in Good condition to prevent deterioration and extend asset life.

Rehabilitation — Treatments that restore or strengthen an asset's structural capacity to extend service life and/or increase load carrying capability.

Reconstruction or replacement — Replacement of an entire asset to restore or update functionality and/or increase traffic volume capacity.

State Transportation Implementation Plan (STIP) —Federal regulations (23 United States Code 135) require that states develop a STIP containing a fiscally constrained listing of projects covering a minimum of four years and developed in consultation with local governments and other parties in the state. ADOT's STIP covers five years and is updated annually.

Work type — Refers to initial construction, maintenance, preservation, rehabilitation, and reconstruction (23 CFR 515.5).

Section 11 Acknowledgments

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Section 12 Appendix A: Documents Referenced

All documents listed below may be found at: azdot.gov/planning/transportation-programs/assetmanagement **https://www.azdot.gov/tamp**

1. 2023 Edition ADOT MAP Book
2. MPO/COG Planning Agreements Templates
3. Bridge Inspection Guidelines
4. ADOT/Maricopa County Bridge Inspection Intergovernmental Agreement
5. Pavement Data Quality Management Plan
6. ADOT's 2024 Comprehensive Financial Report
7. Preliminary Study of Climate Adaptation for the Statewide Transportation System (2013)
8. Extreme Weather Vulnerability Assessment (2015)
9. Asset Management, Extreme Weather, and Proxy Indicators Infrastructure Resilience Report (2020)
10. 2050 ADOT Long-Range Transportation Plan
11. 2050 ADOT Long-Range Transportation Plan. Baseline and Projected Revenues.
12. 2050 ADOT Long-Range Transportation Plan. Multimodal Gap and Investment Choice Analysis.
13. 2050 ADOT Long-Range Transportation Plan. Multimodal Needs Analysis.
14. Arizona Highway User Revenue Fund Forecasting Process & Results FY 2025−2034
15. Maricopa County Transportation Excise Tax Forecasting Process & Results
16. ADOT PMS Deterioration Curve Development Implementation Report

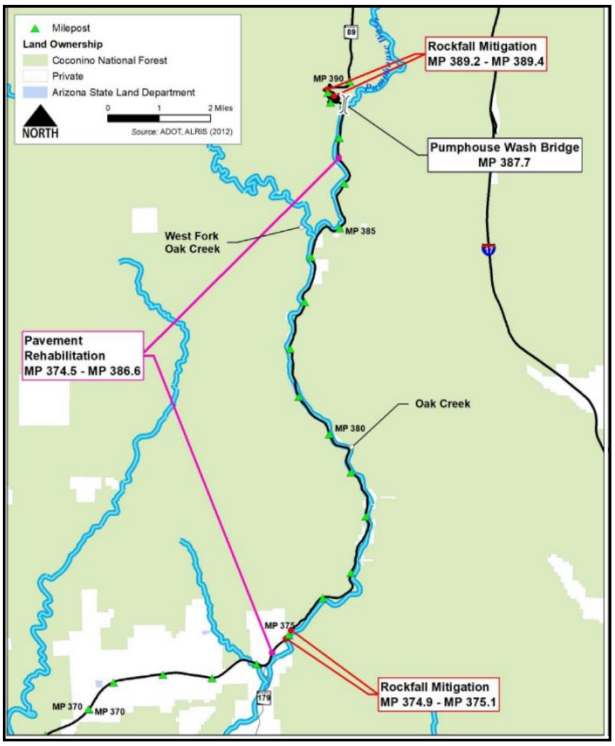
Section 13 Appendix B: Emergency Event Descriptions

ADOT has identified three high-risk areas that have experienced repeated damage from emergency events. These events include erosion, slope failures, landslides, high-water levels, heavy stormwater runoff from intense rainfall, and flooding following fire damage. ADOT continues to enhance weather adaptivity in areas previously affected by such recurring damage. While not all damage occurred at the exact same location, the general areas impacted have been highlighted to describe the activities ADOT is undertaking.

13.1 Summary of Evaluation for SR 89A (MP 375-399)

State Route (SR) 89A, milepost (MP) 375-399, has become a high-risk area due to recurring heavy storm events (see Figure 13-1). This section of SR 89A has required rockfall mitigation, bridge enhancements, and drainage improvements.

Figure 13-1 | **Site Map for State Route 89A Emergency Event Area**



Past storm events have caused significant damage along SR 89A, including erosion from heavy stormwater runoff and flooding in 2004 (MP 375-399), slope failure from stormwater

runoff in January 2010 (MP 387.9), erosion in September 2010 (MP 375-390), and a 17-hour road closure due to erosion from Hurricane Rosa in 2018 (MP 378-390). This section of SR 89A runs through Oak Creek Canyon, an area prone to stormwater erosion and unstable slopes at higher elevations. SR 89A provides vital access to privately owned land, as well as recreational areas, national forest, and state park land. ADOT has been actively addressing and implementing mitigation for active slide zones in this area. Since Fiscal Year (FY) 2022, efforts have included rockfall mitigation, erosion repairs, drainage improvements, and a bridge rehabilitation project. In FY 2025, permanent restoration work was carried out for rockslides and sediment mitigation along SR 89A between MP 378 and MP 390, as outlined in **Table 13-1.**

Table 13-1 | **State Route 89A Project Updates for Fiscal Year 2025**

Highway Name	Direction	From MP	To MP	Emergency Events	FY 2025 Update
S A089	N/S	375	399	Heavy stormwater runoff, hurricane remnants: · erosion · flooding · slope failure · rock slides	SR 89A MPs 378 to 390: Rock slides and sediment mitigation as a result of Hurricane Rosa. Permanent Restoration work was incorporated into the project to prevent repeated occurrences at this location. Total Contract bid amount is $2,355,000.90. The work started in October of 2024.

Key: FY = fiscal year; MP = Milepost; SR = State Route

13.2 Summary of Evaluation for SR 89 (MP 422-432)

A repeated emergency event was previously identified on US 89 from mileposts 422 to 432, north of Flagstaff. Since 2010, three significant fires have occurred in the vicinity of this stretch of highway: the Schultz Fire in 2010, the Tunnel Fire in 2022, and the Pipeline Fire in 2022. The burned areas from these fires have resulted in increased stormwater runoff, which has damaged drainage and roadway structures during the 2010 and 2022 monsoon seasons. Emergency relief funds were used for repairs in both 2010 and 2022. Emergency relief funds also contributed to permanent restoration projects. These projects include drainage infrastructure improvements that are undertaken by Coconino County, working with the local community, to reduce upstream and downstream flood risks, including the construction of the Copeland detention basin with new concrete lined channels.

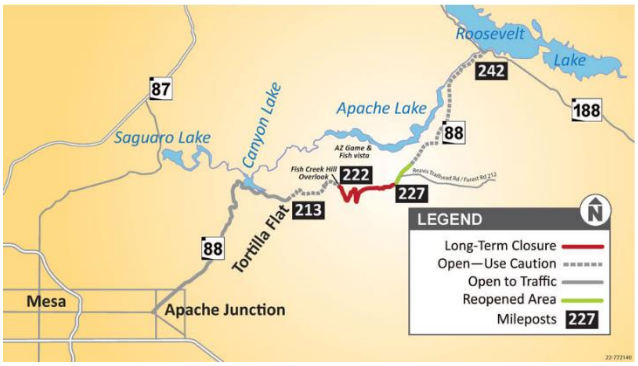
In FY 2025, a project was undertaken to re-establish drainage channels, and make repairs to drainage features to bring them up to current standards. Construction for this project began in April 2025 and used approximately $11.9 million in emergency relief funds.

13.3 Summary of Evaluation for SR 88

SR 88, also known as the Apache Trail, has become a high-risk area due to repeated heavy storm events. Past events include flooding damage to road shoulders, headwalls, retaining walls, and drainage pipes in 2004 and 2005 (MP 225-230), flash flood erosion on roadside

slopes and road washouts in 2017 (MP 196-220), and severe damage from nearly 6 inches of precipitation during Tropical Storm Lorena in 2019 (MP 197-240), including slope washouts, eroded cut sections, undercut pavement, landslides, scour damage, overtopping of the Davis Wash Bridge, buried and clogged drainage structures, and sediment deposition across the roadway (Figure 13-2). Additionally, the 2018 Woodbury Fire in the Superstition Wilderness reduced ground cover, increasing runoff potential. Maintenance crews performed repairs following each event. After Tropical Storm Lorena, sections of SR 88 were damaged and closed, qualifying for funding through the Emergency Relief Program. Ongoing efforts include pavement repair and drainage improvements, with another monsoon flood event at MP 199 in the summer of 2022 also qualifying for emergency relief funds.

Figure 13-2 | **Site Map for State Route 88 Emergency Event Area**



13.3.1 Summary of Weather Activities on State Route 88

SR 88, MP 222 to 229 - Feasibility Study

The area between MP 222 and MP 229 on SR 88 (Fish Creek to Apache Lake Marina) had been closed for public safety due to the severe runoff damage and ongoing risk from future storms. Although portions of this section have been reopened, much of the route is still closed to all traffic. In October 2023 ADOT completed a study, which recommended $33.7 million in improvements to make SR 88 more accessible and weather. Those improvements, developed with extensive public involvement and identified in a design concept report include the following:

- Chip sealing throughout the 5 miles
- Widening the roadway to 15 feet in steeper areas
- Increasing drainage capacity to accommodate heavier rainfall
- Rehabilitating or repairing existing bridges
- Adding pullouts and other safety enhancements

This longer-term plan does not have dedicated funding, and ADOT is pursuing federal funding to advance these longer-term improvements.

In 2025, ADOT completed the interim project to reopen SR 88 (Apache Trail) from Fish Creek Vista (MP 222) to MP 227 near Reavis Trailhead Road. ADOT invested $4 million for an interim project to restore limited access to 5 miles of SR 88 damaged by flooding in 2019, as it seeks funding for more extensive improvements needed to make the roadway more accessible in the long term. ADOT's interim plan called for removing boulders on Fish Creek Hill, mitigating rockfall as needed between Fish Creek Vista and Fish Creek Bridge (MPs 222-223.5), making repairs to retaining walls, installing new signage, cleaning and potentially replacing damaged drainage culverts and taking other steps to safely reopen the highway for high clearance or four-wheel drive vehicles. Maintenance crews worked on preliminary items ahead of the construction project like removing vegetation, filling in eroded areas in the road surface and cleaning out culverts. The U.S. Forest Service reviewed and approved the interim project design, since SR 88 follows an easement through federal land.

SR 88, MsP 229.20 to 240.60 – Planned Roadway Improvements

The area within MP 229.20 to MP 240.60 on SR 88 has received significant damage to the roadway and its surrounding landscape from past storm events. The FHWA, Central Federal Lands Highway Division (CFLHD), ADOT, the United States Forest Service, and Tonto National Forest, have been planning roadway improvements for this section to reduce maintenance, improve and maintain accessibility, and protect elements of this scenic and historic road where possible. Damage from the recent storm events forced the re-initiation of the project design and coordination efforts that were initially started in 2017 and 2018. Detailed damage inspection reports for the route have documented damage to the roadway surface, embankments, culverts, and other drainage features, with the need for replacement or repair of structural features along the route (e.g., pipe culverts, headwalls, riprap aprons, line pipes, eroded decomposed granite roadway, and embankments). The proposed activities for this section of SR 88 included: applying chip seal or paving the existing decomposed granite road surface, replacing or repairing culverts, culvert maintenance, installation of erosion control elements (e.g., gabion baskets, embankment matting, and riprap), removal of excess decomposed granite from road maintenance and blading, application of 20 to 24 feet standard roadway width, cutting back slopes to improve line-of-sight distance, and additional culvert treatments to address erosion and drainage issues. Work on this section has been ongoing. **Table 13-2** has updates on the projects that are being undertaken in FY 2025.

Table 13-2 | **State Route 88 Project Updates for Fiscal Year 2025**

Highway Name	Direction	From MP	To MP	Emergency Events	FY 2025 Update
S 088	E/W	196	242	Heavy storm event, tropical storm: · flooding, · road shoulder damage, · headwalls damage, · retaining wall damage, · drainage pipe damage, · erosion, · road washout, · slope washout, · undercut pavement, · landslides, · bridge damage, · clogging of drainage structures, · sediment deposition	*SR 88, MPs 229.2 to 240.5: SR 88 sustained numerous drainage feature damages caused by erosion and sedimentation. The identified damages were incorporated into an ongoing Central Federal Lands project that is currently under construction. The total contract bid amount for the project was $17,959,492. ADOT requested FHWA emergency relief Funding assistance for the damages and was allocated $8,096,598 for the repairs, however, these funds were transferred directly to the Central Federal Lands projects. The work started in spring of 2025.

Key: ADOT = Arizona Department of Transportation; FHWA = Federal Highway Administration; FY = fiscal year; MP = Milepost

Section 14 Appendix C: Local Public Agency NHS Owners

14.1 Local NHS Asset Owners Workshop – List of Attendees

First Name	Last Name	Agency or Organization	Title and/or Role
Randi	Arnett	Pima County	Administrative Services Manager II
Samuel	Beckett	City of Flagstaff	Streets Director
David	Benton	ADOT	State Bridge Engineer
Jason	Bottjen	Sun Corridor MPO	Deputy Director
Fausto	Burruel	Town of Marana	Public Works Director
Maria	Burton-Sunder	ADOT	Senior Transportation Engineer
CJ	DiMaggio	Town of Carefree	Town Engineer
Alex	Eckel	Yavapai County Public Works	Assistant County Engineer
Ruth	Garcia	ADOT MPD	MPD Regional Planner
Jorge	Gastelum	City of El Mirage	Development Services Director/City Engineer
Nico	Giraldo	Pima Association of Governments	Planner
Susan	Gresavage	Applied Pavement Technologies	Senior Engineer
Brian	Harvel	City of Goodyear	Streets Superintendent
Trevor	Henry	City of Flagstaff	Capital Improvements Engineer
Jennifer	Hobert	ADOT	Regional Planner
Enamul	Hoque	ADOT	Engineer
Raymond	Huang	City of Chandler	Principal Engineer

First Name	Last Name	Agency or Organization	Title and/or Role
Ryan	Jones	Maricopa County DOT	Bridge Engineer
Sydney	Juve	City of Flagstaff	Transportation Engineer Associate
Sam	Kayat	Town of Paradise Valley	CIP Manager
Mafiz	Mian	ADOT	Pavement Preservation Engineer
Paul	Mood	City of Flagstaff	City Engineer
Dan	Nissen	City of Peoria	Deputy Engineering Director
Juan Diego	Porras-Alvarado	WSP	Consultant
Greg	Punske	Pima County DOT	Transportation Engineer
Kimberly	Richards	Maricopa County DOT	CA Liaison
Andria	Samuels	City of Mesa	Engineering Contracts Compliance Officer
Matt	Sierras	Pima County DOT	Maintenance Operations Division Manager
Daniel	Silva	Town of Marana	Street Superintendent
Bryn	Stotler	Yavapai County Public Works	Planning Manager – CYMPO
Leticia	Vargas	City of Phoenix	Engineering Manager
Fernando	Villegas	YMPO	Senior Transportation Planner
Dustin	Ward	Town of Marana	Development Engineering Division Manager

14.2 LPA Asset Snapshots