Statewide Executive Summary

Nevada Airport Pavement Management System Update

May 2019

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Overview

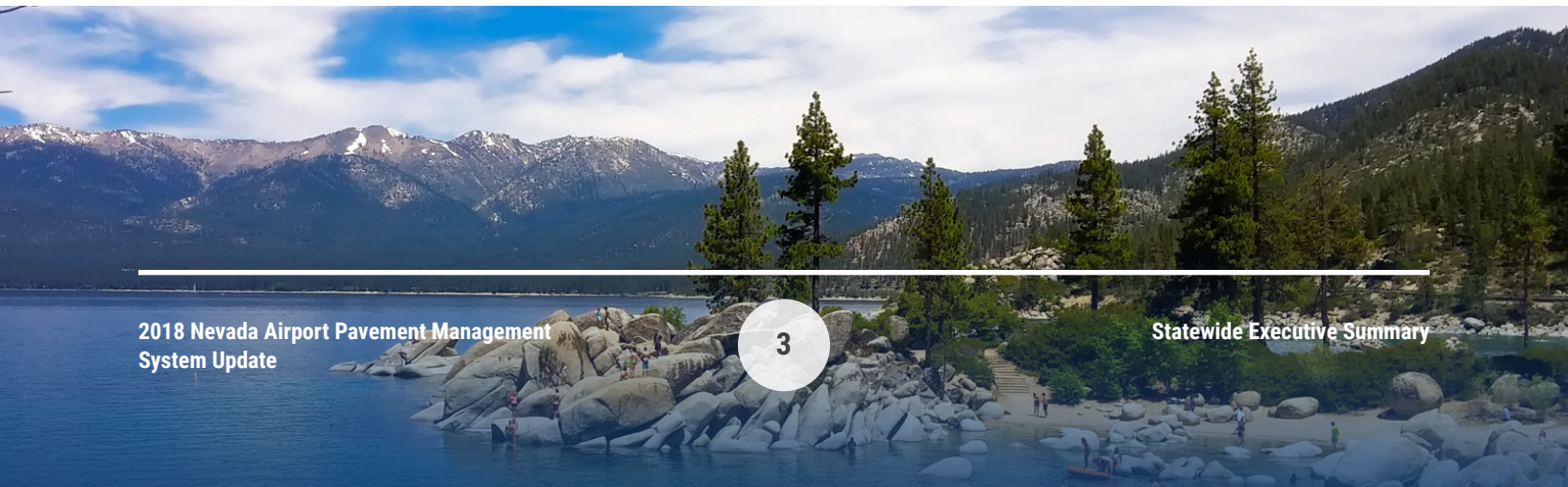
BACKGROUND

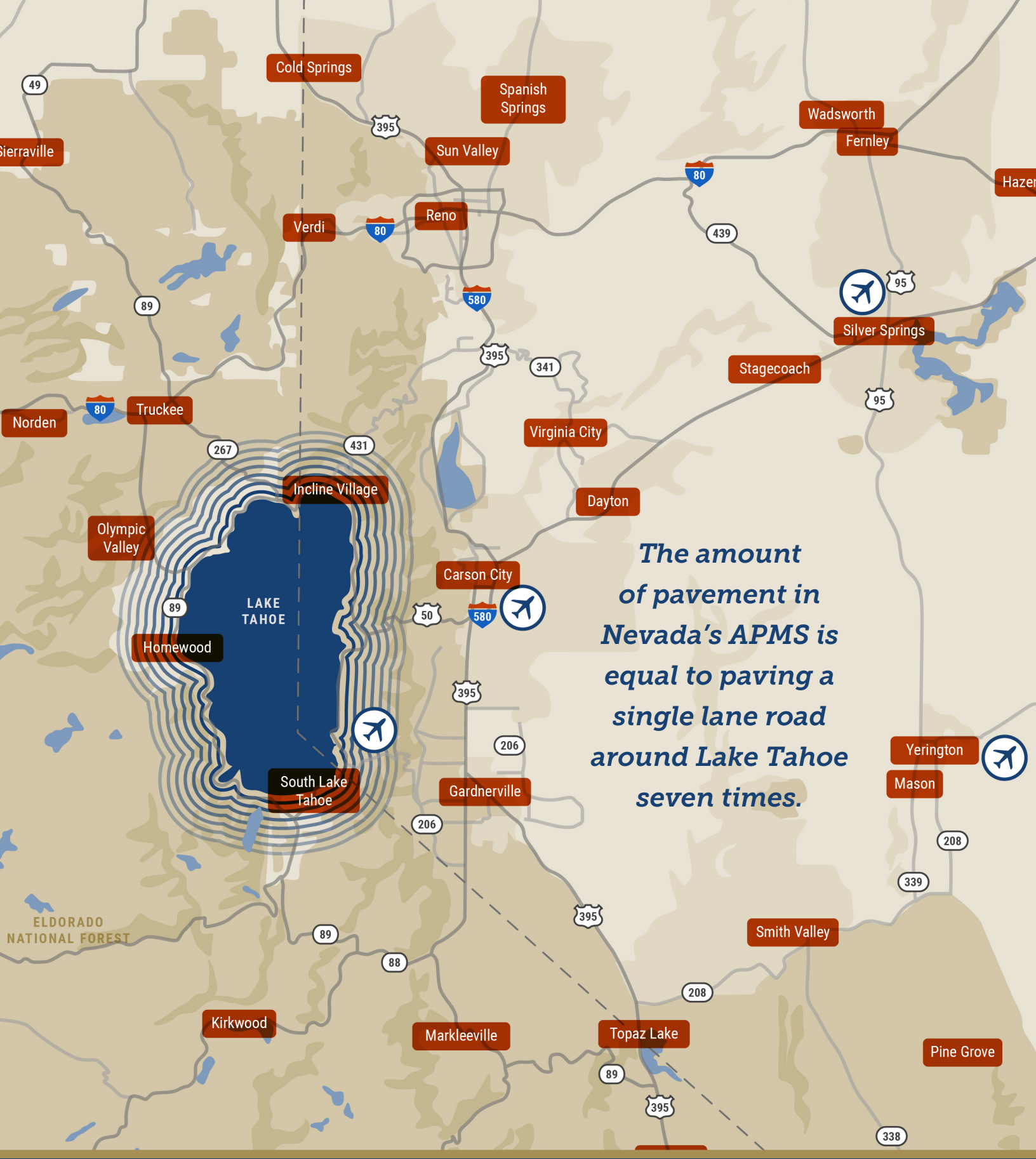
Pavements represent a significant capital investment in Nevada's aviation system. Understanding the importance of maintaining this investment, the Nevada Department of Transportation, Aviation Planning Section (NDOT), established a statewide airport pavement management system (APMS) in the 1990s to assess the condition of the airport pavements and to plan proactive measures in preserving its infrastructure. Periodic updates have occurred to the APMS since that time, and in 2018, NDOT selected Applied Pavement Technology, Inc. (APTech) to complete an update of the APMS. The work under this project was completed between spring 2018 and spring 2019.

Nevada's APMS provides the individual airports, NDOT, and the Federal Aviation Administration (FAA) with current pavement conditions, pavement-related maintenance and rehabilitation (M&R) needs, and the ability to optimize project selection and view their conditional impacts, and it assists with the development of multiyear capital improvement programs.

In addition, the APMS fulfills many of the National Plan of Integrated Airport Systems (NPIAS) airport requirements of Public Law 103-305 and FAA Grant Assurance 11 for maintaining a pavement maintenance management program, or APMS. The effective utilization of APMS data and results demonstrates Nevada's effort to maintain its airport infrastructure, which follows the priorities of the FAA for continued management of this important asset.

Nevada's airport system plays a vital role in supporting economic development opportunities statewide.





The amount of pavement in Nevada's APMS is equal to paving a single lane road around Lake Tahoe seven times.

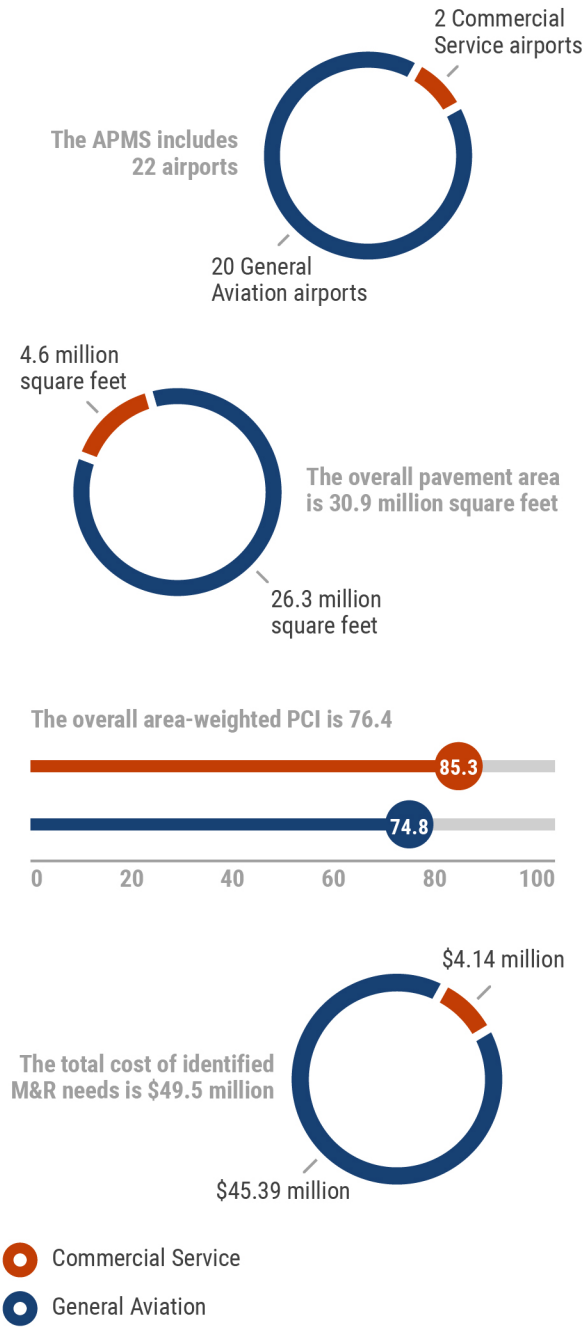
PROJECT AIRPORTS

Twenty-two airports were evaluated as part of the update to Nevada's APMS. The airports displayed in the map on the following page combined for over 30.9 million square feet of pavement. The total pavement area includes:

- 14.5 million square feet of runway (47.1%)
- 8.2 million square feet of taxiway (26.6%)
- 7.6 million square feet of apron (24.6%)
- 0.4 million square feet of T-hangar (1.5%)
- 0.04 million square feet of helipad (0.1%)

The total pavement area can also be divided into different pavement types:

- 7.4 million square feet of asphalt overlaid on asphalt concrete (24%)
- 22.4 million square feet of asphalt concrete (73%)
- 0.5 million square feet of asphalt overlaid on portland cement concrete (2%)
- 0.5 million square feet of portland cement concrete (2%)




Owyhee Airport
Jackpot / Hayden Field
Wells Municipal/ Harriet Field
Elko Regional Airport
Winnemucca Municipal Airport
Battle Mountain Airport
Derby Field
Fallon Municipal Airport
Silver Springs Airport
Austin Airport
Eureka Airport
Ely / Yelland Field
Carson City Airport
Minden / Tahoe Airport
Yerrington Municipal Airport
Hawthorne Industrial Airport
Tonopah Airport
Lincoln County Airport
Alamo Landing Field
Mesquite Airport
Boulder City Municipal Airport
Commercial Service
General Aviation

Condition Assessment

As part of the APMS process, APTech engineers conducted a visual assessment of pavement condition using the Pavement Condition Index (PCI) procedure as documented in FAA Advisory Circular 150/5380-6C, *Guidelines and Procedures for Maintenance of Airport Pavements* and American Society for Testing and Materials (ASTM) Standard D5340, *Standard Test Method for Airport Pavement Condition Index Surveys.* The evaluation is used to calculate a composite index that represents the overall condition of the pavement, which ranges from 0 (failed) to 100 (excellent). This procedure is the standard used by the aviation community for visually assessing the condition of the pavement.

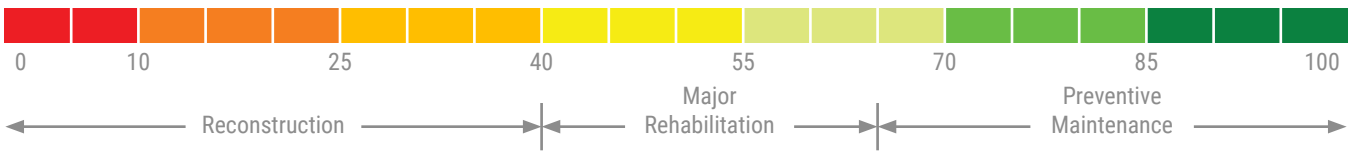
While performing a PCI survey, inspectors identify and quantify the types, severities, and amounts of each distress observed on a pavement's surface. This information is used to calculate the pavement's overall PCI. Additionally, the assessment can identify the potential causes for the deterioration of the pavement, be it load related, climate/durability related, and other distress types that cannot be attributed solely to load or climate/durability (such as patching).

In general, pavements with higher PCIs that are not exhibiting significant load-related distress will benefit from preventive maintenance and/or pavement preservation, such as crack sealing, patching, and/or the application of a surface treatment. As the pavement deteriorates and PCIs decrease in value, pavements become candidates for nominal resurfacing, rehabilitation, or reconstruction. The figure below shows the relationship between the pavement's condition and general category of recommended M&R need.

Pavements below a PCI of 40 usually require major reconstruction due to probable structural issues. In the case of severe raveling, a nominal resurfacing is a viable option.

Pavements in this range do not exhibit significant amounts of load-related distresses but typically require major rehabilitation (such as an overlay) or a nominal resurfacing.

Pavements in this range often get the most cost-effective benefit from preventive maintenance and pavement preservation, such as crack sealing and surface treatment applications.



PAVEMENT DISTRESSES

Following is a description of the most frequently observed pavement distresses, excluding patching, at the evaluated Nevada airports.

Longitudinal and Transverse (L&T) Cracking

L&T cracking can be caused by any of the following: separation of pavement at paving lane joints, shrinkage of AC pavement due to temperature differentials in older or brittle pavements, and reflection cracking from underlying existing cracking in overlaid pavements.

Raveling

Raveling occurs as the coarse aggregate begins to dislodge and produce loose pieces of material, or foreign object debris (FOD).

Longitudinal, Transverse, and Diagonal (LTD) Cracking

LTD cracking divides the slab into two or three pieces and is usually caused by a combination of load repetition, curling stresses, and shrinkage stresses. Low-severity cracks are usually warping or friction related and are not considered major structural distresses. Medium- or high-severity cracks are usually working cracks and are considered major structural distresses.

Alligator Cracking

Alligator cracking is a load-related distress caused by excessive tensile strains at the bottom of the AC layer or stabilized AC base layer from repeated aircraft loadings. It typically shows up on the surface as a series of parallel cracks, which eventually interconnect to form a pattern resembling alligator skin.

Depression

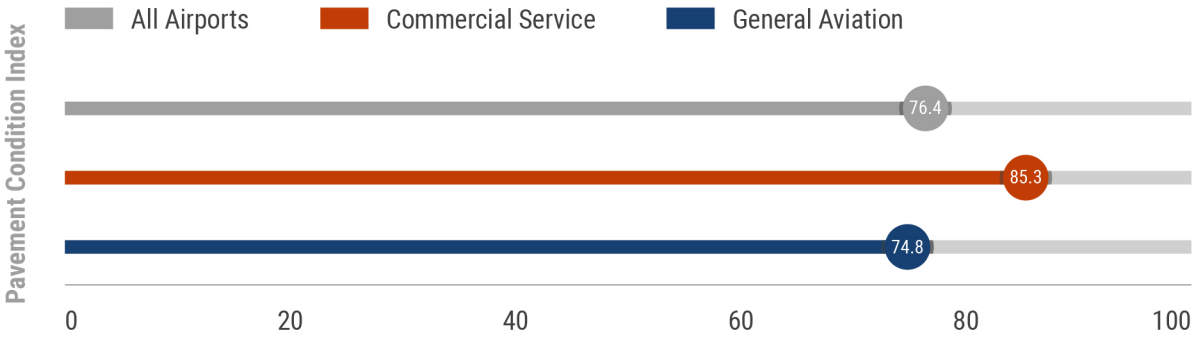
A depression is a pavement surface area that has an elevation slightly lower than that of the surrounding pavement. It can be caused by settlement of the underlying base layers or soils and is often found in areas where insufficient drainage capacity exists and soils are weakened due to water penetration or where underlying layers were not compacted enough during construction.

Spalling

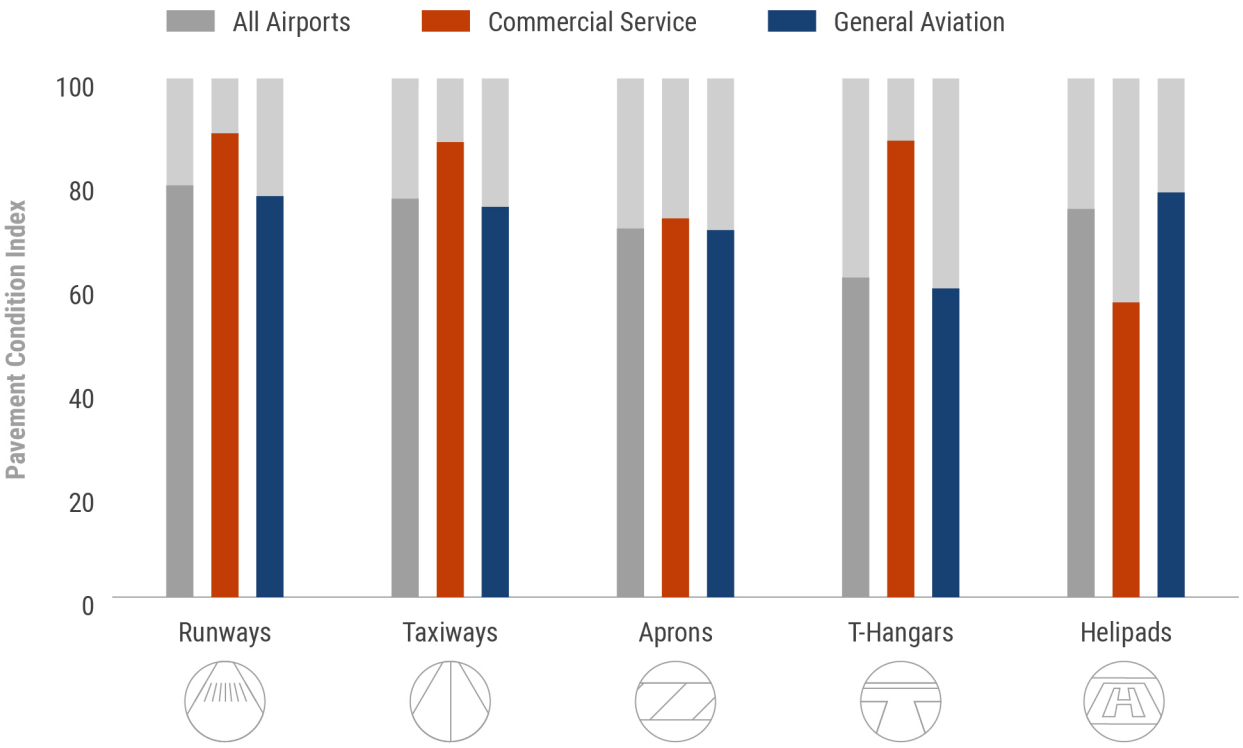
Spalling, in PCC pavement, is the breakdown of the slab edges in close proximity to the slab joint. Spalling is identified as occurring in the corner or along the joint of a PCC slab. Spalling is typically caused by the introduction of incompressible material in the joint, weaker pavement at the joint caused by overworking of the pavement during construction, traffic loading, or a combination of these.

PAVEMENT CONDITION ASSESSMENT

The overall 2018 area-weighted PCI of the twenty-two airports included in the Nevada APMS is 76.4. The figure below shows the 2018 overall area-weighted condition of the system and for each Nevada airport classification.



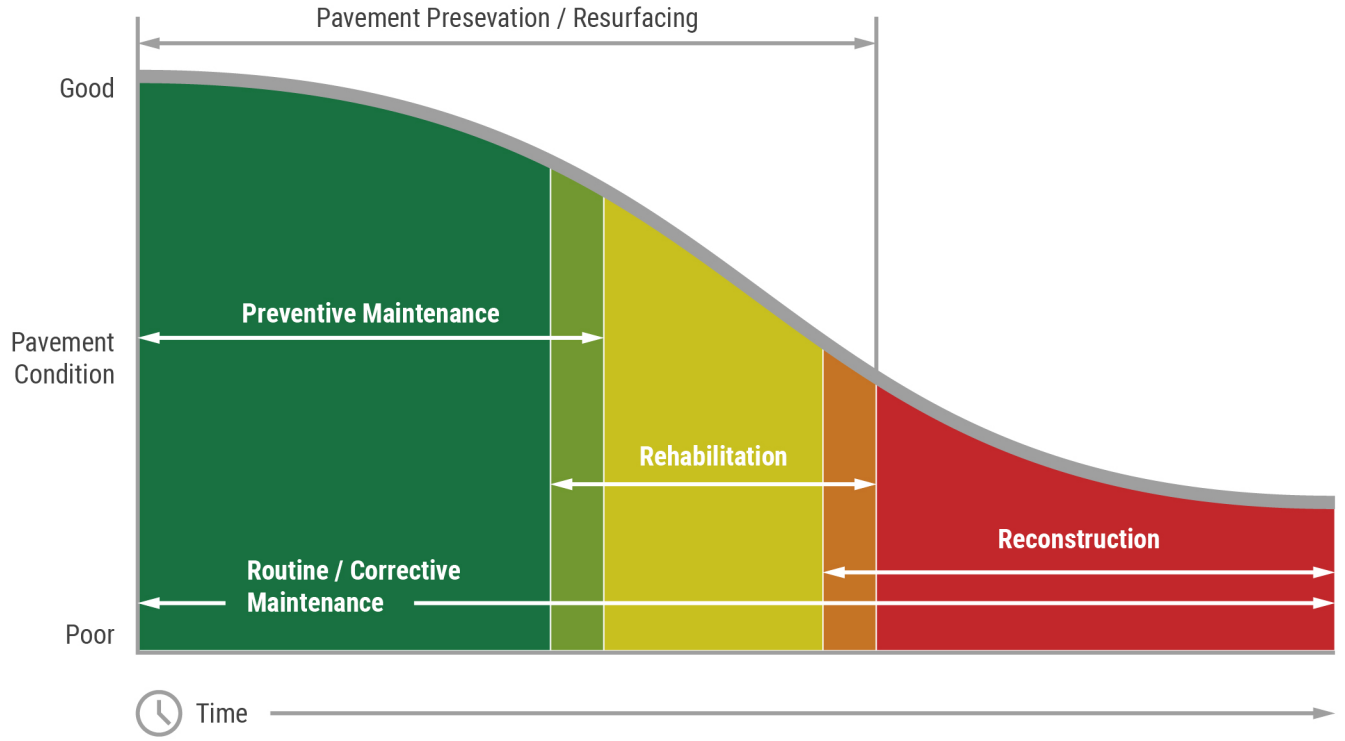
The figure below provides more detail and displays the overall area-weighted condition for each pavement facility type.



PAVEMENT NEEDS ASSESSMENT

Once programmed into an APMS, the analysis of the data collected during the PCI survey is used to determine current and predict future pavement conditions. These data are analyzed to determine the recommended pavement repair, whether preventive maintenance, pavement preservation, nominal resurfacing, or major rehabilitation/reconstruction, as well as the appropriate timing for the work.

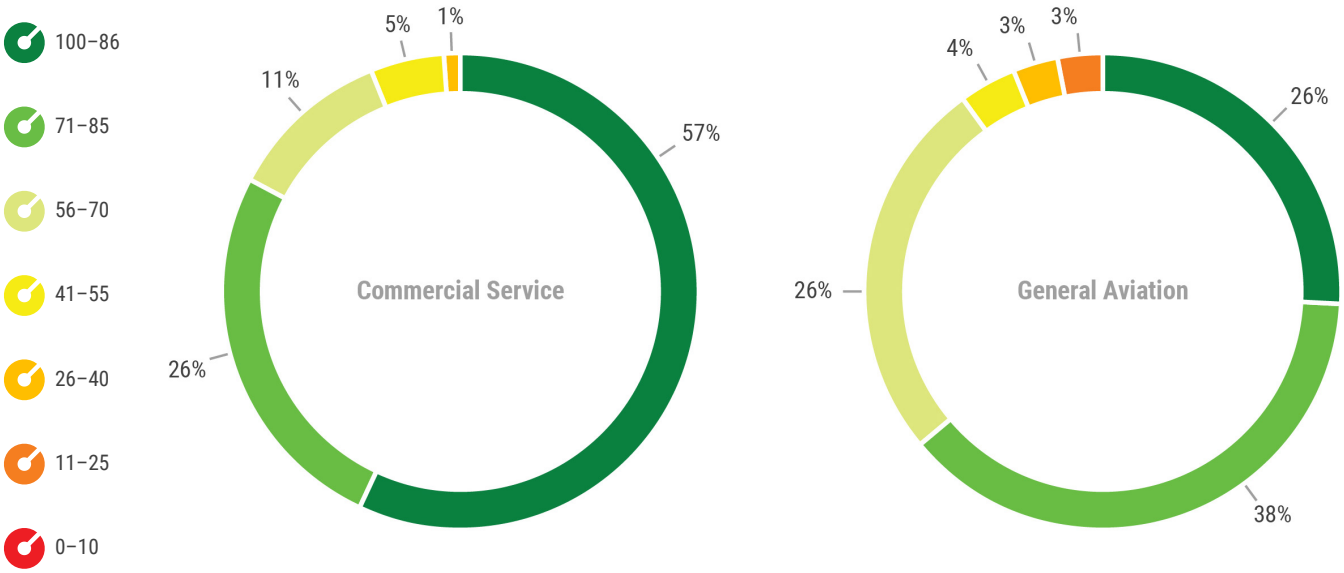
Pavements in relatively good condition that are not exhibiting significant load-related distress will typically benefit from preventive maintenance. Once PCIs drop below a specific threshold, the pavements are then recommended for major rehabilitation, such as an overlay. In situations where the PCI has become low enough and pavements are exhibiting larger quantities of load-related distresses, replacement of the entire pavement (reconstruction) may be the only viable option. In addition, asphalt-surfaced pavements that are primarily experiencing climate-related deterioration in the form of weathering and/or raveling are often candidates for pavement preservation in the form of a surface treatment or a nominal resurfacing. The figure below displays the relationship between the PCI of the pavement and the typical repair strategy associated with it.



Over half of Nevada's airport pavements are candidates for preventive maintenance and / or pavement preservation, while approximately 20 percent need more costly rehabilitation or reconstruction.

A 5-year M&R needs analysis was completed for all pavements included in the Nevada APMS from 2019 to 2023. During this time, approximately 57 percent of Nevada's airport pavement area is recommended for preventive maintenance and/or pavement preservation. Additionally, approximately 2 percent of the pavement area at the evaluated airports needs nominal resurfacing, 16 percent needs major rehabilitation, and approximately 4 percent of the area needs reconstruction. The following figures show the percentage of pavements in each condition range broken out by airport classification. This figure also indicates the typical work type identified for the range of conditions.

PERCENTAGE OF PAVEMENT AREA BY PCI RANGE

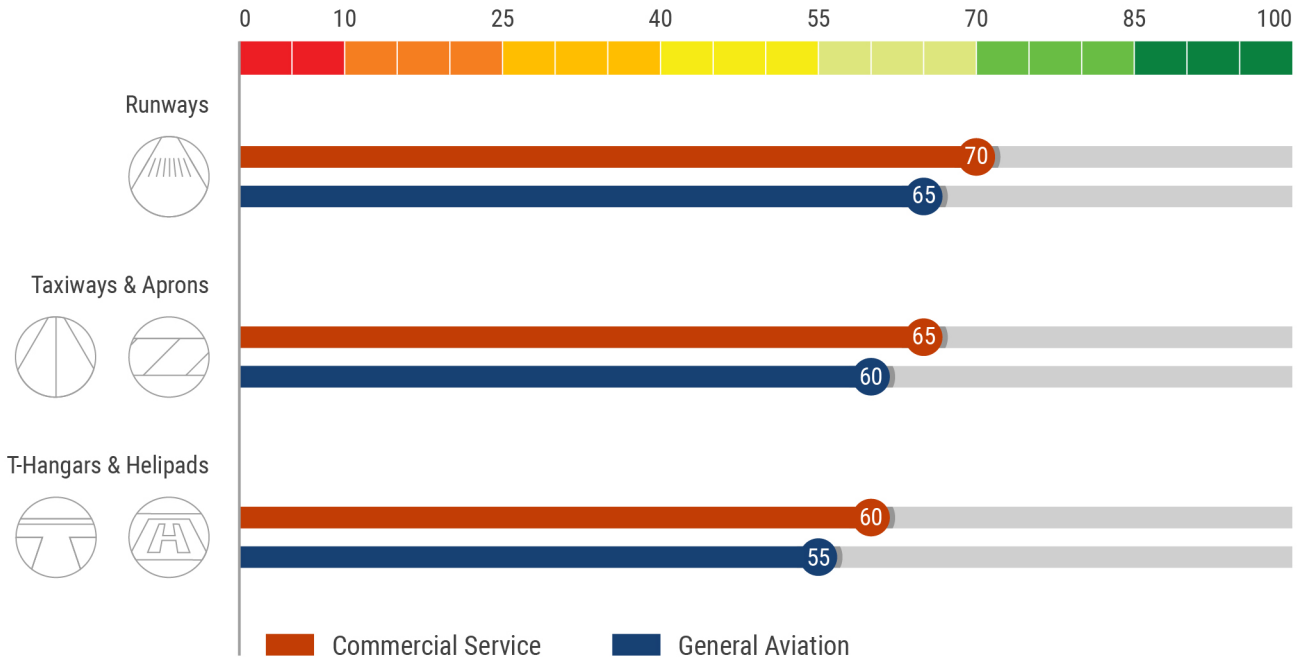


Protecting Capital Investment

The 5-year M&R needs analysis was used to develop an M&R plan for addressing pavement needs from 2019 to 2023. For each year of the analysis, future pavement conditions were predicted and the most cost-effective timing and repair strategy was determined, whether it was preventive maintenance, pavement preservation, major rehabilitation, or reconstruction. This was done with the use of selected critical PCIs, shown in the figure below.

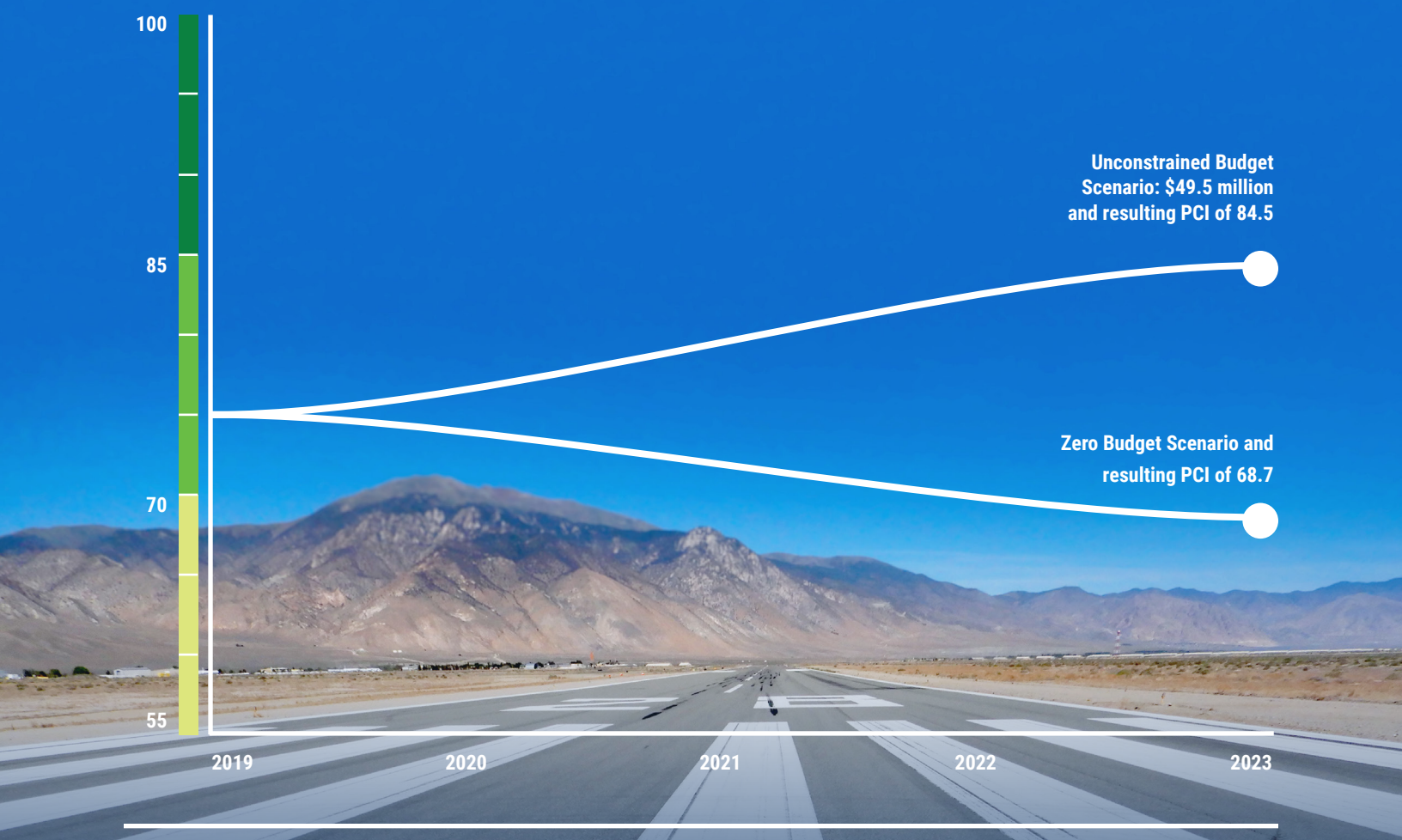
During the analysis, if a pavement was projected to remain above the critical PCI, it was recommended for preventive maintenance. If the current or projected PCI dropped below the critical value during the 5-year period, major rehabilitation or reconstruction was recommended. In addition, the impacts of pavement preservation, such as the application of a surface treatment or nominal resurfacing, were evaluated for asphalt-surfaced pavements that were primarily exhibiting climate-related distresses in the form of weathering and/or raveling. These preservation repairs were recommended for pavements that would benefit from such an application.

CRITICAL PCIS



Analysis of an unconstrained budget scenario identified all pavement-related repair and rehabilitation needs. Under this scenario, if all projects were funded, the system PCI would increase from a value of 76.4 to 84.5. Approximately $49.5 million in needs were identified during the unconstrained budget scenario. While an unconstrained budget scenario is unrealistic, it is an excellent base point in understanding the current airport pavement needs and beginning the prioritization of future projects. The table on the following pages shows estimated total costs for the needs identified for each airport derived from the unconstrained budget analysis. Additionally, a zero-budget analysis was performed to identify the future condition if no repair work is performed. This analysis resulted in a PCI decrease from 76.4 in 2019 to 68.7 in 2023. This scenario shows just how quickly the system could potentially deteriorate if pavement repairs and major rehabilitation/reconstruction projects are not completed to maintain the current airport infrastructure.

PCI VALUES BY ANALYSIS SCENARIO



5-YEAR PAVEMENT FUNDING NEEDS

Airport Name	Associated City	Classification	Weighted PCI	Pavement Area (sf)	Weighted Age	Total Funding Need (nearest thousand)
Elko Regional Airport	Elko	Air Carrier	83.2	2,747,281	10.1	$2,316,000
Ely/Yelland Field	Ely	Air Carrier	88.5	1,848,131	7.6	$1,822,000
Alamo Landing Field	Alamo	General Aviation	92.8	452,400	5.2	$131,000
Austin Airport	Austin	General Aviation	78.0	683,330	14.1	$78,000
Battle Mountain Airport	Battle Mountain	General Aviation	78.3	2,918,203	16.2	$3,675,000
Beatty Airport	Beatty	General Aviation	83.5	495,256	8.4	$336,000
Boulder City Airport	Boulder City	General Aviation	73.4	2,457,494	11.2	$3,762,000
Carson City Airport	Carson City	General Aviation	77.8	2,592,918	7.3	$1,406,000
Derby Field	Lovelock	General Aviation	71.0	978,242	24.3	$2,237,000
Eureka Airport	Eureka	General Aviation	95.0	894,349	9.5	$7,000
Fallon Municipal Airport	Fallon	General Aviation	60.8	1,140,490	13.7	$2,699,000
Hawthorne Airport	Hawthorne	General Aviation	72.3	1,240,948	14.8	$2,150,000
Jackpot/Hayden Field	Jackpot	General Aviation	72.5	780,565	20.0	$248,000
Lincoln County Airport	Panaca	General Aviation	67.0	434,105	11.0	$1,667,000
Mesquite Airport	Mesquite	General Aviation	60.3	891,625	27.2	$3,593,000
Minden - Tahoe Airport	Minden	General Aviation	74.8	3,340,858	13.7	$5,931,000
Owyhee Airport	Owyhee	General Aviation	94.1	553,055	6.0	$2,000
Silver Springs Airport	Silver Springs	General Aviation	80.9	887,905	14.8	$3,000
Tonopah Airport	Tonopah	General Aviation	51.5	1,794,534	17.6	$13,294,000
Wells Municipal/Harriet Field	Wells	General Aviation	82.2	542,817	15.5	$192,000
Winnemucca Municipal Airport	Winnemucca	General Aviation	74.4	2,385,597	12.9	$3,882,000
Yerington Municipal Airport	Yerington	General Aviation	96.1	803,059	2.3	$96,000

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