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Alaska Airport
Pavement Management Program
2023 Statewide Summary Report

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EXECUTIVE SUMMARY

Alaska Department of Transportation and Public Facilities Program Background

Airports participating in the Airport Improvement Program (AIP) Grant Program are required by the Federal Aviation Administration (FAA) to develop and implement a pavement maintenance program to be eligible for funding per FAA Advisory Circular (AC) 150/5380-6C *Guidelines and Procedures for Maintenance of Airport Pavements* and AC 150/5380-7B *Airport Pavement Management Program (PMP)*. This program requires detailed inspection of airport pavement conditions annually, or every three years if the pavement is inspected according to the Pavement Condition Index (PCI) survey procedure specified in ASTM D5340-20 *Standard Test Method for Airport Pavement Condition Index Surveys*.

Starting in 2022, the Alaska Department of Transportation and Public Facilities (Alaska DOT&PF) began the process of implementing a comprehensive PMP in conformance with AC 150/5380-7B. The Department will fully implement the PMP from 2023 to 2025 by conducting pavement inspections, pavement mapping, database administration, engineering analysis, and budgeting and prioritization activities. When complete, the PMP will include 54 paved public-use airports located in three regions (Northern, Central, Southcoast) across the State of Alaska.

The primary objective of the PMP is to implement a data-driven system that allows cost-effective planning, budgeting, and project prioritization for maintenance and repair of airport pavements in Alaska. The findings of this PMP—alternative budget scenarios—are presented in this report and can be utilized by Alaska DOT&PF and the FAA to identify, prioritize, budget, and schedule pavement maintenance, repair, and major rehabilitation projects.

Summary of Results

In 2022 and 2023, Alaska DOT&PF conducted pavement inspections at 26 of the 54 paved airports maintained by the State of Alaska. For the remaining 28 airports, we used historical pavement condition data to predict current-day values.

The overall area-weighted average condition for Statewide Alaska airport system is **71** or **"Satisfactory"**, according to the scale shown in Table 1.

Table 1—Pavement Condition Index Scale and Color Legend

PCI Color Legend	PCI Range	PCI Rating
	86-100	Good
	71-85	Satisfactory
	56-70	Fair
	41-55	Poor
	26-40	Very Poor
	11-25	Serious
	0-10	Failed

Figure 1 summarizes the pavement condition for the 54 paved airports within the PMP. The pavement condition distribution by area is 28% "Good", 28% "Satisfactory", 27% "Fair", 8% "Poor", 8% "Very Poor", 1% "Serious", and less than 1% "Failed".

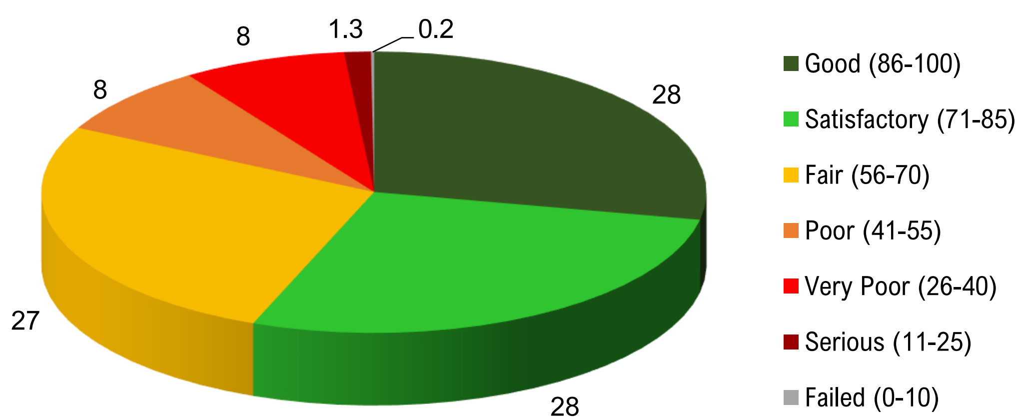

Figure 1—Statewide Alaska Airport PCI Survey Results by Percent Area

We used PAVER to predict future pavement conditions over the five-year period from 2024 to 2028. PAVER is a decision-making tool for the development of cost-effective maintenance and rehabilitation (M&R) alternatives. We analyzed five alternative budget scenarios that established various constraints including budget levels and resulting pavement condition. Based on our five-year analysis, the following conclusions for each of the five scenarios are listed below and summarized in Table 2.

Scenario 1. **Eliminate Backlog in 5 Years**: Backlog is the accumulation of sections that are under the critical PCI and require maintenance. The current (2023) M&R backlog for the 54 airports in the Alaska Airport PMP is $1.2B. An average annual expenditure of **$322M** is necessary to achieve the goal of eliminating the backlog over a five-year period. This level of investment would result in an average PCI of **85** in 2028. The total cost over the five-year analysis period, including funded and unfunded M&R is **$1.61B**.

Scenario 2. **Goal PCI 75**: In order to increase the average condition of the airport pavement system to a PCI of 75, an average annual budget of **$183M** is required over a period of five years. At this level of investment, the PCI at the end of the five-year analysis period will be **75**. The total cost over the five-year analysis period, including funded and unfunded M&R is **$1.72B**.

Scenario 3. **Maintain Current PCI**. In order to stabilize the condition of the airport pavement system at its current PCI, an average annual budget of **$111M** is required over a period of five years. At this level of investment, the PCI at the end of the five-year analysis period will be **71**. The total cost over the five-year analysis period, including funded and unfunded M&R is **$1.79B**.

Scenario 4. **Maintain Current Budget**: Alaska DOT&PF expends approximately **$95M** per year for pavement M&R on the pavements at its 54 airports. Funding sources for this budget include federal AIP funds in addition to state funds. At this level of investment, the PCI at the end of the five-year analysis period will be **70**. The total cost over the five-year analysis period, including funded and unfunded M&R is **$1.80B**.

Scenario 5. **Stopgap Maintenance Only**: If only stopgap maintenance, such as patching and crack sealing, is performed for the next five years, the annual expenditure will be **$18M**. This will result in the M&R backlog increasing from $1.2B to $2.4B and the average PCI will drop from 70 to **58**. The total cost over the five-year analysis period, including funded and unfunded M&R is **$2.46B**.

Table 2—Summary of Five-Year Budget Analyses

Scenario	Title	Description	Annual Cost ($M)	2028 Backlog ($B)	Predicted 2028 PCI
1	**Eliminate Backlog**	Eliminate M&R backlog for the airport pavement system after five years.	322	0	85
2	**Goal PCI 75**	Increase the average PCI of the airport pavement system to 75.	183	0.8	75
3	**Maintain Current PCI**	Stabilize the average PCI of the airport pavement system at the current PCI.	111	1.2	71
4	**Maintain Current Budget**	Maintain M&R funding at the current $95M annual budget.	95	1.3	70
5	**Stopgap Maintenance Only**	Perform only the minimum maintenance needed to maintain safe pavements.	18	2.4	58

Figure 2 shows the consequence of the five alternative budget scenarios on the resulting condition of the Alaska airport pavement system over the five-year period 2024 to 2028.

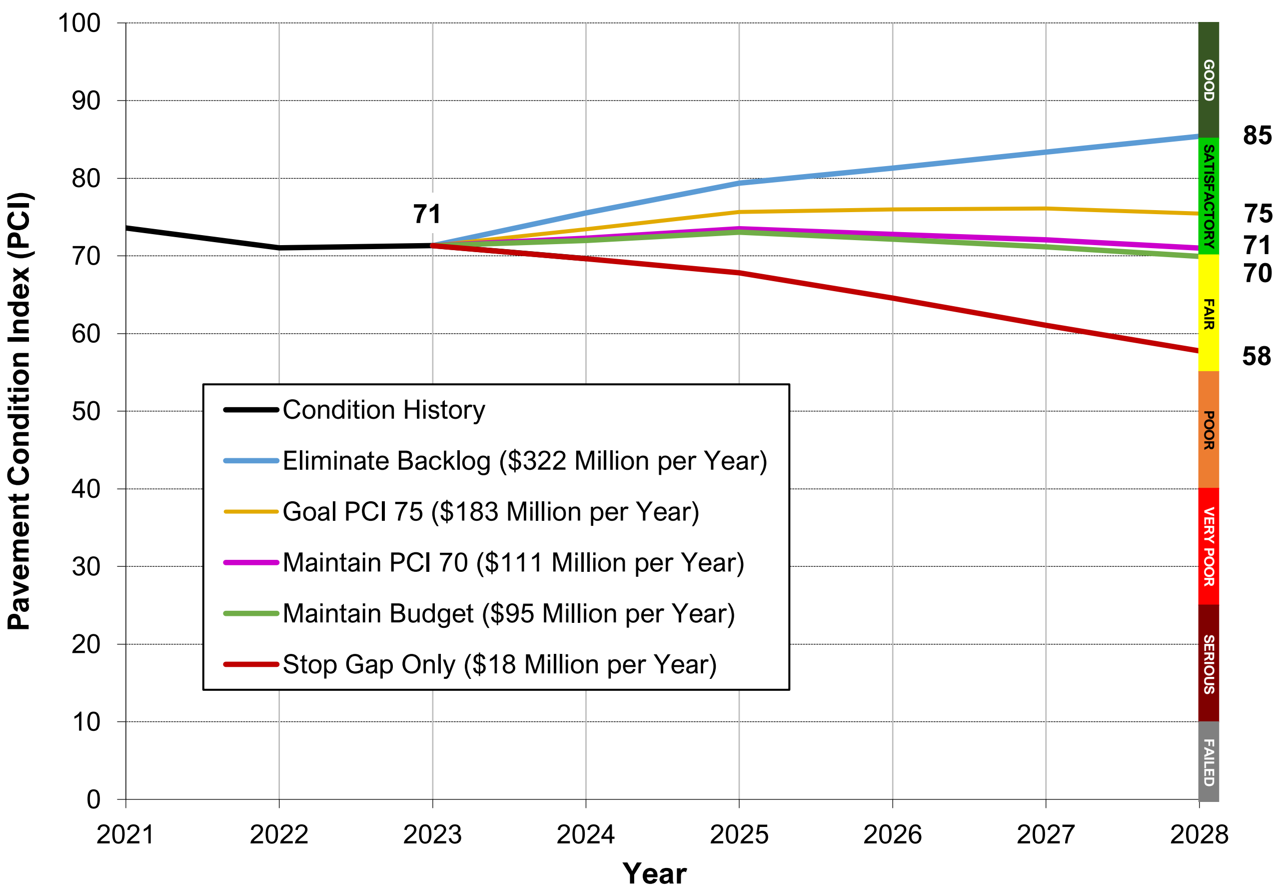

Figure 2—Consequence of Alternative Pavement M&R Budget Scenarios

INTRODUCTION

Background

Alaska is a vast state that is heavily reliant upon air transportation to serve its citizens. At 586,412 square miles, Alaska is the largest state in the United States of America.[1] Even larger than the state itself is the airspace controlled by the FAA Alaskan Region, which amounts to 2,427,971 square miles.[2]

In terms of passenger traffic, the FAA reports for 2022 a total of 4,905,253 enplanements at Alaska airports, broken down as follows.

Table 3—2022 Enplanements at Alaska Airports

Airport Classification	2022 Enplanements
Primary	4,552,711
Non-primary Commercial Service	172,040
General Aviation	180,502
Total	**4,905,253**

The 2022 enplanements are approximately 5.5 times the population of the state. This is a considerably higher ratio than in the lower 48 contiguous states where the typical ratio of annual enplanements to population is 2. Nearly 85% of the communities rely on air transportation for year-round access for transportation, medical supplies, food, and mail[3]. Clearly, aviation plays a critical transportation role in serving communities in the State of Alaska.[4]

Alaska boasts a multitude of climate zones that are influenced by four main factors:

- northerly latitude
- elevation above sea level
- proximity to the ocean
- seasonal distribution of sea ice along western and northern boundaries[5]

An extensive variety of aircraft use Alaska airports, from small single engine aircraft to passenger and military aircraft. The typical general aviation (GA) aircraft operated in Alaska is relatively small, such as the Cessna C206 Stationair with a maximum takeoff weight of 3,789 lb.[6]

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[1] State of Alaska (2024), "Geography of Alaska," Alaska Kids' Corner, Official Alaska State Website, accessed on January 20, 2024: https://alaska.gov/Kids/learn/aboutgeography.htm.

[2] Federal Aviation Administration (2023), "Alaskan Region Aviation Fact Sheet," FAA Alaskan Region, accessed on January 20, 2024: https://www.faa.gov/sites/faa.gov/files/2023_Alaskan_Region_Aviation_Fact_Sheet.pdf.

[3] State of Alaska (2024), "Alaska Cornerstone Plan", Official Alaska State Website, accessed on January 20, 2024: https://dot.alaska.gov/documents/FAA_Strategic_Plan_AAIP.pdf

[4] Federal Aviation Administration (2022), "CY2022 Enplanements at All Airports," FAA Airports, Planning & Capacity, accessed on January 20, 2024: https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/cy22_all_enplanements.

[5] National Oceanic and Atmospheric Administration (2022), "Alaska," NOAA National Centers for Environmental Information, State Climate Summaries 2022, accessed on January 20, 2024: https://statesummaries.ncics.org/chapter/ak/.

[6] Cessna (2024), "Cessna Turbo Stationair HD Specifications," Textron Aviation, accessed on January 20, 2024: https://cessna.txtav.com/en/piston/cessna-turbo-stationair-hd#_model-specs.

Another typical GA aircraft is the Beechcraft King Air 260, a twin-turboprop regional airliner with a maximum takeoff weight of 12,500 lb.[7] Military frequently use Alaska airports for training and other purposes. The Lockheed C-130 cargo aircraft, with a maximum operating weight of 155,000 lb., is commonly sighted at airports throughout the state.[8] At commercial airports throughout Alaska, including Kodiak, Atka, Iliamna, Fairbanks, and Juneau, large aircraft operate regularly, including the Boeing B737 with a maximum takeoff weight of 188,200 lbs.[9] The variety of aircraft utilizing the airport system in Alaska is extensive.

In the face of the challenges of geography, climate, and aircraft traffic variation, Alaska DOT&PF must plan, budget, and schedule pavement M&R projects to ensure that its system of airports remains capable of serving as a critical transportation link for Alaskan communities.

Purpose and History of Program

Airport pavement infrastructure represents a large capital investment in the State of Alaska, whose major objective is to build and maintain safe, strong, smooth, and skid-resistant pavement surfaces for aircraft. As soon as construction is complete, pavements begin a gradual deterioration due to surface weathering, fatigue, drainage, and differential movement of pavement layers. Faulty construction techniques, sub-standard materials, or poor workmanship can accelerate this deterioration process. Over time, pavements may also be subjected to loads much greater than those for which they were originally designed, or they may experience a considerable increase in aircraft traffic volume, both of which contribute to premature pavement deterioration.

Pavement condition is assessed using the PCI methodology as defined in the FAA Advisory Circular 150/5380-7B *Airport Pavement Management Program (PMP)* using the documented procedures set forth by ASTM D5340-20 *Standard Test Method for Airport Pavement Condition Index Surveys.* Pavement deterioration, in accordance with ASTM D5340-20, is characterized in terms of distinct distress types, severity level of distress, and quantity of distress. This information is utilized to calculate a PCI value that represents the overall condition of the pavement in a numeric index that ranges from 0 (a condition category of “Failed”) to 100 (“Good”). The PCI methodology analyzes an overall measure of the pavement condition and provides an indication of the degree of maintenance, repair, or rehabilitation efforts that will be required to sustain functional pavement.

In approximately the year 2000 Alaska DOT&PF implemented PCI inspections to understand the pavement conditions at public airports in the Alaska Aviation System (AAS), to systematically update pavement infrastructure information, and to assist airport operators with recommendations of pavement maintenance, repair, and major rehabilitation needs. Alaska DOT&PF selected the industry available non-proprietary software package known as PAVER (formerly MicroPAVER). The PAVER Pavement Management System (PMS) was developed by the U.S. Army Corps of Engineers Construction Engineering Research Laboratory and was sponsored by the FAA, Federal Highway Administration, U.S. Army, U.S. Air Force, and U.S. Navy to meet the objectives of an effective pavement management system.

[7] Beechcraft (2024), “King Air 260 Specifications,” Textron Aviation, accessed on January 20, 2024: https://beechcraft.txtav.com/en/king-air-260.

[8] US Army Corps of Engineers (2015), “Aircraft Characteristics for Airfield Pavement Design and Evaluation, Air Force and Army Aircraft, TSC Report 13-2, Change 1, Transportation Systems Center, Omaha, Nebraska.

[9] Boeing Commercial Airplanes (2023), “Next-Generation 737—Airplane Characteristics for Airport Planning,” Document No. D6-58325-7, Rev A, Seal Beach, California, downloaded on January 20, 2024: https://www.boeing.com/commercial/airports/plan_manuals.page.

Federal Aviation Administration

Airports participating in the Airport Improvement Program (AIP) Grant Program are required by the FAA to develop and implement a PMP to be eligible for continued funding. FAA AC 150/5380-6C and AC 150/5380-7B provide guidance on these requirements.

In order to properly implement an airport PMP, Alaska DOT&PF performs detailed inspection of airport pavement condition by trained personnel. The FAA requires inspections to be performed annually using the PASER method. If pavement inspection is conducted using the PCI survey procedure in accordance with ASTM D5340, the FAA allows the inspection interval to increase to every three years.

Pavement Management Program Implementation

The PMP addresses the requirements of maintaining an effective pavement management program for all participating airports. Network-level management of pavement assets provides insight of the overall condition of the network (current and future), short-term and long-term budget needs, and knowledge of the pavement assets that are under consideration for projects. A network-level evaluation can support the identification of maintenance, repair, and major rehabilitation needs and budgetary planning-level opinions of probable construction costs.

The key elements of an effective pavement management program include, but are not limited to:

- Establish a pavement inventory with pavement structure and pavement condition information
- Utilize an objective and repeatable process for evaluating pavement condition (PCI)
- Capability to customize M&R policies and prioritization
- Capability to model both past and future pavement conditions
- M&R planning with ability to specify budget constraints or target PCI goals

METHODOLOGY

An effective PMP incorporates both the regular collection of pavement condition information and the historical records from State of Alaska staff. This chapter of the report defines the specific methods utilized as part of the PMP System Implementation to meet the requirements of an effective PMP as defined by the FAA AC 150/5380-7B.

Airport Pavement Database

The Alaska Airport PMP utilizes the database capabilities in the PAVER 7.0.11 software program. The PAVER database includes a network-level inventory of the participating airport's eligible pavements. PAVER consists of a set of engineering tools for conducting pavement condition surveys, predicting past and future conditions, and developing work plans with the objective of optimizing spending. PAVER is a non-proprietary, industry standard software that has been in use since the late 1970s when it was developed to inventory and manage M&R for the Department of Defense's vast pavement network. It is a state-of-the-art scalable platform that can be used for agencies of any size.

Airport Pavement Inventory

The current Alaska Airport PAVER database encompasses approximately 109 million square feet of airport pavement (of which, 1.8 million square feet is considered inactive or closed and will not be included in the summary results) across three distinct Alaska DOT&PF regions. Figure 3 displays the 54 participating airports within their respective region. Table 4 lists the 54 airports, their respective inspection year, the number of active paved runways, and their respective inventoried pavement area.

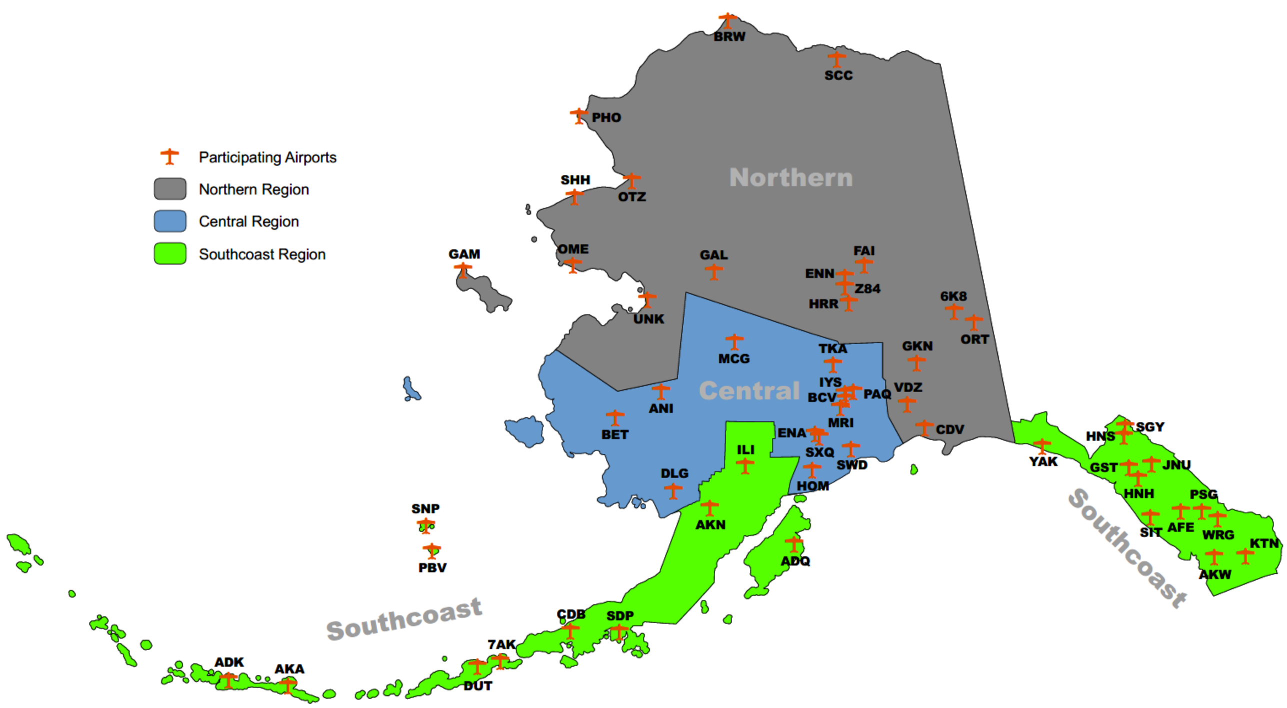

Figure 3—Alaska Airport Locations Relative to Alaska DOT&PF Regions

Table 4—Alaska DOT&PF Paved Public Use Airports

FAA ID	Airport	PCI Inspection Year	Number of Active Paved Runways	Airport Pavement Area (million square ft)
Northern Region				
BRW	Barrow	2021	1	2.33
Z84	Clear	2023	1	0.64
CDV	Cordova	2021	1	1.81
SCC	Deadhorse	2023	1	3.02
FAI	Fairbanks	2021	2	10.47
GAL	Galena	2021	1	2.25
GAM	Gambell	2019	1	0.56
GKN	Gulkana	2023	1	0.92
HRR	Healy River	2023	1	0.49
OTZ	Kotzebue	2020	1	1.99
ENN	Nenana	2022	1	0.87
OME	Nome	2021	2	2.71
ORT	Northway	2022	1	0.79
PHO	Point Hope	2020	1	0.49
SHH	Shishmaref	2019	1	0.48
6K8	Tok Junction	2022	1	0.41
UNK	Unalakleet	2021	2	1.14
VDZ	Valdez	2022	1	2.36
Central Region				
ANI	Aniak	2020	1	1.10
BET	Bethel	2020	2	4.48
BCV	Birchwood	2021	2	2.05
DLG	Dillingham	2023	1	1.97
HOM	Homer	2020	1	1.96
ENA	Kenai	2021	1	4.24
MCG	McGrath	2023	1	1.31
MRI	Merrill	2021	2	3.85
PAQ	Palmer	2022	2	3.65
SWD	Seward	2020	2	1.20
SXQ	Soldotna	2020	1	3.09
TKA	Talkeetna	2023	1	0.80
IYS	Wasilla	2020	1	1.81

Table 4—Alaska DOT&PF Paved Public Use Airports (cont)

FAA ID	Airport	PCI Inspection Year	Number of Active Paved Runways	Airport Pavement Area (million square ft)
Southcoast Region				
ADK	Adak	2023	1	2.28
7AK	Akutan	2021	1	0.45
AKA	Atka	2023	1	0.59
CDB	Cold Bay	2023	2	3.13
GST	Gustavus	2023	2	2.44
HNS	Haines	2021	1	1.08
HNH	Hoonah	2021	1	0.61
ILI	Iliamna	2022	2	1.71
JNU	Juneau	2021	1	4.94
AFE	Kake	2021	1	0.53
KTN	Ketchikan	2022	1	2.36
AKN	King Salmon	2020	2	2.78
AKW	Klawock	2022	1	0.90
ADQ	Kodiak	2023	3	4.40
PSG	Petersburg	2022	1	1.44
PBV	Saint George	2023	1	0.93
SNP	Saint Paul	2023	1	1.31
SDP	Sand Point	2023	1	1.36
SIT	Sitka	2022	1	2.12
SGY	Skagway	2021	1	0.96
DUT	Unalaska	2021	1	0.85
WRG	Wrangell	2022	1	1.48
YAK	Yakutat	2021	2	3.18

In addition to the pavement inventory, a series of tabular data was collected on an individual airport basis for use in the Airport PMP. We created a way to store, categorize, and compare copious quantities of data collected from PAVER as well as the Federal Aviation Administration (FAA), Alaska Aviation System Plan (AAPS), and Western Regional Climate Center (WRCC) websites. The information was then used to help develop custom prediction models, unit costs, and maintenance and rehabilitation planning. **Appendix A** showcases the attribute table that was developed.

Pavement Definition

An effective pavement management program must establish a pavement hierarchy in which a pavement network can be subdivided into smaller, manageable working units. The functional use of each pavement, as well as information from historical construction documents are used to help define the limits of the smaller working units. A critical input for a pavement inventory and network definition is the date of last major construction or rehabilitation, as this type of work will reset the PCI of that pavement area to a value of 100. The following paragraphs define the common terms used in PMPs and explain their application for this implementation.

Pavement Network - A pavement network is a logical unit for organizing pavements into a structure for the purpose of pavement management. For the PMP, a network represents an individual airport's pavement assets that are maintained by Alaska DOT&PF.

Pavement Branch - A pavement branch is a readily identifiable part of the pavement network that has a distinct functional classification. For example, within an airport's pavement network each runway, taxiway, and apron are separate branches. Each branch consists of one or more sections, each with distinct pavement characteristics.

Pavement Section - A pavement section is defined by its characteristics, which include surface type (asphalt or concrete), rank (primary, secondary, tertiary), pavement structure (material type and thickness), construction history, age, condition, and traffic type and/or volume. A section is the smallest management unit of a pavement network where maintenance, repair, or major rehabilitation treatments are considered.

Pavement Sample Unit - A pavement sample unit is a distinct subdivision of a pavement section that has a standard size range of 5,000 contiguous square feet (±2,000 SF) for asphalt pavements or 20 contiguous slabs (±8 slabs) for concrete pavements. A sample unit is the smallest subdivision of a pavement network and is physically inspected during field assessments to establish the PCI. Depending on the total number of sample units within a section, a corresponding number of sample units must be inspected (at a minimum), as shown in Table 5.

Table 5—Sampling Rate

Number of Total Sample Units in Section	Sampling Rate
1 to 5	1
6 to 10	2
11 to 15	3
16 to 40	4
Over 40	10%

Pavement Work History

In accordance with the FAA AC 150/5380-7B, it is best practice that airports maintain records of all construction and maintenance (preventive, stopgap, and major) related to the pavement infrastructure. These records should consist of:

- Location and limits of repair/construction
- Types and severities of repaired distresses
- Work type, date, material, thickness, cost; and
- Supporting documents (e.g., contract documents, construction drawings, as-builts, specifications, bid tabulations, and photograph records).

As part of the PMP, Alaska DOT&PF staff with the assistance of participating airport staff were asked to provide documentation regarding the historical work performed at each airport, most importantly construction drawings and bid tabulations. This information is used to identify location, limits, work type, pavement cross-sections, and the associated construction costs. The historical data collected during this task was entered into the PAVER database. The database includes the following fields for historical information:

- Project name / number (AIP project number)
- Work Category (localized, global, major)
- Work type performed (i.e., reconstruction, mill and overlay, surface seal, crack seal, etc.)
- Date of construction/rehabilitation
- Pavement surface type (Asphalt Concrete, Portland Cement Concrete)
- Section area (limits of work)
- Comments (pavements cross-section)

The PMP PAVER database accuracy is limited to the recorded documentation provided by the State and participating airport staff. State planners should rely on this information as a planning tool and defer to final as-built plans, record drawings, and/or engineer's construction report for pavement construction records.

Pavement Traffic

A pavement section's structural integrity is designed to meet the needs of the user (commercial service, general aviation, air cargo, and/or military) by providing a safe, smooth, operational surface. Pavement deterioration occurs gradually from aircraft loading and environmental conditions. The aircraft fleet mix data for each airport was taken from the Alaska Aviation System Plan (AASP). FAA AC 150/5320-6F provides guidance on incorporation of aircraft traffic fleet mix data.

Pavement Condition Index

The PCI survey is a standardized procedure for visually inspecting pavement samples by recording distress types, quantities, and severities in accordance with the methods described in ASTM D5340-20 and FAA AC 150/5380-7B.

For each inspected sample, the quantity and severity of defined distresses are recorded and analyzed in accordance with ASTM D5340-20, which identifies 17 flexible pavement (AC) distress types and 16 rigid pavement (PCC) distress types. Table 6 identifies these distress types.

Table 6—PAVER Distress Codes for AC and PCC Pavements

Code	Flexible Pavement (AC) Distresses Description	Code	Rigid Pavement (PCC) Distresses Description
41	Alligator Cracking	61	Blowup
42	Bleeding	62	Corner Break
43	Block Cracking	63	Linear Cracking
44	Corrugation	64	Durability Cracking
45	Depression	65	Joint Seal Damage
46	Jet Blast	66	Small Patch
47	Joint Reflection Cracking	67	Large Patch & Utility Cut
48	Longitudinal & Transverse Cracking	68	Popouts
49	Oil Spillage	69	Pumping
50	Patching	70	Scaling
51	Polished Aggregate	71	Faulting
52	Raveling	72	Shattered Slab
53	Rutting	73	Shrinkage Cracking
54	Shoving	74	Joint Spalling
55	Slippage Cracking	75	Corner Spalling
56	Swell	76	Alkali Silica Reaction (ASR)
57	Weathering		

The PAVER User Guide's clarifies that each distress type falls into one of three categories, as displayed in Table 7.

Table 7—Pavement Distress Categories

Distress Category	AC Distress Type	PCC Distress Type
Load	• Alligator Cracking • Rutting	• Corner Break • Linear Cracking • Shattered Slab
Climate/ Durability	• Block Cracking • Joint Reflection Cracking • Longitudinal & Transverse Cracking • Patching • Raveling • Weathering	• Blowup • Durability Cracking • Joint Seal Damage

Table 7—Pavement Distress Categories (cont.)

Distress Category	AC Distress Type	PCC Distress Type
Other (Construction/ Drainage/ Material)	• Bleeding • Corrugation • Depression • Jet Blast • Oil Spillage • Polished Aggregate • Shoving • Slippage Cracking • Swell	• Small Patch • Large Patch & Utility Cut • Popouts • Pumping • Scaling • Faulting • Shrinkage Cracking • Joint Spalling • Corner Spalling • Alkali Silica Reaction

Any given distress may have more than one cause. For example, depressions may be caused by inadequate compaction during construction, or by subgrade softening due to environmental factors, or even by prolonged point loads. In addition, a distress may be initiated by one cause but may progress to a distress of higher severity by another cause. Therefore, engineering judgment is critical in analyzing the actual cause or causes of the distress.

To obtain the section PCI, the distresses and PCI of each inspected sample unit get extrapolated over the entire section. Distresses found in sample units classified as "additional," which are defined as non-representative instead of random, are not extrapolated over the entire section but merely added to the extrapolated quantity. Table 8 gives a detailed description of each PCI rating category and shows the seven-category PCI scale.

Section 4.1 of ASTM D5340-20 governing PCI surveys offers this caution:

> *"The PCI is a numerical indicator that rates the surface condition of the pavement. The PCI provides a measure of the present condition of the pavement based on the distress observed on the surface of the pavement which also indicates the structural integrity and surface operational condition (localized roughness and safety). The PCI cannot measure the structural capacity; neither does it provide direct measurement of skid resistance or roughness. It provides an objective and rational basis for determining maintenance and repair needs and priorities. Continuous monitoring of the PCI is used to establish the rate of pavement deterioration, which permits early identification of major rehabilitation needs. The PCI provides feedback on pavement performance for validation or improvement of current pavement design and maintenance procedures."* [10]

Therefore, it is imperative that engineers and planners treat the PCI as a tool that will assist them during the M&R planning process. Any major project should always be preceded by an up-to-date detailed project level inspection of the pavement in order re-evaluate maintenance needs prior to the project design process.

[10] ASTM International (2020), *Standard Test Method for Airport Pavement Condition Index Surveys*, D5340-20, Volume 04.03: Road And Paving Materials; Vehicle-pavement Systems, West Conshohocken, Pennsylvania.

Table 8—PCI Rating Scale

ASTM PCI Color Legend	PCI Range	PCI Ratings and Definition
	86-100	Good: Pavement has minor or no distresses and should require only routine maintenance.
	71-85	Satisfactory: Pavement has scattered low-severity distresses that should require only routine maintenance.
	56-70	Fair: Pavement has a combination of generally low- and medium-severity distresses. Near-term maintenance and repair needs may range from routine to major.
	41-55	Poor: Pavement has low-, medium-, and high-severity distresses that probably cause some operational problems. Near-term M&R needs will be major.
	26-40	Very Poor: Pavement has predominantly medium- and high-severity distresses that cause considerable maintenance & operational problems. Near-term M&R needs will be major.
	11-25	Serious: Pavement has mainly high-severity distresses that cause operational restrictions; immediate repairs are needed.
	0-10	Failed: Pavement deterioration has progressed to the point that safe aircraft operations are no longer possible; complete reconstruction is required.

A pavement's life cycle is the relationship between its condition and age. A properly designed pavement will usually have a slow deterioration rate during the first part of its life, then at some age and condition value, the pavement's deterioration rate will increase rapidly. This point in a pavement's life is called the critical condition or critical PCI. Finding a pavement's critical condition and performing maintenance and rehabilitation (M&R) before it reaches its critical condition is the key to saving M&R dollars, as the cost to repair pavements increases dramatically beyond this point. Critical PCI values represent a condition level that Alaska DOT&PF managers should strive to maintain pavement above for as long as possible. Guidelines set by the Alaska State Legislature ask to maintain minimum PCI condition ratings of 70 for runways and 60 for taxiways and aprons. Climatic variations, funding and remoteness provide a continuous challenge for maintenance and construction needs of our airports.

Figure 4 shows a pavement's typical life cycle as related to M&R cost to repair. Ideally, if preventive maintenance is performed before the critical PCI is reached, the condition of the pavement can be maintained at a high state during the leveling off period.

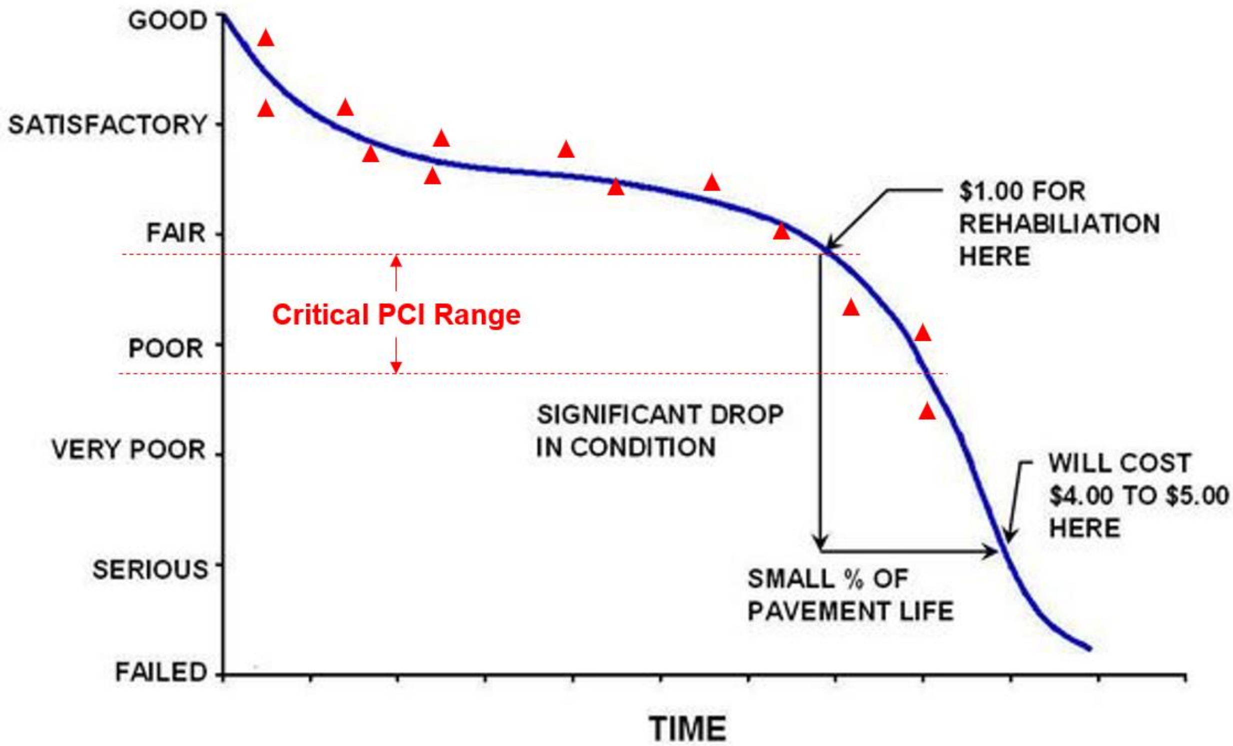

Figure 4—Typical Pavement Deterioration Curve

*Figure is for conceptual purposes only – costs depicted are not specific to Alaska airport pavements

PREDICTION MODELS

Pavement prediction models, also known as performance models or family curves, are generated within PAVER based on an analysis of historical PCI survey data and construction records. Pavements in the same region with similar characteristics such as branch use and surface type generally follow the same deterioration life cycle pattern. Similar pavements are grouped into families and performance models are generated for each family by analyzing numerous PCI vs. pavement age data points from historical inspections. A deterioration curve is fit to the data and its correlation is evaluated based on statistical measures.

The same family curve generated using the look-back procedure described above can be used in a forward-looking capacity to predict future pavement condition. For a particular future year, one can use the performance model to predict the future condition of a pavement section. Then the future PCI is compared to established PCI trigger values to determine whether the pavement section is eligible for pavement preservation, major work, or reconstruction.

Custom Prediction Models

Initial performance models developed for the Alaska PMP received further successive refinements after careful review and analysis of the historical PCI survey data. We also consulted with ALASKA DOT&PF maintenance and operations (M&O) staff to understand the availability of pavement treatment capabilities, geography, susceptibility to severe storm events and access to the road network to improve the accuracy of the models. Through this process, 15 separate performance models were developed. Additional information on the development of performance models is presented in **Appendix B.**

The 15 unique prediction models are described in Table 9. In the Central Region, we refined the performance curves around a geographic distinction of East and West. This distinction takes into account a number of factors. For example, Central Region—West airports are subject to severe storm events more frequently than airports in the East region. West region airports generally do not have access to the road network, which affects the type and frequency of pavement M&R that can be conducted. In the Northern Region, a similar distinction was found to exist between Coastal and Interior subregions. Northern Region—Coastal airports are subject to more frequent severe storm events and are not accessible through the road network. Northern Region—Interior airports experience dry weather and permafrost. In the Southcoast Region, three subregional distinctions were developed around the relative deterioration rate based on the slope of the runway straight line deterioration curve, resulting in six performance models for asphalt pavements in Southcoast Region. Some Southcoast airports demonstrated decades of performance with less than one PCI points per year deterioration of runway pavements, while other airports experience a deterioration rate of two PCI points per year or more. These differences were not so clearly linked to the specific geographical location of the airport and so the subregional distinction is based solely on the deterioration rate. Finally, all asphalt pavement prediction models were refined to distinguish between branch use (one model for runways another for parking aprons and taxiways). This doubled the number of family curves for asphalt pavements from 7 to 14. A single custom model was created for use for concrete pavements throughout the State of Alaska, bringing the total number of performance models to 15, as shown in the following table.

Table 9—Alaska PMP Prediction Models

<table>
<tr><th>Alaska DOT&PF Region</th><th>Subregion</th><th>Branch Use</th></tr>
<tr><td rowspan="4">Central</td><td rowspan="2">East</td><td>Runway</td></tr>
<tr><td>Apron / Taxiway</td></tr>
<tr><td rowspan="2">West</td><td>Runway</td></tr>
<tr><td>Apron / Taxiway</td></tr>
<tr><td rowspan="4">Northern</td><td rowspan="2">Coastal</td><td>Runway</td></tr>
<tr><td>Apron / Taxiway</td></tr>
<tr><td rowspan="2">Interior</td><td>Runway</td></tr>
<tr><td>Apron / Taxiway</td></tr>
<tr><td rowspan="6">Southcoast</td><td rowspan="2">Runway straight line deterioration less than 1 PCI point per year</td><td>Runway</td></tr>
<tr><td>Apron / Taxiway</td></tr>
<tr><td rowspan="2">Runway straight line deterioration between 1 and 2 PCI points per year</td><td>Runway</td></tr>
<tr><td>Apron / Taxiway</td></tr>
<tr><td rowspan="2">Runway straight line deterioration greater than 2 PCI points per year</td><td>Runway</td></tr>
<tr><td>Apron / Taxiway</td></tr>
<tr><td colspan="3">Concrete</td></tr>
</table>

AIRPORT PAVEMENT CONDITIONS

Airport Pavement Database Updates / Records Review

Upon investigation of historical information within the PAVER database, it was evident that many records needed to be updated for the PMP implementation. As a part of the "PAVER scrub" we utilized Section Trend Reports to identify pavements that were either missing work history entries, or that had work entered after an inspection of the newer pavement (i.e. the PCI increased but the pavement age was not reset, which causes outliers in the prediction models). After reviewing records and construction documents, many work history updates were entered into the database. Another QA/QC check found historical PCI inspections with duplicated distresses called on sample units (e.g. Low Weathering on 100% of the sample area entered twice), so the historical PCI data was corrected.

Additional updates were needed on the GIS shapefile that is linked to the database. Some section geometries were incorrect and needed to be redrawn, incorrect dimensions (length, width, area) were linked to the shapefile, and runway overruns needed to be drawn and added to the database inventory. All these updates facilitated more accurate PCI inspections and database analysis.

Airport Pavement Inspections

Alaska DOT&PF began the process of implementing a comprehensive PMP beginning in 2022, which involves conducting PCI inspections in conformance with ASTM D5340 and FAA AC 150/5380-6B. To date, pavements at 26 of 54 airports in the Alaska Airport PMP have received up-to-date pavement inspections conducted by Alaska DOT&PF and contract personnel. For the remaining 28 airports, we rely on historical PCI inspections so that we have pavement condition information for all 54 airports. The following summaries, at the state and regional levels, are based on PCI inspection data fixed to a predicted PCI date of 8/1/2023. Statewide and regional summaries of pavement conditions are computed on an area-weighted average basis and are presented in the following sections.

A summary of condition by surface type is not shown since PCC airport pavements only account for 1.5% of the total pavement area. Of that 1.5%, half equates to the area of the Yakutat runway.

Alaska Statewide Summary of Airport Pavement Condition

The overall average pavement condition of the Alaska airport system is **71** or **"Satisfactory"**. As shown in Figure 5, the pavement condition distribution by area is 28% "Good", 28% "Satisfactory", 27% "Fair", 8% "Poor", 8% "Very Poor", 1% "Serious", and less than 1% "Failed".

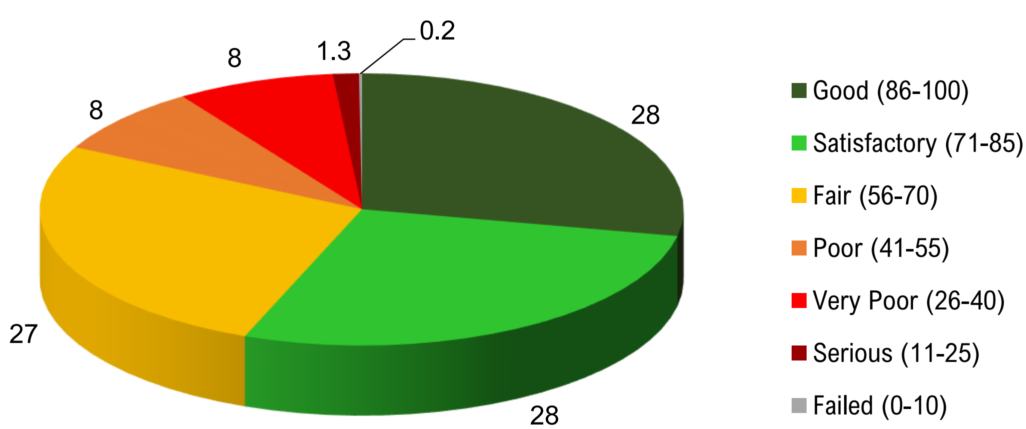

Figure 5—Alaska Airport PCI Summary

An analysis of the Alaska airport pavement condition with respect to pavement age is presented in Table 10 and Figure 6 as follows. Unsurprisingly, across the system, PCI deteriorates with pavement age.

Table 10—Alaska Airport Condition by Age of Pavement

Age at Time of Report (yrs)	Pavement Area (sf)	Pavement Area (%)	Sections	Sections (%)	PCI
0-2	9,883,480	9.2	95	9.5	**94**
3-5	3,935,357	3.7	34	3.4	**89**
6-10	20,664,762	19.3	201	20.2	**86**
11-15	20,826,884	19.5	158	15.9	**74**
16-20	21,450,663	20.0	198	19.9	**68**
21-25	10,795,673	10.1	133	13.4	**63**
26-30	7,449,164	7.0	67	6.7	**51**
31-35	5,748,154	5.4	52	5.2	**48**
36-40	3,270,507	3.1	25	2.5	**45**
41-50	1,721,822	1.6	20	2.0	**42**
Over 50	1,327,446	1.2	12	1.2	**33**
All Inspected	**107,073,912**	**100**	**995**	**100**	**71**

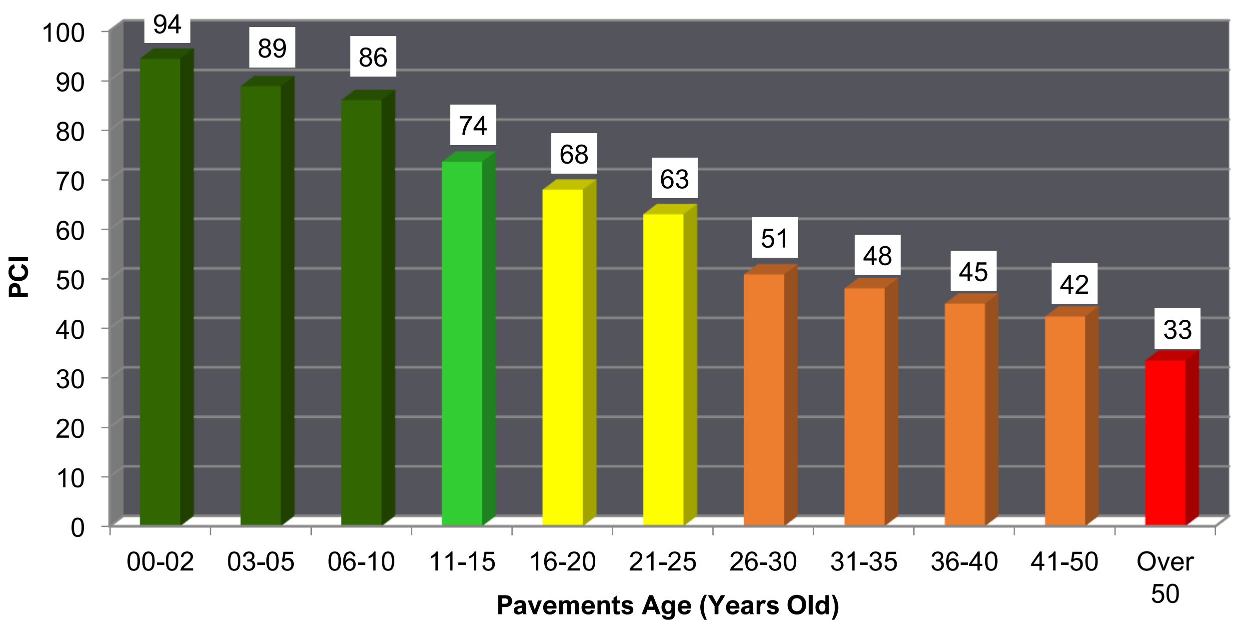

Figure 6—Alaska Airport Condition by Age

Alaska Regional Summaries of Airport Pavement Condition

Figure 7 through Figure 9 present the area-weighted pavement conditions distribution by area for each of the three Regions, Northern, Central, and Southcoast (respectively).

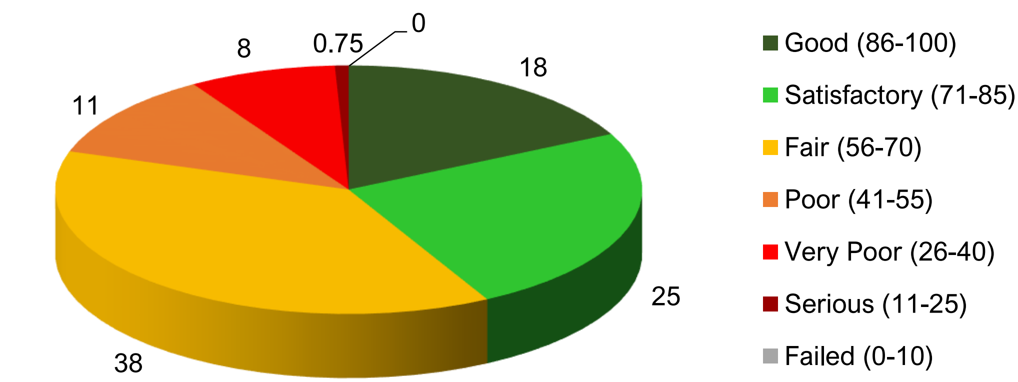

Figure 7—Northern Region Airport PCI Results by Percent Area

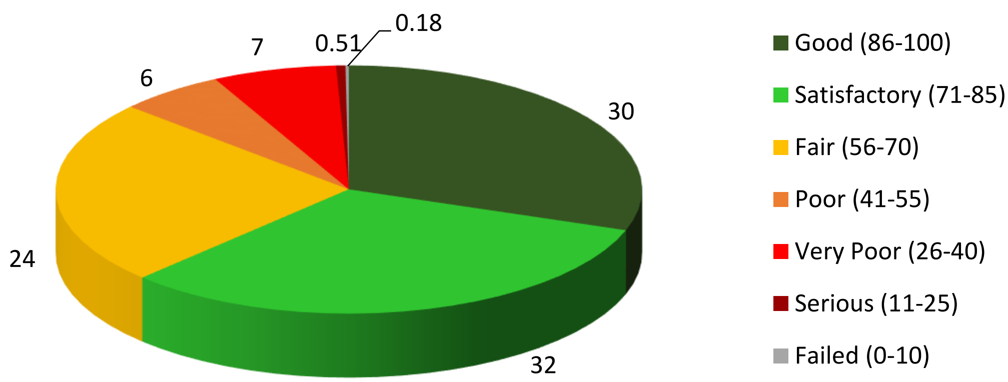

Figure 8—Central Region Airport PCI Results by Percent Area

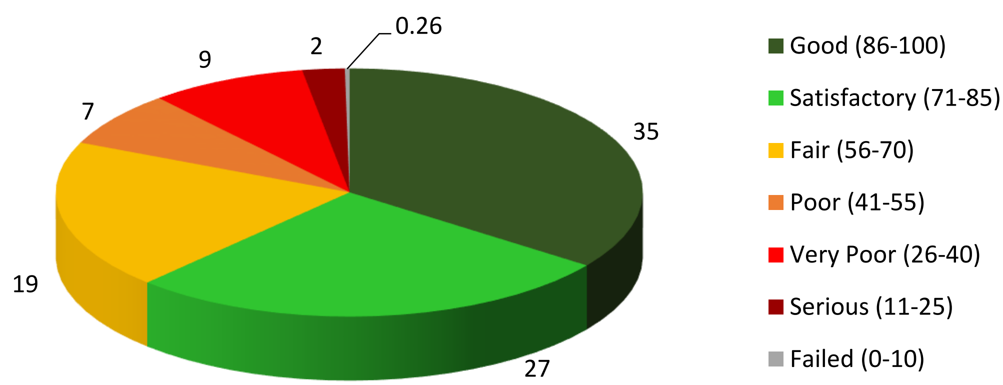

Figure 9—Southcoast Region Airport PCI Results by Percent Area

Figure 10 and Figure 11 present the regional-level area-weighted pavement conditions displayed by branch use and section rank (respectively).

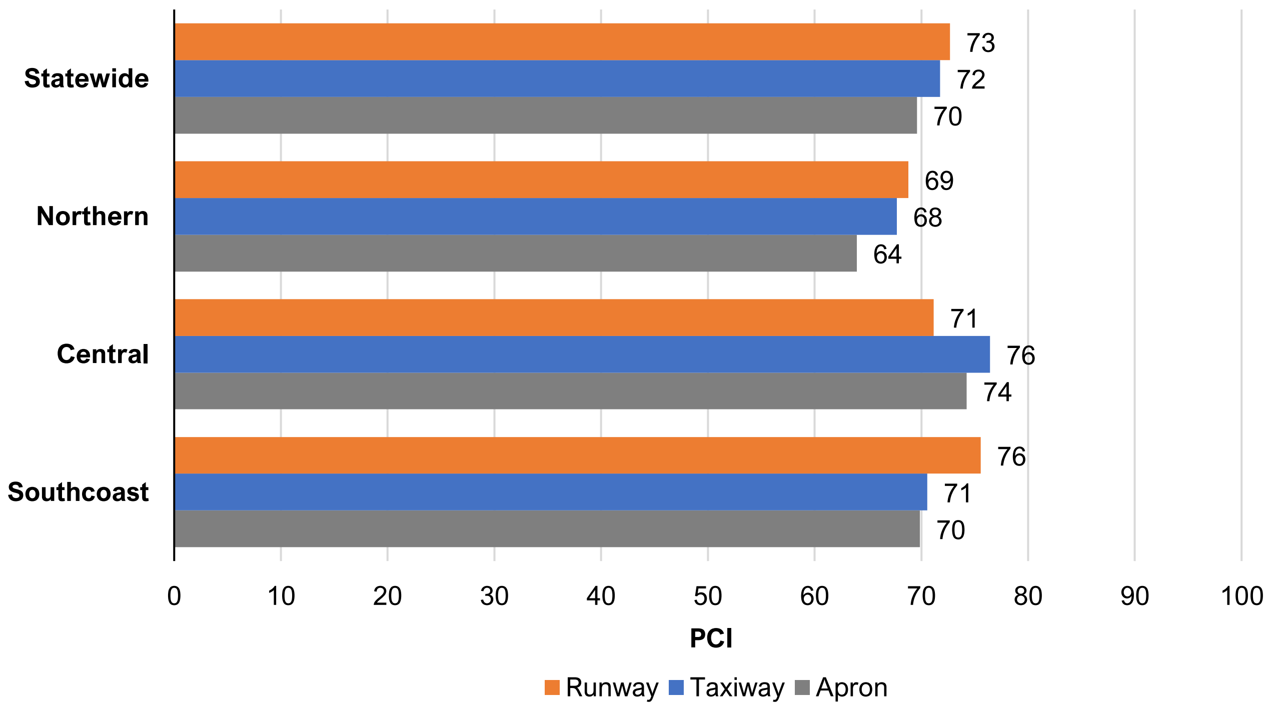

Figure 10—Alaska Airport Pavement Condition by Branch Use

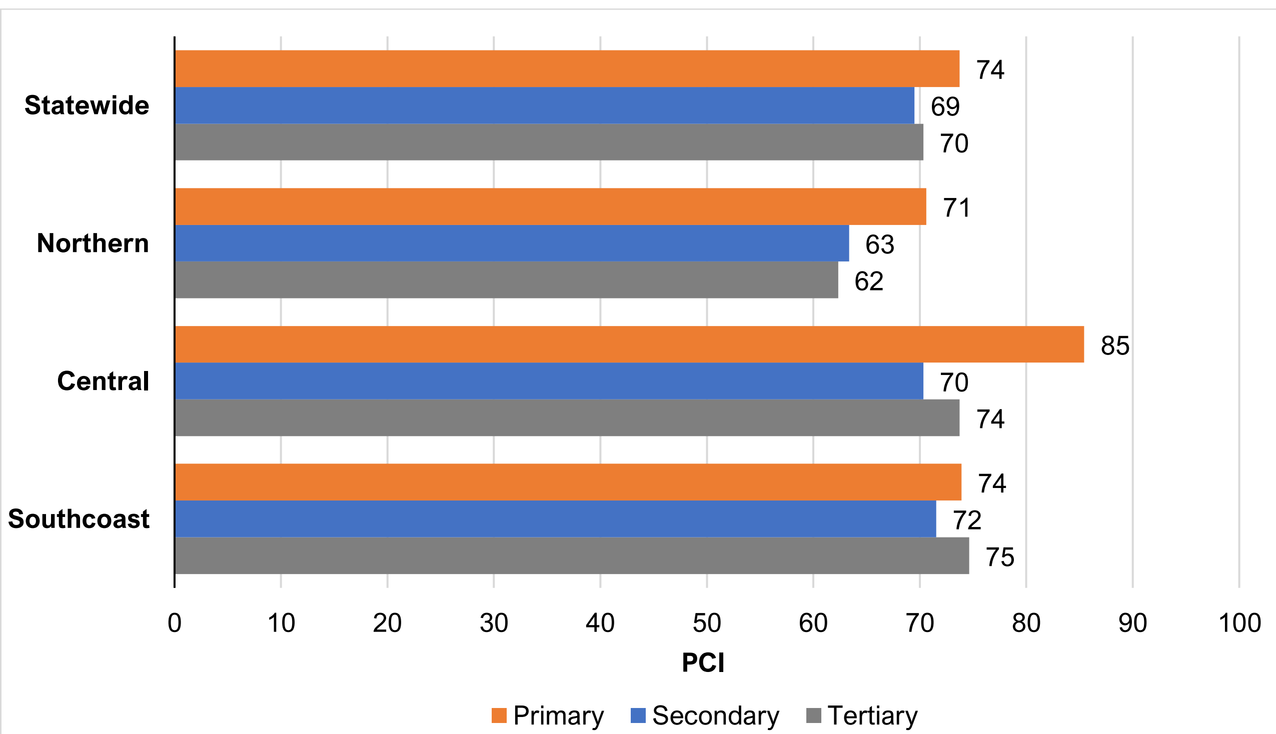

Figure 11—Alaska Airport Pavement Condition by Section Rank

Table 11 summarizes the current condition (2023) by airport and branch use.

Table 11—Pavement Condition Summary by Airport and Branch Use

FAA ID	Airport	Runway PCI	Taxiway PCI	Apron PCI	Network PCI
Northern Region					
BRW	Barrow	88	58	56	72
Z84	Clear	53	60	51	53
CDV	Cordova	62	77	85	68
SCC	Deadhorse	74	78	72	75
FAI	Fairbanks	76	64	55	63
GAL	Galena	78	80	73	75
GAM	Gambell	68	74	78	69
GKN	Gulkana	75	77	87	79
HRR	Healy River	39	45	41	41
OTZ	Kotzebue	70	82	91	79
ENN	Nenana	65	61	59	62
OME	Nome	88	61	63	79
ORT	Northway	33	37	45	36
PHO	Point Hope	30	15	32	30
SHH	Shishmaref	64	76	76	66
6K8	Tok Junction	27	51	61	46
UNK	Unalakleet	61	64	63	62
VDZ	Valdez	52	77	75	66
Central Region					
ANI	Aniak	78	88	80	80
BET	Bethel	93	86	70	82
BCV	Birchwood	79	88	64	73
DLG	Dillingham	85	83	79	82
HOM	Homer	48	79	75	62
ENA	Kenai	40	66	73	61
MCG	McGrath	95	91	71	87
MRI	Merrill	68	72	87	78
PAQ	Palmer	88	70	65	72
SWD	Seward	53	56	62	56
SXQ	Soldotna	59	85	83	78
TKA	Talkeetna	80	82	81	81
IYS	Wasilla	62	69	76	72

Table 11—Pavement Condition Summary by Airport and Branch Use (cont)

FAA ID	Airport	Runway PCI	Taxiway PCI	Apron PCI	Network PCI
Southcoast Region					
ADK	Adak	36	35	89	41
7AK	Akutan	93	93	90	92
AKA	Atka	73	82	82	75
CDB	Cold Bay	89	85	82	87
GST	Gustavus	96	98	98	97
HNS	Haines	54	64	89	69
HNH	Hoonah	52	51	60	56
ILI	Iliamna	60	63	67	63
JNU	Juneau	95	78	61	76
AFE	Kake	88	66	58	81
KTN	Ketchikan	65	89	87	76
AKN	King Salmon	86	71	66	78
AKW	Klawock	73	70	70	72
ADQ	Kodiak	75	62	40	67
PSG	Petersburg	66	74	82	70
PBV	Saint George	83	80	86	83
SNP	Saint Paul	85	81	79	84
SDP	Sand Point	82	77	85	82
SIT	Sitka	90	67	81	83
SGY	Skagway	60	61	60	60
DUT	Unalaska	94	29	21	58
WRG	Wrangell	72	72	87	76
YAK	Yakutat	63	78	44	58

Pavement Condition Forecast

Utilizing the prediction models described previously, we used PAVER to forecast pavement conditions over a 10-year period spanning from 2024 to 2033, assuming that only routine preventive maintenance is performed on the pavements. Table 12 and Figure 12 are the 10-year state and regional PCI forecast in tabular and graphical format (respectively).

Table 12—Alaska Airport Pavement 10-Year PCI Forecast

Region	Current	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Statewide	**71**	69	67	65	63	61	60	58	57	55	53
Northern	**67**	64	62	59	57	55	53	51	49	48	46
Central	**74**	71	69	67	65	63	62	60	59	58	57
Southcoast	**73**	71	69	68	66	65	63	62	60	59	57

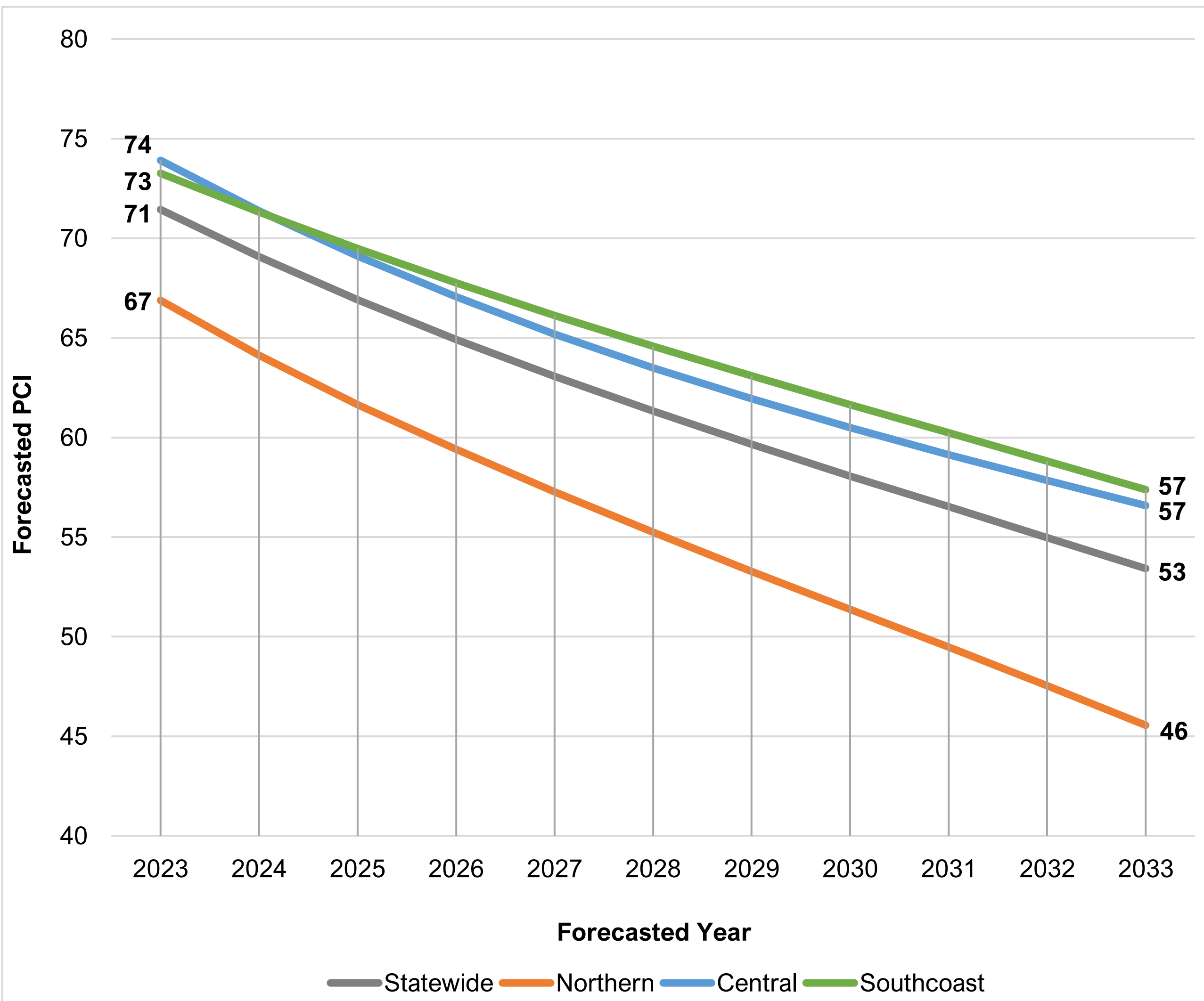

Figure 12—Alaska Airport Pavement 10-Year PCI Forecast

Individual Airport Pavement Inspection Reports

Detailed reports for each individual airport pavement network are generated after their inspection. For airport pavement inspection reports published starting in 2023, the organization of the reports is as follows:

- Airport Maps
    - Pavement Condition Index
    - Sample Unit PCI
    - 5-Year Predicted PCI
    - 10-Year Predicted PCI
    - Pavement Age at Inspection
    - Pavement Crack Seal Condition
- Airport Pavement Inspection Notes by Branch
- Branch Condition Report
- Branch Use Condition Report
- Section Condition Report
- Section Condition Report (Summary by Age Category)
- Work History Report
- Physical Property Data Table
- Pavement Classification Rating (PCR)
- References

Individual airport reports can be found on the Alaska Department of Transportation and Public Facilities website https://dot.alaska.gov/stwddes/asset_mgmt/airport_pave.shtml. Under the "**Airports Pavement Condition Data"** window there is a dropdown list in which you can access the latest Airport Pavement Condition Reports for each of the 54 airports.

MAINTENANCE AND REHABILITATION (M&R) PLANNING

For the PMP to be effective, the program must be unique to Alaska DOT&PF maintenance policies, M&R prioritization, and construction unit costs. Each of these factors will influence the development of long-term M&R strategies, including their associated budgetary requirements. Therefore, it is essential that the information in the database is accurate so that the proper long-term M&R strategy can ultimately be selected. The following tables regarding distress maintenance policies, M&R prioritization, and unit costs were customized specifically for the Alaska DOT&PF PAVER database.

Maintenance and Rehabilitation Work Types

PAVER uses four (4) distinct work type policies when applying funds for M&R planning. Each policy is defined below and describes which pavement they will be applied to.

- **Localized Preventive M&R** - Defined as distress maintenance activities performed with the primary objective of slowing the rate of deterioration. This policy is applied to pavements above the critical PCI.

- **Localized Stopgap (Safety) M&R -** Stopgap M&R is defined as the localized M&R needed to keep the pavement operational in a safe condition. This policy is applied to pavements below the critical PCI.

- **Global Preventive M&R -** Defined as activities applied to entire pavement sections with the primary objective of slowing the rate of deterioration. This policy is applied to pavements above the critical PCI.

- **Major M&R -** Activities applied to the entire pavement section to correct or improve existing structural or functional requirements. It is also used to upgrade pavements below the critical PCI.

Distress Maintenance Policies

Distress maintenance policies are used to determine what work will be recommended per recorded distress in any given section. The two types of localized maintenance policies are preventive and stopgap. Preventive policies are for sections having a PCI value above the critical value and are designed to provide preventive repair when it is beneficial to the life of the pavement. Stopgap policies are for sections that have a PCI below the critical value and are designed to repair any safety hazards to keep the pavement in operational condition. Table 13 and Table 14 list the localized preventive and stopgap maintenance policies for AC and PCC pavements, respectively. These policies are used to determine the localized maintenance recommendations in this PMP.

Table 13—AC Pavement Localized Preventive and Stopgap Maintenance and Repair Policy

Distress	Severity	Description	Preventive Work Type	Stopgap Work Type
41	Low	Alligator Cracking	-	-
41	Medium	Alligator Cracking	Patching - AC Deep	-
41	High	Alligator Cracking	Patching - AC Deep	Patching - AC Deep
42	N/A	Bleeding	Patching - AC Shallow	-
41	Low	Alligator Cracking	-	-
41	Medium	Alligator Cracking	Patching - AC Deep	-
41	High	Alligator Cracking	Patching - AC Deep	Patching - AC Deep
42	N/A	Bleeding	Patching - AC Shallow	-
43	Low	Block Cracking	-	-
43	Medium	Block Cracking	Crack Sealing – AC	-
43	High	Block Cracking	Patching - AC Deep	Crack Sealing - AC
44	Low	Corrugation	Patching - AC Shallow	-
44	Medium	Corrugation	Patching - AC Shallow	-
44	High	Corrugation	Patching - AC Shallow	Patching - AC Shallow
45	Low	Depression	Patching - AC Deep	-
45	Medium	Depression	Patching - AC Deep	-
45	High	Depression	Patching - AC Deep	Patching - AC Deep
46	N/A	Jet Blast	-	-
47	Low	Jt. Reflective Cracking	-	-
47	Medium	Jt. Reflective Cracking	Crack Sealing - AC	-
47	High	Jt. Reflective Cracking	Crack Sealing - AC	Crack Sealing - AC
48	Low	L&T Cracking	-	-
48	Medium	L&T Cracking	Crack Sealing - AC	-
48	High	L&T Cracking	Crack Sealing - AC	Crack Sealing - AC
49	N/A	Oil Spillage	Patching - AC Deep	-
50	Low	Patching	-	-
50	Medium	Patching	Patching - AC Deep	-
50	High	Patching	Patching - AC Deep	Patching - AC Deep
51	N/A	Polished Aggregate	-	-
52	Low	Raveling	-	-
52	Medium	Raveling	-	-
52	High	Raveling	Patching - AC Shallow	Patching - AC Shallow
53	Low	Rutting	Patching - AC Deep	-
53	Medium	Rutting	Patching - AC Deep	-
53	High	Rutting	Patching - AC Deep	Patching - AC Deep
54	Low	Shoving	Grinding (Localized)	-
54	Medium	Shoving	Grinding (Localized)	-
54	High	Shoving	Grinding (Localized)	Grinding (Localized)
55	N/A	Slippage Cracking	Patching - AC Deep	Patching - AC Deep
56	Low	Swelling	Patching - AC Deep	-
56	Medium	Swelling	Patching - AC Deep	-
56	High	Swelling	Patching - AC Deep	Patching - AC Deep
57	Low	Weathering	-	-
57	Medium	Weathering	-	-
57	High	Weathering	-	-

(-) No action required—monitor pavement.

Table 14—PCC Pavement Localized Preventive and Stopgap Maintenance and Repair Policy

Distress	Severity	Description	Preventive Work Type	Stopgap Work Type
61	Low	Blow-up	Patching - PCC Full Depth	-
61	Medium	Blow-up	Patching - PCC Full Depth	Patching - PCC Full Depth
61	High	Blow-up	Patching - PCC Full Depth	Slab Replacement - PCC
62	Low	Corner Break	Crack Sealing - PCC	-
62	Medium	Corner Break	Patching - PCC Full Depth	-
62	High	Corner Break	Patching - PCC Full Depth	Patching - PCC Full Depth
63	Low	Linear Cracking	-	-
63	Medium	Linear Cracking	Crack Sealing - PCC	Crack Sealing - PCC
63	High	Linear Cracking	Patching - PCC Partial Depth	Patching - PCC Full Depth
64	Low	Durability Cracking	-	-
64	Medium	Durability Cracking	Patching - PCC Full Depth	Patching - PCC Full Depth
64	High	Durability Cracking	Slab Replacement - PCC	Slab Replacement - PCC
65	Low	Jt. Seal Damage	-	-
65	Medium	Jt. Seal Damage	Joint Seal (Localized)	-
65	High	Jt. Seal Damage	Joint Seal (Localized)	-
66	Low	Small Patch	-	-
66	Medium	Small Patch	Patching - PCC Partial Depth	-
66	High	Small Patch	Patching - PCC Partial Depth	Patching - PCC Partial Depth
67	Low	Large Patch	-	-
67	Medium	Large Patch	Patching - PCC Full Depth	-
67	High	Large Patch	Patching - PCC Full Depth	Patching - PCC Full Depth
68	N/A	Popouts	-	-
69	N/A	Pumping	Joint Seal (Localized)	-
70	Low	Scaling	-	-
70	Medium	Scaling	Patching - PCC Partial Depth	-
70	High	Scaling	Slab Replacement - PCC	Slab Replacement - PCC
71	Low	Faulting	-	-
71	Medium	Faulting	Grinding (Localized)	-
71	High	Faulting	Grinding (Localized)	Grinding (Localized)
72	Low	Shattered Slab	-	-
72	Medium	Shattered Slab	Slab Replacement - PCC	-
72	High	Shattered Slab	Slab Replacement - PCC	Slab Replacement - PCC
73	N/A	Shrinkage Cracking	-	-
74	Low	Joint Spall	-	-
74	Medium	Joint Spall	Patching - PCC Partial Depth	-
74	High	Joint Spall	Patching - PCC Partial Depth	Patching - PCC Partial Depth
75	Low	Corner Spall	-	-
75	Medium	Corner Spall	Patching - PCC Partial Depth	-
75	High	Corner Spall	Patching - PCC Partial Depth	Patching - PCC Partial Depth
76	Low	ASR	-	-
76	Medium	ASR	Slab Replacement - PCC	-
76	High	ASR	Slab Replacement - PCC	Slab Replacement - PCC

(-) No action required—monitor pavement.

Pavement Branch Use and Section Rank Prioritization

Pavement branches and sections are prioritized to establish their relative importance during the M&R budget analysis. The highest priority branch use for any airport is the runway, followed by taxiways and then aprons. Section rank refers to the relative importance assigned to multiple pavements having the same branch use. Each pavement section is assigned a rank of primary (P), secondary (S) or tertiary (T). As an example, an airport with two runways might rank the more heavily used jet service runway as primary and the general aviation runway as secondary or tertiary.

The combination of the branch use and the section rank is used to define the priority of each section during the M&R budget analysis. Table 15 presents the branch use and section rank prioritization matrix used in budget analysis for the Alaska Airport PMP.

Table 15—M&R Work Priority by Branch Use and Section Rank

Branch Use	Section Rank		
	Primary	Secondary	Tertiary
Runway	1	3	7
Taxiway	2	4	8
Apron	5	6	9

Unit Costs

Derivation of appropriate pavement M&R unit costs is not trivial and is described in full in a separate report, **Appendix C**. A brief description of the process follows.

First, pavement unit costs were derived from a sample of actual construction projects completed by Alaska DOT&PF during the period 2005 to 2024. We carefully reviewed the projects, assigned them to a category of work, removed any miscellaneous costs unrelated to pavement M&R (i.e. fencing, access roads, building, generators, etc.), and computed a unit cost for the pavement treatment based on the pavement area constructed. We then developed a method of standardizing pavement M&R costs around the state to a single location—Anchorage—by use of published heating fuel prices. Lastly, we ensured that unit costs were adjusted to a standard year of analysis—2023.

Through this process, unit costs for a range of pavement M&R treatments were developed for four categories: Pavement Preservation and Corrective Maintenance, Rehabilitation, Reconstruction and Permafrost Reconstruction and Repair. These unit costs are used for a variety of purposes in PAVER including the analysis of alternative M&R budget scenarios.

Table 16 through Table 18 summarizes the localized preventive and stopgap, global, and major M&R work types, and their respective unit costs.

Table 16—Anchorage Localized M&R Work Unit Costs

Localized Work Type	Cost	Units
Crack Sealing - AC	$5.00	ft
Grinding (Localized)	$9.60	ft
Joint Seal (Localized)	$5.00	ft
Patching - AC Deep	$14.00	sf
Patching - AC Shallow	$6.50	sf
Crack Sealing - PCC	$5.00	ft
Patching - PCC Full Depth	$50.00	sf
Patching - PCC Partial Depth	$13.00	sf
Slab Replacement - PCC	$36.00	sf

Table 17—Anchorage Global M&R Work Unit Costs

Global Work Type	Cost ($/sf)
Emulsified Asphalt Seal Coat (P-608)	$1.20
Rapid Cure Seal Coat (P-608-R)	$1.20
Sand Seal (P-633)	$1.20

Table 18—Anchorage Major M&R Work Unit Costs

Rehabilitation Work Type	Unit Cost ($/sf)
Minor Rehabilitation - AC	$11.24
Major Rehabilitation - AC	$17.79
Complete Reconstruction - AC	$37.20
Minor Rehabilitation - PCC	$28.10
Major Rehabilitation - PCC	$38.12
Complete Reconstruction - PCC	$79.05

Cost by Condition

The localized maintenance policies in Table 13 and Table 14 are used in the budget plans and represent what localized repair is needed immediately. While this is helpful knowledge for an engineer or pavement manager, planning a five-year budget requires incorporation of work categories like major M&R. A five-year work plan computes the required budget by applying a cost to repair based on a PCI condition. For localized maintenance, the cost by condition is found by running a “consequence of localized distress” maintenance plan in PAVER. This plan is run by individually applying the localized maintenance policies over a period of one year. Section level distresses covered by the applied policies will generate total distress quantities and the corresponding unit cost to repair, therefore calculating a total cost to repair based on the section PCI. We plotted the cost to PCI section values, which allowed us to derive a best-fit relationship and equation. Table 19 shows the Anchorage-based AC and PCC preventive maintenance cost by condition while Table 20 presents the Anchorage-based AC and PCC stopgap maintenance cost by condition.

Table 19—Anchorage Localized Preventive Cost ($/sf) by Condition Values

Condition	AC	PCC
0	$6.00	$7.60
10	$3.20	$4.40
20	$1.60	$2.80
30	$0.95	$1.80
40	$0.47	$1.20
50	$0.19	$0.76
60	$0.12	$0.40
70	$0.07	$0.12
80	$0.04	$0.05
90	$0.02	$0.02
100	$0.00	$0.00

Table 20—Anchorage Localized Stopgap Cost ($/sf) by Condition Values

Condition	AC	PCC
0	$1.20	$24.00
10	$0.85	$12.00
20	$0.55	$6.00
30	$0.33	$2.00
40	$0.18	$0.60
50	$0.09	$0.12
60	$0.05	$0.04
70	$0.02	$0.01
80	$0.00	$0.00
90	$0.00	$0.00
100	$0.00	$0.00

The major M&R cost by condition is a relationship between minor and major M&R requirements for a range of PCI values. Pavement sections with PCI values greater than 70 generally require preventive/preservation treatments while pavements with PCI values less than 30 require complete reconstruction. As such, the associated costs are near constant for PCI values at or above 70 and at or below 30. For PCI values between 70 and 55 pavements require minor rehabilitation while PCI values between 55 and 30 require major rehabilitation. Rehabilitation allows for additional work such as patching, milling or any other remedial work that must be accomplished prior to an overlay. As such, the rehabilitation costs of pavements with a PCI between 70 and 30 are interpolated. Table 21 presents the Anchorage-based AC and PCC major M&R cost by condition.

Table 21—Anchorage Major M&R Cost ($/sf) by Condition Values

Condition	AC	PCC
0	$37.20	$79.05
10	$37.20	$79.05
20	$37.20	$79.05
30	$37.20	$79.05
40	$30.76	$66.46
50	$24.32	$53.88
60	$17.88	$41.29
70	$11.44	$28.70
80	$11.35	$28.35
90	$11.29	$28.20
100	$11.24	$28.10

Five-Year Rehabilitation Needs

We used the Alaska Airport PMP to predict future pavement conditions over the five-year period from 2024 to 2028. We analyzed five alternative budget scenarios that established various constraints including budget levels and resulting pavement condition.

Budget Scenario 1—Eliminate Backlog in Five Years

Analysis using PAVER indicates that the current (2023) M&R backlog for the 54 airports in the Alaska Airport PMP is $1.2B. An average annual expenditure of **$322M** is necessary to achieve the goal of eliminating the backlog over a five-year period. This level of investment would result in an average PCI of **85** in 2028. A summary of this budget is presented in Table 22**.**

Table 22—Budget Scenario 1—Eliminate Backlog in Five Years ($M)

Date of Plan	Funded M&R Work Type				Total Funded	Total Unfunded	Total Funded and Unfunded	PCI	
	Localized Stopgap	Localized Preventive	Global	Major				Before Work	After Work
5/1/2024	$10.02	$3.88	$4.81	$305.85	$325	$889	$1,214	70	76
5/1/2025	$7.41	$3.94	$0.36	$312.85	$325	$552	$877	75	79
5/1/2026	$6.14	$4.19	$0.95	$313.29	$325	$369	$694	77	81
5/1/2027	$2.24	$4.22	$1.01	$317.09	$325	$214	$538	79	83
5/1/2028	$0.00	$4.66	$0.15	$306.22	$311	$0	$311	81	85
Total	**$26**	**$21**	**$7**	**$1,555**	**$1,609**	-	**$1,609**	**70**	**85**

The total cost over the five-year analysis period, including funded and unfunded M&R is $1.61B. Figure 13 displays the impact to the PCI (overall network and each section rank) over time with respect to the total funded and unfunded M&R.

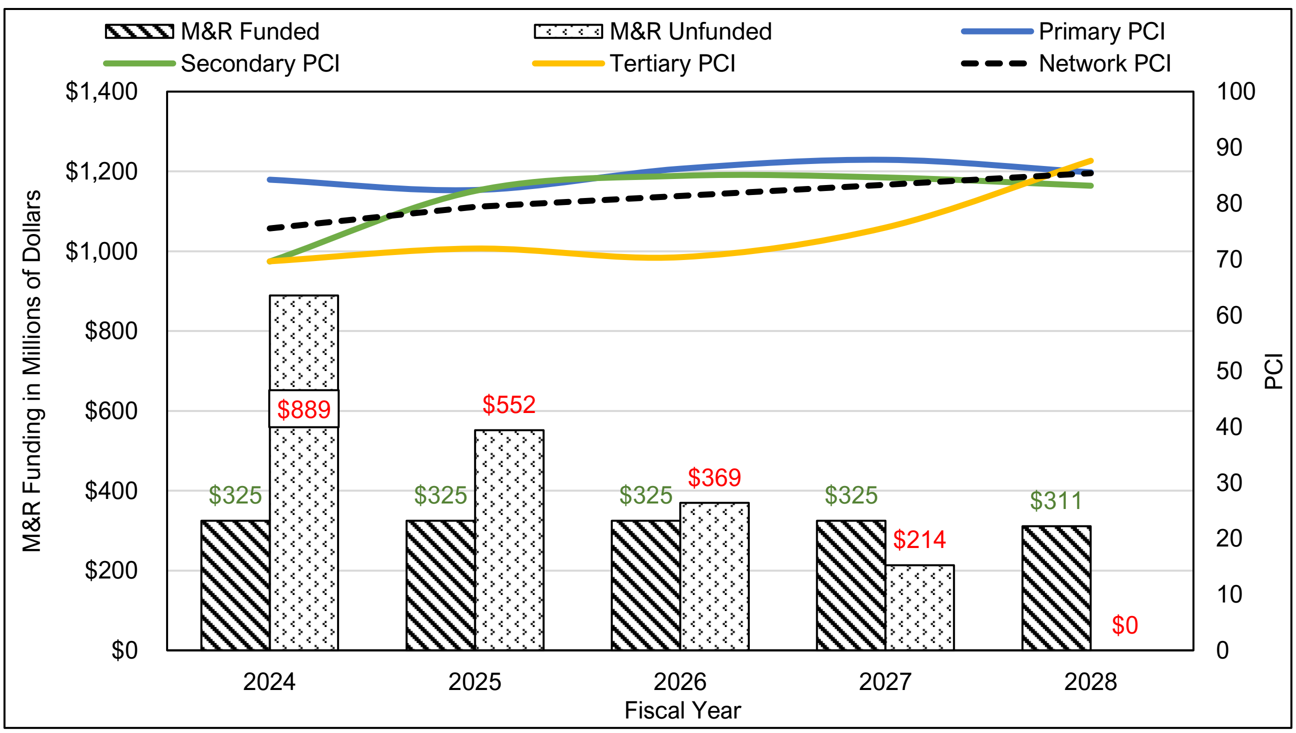

Figure 13—Budget Scenario 1—Eliminate Backlog in Five Years

Budget Scenario 2—Goal PCI 75

In order to increase the average condition of the airport pavement system to a PCI of 75, an average annual budget of **$183M** is required over a period of five years. At this level of investment, the PCI at the end of the five-year analysis period will be **75.** A summary of this budget is shown in Table 23.

Table 23—Budget Scenario 2—Goal PCI 75 ($M)

Date of Plan	Funded M&R Work Type				Total Funded	Total Unfunded	Total Funded and Unfunded	PCI	
	Localized Stopgap	Localized Preventive	Global	Major				Before Work	After Work
5/1/2024	$10.86	$3.88	$4.81	$163.94	$183	$1,031	$1,215	70	73
5/1/2025	$10.10	$3.89	$0.36	$169.05	$183	$846	$1,029	73	76
5/1/2026	$10.76	$4.05	$0.95	$167.73	$183	$829	$1,013	73	76
5/1/2027	$11.81	$3.97	$1.01	$166.64	$183	$851	$1,034	74	76
5/1/2028	$10.49	$4.27	$0.15	$168.50	$183	$806	$989	74	75
Total	**$54**	**$20**	**$7**	**$836**	**$917**	-	**$1,723**	**70**	**75**

The total cost over the five-year analysis period, including funded and unfunded M&R is $1.72B. Figure 14 displays the impact to the PCI (overall network and each section rank) over time with respect to the total funded and unfunded M&R.

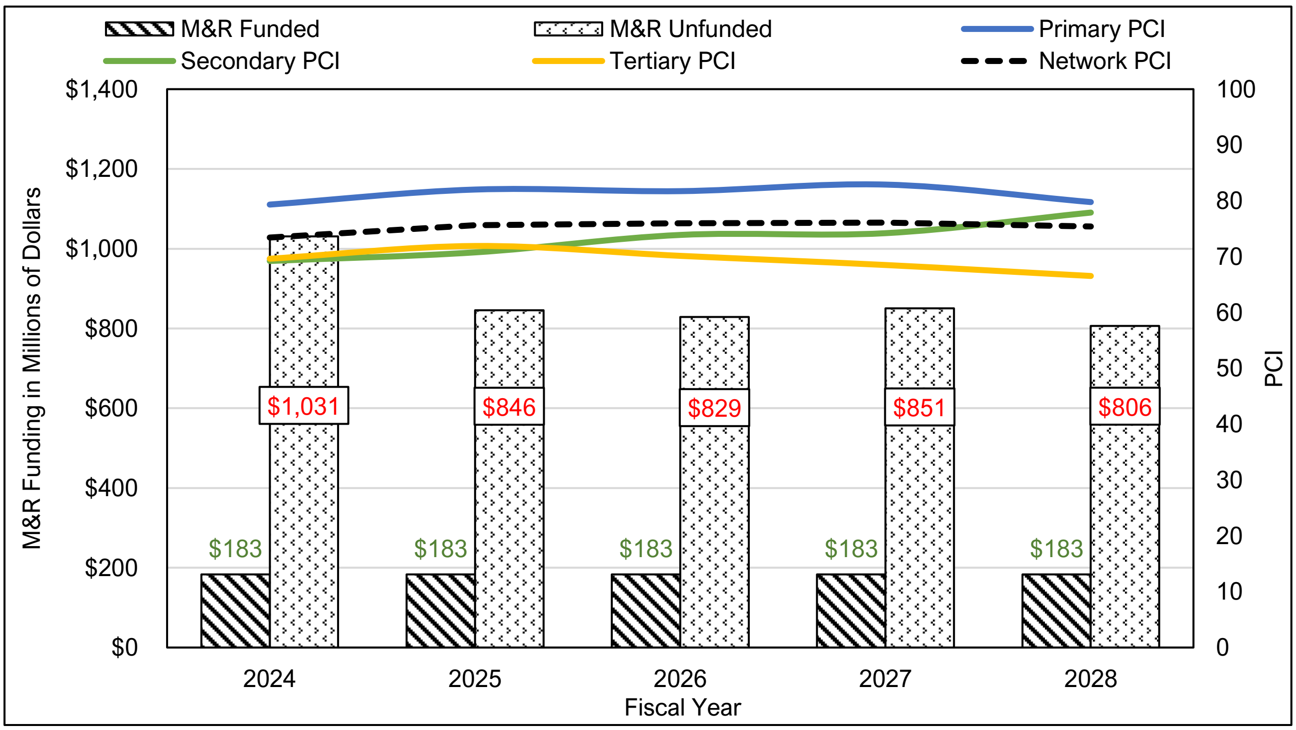

Figure 14—Budget Scenario 2—Goal PCI 75

Budget Scenario 3—Maintain Current PCI

In order to stabilize the condition of the airport pavement system at its current PCI, an average annual budget of **$111M** is required over a period of five years. At this level of investment, the PCI at the end of the five-year analysis period will be **71**. A summary of this budget is shown in Table 24.

Table 24—Budget Scenario 3—Maintain Current PCI ($M)

Date of Plan	Funded M&R Work Type				Total Funded	Total Unfunded	Total Funded and Unfunded	PCI	
	Localized Stopgap	Localized Preventive	Global	Major				Before Work	After Work
5/1/2024	$11.25	$3.88	$4.81	$90.64	$111	$1,105	$1,215	70	72
5/1/2025	$11.04	$3.87	$0.36	$95.24	$111	$999	$1,110	72	73
5/1/2026	$12.00	$3.99	$0.95	$93.57	$111	$1,065	$1,176	71	73
5/1/2027	$13.53	$3.81	$1.01	$92.25	$111	$1,177	$1,288	71	72
5/1/2028	$14.92	$3.97	$0.15	$91.55	$111	$1,233	$1,344	70	71
Total	**$63**	**$20**	**$7**	**$463**	**$553**	-	**$1,786**	**70**	**71**

The total cost over the five-year analysis period, including funded and unfunded M&R is $1.79B. Figure 15 displays the impact to the PCI (overall network and each section rank) over time with respect to the total funded and unfunded M&R.

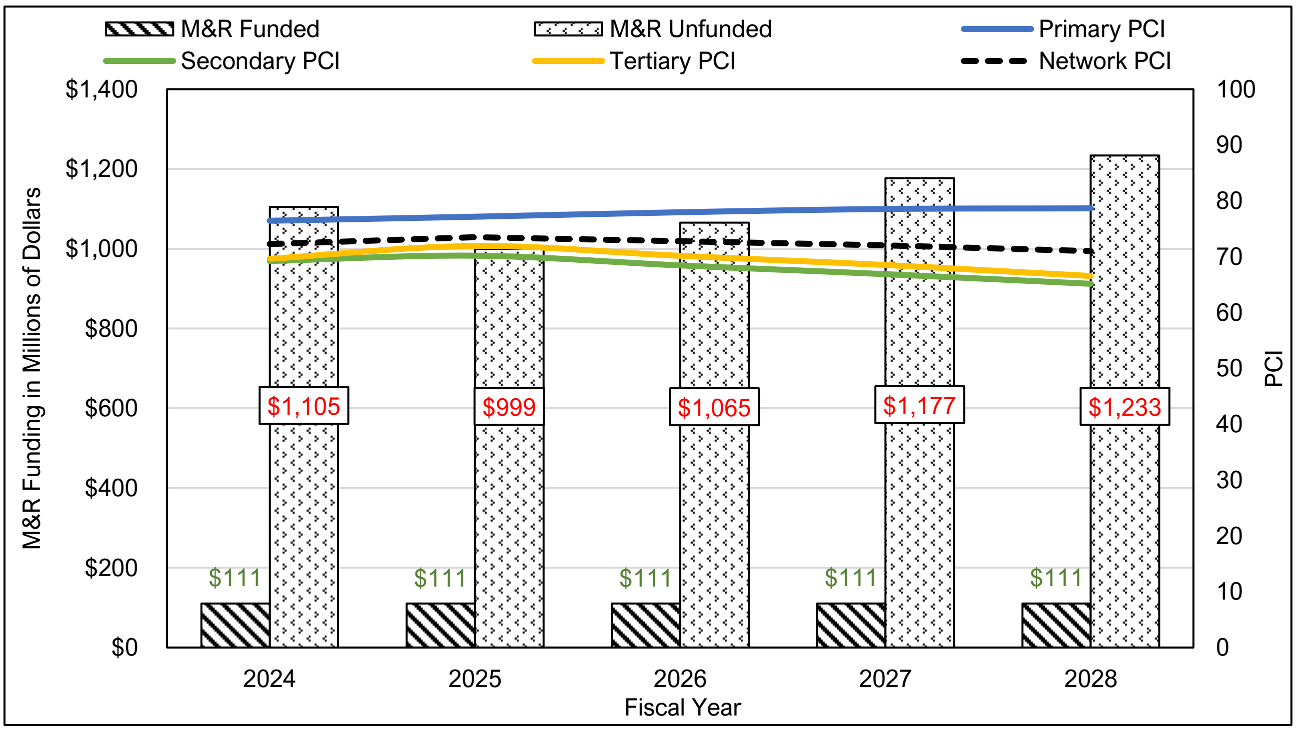

Figure 15—Budget Scenario 3—Maintain Current PCI

Budget Scenario 4—Maintain Current Budget

Alaska DOT&PF expends approximately **$95M** per year for pavement M&R on the pavements at its 54 airports. Funding sources for this budget include federal AIP funds in addition to state funds. At this funding level, the M&R backlog will increase to $1.3B and the PCI will be **70**. A summary of this budget is shown in Table 25**.**

Table 25—Budget Scenario 4—Maintain Current Budget ($M)

Date of Plan	Funded M&R Work Type				Total Funded	Total Unfunded	Total Funded and Unfunded	PCI	
	Localized Stopgap	Localized Preventive	Global	Major				Before Work	After Work
5/1/2024	$11.31	$3.88	$4.81	$74.92	$95	$1,120	$1,215	70	72
5/1/2025	$11.27	$3.87	$0.36	$79.47	$95	$1,032	$1,127	72	73
5/1/2026	$12.47	$3.98	$0.95	$77.60	$95	$1,115	$1,210	71	72
5/1/2027	$14.12	$3.79	$1.01	$76.06	$95	$1,245	$1,340	70	71
5/1/2028	$15.52	$3.93	$0.15	$75.39	$95	$1,321	$1,416	69	70
Total	**$65**	**$19**	**$7**	**$383**	**$475**	-	**$1,795**	**70**	**70**

The total cost over the five-year analysis period, including funded and unfunded M&R is $1.80B. Figure 16 displays the impact to the PCI (overall network and each section rank) over time with respect to the total funded and unfunded M&R.

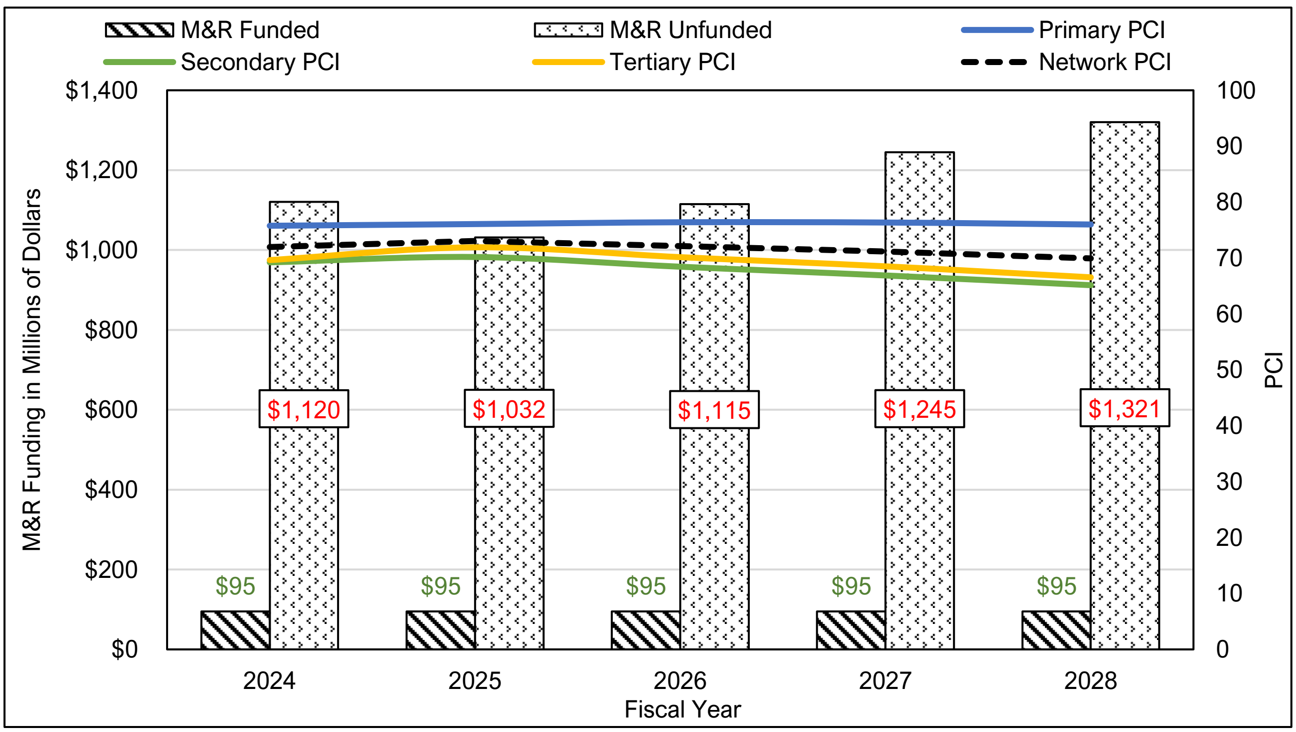

Figure 16—Budget Scenario 4—Maintain Current Budget

Budget Scenario 5—Stopgap Maintenance Only

If only stopgap maintenance, such as patching and crack sealing, is performed for the next five years, the annual expenditure will be **$18M**. This will result in the M&R backlog increasing from $1.2B to $2.4B and the average PCI will drop from **70** to **58**. A summary of this budget is shown in Table 26.

Table 26—Budget Scenario 5—Stopgap Maintenance Only ($M)

Date of Plan	Funded M&R Work Type				Total Funded	Total Unfunded	Total Funded and Unfunded	PCI	
	Localized Stopgap	Localized Preventive	Global	Major				Before Work	After Work
5/1/2024	$11.56	-	-	-	$12	$1,195	$1,207	70	70
5/1/2025	$13.09	-	-	-	$13	$1,440	$1,453	68	68
5/1/2026	$16.25	-	-	-	$16	$1,728	$1,744	65	65
5/1/2027	$21.49	-	-	-	$21	$2,089	$2,111	61	61
5/1/2028	$28.70	-	-	-	$29	$2,372	$2,401	58	58
Total	**$91**	-	-	-	**$91**	-	**$2,463**	**70**	**58**

The total cost over the five-year analysis period, including funded and unfunded M&R is $2.46B. Figure 17 displays the impact to the PCI (overall network and each section rank) over time with respect to the total funded and unfunded M&R.

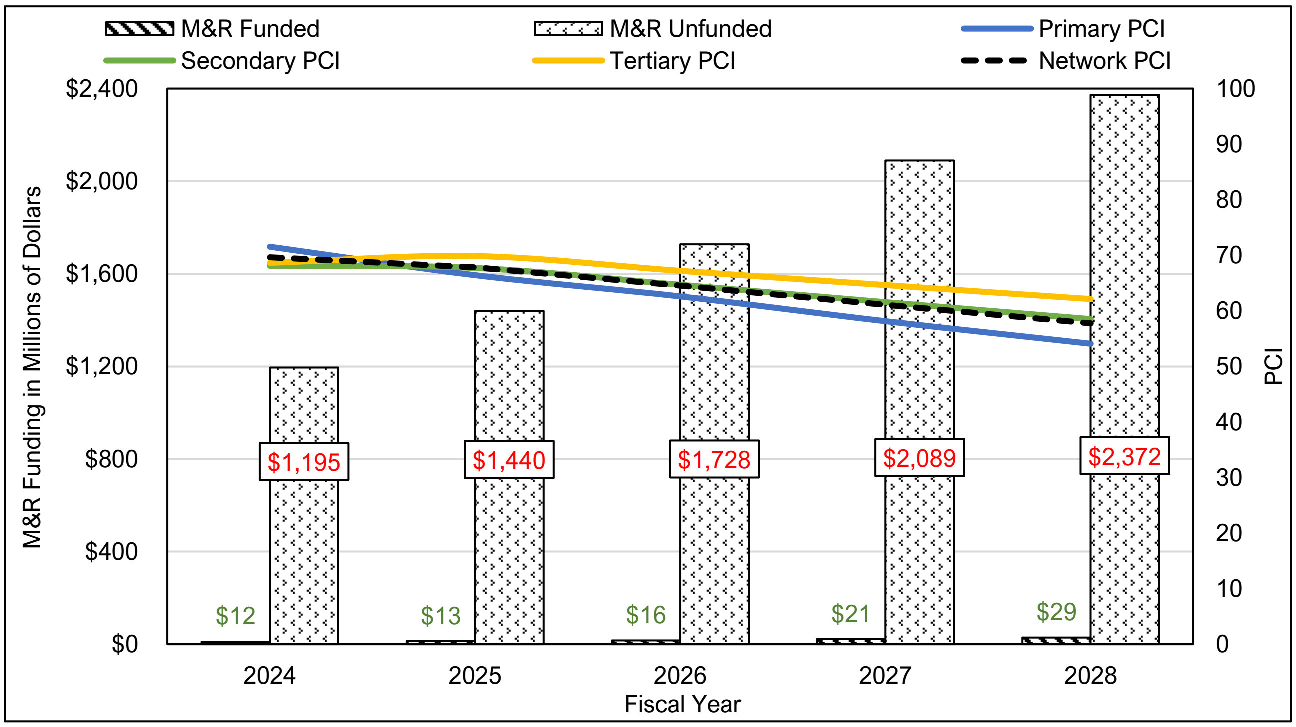

Figure 17—Budget Scenario 5—Stopgap Maintenance Only

PAVEMENT CLASSIFICATION RATINGS

Pavement Classification Ratings (PCR) were computed for 26 of 54 airports. Please reference **Appendix D** for a discussion of the methodology used and a summary of the PCRs for these airports.

CONCLUSIONS

The Alaska Airport PMP is fully implemented using the PAVER software. Of the 54 airports with paved runways represented in the PMP, 26 airports have received FAA-compliant PCI inspections, database inventory updates, GIS map updates, and related activities in 2022/2023. For the remaining 28 airports, we rely on historical PCI data to complete analysis of budget scenarios. As the remaining 28 airports receive PCI inspections, database refinements, and GIS map updates over the next two years, budget analysis will naturally be improved.

We conclude that the area-weighted average pavement condition of the Alaska airport system is **71** or **"Satisfactory"**. This rating represents the actively utilized pavements on the airside portion of all airports participating in the PMP. Some closed or inactive pavement facilities were excluded from analysis.

We further conclude that the 2023 M&R backlog for the 54 airports in the Alaska Airport PMP is $1.2B.

We used the Alaska Airport PMP to predict future pavement conditions over the five-year period from 2024 to 2028. We analyzed five alternative budget scenarios that established various constraints including budget levels and resulting pavement condition. Based on our five-year analysis, the following conclusions for each of the five scenarios are presented in Table 27.

Table 27—Summary of Five-Year Budget Analyses

Scenario	Title	Description	Annual Cost ($M)	2028 Backlog ($B)	Predicted 2028 PCI
1	**Eliminate Backlog**	Eliminate M&R backlog for the airport pavement system after five years.	322	0	85
2	**Goal PCI 75**	Increase the average PCI of the airport pavement system to 75.	183	0.8	75
3	**Maintain Current PCI**	Stabilize the average PCI of the airport pavement system at the current PCI.	111	1.2	71
4	**Maintain Current Budget**	Maintain M&R funding at the current $95M annual budget.	95	1.3	70
5	**Stopgap Maintenance Only**	Perform only the minimum maintenance needed to maintain safe pavements.	18	2.4	58

Figure 18 shows the consequence of the five alternative budget scenarios on the resulting condition of the Alaska airport pavement system over the five-year period 2024 to 2028.

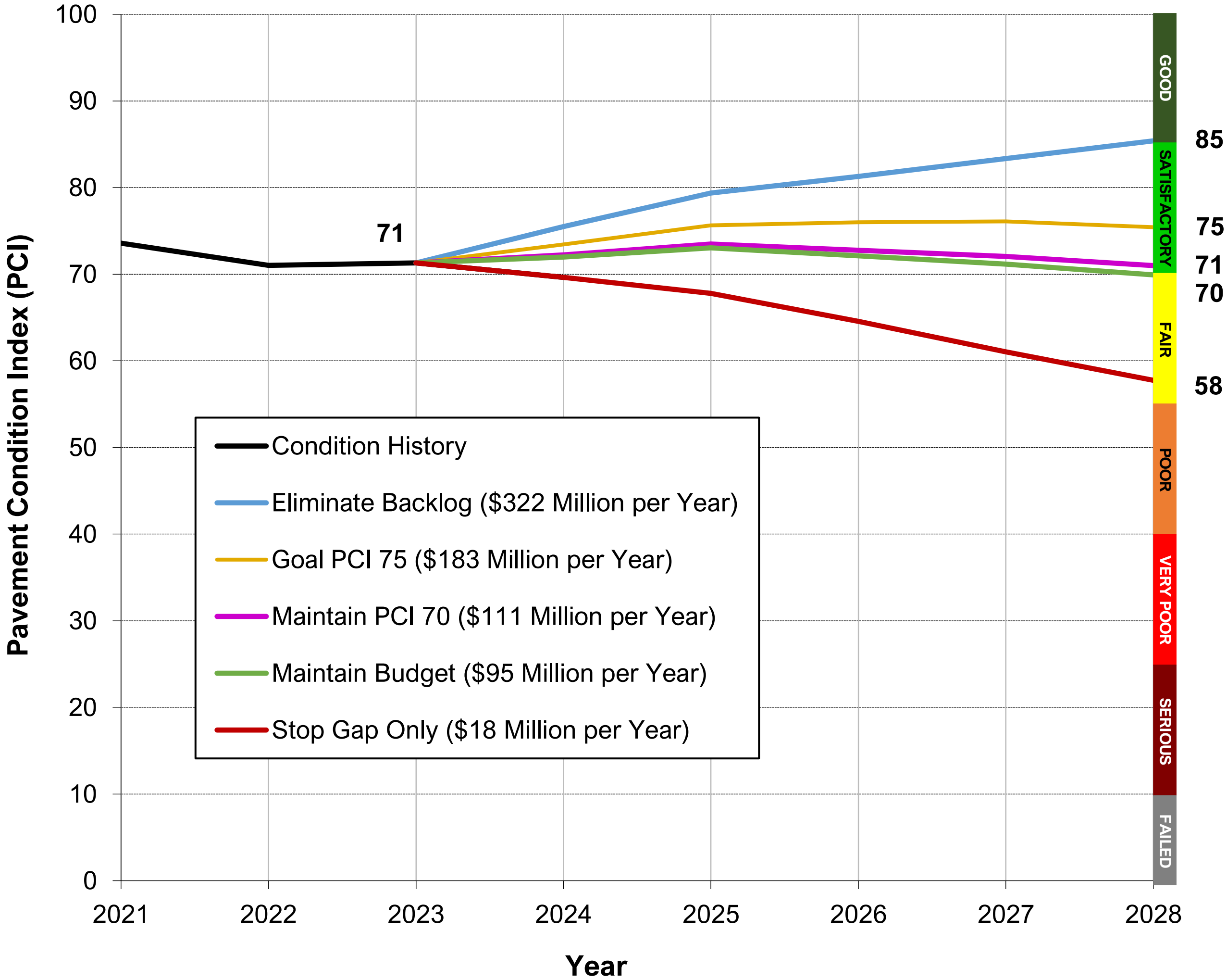

Figure 18—Consequence of Alternative Pavement M&R Budget Scenarios

RECOMMENDATIONS

Adopt Budget Scenario No. 3—Maintain Current PCI

We recommend that Alaska DOT&PF strive to maintain the current PCI of the Alaska airport pavement system. M&R activities planned and programmed by the Department in past years (and funded by the FAA through the AIP program) have resulted in a relatively high average PCI of 71 across a system of 54 airports in Alaska. This is a remarkable achievement and Alaska DOT&PF should take stock of the relatively high condition of its airport pavement system.

At an average PCI of 71, the condition of the pavement system is nearing the critical PCI of 70. While the PCI is above the critical PCI, the pavement system will generally benefit from a sustained program of pavement preservation as opposed to major work. The pavement preservation approach takes advantage of lower-cost technologies, such as seal coats, to preserve and protect a structurally sound pavement in a relatively high state of condition. Since pavement preservation treatments cost only a fraction of the price of major work, such as mill/overlay, the preservation approach is to apply these treatments "early and often." Routine, regular application of seal coats, in concert with crack sealing and patching, is a widely accepted strategy of preserving the high condition of a pavement network at a reasonable cost.

For this reason, we strongly recommend that Alaska DOT&PF adopt Budget Scenario 3—Maintain Current PCI. At an annual cost of $111M, the Maintain Current PCI budget is approximately 17 percent higher than the current annual budget of $95M for pavement M&R. This is a modest increase in annual cost, but at the same time represents a very cost-effective alternative to some of the other alternatives summarized in Table 27. In addition, Budget Scenario 3—Maintain Current PCI will reduce backlog growth by nearly $90M over the five-year period as compared to Budget Scenario 4—Maintain Current Budget.

Continue Pavement Management Plan Implementation

This report is being submitted in the second year of a three-year project to fully implement the Alaska Airport PMP across 54 airports. The PAVER database is fully implemented and has been used to produce the results discussed in this report. Alaska DOT&PF has made great strides toward its goals in this arena, we recommend that the Department continue its efforts to fully implement the Alaska Airport PMP across the entire system of 54 airports. On an annual basis, the Department should update essential components of the Alaska Airport PMP to ensure that the PMP is capable of providing reliable decision support in analysis of various M&R budget alternatives. Some of these activities include:

- Utilize the most current version of the PAVER software.
- Update and maintain detailed records on localized, global, and major pavement construction projects (year, scope, cost, construction documents).
- Adjust inventory records to reflect recent changes due to construction.
- Update airport traffic data and fleet mix, including the type and number of operations of the range of aircraft using the pavement at each airport.
- Verify or update current distress maintenance policies.
- Update unit costs, which can vary year to year based on inflation, fuel costs, construction methods and materials.
- Update prediction models to forecast future pavement conditions more accurately. Pavement deterioration is affected by many factors including environment, surface condition, structural condition and changes in the aircraft fleet mix.

In the event that Alaska DOT&PF continues the same level of M&R funding during the five-year period from 2024 to 2028, **Appendix E** provides the PAVER-recommended M&R work plan details for Budget Scenario No. 4—Maintain Current Budget.

Continue PCI Survey Inspections

We recommend that Alaska DOT&PF continue to perform annual PCI surveys on one-third of the airports in the Alaska PMP. Inspections should conform to ASTM D5340. Pavement inspections allow the Department to regularly monitor conditions and update airport pavement facility records.

Potential Cost-Effective Improvements

Analysis of potential cost-effective improvements will be provided in subsequent Cost Reports and Statewide Summary Reports after more airports have been inspected and additional data can be analyzed.

♦ ♦ ♦

Appendix A
Alaska Airport
Pavement Management Program
2023 Attribute Table

May 2024

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GLOSSARY OF TERMS AND ABBREVIATIONS

AASP: Alaska Aviation System Plan.

AC: Asphalt Concrete Pavement.

AIP: Airport Improvement Program.

CS: Commercial Service air transport.

DOT&PF: Department of Transportation and Public Facilities.

FAA: Federal Aviation Administration.

GA: General Aviation air transport.

HMA: Hot Mix Asphalt.

ICAO: International Civil Aviation Organization.

ICAO Code: consists of 4 letters. Certain classifications among countries and regions are used in creating these codes. The first letter stands for the region in which the airport is located, the second is for the country. The other two letters are generally given in order.

Maintenance Provider

> **Contract**: includes airports owned and operated by DOT&PF but with day-to-day maintenance activities provided through DOT&PF funded contract. Contract airports may still require some maintenance services to be provided by DOT&PF as well as possibly other contractors i.e. electrical, building, heavy re-surfacing repairs, large scale brushing, or other repairs that may be outside the scope of the scope of the standard maintenance contract.
> **DOT M&O**: includes airports with onsite DOT&PF maintenance crews or airports maintained by DOT&PF crews from satellite maintenance stations.
> **Local Sponsor**: includes airports not owned and/or operated by DOT&PF.
> **N/A**: includes airports where ownership and/or maintenance is uncertain.

M&O District: Maintenance and Operations District.

NPIAS: National Plan of Integrated Airport Systems.

> **FAA NPIAS**: The Federal Aviation Administration National Plan of Integrated Airport Systems identifies airports, the roles they serve, and eligibility for federal funding under the Airport Improvement Program (AIP).
> **AASP NPIAS**: The Alaska Aviation System Plan classifications take into account the unique characteristics of Alaska to further clarify the specific role an airport fulfills in the state transportation system.

OR&EE: Overrun and Elephant Ear describe areas on a runway with limited aviation operations.

Part 139: U.S. airports serving certain air carrier operations are required to be certificated by the Federal Aviation Administration.

PCC: Portland cement concrete pavement.

PMP: Pavement Management Program.

WRCC: Western Regional Climate Center.

INTRODUCTION

This report documents the development of tabular data collected on an individual airport basis for use in the Airport PMP. We created a way to store, categorize, and compare copious data collected from PAVER as well as the Federal Aviation Administration (FAA), Alaska Aviation System Plan (AASP), and the Western Regional Climate Center (WRCC) websites. The information was then used to help develop custom prediction models, unit costs, and maintenance and rehabilitation plans. Table 1 through Table 7 group data into categories to sort the information on a per airport basis.

Table 1 - General PAVER and Airport Information

PAVER Network ID	Airport Name	FAA Site ID	FAA ID	ICAO Code	NPIAS Number	Network Area (SF) as of (10/13/2023)
Adak	Adak Airport	50009.*A	ADK	PADK	02-0001	4,036,542
Akutan	Akutan Airport	50022.1*A	7AK	PAUT	02-0005	446,789
Aniak	Aniak Airport	50038.*A	ANI	PANI	02-0019	1,099,403
Atka	Atka Airport	50040.5*A	AKA	PAAK	02-0394	590,000
Barrow	Wiley Post-Will Rogers Airport	50054.3*A	BRW	PABR	02-0026	2,331,494
Bethel	Bethel Airport	50061.1*A	BET	PABE	02-0029	4,479,428
Birchwood	Birchwood Airport	50069.*A	BCV	PABV	02-0034	2,049,162
Clear	Clear Airport	50109.01*A	Z84	PACL	02-0420	635,013
Cold Bay	Cold Bay Airport	50114.*A	CDB	PACD	02-0065	3,129,240
Cordova	Merle K. (Mudhole) Smith Airport	50124.*A	CDV	PACV	02-0067	1,806,601
Deadhorse	Deadhorse Airport	50140.7*A	SCC	PASC	02-0339	3,023,013
Dillingham	Dillingham Airport	50153.*A	DLG	PADL	02-0078	1,966,900
Fairbanks	Fairbanks International Airport	50219.*A	FAI	PAFA	02-0096	10,466,170
Galena	Galena Airport	50258.*A	GAL	PAGA	02-0102	2,253,261
Gambell	Gambell Airport	50260.*A	GAM	PAGM	02-0103	564,150
Gulkana	Gulkana Airport	50281.*A	GKN	PAGK	02-0110	924,952
Gustavus	Gustavus Airport	50284.*A	GST	PAGS	02-0111	2,439,952
Haines	Haines Airport	50296.*A	HNS	PAHN	02-0112	1,080,814
Healy R.	Healy River Airport	50308.*A	HRR	PAHV	02-0414	489,782
Homer	Homer Airport	50320.*A	HOM	PAHO	02-0122	1,962,513
Hoonah	Hoonah Airport	50321.01*A	HNH	PAOH	02-0125	602,353
Iliamna	Iliamna Airport	50340.*A	ILI	PAIL	02-0132	1,713,282
Juneau	Juneau International Airport	50385.*A	JNU	PAJN	02-0133	4,941,426
Kake	Kake Airport	50393.01*A	AFE	PAFE	02-0398	527,785
Kenai	Kenai Municipal Airport	50410.*A	ENA	PAEN	02-0142	4,243,422
Ketchikan	Ketchikan International Airport	50412.03*A	KTN	PAKT	02-0144	2,363,965
KingSalmon	King Salmon Airport	50416.*A	AKN	PAKN	02-0148	2,854,560
Klawock	Klawock Airport	50420.01*A	AKW	PAKW	02-0154	896,900
Kodiak	Kodiak Airport	50425.*A	ADQ	PADQ	02-0158	4,399,012
Kotzebue	Kotzebue (Ralph Wein Memorial) Airport	50429.*A	OTZ	PAOT	02-0160	1,985,801
McGrath	McGrath Airport	50467.*A	MCG	PAMC	02-0176	1,311,478
Merrill	Merrill Field	50035.*A	MRI	PAMR	02-0015	3,848,239
Nenana	Nenana Municipal Airport	50524.*A	ENN	PANN	02-0191	870,345
Nome	Nome Airport	50540.*A	OME	PAOM	02-0199	2,709,598
Northway	Northway Airport	50544.*A	ORT	PAOR	02-0203	794,814
Palmer	Palmer Airport (Palmer, Alaska)	50584.*A	PAQ	PAAQ	02-0211	3,651,288
Petersburg	Petersburg (James A. Johnson) Airport	50590.2*A	PSG	PAPG	02-0340	1,440,226
Point Hope	Point Hope Airport	50601.*A	PHO	PAPO	02-0226	488,579
Sand Point	Sand Point Airport	50684.4*A	SDP	PASD	02-0253	1,363,350
Seward	Seward Airport	50696.*A	SWD	PAWD	02-0259	1,204,641
Shishmaref	Shishmaref Airport	50701.01*A	SHH	PASH	02-0404	475,032
Sitka	Sitka Rocky Gutierrez Airport	50703.*A	SIT	PASI	02-0268	2,117,332
Skagway	Skagway Airport	50704.*A	SGY	PAGY	02-0270	962,198
Soldotna	Soldotna Municipal Airport	50713.2*A	SXQ	PASX	02-0274	3,088,691
StGeorge	Saint George Airport	50680.4*A	PBV	PAPB	02-0416	932,650
StPaul	Saint Paul Airport	50682.*A	SNP	PASN	02-0277	1,311,035
Talkeetna	Talkeetna Airport	50738.*A	TKA	PATK	02-0287	804,604
Tok	Tok Junction Airport	50764.72*A	6K8	PFTO	02-0412	407,098
Unalakleet	Unalakleet	50799.*A	UNK	PAUN	02-0309	1,139,967
Unalaska	Unalaska/Dutch Harbor Airport	50801.*A	DUT	PADU	02-0082	848,980
Valdez	Valdez Airport	50825.1*A	VDZ	PAVD	02-0311	2,355,748
Wasilla	Wasilla Airport	50870.3*A	IYS	PAWS	02-0417	1,807,157
Wrangell	Wrangell Airport	50905.2*A	WRG	PAWG	02-0323	1,481,277
Yakutat	Yakutat Airport	50920.*A	YAK	PAYA	02-0327	3,178,784

Table 2 - Family Curves / Models and Deterioration

PAVER Network ID	Family Model Sub Region	Number of Paved Runways	Runway Straight Line Deterioration (No OR&EE)	Runway 6100 – AC (No OR&EE)	Runway 6200 – AC (No OR&EE)	Runway 6200 - PCC (No OR&EE)	Runway 6300 - AC (No OR&EE)
Adak	Southcoast High Deterioration	2	2.06	1.95	2.25		
Akutan	Southcoast Low Deterioration	1	0.67	0.67			
Aniak	Central West	1	4.30	4.3			
Atka	Southcoast High Deterioration	1	3.69	3.69			
Barrow	Northern Coastal	1	4.29	4.29			
Bethel	Central West	2	2.89	2.93			3.03
Birchwood	Central East	2	1.61	1.67	1.56		
Clear	Northern Interior	1	1.80	1.80			
Cold Bay	Southcoast High Deterioration	2	1.61	1.72	0.82		
Cordova	Northern Interior	1	1.50	1.50			
Deadhorse	Northern Coastal	1	4.33	4.33			
Dillingham	Central West	1	3.56	3.56			
Fairbanks	Northern Interior	2	2.26	2.32	2.33		
Galena	Northern Interior	1	1.94	1.94			
Gambell	Northern Coastal	1	2.50	2.50			
Gulkana	Northern Interior	1	2.40	2.40			
Gustavus	Southcoast Medium Deterioration	2	1.09	0.87	1.34		
Haines	Southcoast Medium Deterioration	1	1.57	1.57			
Healy R.	Northern Interior	1	2.28	2.28			
Homer	Central East	1	1.69	1.69			
Hoonah	Southcoast Medium Deterioration	1	1.45	1.45			
Iliamna	Southcoast High Deterioration	2	2.07	2.09	2.06		
Juneau	Southcoast Medium Deterioration	1	2.51	2.51			
Kake	Southcoast Medium Deterioration	1	1.56	1.56			
Kenai	Central East	1	4.00	4.00			
Ketchikan	Southcoast Medium Deterioration	1	3.21	3.21			
KingSalmon	Southcoast High Deterioration	2	2.92	1.41	3.88		
Klawock	Southcoast Medium Deterioration	1	1.41	1.41			
Kodiak	Southcoast High Deterioration	3	2.22	2.75	1.62		2.2
Kotzebue	Northern Coastal	1	3.41	3.41			
McGrath	Central West	1	2.83	2.83			
Merrill	Central East	2	2.02	2.05	2.00		
Nenana	Northern Interior	1	1.68	1.68			
Nome	Northern Coastal	2	3.36	3.61	3.21		
Northway	Northern Interior	1	5.47	5.47			
Palmer	Central East	2	1.70	1.75	1.51		
Petersburg	Southcoast Medium Deterioration	1	2.69	2.69			
Point Hope	Northern Coastal	1	3.85	3.85			
Sand Point	Southcoast Low Deterioration	1	0.56	0.56			
Seward	Central East	2	1.45	1.38	1.51		
Shishmaref	Northern Coastal	1	5.26	5.26			
Sitka	Southcoast Medium Deterioration	1	1.72	1.72			
Skagway	Southcoast Medium Deterioration	1	1.73	1.73			
Soldotna	Central East	1	2.00	2.00			
StGeorge	Southcoast Low Deterioration	1	0.37	0.37			
StPaul	Southcoast Low Deterioration	1	0.49	0.49			
Talkeetna	Central East	1	2.38	2.38			
Tok	Northern Interior	1	4.22	4.22			
Unalakleet	Northern Coastal	2	3.19	2.92	3.33		
Unalaska	Southcoast High Deterioration	1	5.89	5.89			
Valdez	Northern Interior	1	2.77	2.77			
Wasilla	Central East	1	1.87	1.87			
Wrangell	Southcoast Medium Deterioration	1	2.16	2.16			
Yakutat	Southcoast Medium Deterioration	2	2.46	3.82	0.95	0.78	

Table 3 - Alaska Department of Transportation Information

PAVER Network ID	DOT&PF Region	DOT&PF M&O District	DOT&PF AASP Classification	DOT&PF Maintenance Provider	AASP NPIAS Airport Categories (FY23)	AASP NPIAS Airport Sub Categories (FY23)
Adak	Southcoast	Kodiak-Aleutian	Community Off-Road	DOT M&O	CS	Nonprimary
Akutan	Southcoast	Kodiak-Aleutian	Community Off-Road	DOT M&O	GA	Basic
Aniak	Central	Southwest	Regional Hub	DOT M&O	CS	Non hub
Atka	Southcoast	Kodiak-Aleutian	Community Off-Road	Contract	GA	Basic
Barrow	Northern	Dalton	Regional Hub	DOT M&O	CS	Non hub
Bethel	Central	Southwest	Regional Hub	DOT M&O	CS	Non hub
Birchwood	Central	Anchorage	Local High Activity	DOT M&O	GA	Local
Clear	Northern	Denali / Rural	Local Low Activity	DOT M&O	GA	Unclassified
Cold Bay	Southcoast	Kodiak-Aleutian	Regional Hub	DOT M&O	CS	Nonprimary
Cordova	Northern	Valdez	Regional Hub	DOT M&O	CS	Non hub
Deadhorse	Northern	Dalton	Regional Hub	DOT M&O	CS	Non hub
Dillingham	Central	Southwest	Regional Hub	DOT M&O	CS	Non hub
Fairbanks	Northern	AIAS	Medium & Small Hub	DOT M&O	CS	Small Hub
Galena	Northern	Denali / Rural	Regional Hub	DOT M&O	CS	Nonprimary
Gambell	Northern	Western	Community Off-Road	Contract	CS	Nonprimary
Gulkana	Northern	Tazlina	Community On-Road	DOT M&O	GA	Local
Gustavus	Southcoast	Southeast	Regional Hub	DOT M&O	CS	Non hub
Haines	Southcoast	Southeast	Community On-Road	DOT M&O	CS	Non hub
Healy R.	Northern	Denali / Rural	Community On-Road	DOT M&O	GA	Basic
Homer	Central	Kenai Peninsula	Regional Hub	DOT M&O	CS	Non hub
Hoonah	Southcoast	Southeast	Community Off-Road	DOT M&O	CS	Nonprimary
Iliamna	Southcoast	Kodiak-Aleutian	Regional Hub	DOT M&O	CS	Nonprimary
Juneau	Southcoast		Medium & Small Hub	Local Sponsor	CS	Non hub
Kake	Southcoast	Southeast	Community Off-Road	DOT M&O	GA	Basic
Kenai	Central		Regional Hub	Local Sponsor	CS	Non hub
Ketchikan	Southcoast	Southeast	Regional Hub	Contract	CS	Non hub
KingSalmon	Southcoast	Kodiak-Aleutian	Regional Hub	DOT M&O	CS	Non hub
Klawock	Southcoast	Southeast	Community Off-Road	DOT M&O	CS	Non hub
Kodiak	Southcoast	Kodiak-Aleutian	Regional Hub	DOT M&O	CS	Non hub
Kotzebue	Northern	Western	Regional Hub	DOT M&O	CS	Non hub
McGrath	Central	Southwest	Regional Hub	DOT M&O	GA	Local
Merrill	Central		Local High Activity	N/A	CS	Non hub
Nenana	Northern		Local High Activity	N/A	GA	Basic
Nome	Northern	Western	Regional Hub	DOT M&O	CS	Non hub
Northway	Northern	Tok	Community On-Road	DOT M&O	GA	Basic
Palmer	Central		Community On-Road	N/A	GA	Local
Petersburg	Southcoast	Southeast	Regional Hub	DOT M&O	CS	Non hub
Point Hope	Northern	Western	Community Off-Road	Contract	CS	Nonprimary
Sand Point	Southcoast	Kodiak-Aleutian	Community Off-Road	DOT M&O	CS	Nonprimary
Seward	Central	Kenai Peninsula	Community On-Road	DOT M&O	GA	Local
Shishmaref	Northern	Western	Community Off-Road	Contract	CS	Nonprimary
Sitka	Southcoast	Southeast	Regional Hub	DOT M&O	CS	Non hub
Skagway	Southcoast	Southeast	Community On-Road	DOT M&O	CS	Nonprimary
Soldotna	Central		Local High Activity	N/A	GA	Local
StGeorge	Southcoast	Kodiak-Aleutian	Community Off-Road	Contract	GA	Basic
StPaul	Southcoast	Kodiak-Aleutian	Community Off-Road	Contract	CS	Nonprimary
Talkeetna	Central	Matanuska-Susitna	Community On-Road	DOT M&O	GA	Local
Tok	Northern	Tok	Community On-Road	DOT M&O	GA	Local
Unalakleet	Northern	Western	Regional Hub	DOT M&O	CS	Non hub
Unalaska	Southcoast	Kodiak-Aleutian	Regional Hub	DOT M&O	CS	Non hub
Valdez	Northern	Valdez	Regional Hub	DOT M&O	CS	Non hub
Wasilla	Central		Local High Activity	N/A	GA	Local
Wrangell	Southcoast	Southeast	Regional Hub	DOT M&O	CS	Non hub
Yakutat	Southcoast	Southeast	Regional Hub	DOT M&O	CS	Non hub

Table 4 - Federal Aviation Administration Information

PAVER Network ID	FAA NPIAS Airport Categories (FY23)	FAA Airport Categories (FY23)	FAA Enplaned (CY19)	FAA Enplaned (CY21)*
Adak	GA	Basic	2,901	2,205
Akutan	GA	Basic	2,126	1,275
Aniak	CS	Local	12,853	3,935
Atka	GA	Basic	285	183
Barrow	CS	Non hub	46,450	31,898
Bethel	CS	Non hub	160,110	105,877
Birchwood	GA	Local		
Clear	GA	Unclassified		
Cold Bay	CS	Local	7,042	3,814
Cordova	CS	Non hub	17,654	15,058
Deadhorse	CS	Non hub	43,665	64,245
Dillingham	CS	Non hub	34,496	25,988
Fairbanks	CS	Small Hub	549,289	450,694
Galena	CS	Local	9,440	7,978
Gambell	GA	Basic	3,610	1,963
Gulkana	GA	Local	48	408
Gustavus	CS	Non hub	11,023	10,305
Haines	CS	Local	1,142	7,206
Healy R.	GA	Basic	105	558
Homer	CS	Non hub	46,867	30,972
Hoonah	CS	Local	6,817	5,575
Iliamna	CS	Local	5,553	3,933
Juneau	CS	Non hub	440,277	306,512
Kake	CS	Local	3,309	2,552
Kenai	CS	Non hub	93,889	68,044
Ketchikan	CS	Non hub	135,389	117,728
KingSalmon	CS	Non hub	44,131	29,914
Klawock	CS	Non hub	13,503	14,157
Kodiak	CS	Non hub	81,562	72,905
Kotzebue	CS	Non hub	69,070	46,305
McGrath	GA	Local	2,006	2,228
Merrill	CS	Non hub	10,478	22,907
Nenana	GA	Basic	29	24
Nome	CS	Non hub	64,122	46,645
Northway	GA	Basic		
Palmer	GA	Local	38	1
Petersburg	CS	Non hub	24,520	20,690
Point Hope	CS	Local	4,515	2,844
Sand Point	GA	Basic	3,636	1,874
Seward	GA	Local	11	14
Shishmaref	CS	Local	3,350	2,822
Sitka	CS	Non hub	87,119	80,366
Skagway	CS	Local	7,324	3,082
Soldotna	GA	Local	6	15
StGeorge	GA	Basic	366	198
StPaul	GA	Basic	2,596	1,533
Talkeetna	GA	Local	7	0
Tok	GA	Local	187	298
Unalakleet	CS	Local	16,208	6,594
Unalaska	CS	Non hub	29,229	19,099
Valdez	CS	Local	10,050	5,195
Wasilla	GA	Local	11	0
Wrangell	CS	Non hub	14,033	12,100
Yakutat	CS	Non hub	11,800	10,899

*Enplanement values were affected due to COVID

Table 5 – Alaska Weather Conditions[1]

PAVER Network ID	Frozen Months	Frost Depth (Ft)	Temp: Max (°C)	Temp: Min (°C)	Annual Precipitation (in)	Runway Bound Base (Y/N)
Adak	0	0	16	-3	54.1	N
Akutan	0	0	27	-15	61	N
Aniak	6.5	Perm F	29	-48	19	N
Atka	3	1	16	-3	61	N
Barrow	8.2	Perm F	24	-46	5.4	N
Bethel	6.2	Perm F	29	-43	19.7	N
Birchwood	5.5	7	29	-32	15	Y
Clear	6.5	Perm F	29	-48	13	N
Cold Bay	3	2	22	-21	38	N
Cordova	2	1.5	27	-29	91	N
Deadhorse	8	Perm F	24	-46	4	N
Dillingham	6	9.5	29	-34	25	Y
Fairbanks	6.5	Perm F	32	-51	11.7	N
Galena	7	Perm F	29	-51	13	N
Gambell	7.5	Perm F	18	-30	18	N
Gulkana	6.5	Perm F	29	-48	11.8	N
Gustavus	4	2	29	-26	56	N
Haines	4	3	32	-26	48	N
Healy R.	6.5	10	29	-43	15	N
Homer	4.5	4	24	-26	23.9	N
Hoonah	0	0	26.7	-15.0	62	N
Iliamna	5	10	27	-40	25.6	N
Juneau	2	1	29	-24	67	N
Kake	3.5	1.5	24	-18	54	N
Kenai	5	6	27	-40	19	N
Ketchikan	0	0	29	-18	154	N
KingSalmon	5.5	7	28	-40	21.4	Y
Klawock	0	0	21	-9	88	N
Kodiak	3	0.5	24	-18	59	Y
Kotzebue	7	Perm F	27	-46	10	N
McGrath	6.5	10	29	-51	18.1	Y
Merrill	6	7	32	-34	16.4	N
Nenana	7	Perm F	32	-51	11	N
Nome	6.5	Perm F	27	-43	16	N
Northway	6.5	Perm F	29	-54	10	N
Palmer	5	6	27	-34	16	N
Petersburg	0	0	27	-23	105	N
Point Hope	8	Perm F	21	-46	6	N
Sand Point	0	0	21	-15	45	N
Seward	5	3	29	-23	69.7	N
Shishmaref	8	Perm F	18	-29	11	N
Sitka	0	0	24	-13	86	N
Skagway	4	3	29	-23	26	N
Soldotna	5.5	7	24	-34	17	N
StGeorge	5	7	16	-23	24.3	Y
StPaul	5	7	16	-23	24.3	Y
Talkeetna	6.4	10	29	-43	26.5	N
Tok	6.5	Perm F	32	-54	10	N
Unalakleet	7	Perm F	29	-43	13	N
Unalaska	0	0	27	-15	61	N
Valdez	4	2	24	-21	67.9	N
Wasilla	5	7	27	-37	18	N
Wrangell	0	0	28	-21	82	N
Yakutat	4	1.5	27	-26	140.4	N

[1]Temperature and Precipitation data collected using (https://wrcc.dri.edu/summary/Climsmak.html)

Table 6 - Form 5010 and Airport Questionnaire

PAVER Network ID	Part 139 (Y/N)	On Road Network (Y/N)	Crack Seal Frequency (Years)	Seal EQ Onsite (Y/N/M)	Treatment Candidate (Y/N)	Runway Year Paved	Runway current Age on 4/30/23
Adak	Y	N	none	Y	Y	6/1/90	32.8
Akutan	N	N	5	N	Y	8/31/12	10.6
Aniak	N	N	3	Y	N	7/14/19	3.8
Atka	N	N	none	N	Y	9/1/09	13.6
Barrow	Y	N	1	Y	N	9/1/19	3.6
Bethel	Y	N	1	Y	N	9/1/21	1.6
Birchwood	N	Y	5	M	Y	9/1/12	10.6
Clear	N	Y	5	N	Y	9/1/96	26.6
Cold Bay	Y	N	none	N	Y	8/15/18	4.7
Cordova	Y	N	1	Y	Y	9/1/98	24.6
Deadhorse	Y	Y	1	Y	Y	8/1/12	10.7
Dillingham	Y	N	1	Y	Y	7/1/18	4.8
Fairbanks	Y	Y	1	Y	Y	7/1/08	14.8
Galena	N	N	3	Y	Y	7/1/18	4.8
Gambell	N	N	5	M	N	7/1/18	4.8
Gulkana	N	Y	3	N	N	9/1/07	15.6
Gustavus	Y	Y	none	N	Y	9/1/20	2.6
Haines	N	Y	none	N	N	9/1/92	30.6
Healy R.	N	Y	3	N	Y	8/31/96	26.6
Homer	Y	Y	1	M	N	9/1/97	25.6
Hoonah	N	N	none	N	Y	9/1/92	30.6
Iliamna	N	N	Bi-annual	Y	Y	8/1/03	19.7
Juneau	Y	Y	1	Y	Y	4/1/15	8.0
Kake	N	N	none	N	N	3/15/18	5.1
Kenai	Y	Y	3	N	Y	8/1/06	16.7
Ketchikan	Y	Y	3	N	Y	8/1/08	14.7
KingSalmon	Y	N	annual	Y	Y	7/14/18	4.8
Klawock	N	N	none	N	N	9/1/08	14.6
Kodiak	Y	Y	none	N	Y	8/1/12	10.7
Kotzebue	Y	N	1	Y	N	9/1/11	11.6
McGrath	N	N	3	Y	N	9/1/20	2.6
Merrill	N	Y	3	N	Y	6/1/04	18.8
Nenana	N	Y	3	N	Y	8/7/03	19.7
Nome	Y	Y	1	Y	Y	7/1/08	14.8
Northway	N	Y	3	N	Y	9/1/09	13.6
Palmer	N	Y	3	N	Y	7/1/17	5.8
Petersburg	Y	N	none	N	Y	8/1/10	12.7
Point Hope	N	N	5	M	N	9/16/93	29.6
Sand Point	Y	N	none	N	Y	6/2/06	16.8
Seward	N	Y	5	M	Y	9/1/93	29.6
Shishmaref	N	N	5	Y	N	7/14/93	29.8
Sitka	Y	N	none	N	N	9/1/12	10.6
Skagway	N	Y	none	N	Y	8/1/00	22.7
Soldotna	N	Y	3	N	Y	8/1/96	26.7
StGeorge	N	N	none	N	Y	8/30/06	16.7
StPaul	N	N	none	N	Y	7/1/05	17.8
Talkeetna	N	Y	5	M	Y	9/10/17	5.6
Tok	N	Y	5	N	Y	7/25/08	14.8
Unalakleet	N	N	5	Y	Y	8/1/09	13.7
Unalaska	Y	N	1	Y	Y	8/1/14	8.7
Valdez	Y	Y	1	Y	Y	9/30/06	16.6
Wasilla	N	Y	3	N	Y	9/1/00	22.6
Wrangell	Y	N	none	M	Y	6/1/07	15.8
Yakutat	Y	N	none	M	Y	3/16/16	7.1

Table 7 – Maintenance and Rehabilitation Information

PAVER Network ID	Crack Seal (Y/N)	Cold Patch (Y/N)	HMA Patch (Y/N)	Seal Coat (Y/N)	HMA Overlay (Y/N)	Mill & Fill (Y/N)	Mill, Stabilize Base, Pave (Y/N)	Reconst. Rebuild Str Sect. (Y/N)	Fuel Factor Group	Fuel Factor
Adak	Y	Y	N	Y	Y	Y	N	N	Southcoast	1.26
Akutan	Y	Y	N	Y	Y	Y	N	N	Southcoast	1.26
Aniak	Y	Y	N	Y	Y	Y	Y	Y	Central Coastal	1.51
Atka	Y	Y	N	Y	Y	Y	Y	N	Southcoast Island	1.63
Barrow	Y	Y	N	Y	Y	Y	Y	Y	Northern Coastal	1.90
Bethel	Y	Y	N	Y	Y	Y	Y	Y	Central Coastal	1.51
Birchwood	Y	Y	Y	Y	Y	Y	Y	N	Anchorage	1.00
Clear	Y	Y	N	Y	Y	Y	N	N	Central Interior	1.13
Cold Bay	Y	Y	N	Y	Y	Y	Y	N	Southcoast	1.26
Cordova	Y	Y	N	Y	Y	Y	Y	N	Central Interior	1.13
Deadhorse	Y	Y	N	Y	Y	Y	Y	Y	Central Coastal	1.51
Dillingham	Y	Y	N	Y	Y	Y	N	N	Central Coastal	1.51
Fairbanks	Y	Y	Y	Y	Y	Y	Y	Y	Central Interior	1.13
Galena	Y	Y	N	Y	Y	Y	Y	Y	Northern Coastal	1.90
Gambell	Y	Y	N	Y	Y	Y	Y	Y	Northern Coastal	1.90
Gulkana	Y	Y	N	Y	Y	Y	Y	Y	Central Interior	1.13
Gustavus	Y	Y	N	Y	Y	Y	Y	N	Southcoast	1.26
Haines	Y	Y	N	Y	Y	Y	Y	N	Southcoast	1.26
Healy R.	Y	Y	N	Y	Y	Y	Y	N	Central Interior	1.13
Homer	Y	Y	Y	Y	Y	Y	Y	N	Central Interior	1.13
Hoonah	Y	Y	N	Y	Y	Y	Y	N	Southcoast	1.26
Iliamna	Y	Y	N	Y	Y	Y	Y	N	Central Coastal	1.51
Juneau	Y	Y	Y	Y	Y	Y	Y	N	Southcoast	1.26
Kake	Y	Y	N	Y	Y	Y	Y	N	Southcoast	1.26
Kenai	Y	Y	Y	Y	Y	Y	Y	N	Central Interior	1.13
Ketchikan	Y	Y	N	Y	Y	Y	Y	N	Southcoast	1.26
KingSalmon	Y	Y	N	Y	Y	Y	Y	N	Southcoast	1.26
Klawock	Y	Y	N	Y	Y	Y	Y	N	Southcoast	1.26
Kodiak	Y	Y	Y	Y	Y	Y	N	N	Southcoast	1.26
Kotzebue	Y	Y	N	Y	Y	Y	Y		Central Coastal	1.51
McGrath	Y	Y	N	Y	Y	Y	N	N	Central Coastal	1.51
Merrill	Y	Y	N	Y	Y	Y	Y		Anchorage	1.00
Nenana	Y	Y	N	Y	Y	Y	N	N	Central Interior	1.13
Nome	Y	Y	N	Y	Y	Y	Y		Central Coastal	1.51
Northway	Y	Y	N	Y	Y	Y	N	N	Central Interior	1.13
Palmer	Y	Y	Y	Y	Y	Y	Y	N	Anchorage	1.00
Petersburg	Y	Y	N	Y	Y	Y	Y		Southcoast	1.26
Point Hope	Y	Y	N	Y	Y	Y	N	N	Northern Coastal	1.90
Sand Point	Y	Y	N	Y	Y	Y	Y	N	Southcoast Island	1.63
Seward	Y	Y	N	Y	Y	Y	Y	Y	Central Interior	1.13
Shishmaref	Y	Y	N	Y	Y	Y	Y	N	Northern Coastal	1.90
Sitka	Y	Y	N	Y	Y	Y	Y		Southcoast	1.26
Skagway	Y	Y	N	Y	Y	Y	Y	N	Southcoast	1.26
Soldotna	Y	Y	Y	Y	Y	Y	Y	Y	Central Interior	1.13
StGeorge	Y	Y	N	Y	Y	Y	N	N	Southcoast Island	1.63
StPaul	Y	Y	N	Y	Y	Y	N	N	Southcoast Island	1.63
Talkeetna	Y	Y	N	Y	Y	Y	Y	Y	Central Interior	1.13
Tok	Y	Y	N	Y	Y	Y	N	N	Central Interior	1.13
Unalakleet	Y	Y	N	Y	Y	Y	N	N	Central Coastal	1.51
Unalaska	Y	Y	N	Y	Y	Y	Y	Y	Southcoast	1.26
Valdez	Y	Y	Y	Y	Y	Y	Y	Y	Central Interior	1.13
Wasilla	Y	Y	Y	Y	Y	Y	N	N	Anchorage	1.00
Wrangell	Y	Y	N	Y	Y	Y	Y	Y	Southcoast	1.26
Yakutat	Y	Y	N	Y	Y	Y	Y	Y	Southcoast	1.26

♦ ♦ ♦

Appendix B
Alaska Airport
Pavement Management Program
2023 Prediction Model Report

May 2024

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INTRODUCTION

Pavement prediction models, also known as performance models or family curves, are generated within PAVER based on an analysis of historic PCI survey data and construction records. Pavements in the same region with similar characteristics such as branch use and surface type generally follow the same deterioration life cycle pattern. Similar pavements are grouped into families and performance models are generated for each family by analyzing numerous PCI vs. pavement age data points from historical inspections. A deterioration curve is fit to the data and its correlation is evaluated based on statistical measures.

The same family curve generated using the look-back procedure described above can be used in a forward-looking capacity to predict future pavement condition as shown in Figure 1. For a particular future year, one can use the performance model to predict the future condition of a pavement section. Then the future PCI is compared to established PCI trigger values to determine whether the pavement section is eligible for pavement preservation, major work, or reconstruction.

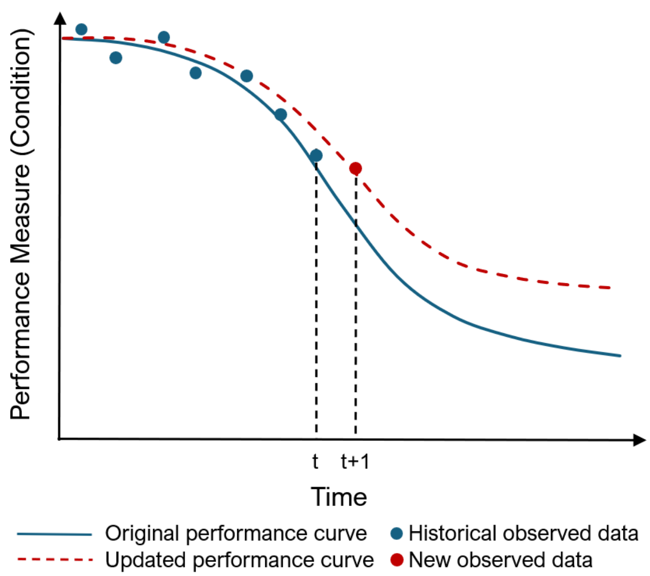


Figure 1—Development of an Updated Performance Curve from Historical Data

DEVELOPMENT OF CUSTOM PREDICTION MODELS FOR ALASKA PMP

Initial performance models developed for the Alaska PMP received further successive refinements after careful review and analysis of the historical PCI survey data. We also consulted with Alaska DOT&PF maintenance and operations (M&O) staff to understand the availability of pavement treatment capabilities, geography, susceptibility to severe storm events and access to the road network to improve the accuracy of the models.

Step 1—Group Airports by Alaska DOT&PF Region

The first attempt at refining the prediction models involved grouping airports together by each of the three regions designated by the Alaska DOT&PF (Northern, Central, Southcoast) shown in Figure 2.

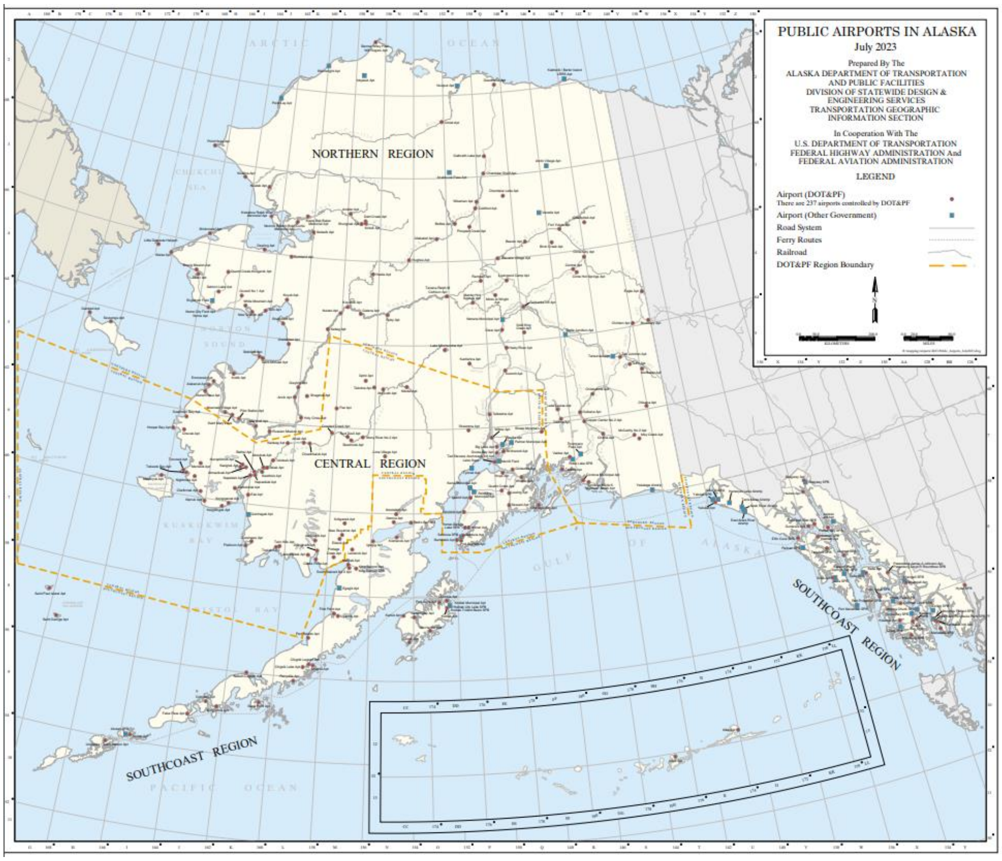


Figure 2—Alaska DOT&PF Region Boundaries[1]

Step 2—Separate Air Carrier Airports from General Aviation Airports

In addition to separating airports by Alaska DOT&PF administrative regions, we distinguished between airports that provide air carrier passenger operations and those airports that did not. The FAA provides an Airport Operating Certificate to airports to allow them to serve airlines providing passenger operations. These Part 139 certificated airports are required to comply with safety and emergency response requirements that are not required at general aviation airports.[2]

We created groups of airports based on the distinctions described in steps 1 and 2 and created runway prediction models for each group. While some improvement was noted, the prediction models still contained a significant number of outlier data points, indicating that further refinement was necessary.

Step 3—Create Subregional Categories

Refinement of the family curves continued by comparison and contrast of past performance among the airports within each of the three regions. In Step 3 we took a closer look at the geographical differences within each region to determine whether further geographic separation

[1] State of Alaska (2024), "Public Airports in Alaska", Official Alaska State Website, accessed on January 20, 2024: https://dot.alaska.gov/stwddes/gis/dataproducts/Public_Airports.pdf

[2] Federal Aviation Administration (2024), "Part 139 Airport Certification," US Department of Transportation, webpage, accessed on January 24, 2024 at: https://www.faa.gov/airports/airport_safety/part139_cert#guidance

would improve the performance models. We developed a straight-line deterioration model for each airport and used this measure to confirm the geographical groupings within each region.

Central Region: We established a boundary in the Central Region that separates airports in the East from those in the West, as shown in Figure 3. The boundary separates airports in the East Subregion (highlighted blue), including the Kenai Peninsula and the vicinity around Anchorage north to Talkeetna, from those in the West Subregion. Upon establishing this boundary, the following distinguishing characteristics became apparent for most of the airports within the East and West Subregions:

Table 1—Central Region Airport Characteristics

Characteristic	East Subregion	West Subregion
On Alaska Road Network	Yes	No
Air Carrier Passenger Service	No	Yes
No. of Frozen Months per Year	<= 6	>= 6
Frost Penetration (ft)	< 7 avg	> 7 or permafrost
Runway PCI Straight-Line Deterioration (pts/yr)	2	3.5

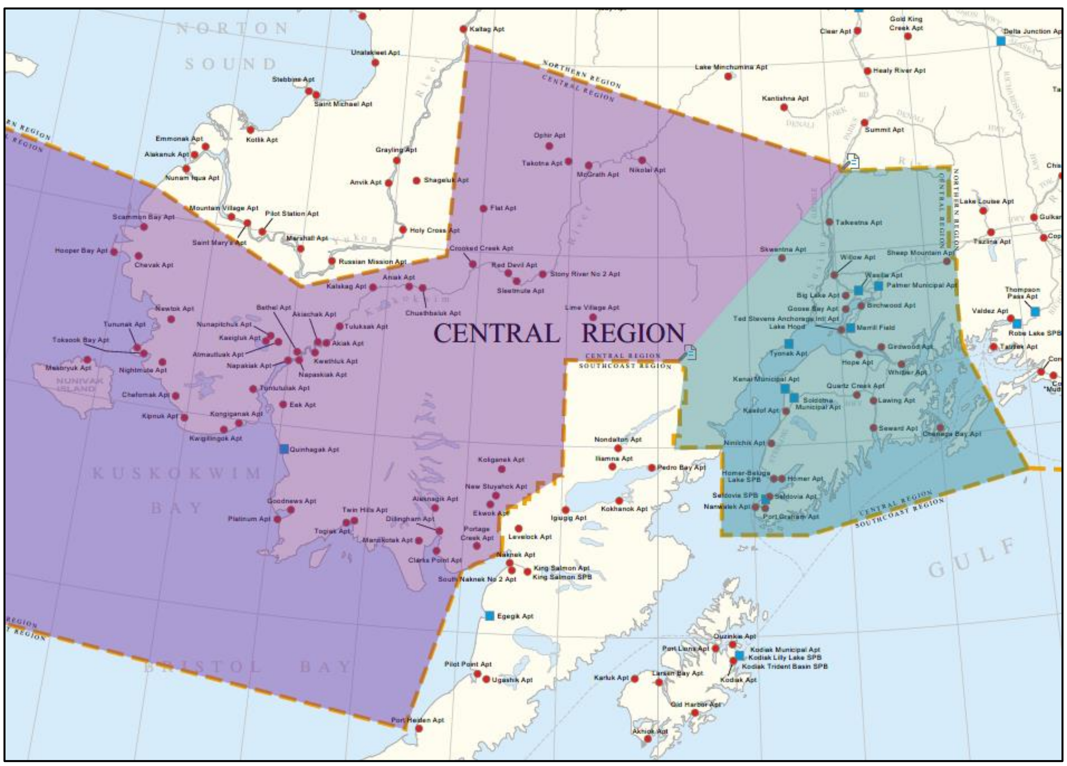


Figure 3—Alaska Central East and West Subregions

Northern Region: In a similar manner as for the Central Region, we established a boundary within the Northern Region to distinguish between those airports in a Coastal zone (highlighted red) in contrast to those in the Interior (highlighted blue) as shown in Figure 4. Based on a review of weather data and passenger enplanement statistics, it became apparent that the airports experience differences in environmental conditions and rates of pavement deterioration. The following distinguishing characteristics are apparent for most of the airports within the Coastal and Interior Subregions:

Table 2—Northern Region Airport Characteristics

Characteristic	Coastal Subregion	Interior Subregion
Western or Dalton M&O Districts	Yes	No
No. of Frozen Months per Year	>= 7	<= 7
On Alaska Road Network	No	Yes
Runway PCI Straight-Line Deterioration (pts/yr)	3.8	2

There were several outlier airports that did not exactly meet these subregional definitions. The outlier airports (highlighted grey) are all within the Tok M&O District, have runway PCIs of less than 40 and have very high runway straight-line deterioration rates. We excluded these outlier data points during the development of the Coastal and Interior Subregion prediction models.

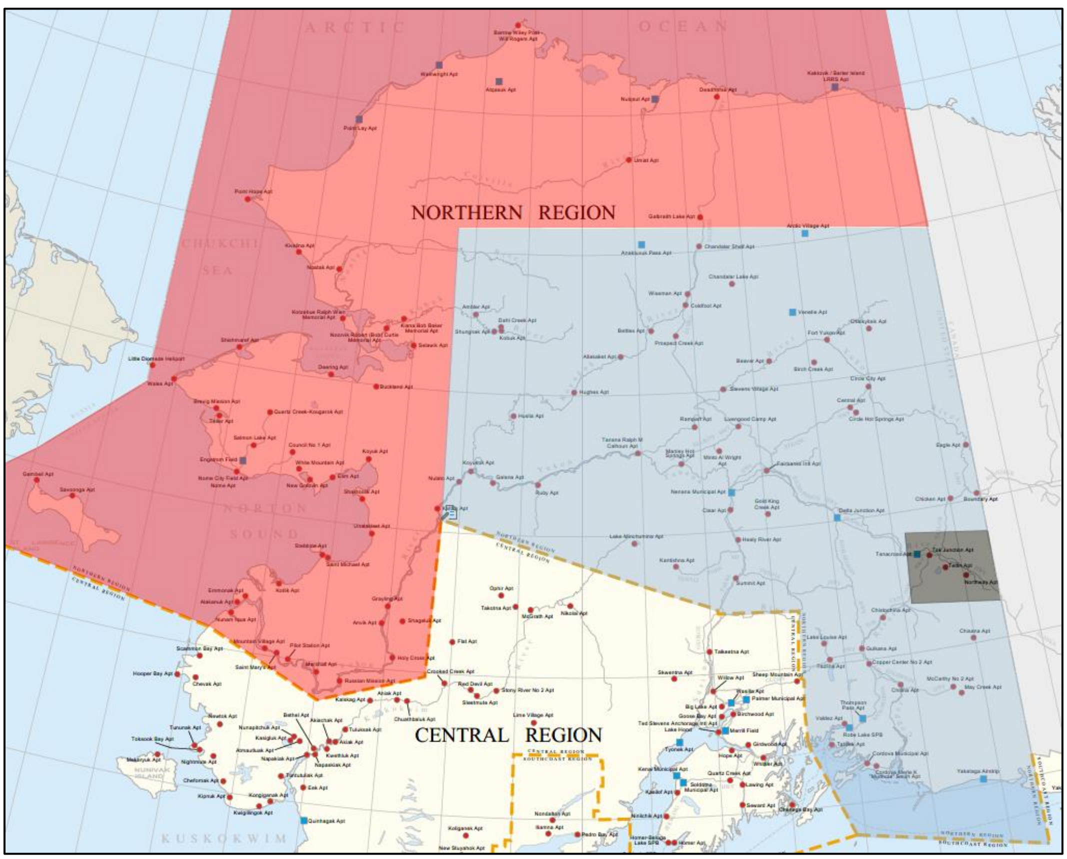


Figure 4—Alaska Northern Subregions

Southcoast Region: The Southcoast region is a vast geographic area that includes the Aleutian Island chain. We initially attempted to refine the performance models around geographic differences, such as Aleutian Island and Continental, but since all the airports in the Southcoast region are influenced by cold, wet weather patterns due to their proximity to the water, the underlying rationale for the geographic separation did not make as much sense as for the other regions. Furthermore, when we attempted an East and West boundary, we observed that the generated prediction models did not conform well to the traditional shape of a pavement deterioration curve and had a high number of outlier data points.

Rather than rely on geographic difference, we explored the direct use of the runway straight-line PCI deterioration model as a method of categorizing each individual runway within the region as shown in Table 3. Of the 23 airports in the Southcoast Region, seven have multiple runways. Since these runways do not always have the same deterioration rate, so we generated a straight-line deterioration rate for each runway. This resulted in three distinct ranges of runway deterioration. A low rate of deterioration less than 1 PCI point per year (highlighted green), a moderate deterioration rate between 1 and 2 PCI points per year (highlighted orange), and a high rate of deterioration of more than 2 PCI points per year (highlighted yellow) as shown in Figure 5.

Table 3—Southcoast Region Airport Characteristics

Characteristic	Low	Moderate	High
Runway PCI Straight-Line Deterioration (pts/yr)	< 1	1-2	> 2

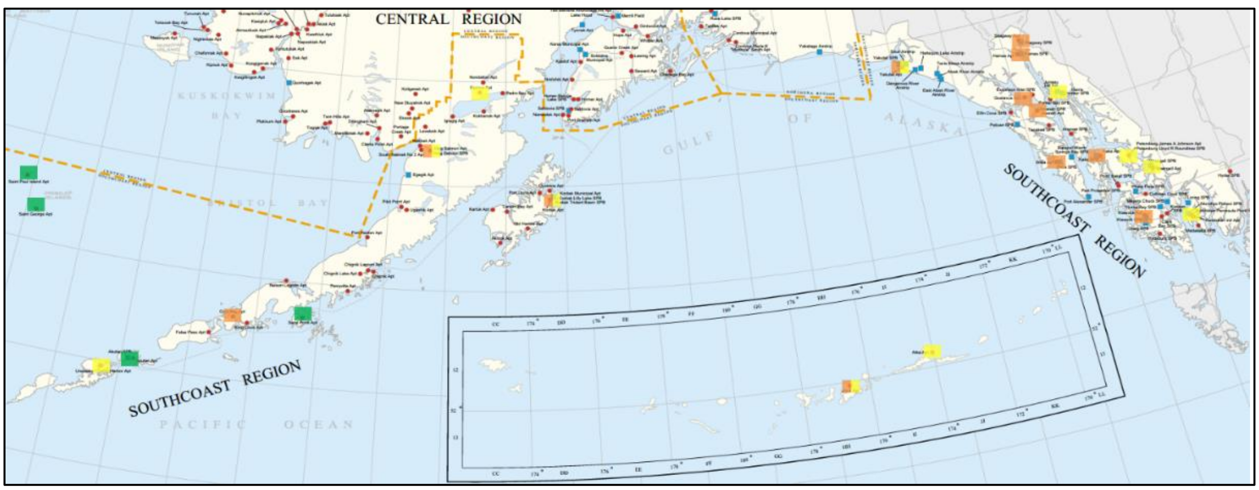


Figure 5—Alaska Southcoast Subregions

Step 4—Prediction Model for Concrete Pavements

The last area of refinement within the Alaska PMP was to separate out airport pavement sections constructed of portland cement concrete (PCC) from those constructed of asphalt concrete (AC). PCC pavements represent less than two percent of the pavements within the Alaska PMP by area, so a single concrete model was developed for use by all concrete pavements.

PREDICTION MODEL SUMMARY

Through a series of sequential refinements and analysis, we grouped the airports in the Alaska PMP into a total of seven categories for use in categorizing AC pavements. For each AC pavement category, we developed two prediction models based on branch use as either a runway or apron/taxiway pavement. This resulted in 14 models for AC airport pavements. With the addition of a single PCC model, this resulted in a total of 15 unique family curves developed for use in the Alaska PMP, as shown in Table 4. Additionally, Table 2 in Appendix A (page 4) shows each airport with respect to the prediction model sub region they are assigned to.

Table 4—Alaska PMP Prediction Models

Region	Sub Region	Branch Use
Central	East	Runway
		Apron / Taxiway
	West	Runway
		Apron / Taxiway
Northern	Coastal	Runway
		Apron / Taxiway
	Interior	Runway
		Apron / Taxiway
Southcoast	Low Runway Deterioration	Runway
		Apron / Taxiway
	Moderate Runway Deterioration	Runway
		Apron / Taxiway
	High Runway Deterioration	Runway
		Apron / Taxiway
All Concrete		

Figure 6 through Figure 20 are graphical depictions of the family curves in the PAVER software. Each prediction model is characterized by an equation and relevant statistics that describe the closeness of fit.

Central East

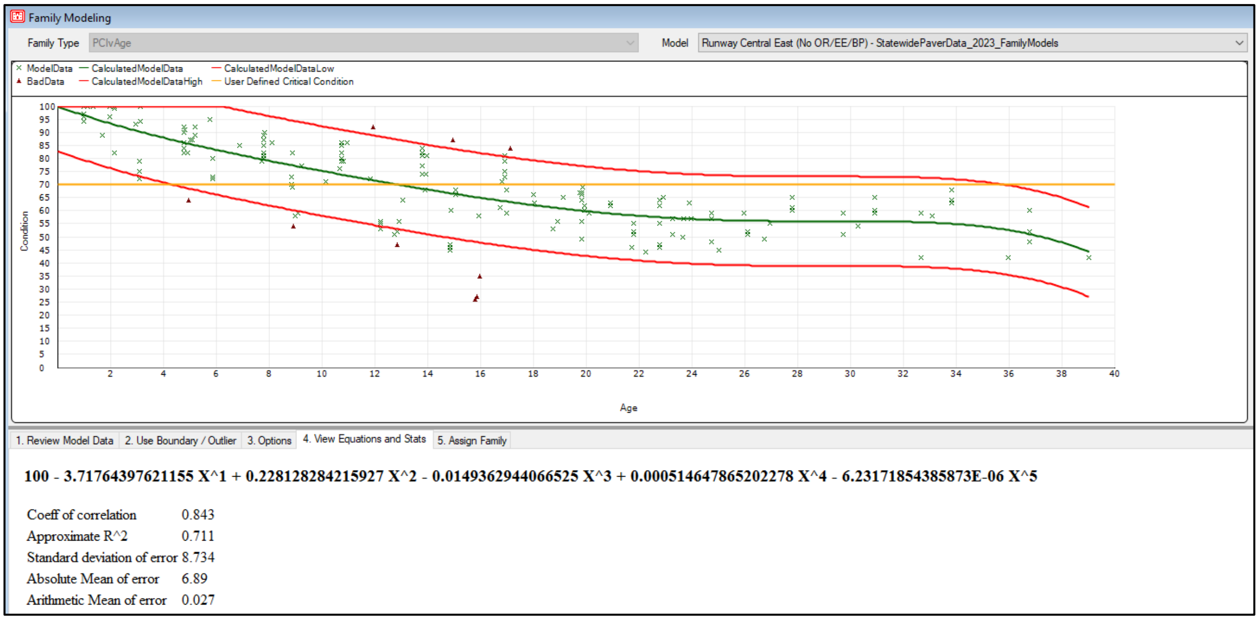


Figure 6—Central East Runway Model

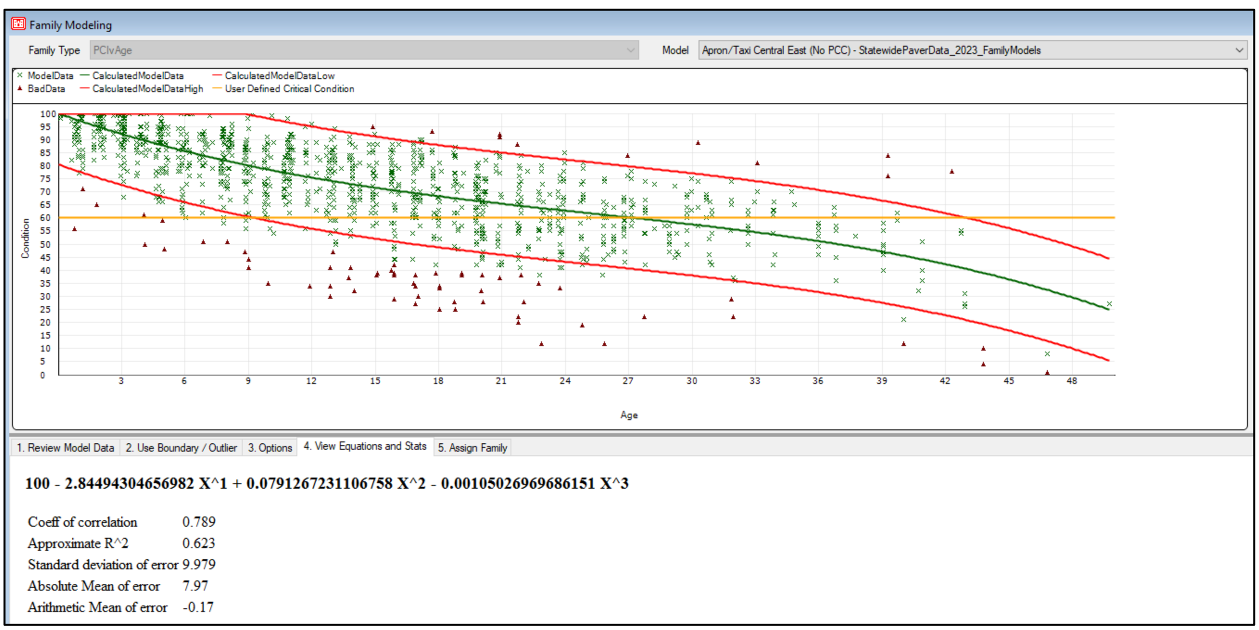
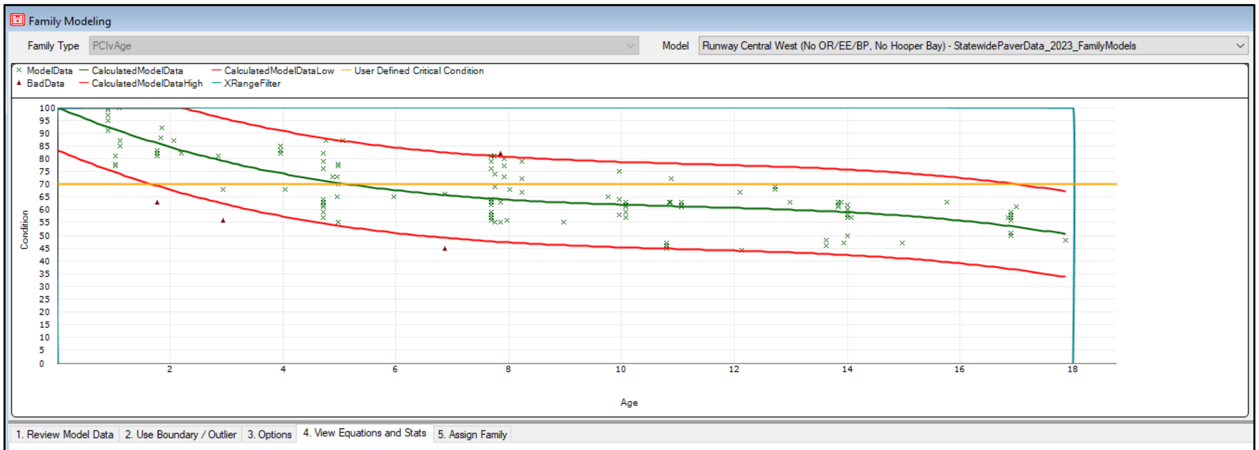


Figure 7—Central East Apron and Taxiway Model

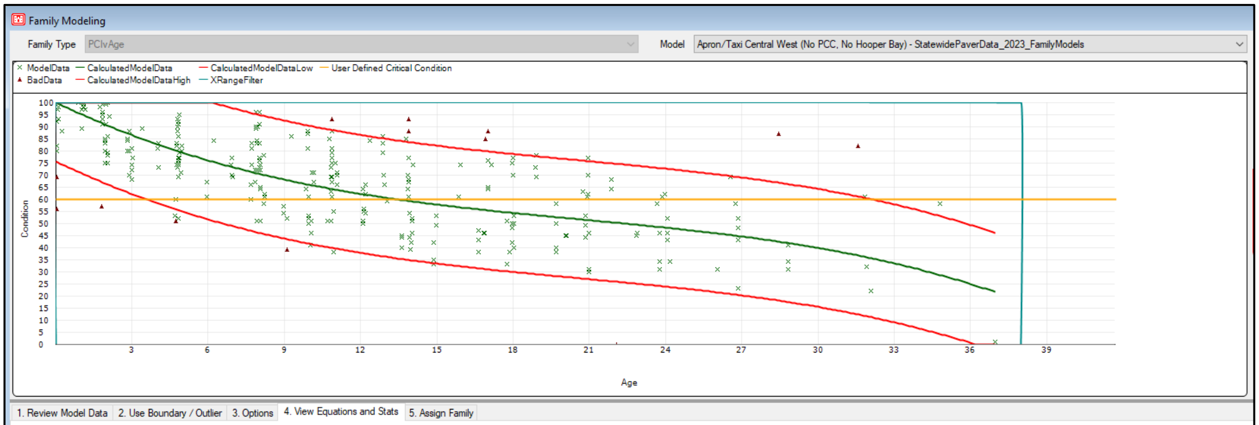
Central West



100 - 9.14438533782959 X^1 + 0.760370671749115 X^2 - 0.0225924849510193 X^3

Coeff of correlation	0.769
Approximate R^2	0.591
Standard deviation of error	8.527
Absolute Mean of error	6.844
Arithmetic Mean of error	-0.152

Figure 8—Central West Runway Model



100 - 5.07948732376099 X^1 + 0.198569536209106 X^2 - 0.00320671917870641 X^3

Coeff of correlation	0.777
Approximate R^2	0.603
Standard deviation of error	12.441
Absolute Mean of error	10.11
Arithmetic Mean of error	-0.316

Figure 9—Central West Apron and Taxiway Model

Northern Coastal

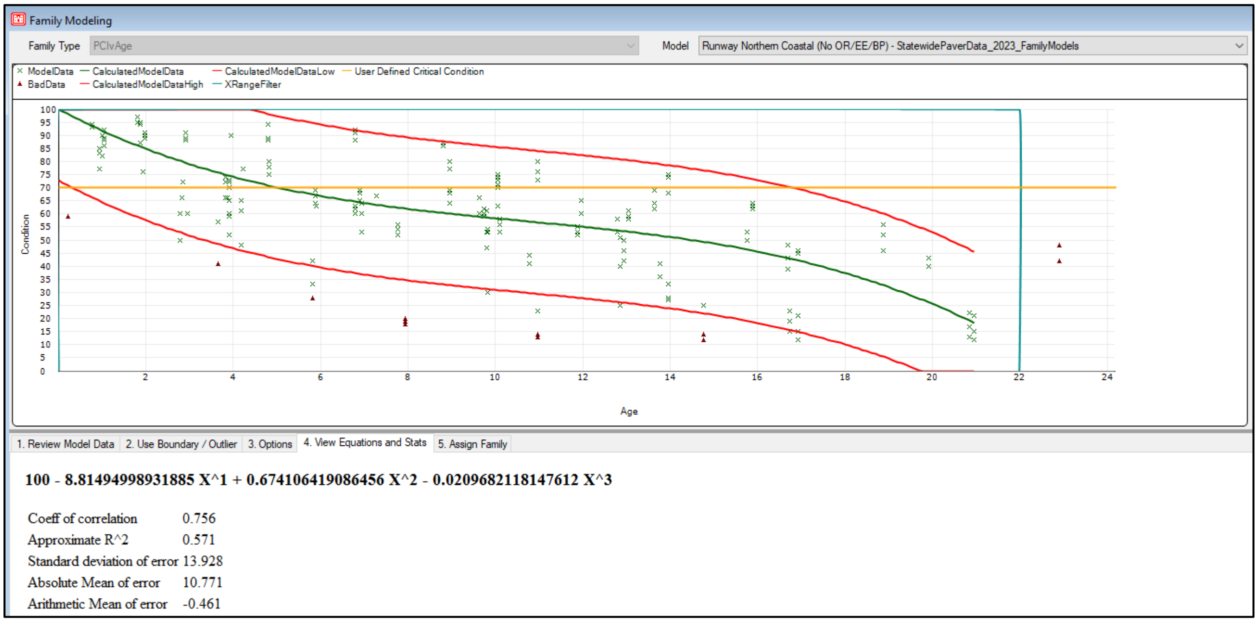


Figure 10—Northern Coastal Runway Model

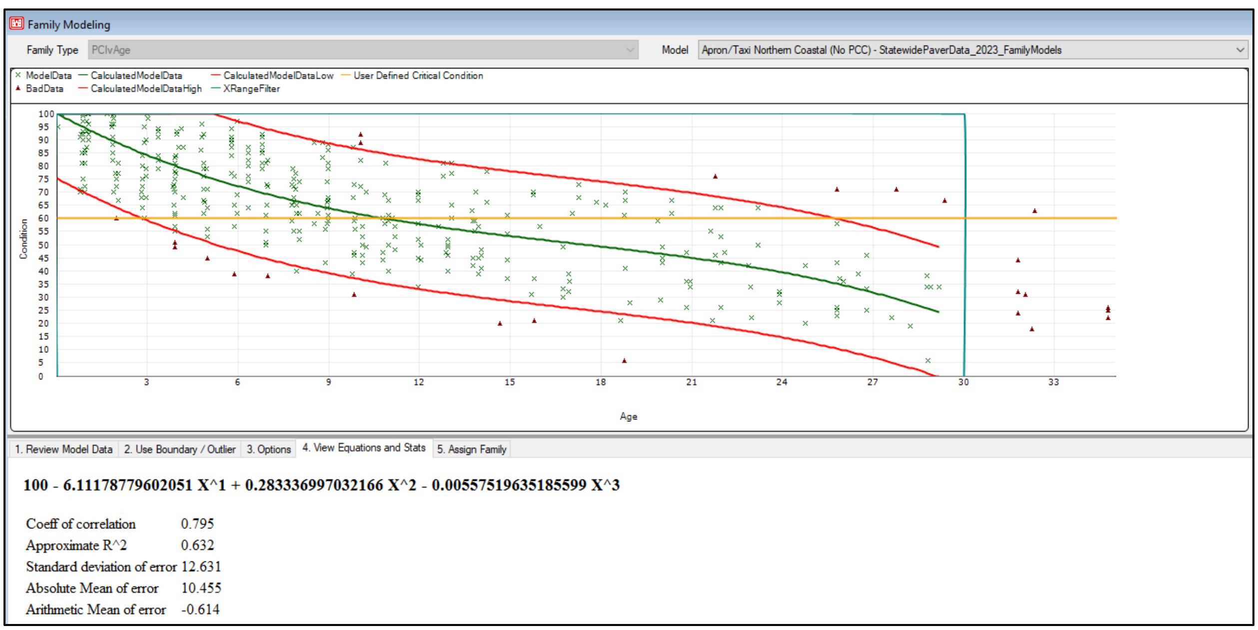
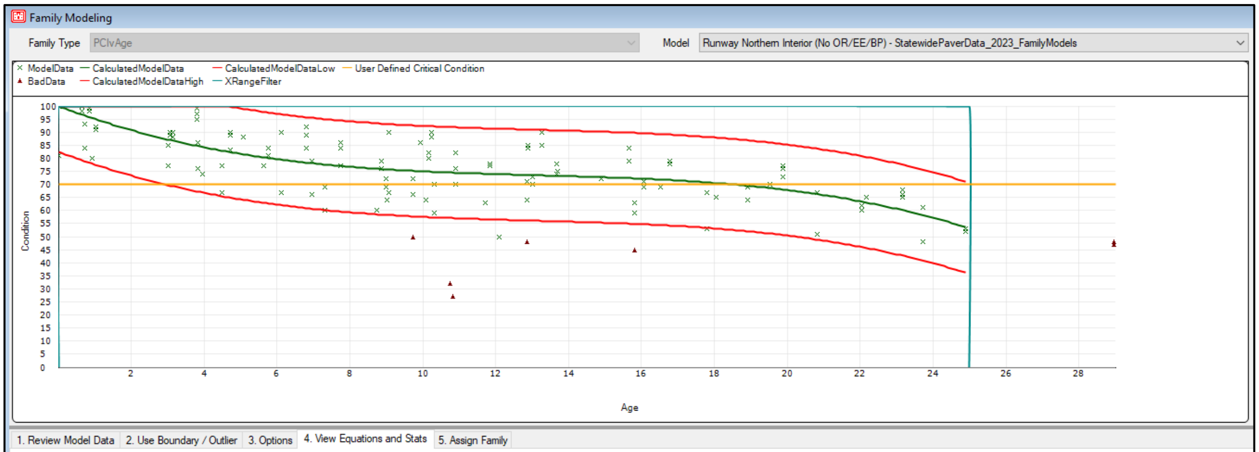


Figure 11—Northern Coastal Apron and Taxiway Model

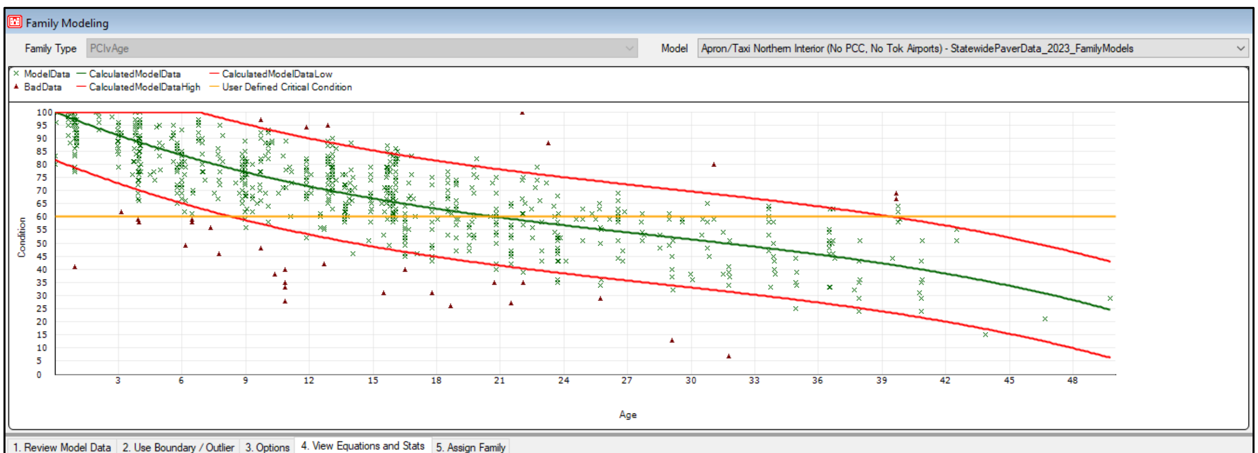
Northern Interior



100 - 5.2913064956665 X^1 + 0.373746752738953 X^2 - 0.00947951525449753 X^3

Coeff of correlation	0.71
Approximate R^2	0.504
Standard deviation of error	8.885
Absolute Mean of error	6.912
Arithmetic Mean of error	-0.651

Figure 12—Northern Interior Runway Model



100 - 3.21380829811096 X^1 + 0.0818066671490669 X^2 - 0.000958040298428386 X^3

Coeff of correlation	0.848
Approximate R^2	0.719
Standard deviation of error	9.347
Absolute Mean of error	7.444
Arithmetic Mean of error	-0.395

Figure 13—Northern Interior Apron and Taxiway Model

Southcoast Low Deterioration

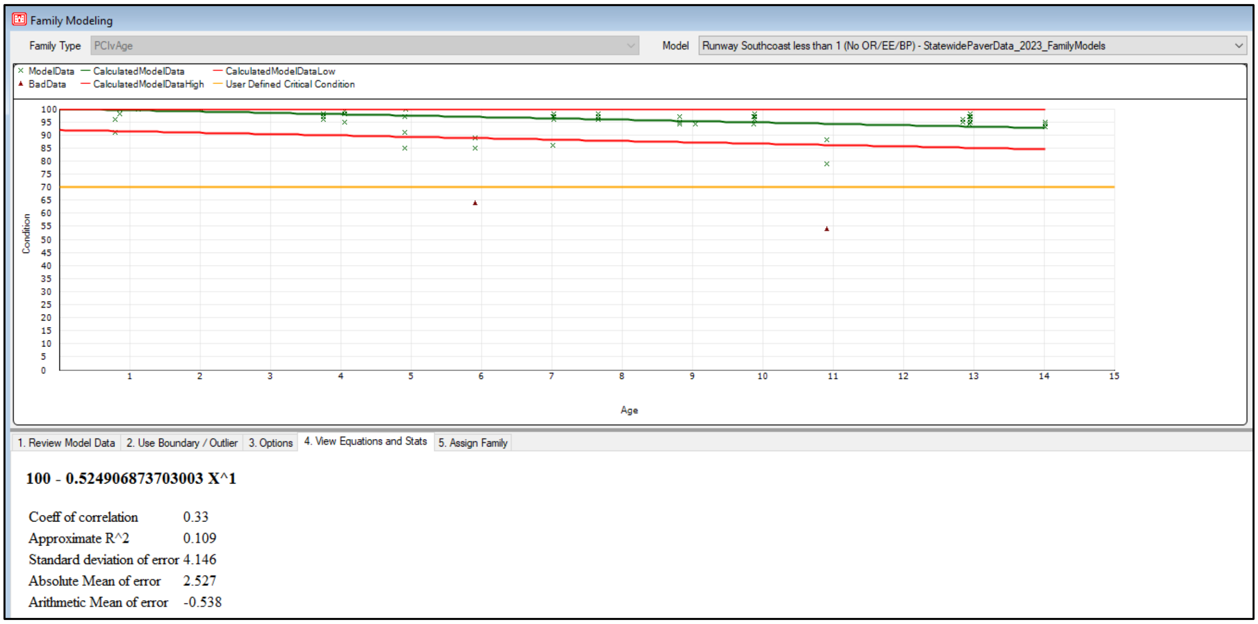


Figure 14—Southcoast Low Deterioration Runway Model

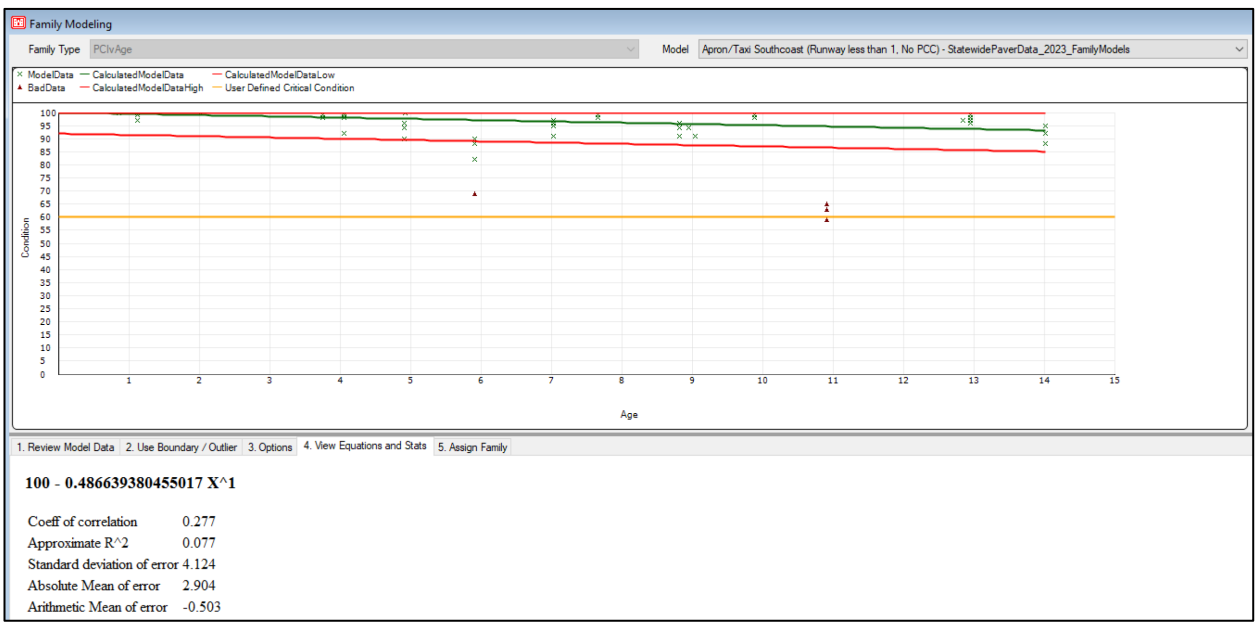


Figure 15—Southcoast Low Deterioration Apron and Taxiway Model

Southcoast Moderate Deterioration

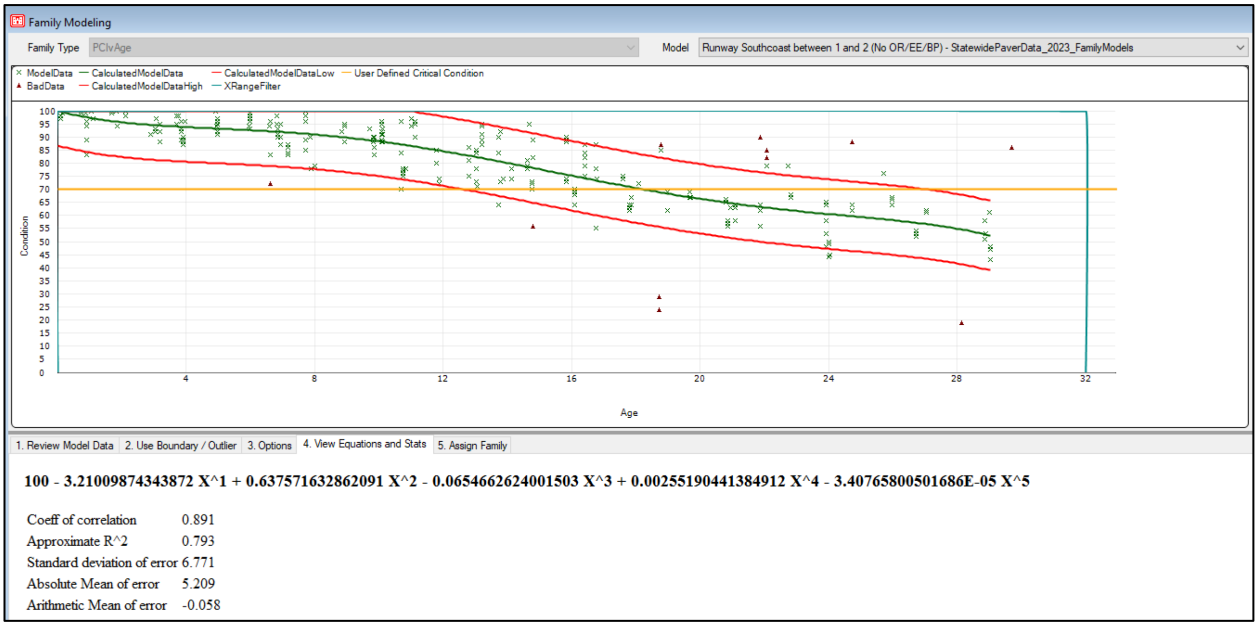


Figure 16—Southcoast Moderate Deterioration Runway Model

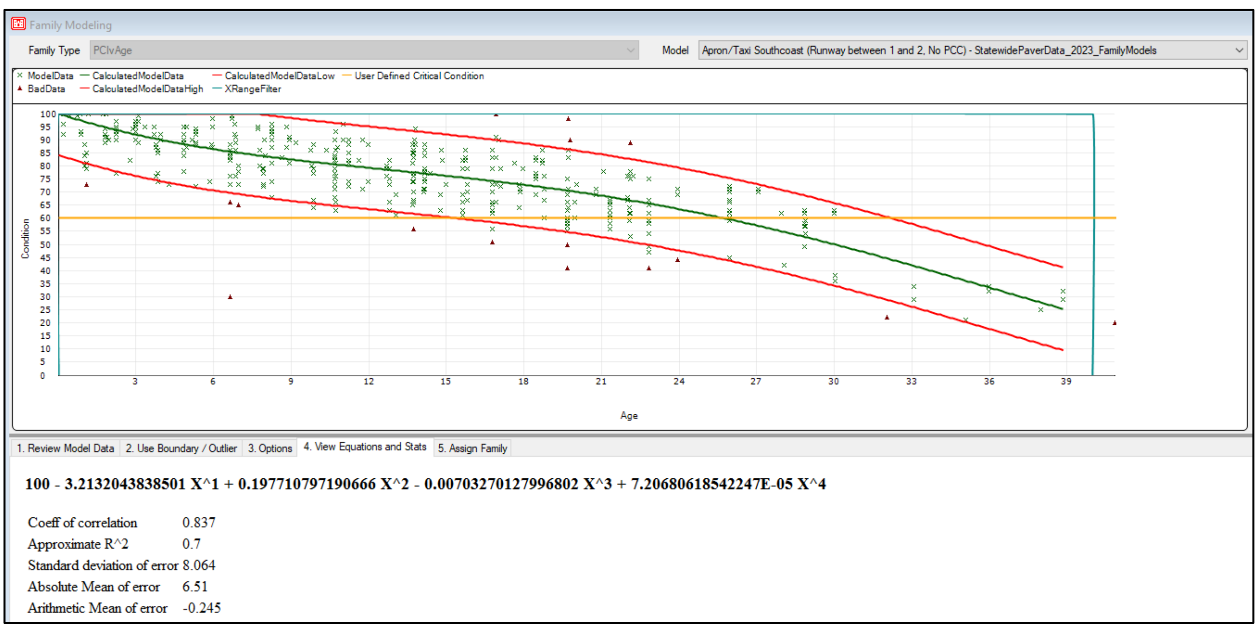
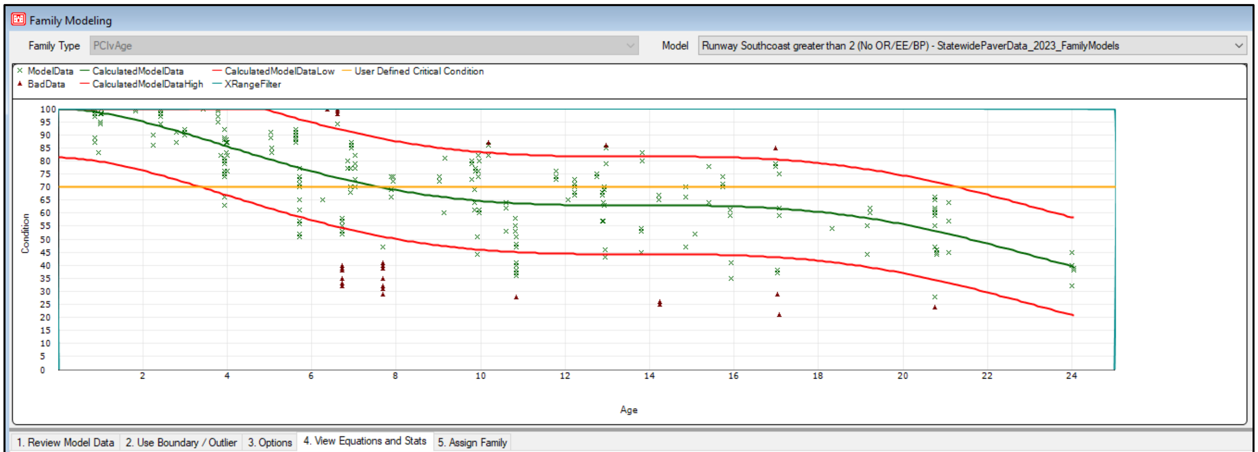


Figure 17—Southcoast Moderate Deterioration Apron and Taxiway Model

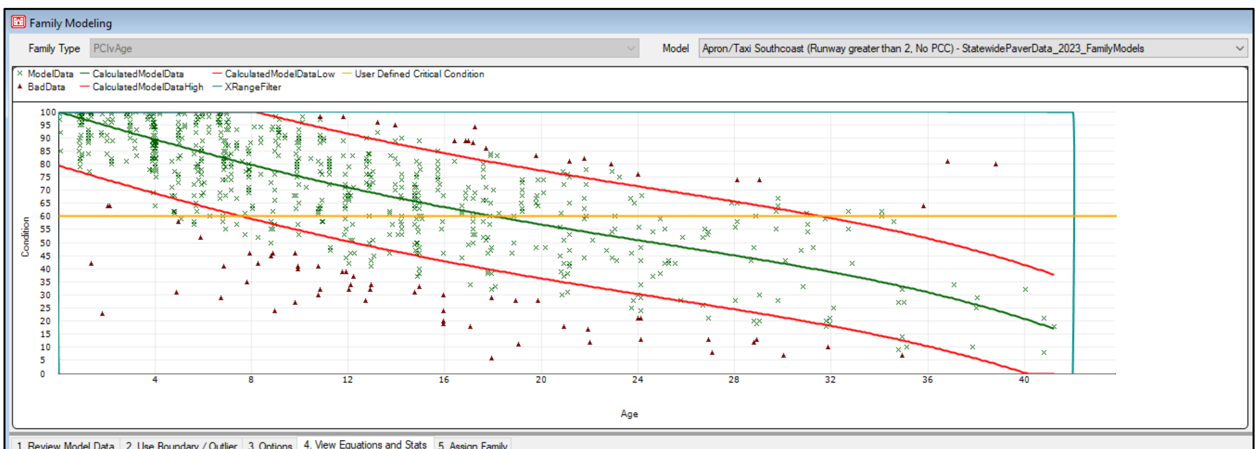
Southcoast High Deterioration



100 - 0.292630881071091 X^1 - 1.40631377696991 X^2 + 0.173453271389008 X^3 - 0.00764967547729611 X^4 + 0.000112635563709773 X^5

Coeff of correlation	0.792
Approximate R^2	0.627
Standard deviation of error	11.384
Absolute Mean of error	8.904
Arithmetic Mean of error	-0.049

Figure 18—Southcoast High Deterioration Runway Model



100 - 2.73050570487976 X^1 + 0.0160349849611521 X^2 + 0.00119809329044074 X^3 - 2.82131077256054E-05 X^4

Coeff of correlation	0.796
Approximate R^2	0.634
Standard deviation of error	12.518
Absolute Mean of error	10.202
Arithmetic Mean of error	-0.233

Figure 19—Southcoast High Deterioration Apron and Taxiway Model

All Concrete

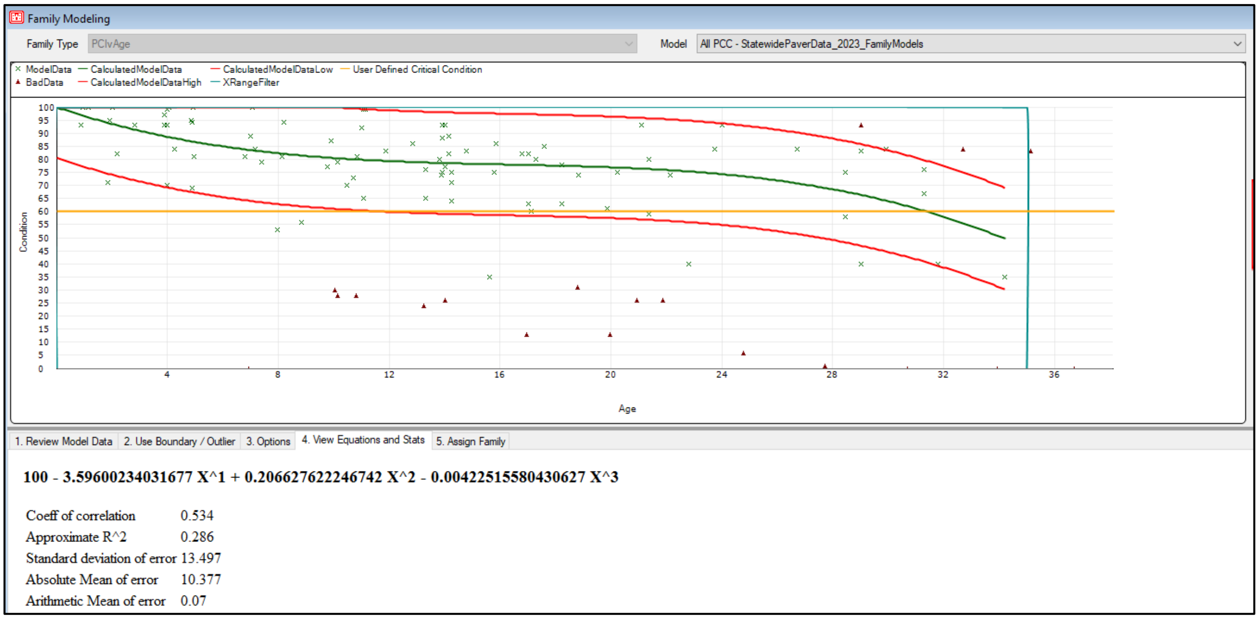


Figure 20—Concrete Model

SUMMARY

A good pavement performance model is essential for effective pavement management and provides a solid base for timely and reasonable pavement maintenance and rehabilitation decision-making. Pavement performance deterioration is a dynamic process and pavement inspections need to be conducted routinely so that pavement performance data can be updated regularly. We have completed the development of pavement prediction models for use in the Alaska PMP.

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Appendix C
Alaska Airport
Pavement Management Program
2023 Unit Cost Analysis Report

May 2024

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INTRODUCTION

This report documents the development of pavement treatment unit costs for use in the Airport Pavement Management Program (PMP). Unit costs are used to predict annual pavement maintenance and repair (M&R) budgets for paved airports within Alaska.

Derivation of appropriate pavement M&R unit costs is not trivial. First, pavement unit costs were derived from a sample of actual construction projects completed by Alaska DOT&PF during the period 2005 to 2024. We carefully reviewed the projects, assigned them to a category of work, removed any costs unrelated to pavement M&R (i.e. fencing, access roads, building, generators, etc.), and computed a unit cost for the pavement treatment based on the pavement area constructed. We then developed a method of standardizing pavement M&R costs around the state to a single location—Anchorage—by use of published heating fuel prices. Lastly, we ensured that unit costs were adjusted to a standard year of analysis—2023.

Through this process, we developed unit costs for a variety of pavement M&R treatments in four categories: Pavement Preservation and Corrective Maintenance, Rehabilitation, Reconstruction and Permafrost Reconstruction and Repair.

BACKGROUND

The recommendations shown in Figure 1 are based on maintaining the airports at the Legislative standards[1]. Note that a series of preservation treatments can extend the pavement life more economically than waiting until more major preservation treatments are required.

Guideline for Determination of Action to be Taken for a Given PCI Rating

Runways	Taxiways/Aprons	Action
100 - 70	100 - 60	Preventative Maintenance
69 - 40	59 - 40	Corrective Maintenance/Rehabilitate
39 - 0	39 - 0	Reconstruct

Figure 1—Alaska Maintenance Definitions of Recommendations

Alaska DOT&PF uses the PCI to set policies to determine the type of pavement treatment to be applied but is constrained by budgets that are available. The PAVER software is used to generate optimal solutions for airport pavement management decisions.

Pavement preservation treatments are applied to the surface of the existing pavement and include crack sealing, asphalt patching of localized distresses, seal coats to control weathering or raveling, etc. These treatments do not affect other operating systems at an airport such as lighting. They take a short lead time to implement, have relatively low unit costs, and may not raise the PCI but will retard the pavement deterioration to extend the useful life.

[1] Pavement Management and Preservation Airport Pavement Condition Reporting, Official Alaska State Website, accessed on January 20, 2024: https://dot.alaska.gov/stwddes/asset_mgmt/airport_pave.shtml

Pavement rehabilitation is the cost-effective repair which may strengthen the pavements structural layers. Rehabilitation is triggered when the pavement PCI falls into the range of 40 to 69. As a result of rehabilitation, the PAVER software resets the pavement PCI to 100, however, the condition after rehabilitation is dependent on the quality of construction and the overlaid surface. Rehabilitation activities generally provide a long-term benefit to the pavement in contrast to the short-term benefit provided by surface treatments. Rehabilitation improves performance methods and materials to extend the useful life of the pavement. Consequently, the unit costs of rehabilitation activities are much higher than those of preservation treatments. Also, and take a longer lead time for Alaska DOT&PF to accomplish this work.

Pavement reconstruction is required when the PCI is below 40, but reconstruction may be economical when PCI values range from 40-54 and requires rebuilding the entire pavement (structural section). A long lead time is required to design and reconstruct a pavement section as all the related components are affected such as utilities, right of way, environmental issues, maintaining airport functionality during construction. Thus, a very high unit cost is generated. Again, PAVER resets the PCI to 100 for Reconstruction, but it depends on the quality of the construction and materials.

LITERATURE REVIEW

We conducted a review of relevant literature on the topic of pavement preservation treatments. In particular there are two specific studies that appear relevant to the development of unit costs for airport M&R in Alaska:

1. Airport Cooperative Research Program Synthesis 22, ***"Common Airport Pavement Maintenance Practices,"*** was published in 2011 and provides a review of the effectiveness of surface treatments in airport applications.
2. Alaska DOT&PF Research funded a 2012 report that establishes unit costs, service life and treatment timing for pavement preservation treatments in Alaska. Report No. FHWA-AK-RD-12-14, ***"Develop Guidelines for Pavement Preservation Treatments and for Building a Pavement Preservation Program Platform for Alaska"***, was authored by R. Gary Hicks, DingXin Cheng, Hannele Zubeck, Jenny Liu, and Tony Mullins.

The following summary statements describe essential findings from the Alaska DOT&PF funded report, which appears to be highly relevant to pavement preservation on Alaska airports.

- A wide range of surface treatments and other preservation treatments have been used successfully in cold climates.
- Unit costs for many treatments are presented, but the costs are for the lower 48.
- Five preservation treatments have been used in the State of Alaska, including:
    1. Thin HMA overlays
    2. Chip seals
    3. Slurry seal and microsurfacing
    4. Crack sealing
    5. Saw cut and seal joints

The timing between the treatments and the service life do not necessarily match. Current policy and available funding affect the spacing between the treatments in addition to the actual pavement surface condition. Typical treatment timing, as reported by Hicks et. al. is presented in **Error! Reference source not found.**.

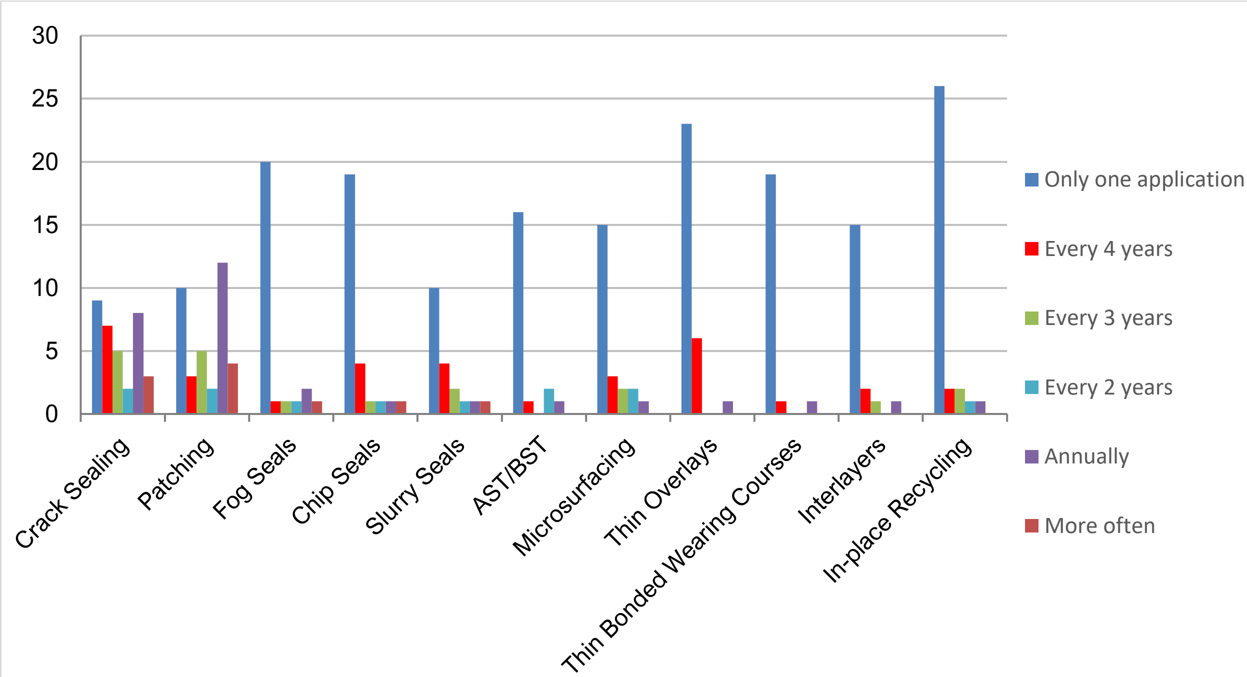

Figure 2—Typical Treatment Timing

The average service life of the various surface treatments as assessed by Hicks et. al. are presented in **Error! Reference source not found.**.

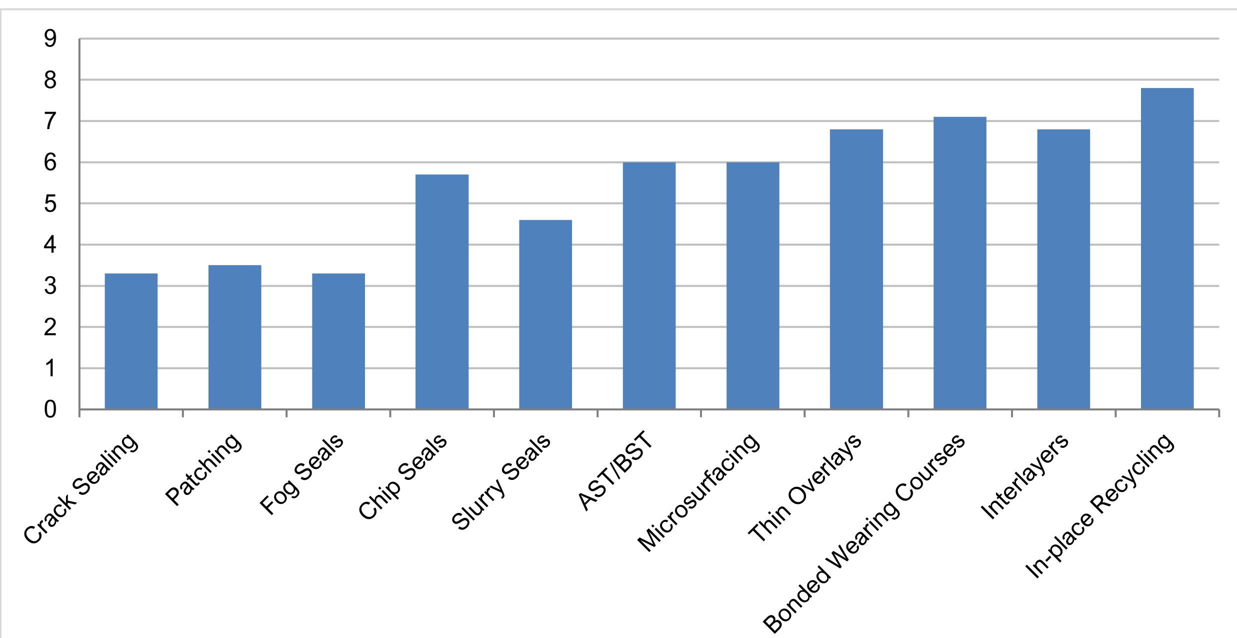

Figure 3—Average Treatment Service Life

Hicks et. al. developed a summary of treatment costs which are shown in Figure 4 and Table 1.

	Crack Sealing	Patching	Fog Seals	Chip Seals	Slurry Seals	AST/BST	Microsurfacing	Thin Overlays	Bonded Wearing Courses	Interlayers	In-place Recycling
USA											
Maine	**7,500/ mile**		**17,000/ mile**				**91,800/ mile**	**150,000/mile**			**500,000/ mile**
Michigan	**4,500/ mile**		**0.50/yd^2**	**1.51/yd^2 (single chip seal)**			**3.50/yd^2 (two course)**	**60/ton**	**5.5/yd^2**		
Minnesota	**2,500/mi le**			**26,000/ mile**			**37,000/ mile**	**60,000/ mile**	**65,000/ mile**		**400,000/ mile**
New Hampshire	**0.90/ lb**			**2.15/yd^2**			**3.00/yd^2**	**2.70/yd^2**	**6.0/yd^2**	**10.0/yd^2**	**6.0/yd^2**
New York	**5,000/lan e mile**		**10,000/ lane mile**	**20,000/ lane mile**	**15,000/ lane mile**		**40,000/ lane mile**	**50,000/ lane mile**	**50,000/ lane mile**		**120,000/ lane mile**
Wisconsin (Dane County)	**5,000/lan e mile**	**8,000/ lane mile**	**varies**	**13,000/ lane mile**	**varies**		**28,000/ lane mile**	**40,000/ lane mile**			
Canada											
Entire Country	**2-4 /m**	**30-40 /m^2**	**11 /m^2**	**10 /m^2**	**11 /m2**	**16 /m^2**	**7 /m^2**	**20 /m^2**	**45 /m^2**		**50 /m^2**
British Colombia	**10 /m**	**20/m^2**		**10/m^2**	**120,000/ lane km**	**100,000/ lane km**	**10/m**	**20/m^2**		**10/m^2**	**$120,000/ lane km**
Northern Canada		**300/km**				**50,000/km**	**75,000/km**	**225,000/ km**		**250,000/km**	
Nordic Countries											
Denmark	**3.40/m**	**37.00/m**	**1.80/m^2**	**5.80/m^2**		**5.60/m^2**			**24.80/m^2**	**3.40/m**	**37.00/m**
Sweden	**37/m^2**	**22/m^2**	**2.3/m^2**	**2.4/m^2**	**2.4/m^2**	**2.0/m^2**		**9.0/m^2**	**9.8/m^2 (incl. surface planing)**	**13/m^2**	**6.8/m^2**
Finland											**3.0/m^2**
China											
Northeast	**2/m^2**	**2/m^2**	**1/m^2**	**2/m^2**	**1.5/m^2**	**1/m^2**	**4/m^2**	**7/m^2**		**8/m^2**	

Figure 4—Summary of Treatment Costs

Table 1—Summary of Treatment Unit Costs

Treatment	Relative Cost ($ to $$$$)	Estimated Unit Cost
Crack filling	$	$0.10 to $1.20/ft
Crack sealing	$	$0.75 to $1.50/ft
Slurry seal	$$	$0.75 to $1.00/yd^2
Microsurfacing (single-course)	$$	$1.50 to $3.00/yd^2
Chip seal (single-course)	$$(conventional)	$1.50 to $2.00/yd^2 (conventional)
Chip seal (single-course)	$$$ (polymer modified)	$2.00 to $4.00/yd^2 (polymer modified)
Ultra-thin bonded wearing course	$$$	$4.00 to $6.00/yd^2
Thin HMA overlay (dense-graded)	$$$	$3.00 to $6.00/yd^2
Cold milling and thin HMA overlay	$$$	$5.00 to $10.00/yd^2
Ultra-thin HMA overlay	$$	$2.00 to $3.00/yd^2
Hot in-place recycling (excluding thin HMA overlay for surface recycle and remixing types)	$$/$$$	$2.00 to $7.00/yd^2
Cold in-place recycling (excluding thin HMA overlay)	$$	$1.25 to $3.00/yd^2
Profile milling	$	$0.35 to $0.75/yd^2
Ultra-thin whitetopping	$$$$	$15.00 to $25.00/yd^2
Note: $ = low cost; $$ = moderate cost; $$$ = high cost; $$$$ = very high cost.		

ALASKA DOT&PF STAFF INTERVIEWS

A questionnaire was sent to each of Alaska DOT&PF regions and Headquarters in the winter of 2022-2023 requesting information and cost data on the preservation treatments that M&O uses. The response was that typically only crack sealing and localized pavement patching was performed by Maintenance and Operations (M&O) staff when material and equipment were available, and that unit cost data was not available from the State accounting system. Other preservation treatments were AIP funded and the work was contracted. Records indicated that two surface seal contracts were AIP funded and other AIP preservation treatments were processed through Alaska DOT&PF Design and Construction.

Table 2 summarizes the responses to the M&O questionnaire sent to Alaska DOT&PF staff regarding pavement maintenance, rehabilitation, and reconstruction (M&R) activities.

Table 2—Summary of Responses to M&O Questionnaire

PAVER Network ID	Part 139 (Y/N)	On Road Network (Y/N)	Crack Seal Freq (Yr)	Seal Equip Onsite (Y/N/M)	Treatment Candidate (Y/N)	Crack Seal (Y/N)	Cold Patch (Y/N)	HMA Patch (Y/N)	Seal Coat (Y/N)	HMA Overlay (Y/N)	Mill & Fill (Y/N)	Mill, Stabilize Base, Pave (Y/N)	Reconstruct, Rebuild Str Section (Y/N)
Adak	Y	N	none	Y	Y	Y	Y	N	Y	Y	Y	N	N
Akutan	N	N	5	N	Y	Y	Y	N	Y	Y	Y	N	N
Aniak	N	N	3	Y	N	Y	Y	N	Y	Y	Y	Y	Y
Atka	N	N	none	N	Y	Y	Y	N	Y	Y	Y	Y	N
Barrow	Y	N	1	Y	N	Y	Y	N	Y	Y	Y	Y	Y
Bethel	Y	N	1	Y	N	Y	Y	N	Y	Y	Y	Y	Y
Birchwood	N	Y	5	M	Y	Y	Y	Y	Y	Y	Y	Y	N
Clear	N	Y	5	N	Y	Y	Y	N	Y	Y	Y	N	N
Cold Bay	Y	N	none	N	Y	Y	Y	N	Y	Y	Y	Y	N
Cordova	Y	N	1	Y	Y	Y	Y	N	Y	Y	Y	Y	N
Deadhorse	Y	Y	1	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
Dillingham	Y	N	1	Y	Y	Y	Y	N	Y	Y	Y	N	N
Fairbanks	Y	Y	1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Galena	N	N	3	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
Gambell	N	N	5	M	N	Y	Y	N	Y	Y	Y	Y	Y
Gulkana	N	Y	3	N	N	Y	Y	N	Y	Y	Y	Y	Y
Gustavus	Y	Y	none	N	Y	Y	Y	N	Y	Y	Y	Y	N
Haines	N	Y	none	N	N	Y	Y	N	Y	Y	Y	Y	N
Healy R.	N	Y	3	N	Y	Y	Y	N	Y	Y	Y	Y	N
Homer	Y	Y	1	M	N	Y	Y	Y	Y	Y	Y	Y	N
Hoonah	N	N	none	N	Y	Y	Y	N	Y	Y	Y	Y	N
Iliamna	N	N	Bi-annual	Y	Y	Y	Y	N	Y	Y	Y	Y	N
Juneau	Y	Y	1	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Kake	N	N	none	N	N	Y	Y	N	Y	Y	Y	Y	N
Kenai	Y	Y	3	N	Y	Y	Y	Y	Y	Y	Y	Y	N
Ketchikan	Y	Y	3	N	Y	Y	Y	N	Y	Y	Y	Y	N
KingSalmon	Y	N	annual	Y	Y	Y	Y	N	Y	Y	Y	Y	N
Klawock	N	N	none	N	N	Y	Y	N	Y	Y	Y	Y	N
Kodiak	Y	Y	none	N	Y	Y	Y	Y	Y	Y	Y	N	N
Kotzebue	Y	N	1	Y	N	Y	Y	N	Y	Y	Y	Y	
McGrath	N	N	3	Y	N	Y	Y	N	Y	Y	Y	N	N
Merrill	N	Y	3	N	Y	Y	Y	N	Y	Y	Y	Y	
Nenana	N	Y	3	N	Y	Y	Y	N	Y	Y	Y	N	N
Nome	Y	Y	1	Y	Y	Y	Y	N	Y	Y	Y	Y	
Northway	N	Y	3	N	Y	Y	Y	N	Y	Y	Y	N	N
Palmer	N	Y	3	N	Y	Y	Y	Y	Y	Y	Y	Y	N
Petersburg	Y	N	none	N	Y	Y	Y	N	Y	Y	Y	Y	

Table 2—Summary of Responses to M&O Questionnaire (cont)

PAVER Network ID	Part 139 (Y/N)	On Road Network (Y/N)	Crack Seal Freq (Yr)	Seal Equip Onsite (Y/N/M)	Treatment Candidate (Y/N)	Crack Seal (Y/N)	Cold Patch (Y/N)	HMA Patch (Y/N)	Seal Coat (Y/N)	HMA Overlay (Y/N)	Mill & Fill (Y/N)	Mill, Stabilize Base, Pave (Y/N)	Reconstruct, Rebuild Str Section (Y/N)
Sand Point	Y	N	none	N	Y	Y	Y	N	Y	Y	Y	Y	N
Seward	N	Y	5	M	Y	Y	Y	N	Y	Y	Y	Y	Y
Shishmaref	N	N	5	Y	N	Y	Y	N	Y	Y	Y	Y	N
Sitka	Y	N	none	N	N	Y	Y	N	Y	Y	Y	Y	
Skagway	N	Y	none	N	Y	Y	Y	N	Y	Y	Y	Y	N
Soldotna	N	Y	3	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
StGeorge	N	N	none	N	Y	Y	Y	N	Y	Y	Y	N	N
StPaul	N	N	none	N	Y	Y	Y	N	Y	Y	Y	N	N
Talkeetna	N	Y	5	M	Y	Y	Y	N	Y	Y	Y	Y	Y
Tok	N	Y	5	N	Y	Y	Y	N	Y	Y	Y	N	N
Unalakleet	N	N	5	Y	Y	Y	Y	N	Y	Y	Y	N	N
Unalaska	Y	N	1	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
Valdez	Y	Y	1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Wasilla	N	Y	3	N	Y	Y	Y	Y	Y	Y	Y	N	N
Wrangell	Y	N	none	M	Y	Y	Y	N	Y	Y	Y	Y	Y
Yakutat	Y	N	none	M	Y	Y	Y	N	Y	Y	Y	Y	Y

AIRPORT PAVEMENT TREATMENTS

The following airport pavement treatments have been used in Alaska and were selected to develop unit cost data for use in the Alaska Airport Pavement Management Program.

Pavement Preservation and Corrective Maintenance

- Crack Sealing/Joint Sealing
- Patching
- Grinding
- Slab Replacement

Global Surface Treatments

- Surface Seal
    - Emulsified Asphalt Seal Coat (P-608)
    - Rapid Cure Seal Coat (P-608-R)
    - Sand Seal (P-633)

Rehabilitation

- Minor Rehabilitation – AC
    - HMA Overlay
    - Mill and HMA Overlay
- Major Rehabilitation
    - Base Reclamation and HMA Overlay
    - Base Reclamation with Stabilization and HMA Overlay
    - Partial Depth Reconstruction

Reconstruction

- Complete Reconstruction
    - Reconstruct with Subgrade Stabilization
    - Reconstruct with Subgrade Repair

EVALUATION OF ALASKA DOT&PF PROJECT COSTS

Alaska DOT&PF provided a list of 55 recent airport contracts including project cost data. The project information included enough information to understand the Alaska DOT&PF design and construction costs, the Contractor's price to perform the work, the type of pavement treatment, and the area of pavement treated.

Total Project Cost vs Pavement Treatment Cost

Based on our review and understanding of project costs, the Total Pavement Project Cost reported in each of the 55 contract packages reviewed is made up of two components: 1) Design Cost and 2) Construction Cost. The Construction Cost is further broken into those costs borne directly by Alaska DOT&PF and those costs performed by the Contractor and reflected in the Contract Price. To further complicate matters, the Construction Cost typically includes both the costs to perform the pavement treatment as well as costs to perform work unrelated to treatment of the pavement. These unrelated costs may include: buildings, generators, security fence improvements, access roads, etc. To understand the actual treatment unit costs, one must analyze each project to understand the components of the contract and separate out the overhead costs and the costs to perform work unrelated to the pavement. The process can be summarized the following two equations:

Equation No. 1:	TP	=	DC + AK_P + CP_P
Equation No. 2:	CC	=	(AK_P + AK_NP) + (CP_P + CP_NP)
where,	TP	=	Total Pavement Project Cost
	CC	=	Total Construction Cost
	CP	=	Contractor's Price = CP_P + CP_NP
	CP_P	=	Contractor's Price—Pavement Related
	CP_NP	=	Contractor's Price—Not Pavement Related
	DC	=	Design Costs
	AK	=	Alaska DOT&PF Construction Costs = AK_P + AK_NP
	AK_P	=	Alaska DOT&PF Construction Costs—Pavement Related
	AK_NP	=	Alaska DOT&PF Construction Costs—Not Pavement Related

Based on the understanding of project costs reflected above, we analyzed the costs of the 55 projects to solve for the Total Pavement Project Cost (TP). Once this cost was known, it was a straightforward matter to divide TP by the area of the pavement that was treated to find the unit cost of the pavement treatment. The following is an example of how this procedure was used to compute the unit cost of pavement rehabilitation treatment conducted as part of the 2009 Petersburg Airport Runway Safety Improvements.

Example—Pavement Treatment Unit Cost

Project No. 3-02-0219-013, #69360, **Runway Safety Improvements** was a 2009 project at Petersburg airport consisting of the following work scope: base reclamation, regrading, and HMA overlay. The following details of the project are of interest:

Area	=	932,240 sf
CP	=	$ 9,781,787
CP_NP	=	$ 739,800
AK_NP	=	$ 0
CC	=	$ 12,584,336
DC	=	$ 226,805
CP_P	=	$ 9,781,787 - $ 739,800 = $ 9,041,987
AK_P	=	CC – CP
	=	$ 12,584,336 – $ 9,781,787 = $ 2,802,549
TP	=	DC + AK_P + CP_P
	=	$ 226,805 + $ 2,802,549 + $ 9,041,987 = $ 12,071,341
Unit Cost	=	TP / Area
	=	$ 12,071,341 / 932,240 sf = **$12.95 / sf**

Standardize Costs for Geographic Location and Time

Two of the inherent difficulties in estimating pavement construction costs are the geographic variability of these costs throughout Alaska coupled with variability over time. To effectively use the unit cost data derived from the 55 reviewed construction project records, we standardized unit costs to the 2023 cost of construction in Anchorage by the following method.

To standardize costs for geography, we elected to create an index based on heating fuel as a proxy. The benefits of this method are as follows. First, the State of Alaska monitors and publishes the average cost of heating fuel in 100 communities throughout the state, so a ready source of data if available. Second, heating fuel is essentially the same as diesel fuel. Third, the price of diesel fuel is a major cost driver for construction projects.

Heating fuel costs are published by the Alaska Department of Commerce at https://storymaps.arcgis.com/stories/b7c2c672432e456a8e1f9f6e52206d1d. As discussed on the Alaska Department of Commerce (ADOC) website, heating fuel is shipped throughout the state by truck, barge and even by air, depending on access to each community, and the price of heating fuel is highly dependent upon the cost of transporting the fuel to each community.

ADOC classifies fuel prices by region, listed as follows and as shown in Figure 5:

- Southeast (SE)
- Southwest (SW)
- Gulf Coast GC)
- Interior (INT)
- Western (W)
- Northwest (NW)
- North Slope (NS)

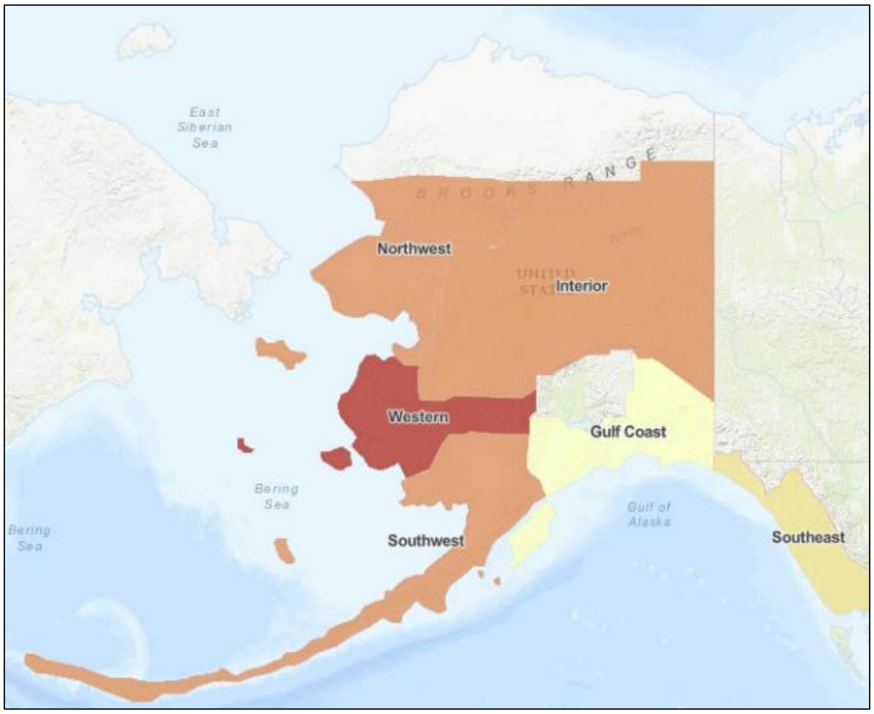

Figure 5—Alaska Heating Fuel Regions

Note: The heating fuel cost in Anchorage is included in the average heating fuel cost in the Gulf Coast Region.

ADOC also tracks the price of gasoline and publishes a comparison of the average prices of a gallon of regular gasoline in Anchorage along with the national average price in the US.

From these two sources of information, we computed the average heating fuel price for each of the seven ADOC regions during the period 2005 to 2023 as shown in Table 3.

Table 3—Regional Heating Fuel Cost by Year ($)

Year	SE	SW	GC	INT	W	NW	NS
2023	5.46	5.45	4.71	7.17	7.2	8.00	10.00
2022	5.74	5.69	5.72	7.54	7.24	6.67	8.67
2021	3.21	3.52	3.19	4.99	3.95	5.81	7.81
2020	2.59	2.67	2.41	4.60	3.77	5.82	7.82
2019	3.44	3.50	3.30	5.28	4.45	6.17	8.17
2018	3.62	3.44	3.40	5.92	4.61	6.22	8.22
2017	2.72	3.15	2.70	4.63	4.41	5.04	7.04
2016	2.79	3.45	2.63	5.29	5.4	5.48	7.48
2015	3.42	3.81	3.09	5.63	6.11	6.53	8.53
2014	4.04	4.35	4.19	5.93	7.21	6.15	8.15
2013	4.26	4.14	4.10	5.78	6.02	6.07	8.07
2012	4.26	4.36	4.17	5.51	5.78	5.97	7.97
2011	4.54	4.35	4.37	5.11	5.59	5.30	7.30
2010	3.24	3.44	3.37	4.78	4.82	4.64	6.64
2009	2.96	3.16	3.03	4.64	4.54	6.35	8.35
2008	4.89	4.59	4.98	6.09	6.33	4.20	6.20
2007	3.28	3.23	3.35	3.86	4.1	4.02	6.02
2006	3.02	2.97	2.85	3.78	3.98	3.86	5.86
2005	3.06	3.00	2.80	3.29	3.37	4.55	6.55

The regional heating fuel costs presented in Table 3 can be used to standardize pavement costs for any project in Alaska during the period 2005 to 2023 to the cost of a pavement treatment in Anchorage in 2023.

The calculation steps to standardize pavement treatment unit costs is as follows:

1. Compute the unit cost ($/sf) in the year of construction.
2. Factor up the unit cost from the year of construction to 2023 using the ratio of heating fuel prices.
3. To standardize the unit cost to Anchorage, multiply by the ratio of the 2023 heating fuel price in the Gulf Coast Region to the region of the project.

Example—Standardize 2009 Petersburg Pavement Treatment Unit Costs

As an example, we applied this methodology to the 2009 Petersburg project, which is in the Southcoast Region.

Step 1 **Establish Unit Cost for Year of Construction in Region of Construction**	Petersburg Airport Base Reclamation	Unit Cost
		2009 Petersburg
		$12.95 / sf

Step 2 **Bring Cost Forward to 2023**	Southcoast Heating Fuel Cost			Unit Cost
	2009	2023	Factor	2023 Petersburg
	$2.96/gal	$5.46/gal	1.845	$23.89 / sf

Step 3 **Standardize Cost to Anchorage (Gulf Coast)**	2023 Heating Fuel Costs			Unit Cost
	Southcoast Region	Gulf Coast Region	Factor	2023 Anchorage
	$5.46/gal	$4.71/gal	0.863	$20.61 / sf

Standardized 2023 Pavement M&R Construction Costs for use in Alaska Airport PMP

Table 4 through Table 6 list unit costs that are within the PAVER database and are used within the M&R plans. Most of the localized M&R work is conducted by the individual airports and not recorded, making it difficult to determine the unit costs for localized work. Similar roadway localized costs were approximately two times the PAVER default costs, so it was decided to multiply all PAVER default unit costs by two for localized work, which is shown in Table 4. Though some of the work types may not always be used in Alaska, they are currently used to determine the cost by condition curves based on the distress maintenance policies currently applied.

Table 4—Anchorage Localized M&R Work Unit Costs

Localized Work Type	Cost	Units
Crack Sealing - AC	$5.00	ft
Grinding (Localized)	$9.60	ft
Joint Seal (Localized)	$5.00	ft
Patching - AC Deep	$14.00	sf
Patching - AC Shallow	$6.50	sf
Crack Sealing - PCC	$5.00	ft
Patching - PCC Full Depth	$50.00	sf
Patching - PCC Partial Depth	$13.00	sf
Slab Replacement - PCC	$36.00	sf

Table 5—Anchorage Global M&R Work Unit Costs

Global Work Type	Cost ($/sf)
Emulsified Asphalt Seal Coat (P-608)	$1.20
Rapid Cure Seal Coat (P-608-R)	$1.20
Sand Seal (P-633)	$1.20

Table 6—Anchorage Major M&R Work Unit Costs

Rehabilitation Work Type	Cost ($/sf)
Minor Rehabilitation - AC	$11.24
Major Rehabilitation - AC	$17.79
Complete Reconstruction - AC	$37.20
Minor Rehabilitation - PCC	$28.10
Major Rehabilitation - PCC	$38.12
Complete Reconstruction - PCC	$79.05

Modified Fuel Factors

We observed several outlier airports when comparing the heating fuel price for individual airport locations in the seven ADOC regional groups. For example, Deadhorse and Barrow are both within the ADOC Northern Region, but Deadhorse has a fuel price of $6.20 per gallon while Barrow has a fuel price of $9.00 per gallon (45% larger). Therefore, we decided to make a slight modification to the regional groupings to better account for these outliers.

The area-weighted combined fuel factor was calculated by dividing the area-weighted average heating fuel cost for all locations within a group by the Anchorage heating fuel cost. The modified fuel factors shown in Table 7 and Figure 6.

Table 7—Modified Fuel Factor Groups

Modified Fuel Factor Group	Number of Airports	Modified Fuel Factor
Anchorage	4	1.00
Central Interior	14	1.13
Southcoast	18	1.26
Central Coastal	9	1.51
Southcoast Island	4	1.63
Northern Coastal	5	1.90

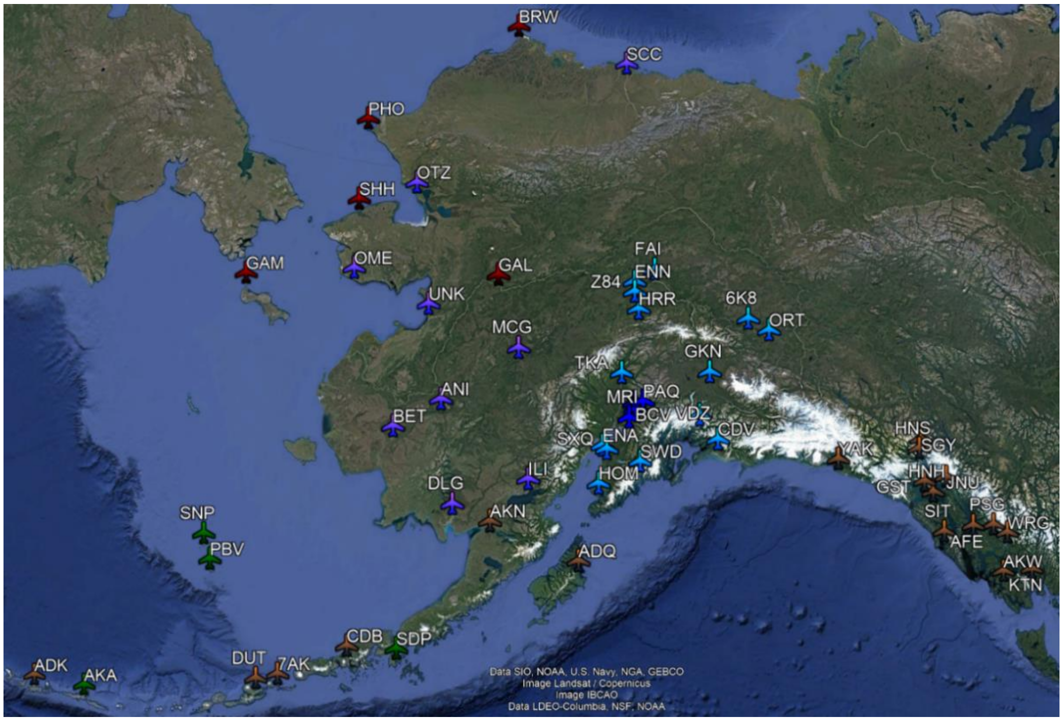

Figure 6—Airport Location Relative to Modified Fuel Factor Groups

Table 8 shows the fuel price and modified fuel factor for each individual airport relative to its assigned modified fuel factor group.

Table 8—Airport Assignments to Modified Fuel Factor Groups for Unit Cost Analysis

PAVER Network ID	Fuel Price ($/gal)	Modified Fuel Factor	Modified Fuel Factor	Modified Fuel Factor Group
Birchwood	$4.71	1.00	1.00	Anchorage
Merrill	$4.71	1.00		
Palmer	$4.71	1.00		
Wasilla	$4.71	1.00		
Clear	$5.50	1.17	1.13	Central Interior
Cordova	$5.95	1.26		
Fairbanks	$5.08	1.08		
Gulkana	$5.92	1.26		
Healy R.	$5.45	1.16		
Homer	$5.59	1.19		
Kenai	$5.20	1.10		
Nenana	$5.27	1.12		
Northway	$5.75	1.22		
Seward	$5.59	1.19		
Soldotna	$5.20	1.10		
Talkeetna	$5.30	1.13		
Tok	$5.50	1.17		
Valdez	$5.09	1.08		
Adak	$5.50	1.17	1.26	Southcoast
Akutan	$5.00	1.06		
Cold Bay	$6.50	1.38		
Gustavus	$6.52	1.38		
Haines	$6.52	1.38		
Hoonah	$6.01	1.28		
Juneau	$5.53	1.17		
Kake	$6.61	1.40		
Ketchikan	$5.53	1.17		
KingSalmon	$6.79	1.44		
Klawock	$6.02	1.28		
Kodiak	$5.98	1.27		
Petersburg	$5.68	1.21		
Sitka	$5.60	1.19		
Skagway	$6.52	1.38		
Unalaska	$5.40	1.15		
Wrangell	$6.02	1.28		
Yakutat	$5.80	1.23		
Aniak	$6.00	1.27	1.51	Central Coastal
Bethel	$7.24	1.54		
Deadhorse	$6.20	1.32		
Dillingham	$6.79	1.44		
Iliamna	$8.92	1.89		
Kotzebue	$6.67	1.42		
McGrath	$8.98	1.91		
Nome	$6.50	1.38		
Unalakleet	$6.56	1.39		
Atka	$7.50	1.59	1.63	Southcoast Island
Sand Point	$7.49	1.59		
StGeorge	$7.84	1.66		
StPaul	$7.84	1.66		
Barrow	$9.00	1.91	1.90	Northern Coastal
Galena	$8.56	1.82		
Gambell	$8.00	1.70		
Point Hope	$10.36	2.20		
Shishmaref	$10.00	2.12		

SUMMARY

This report documents the development of pavement treatment unit costs for use in the Airport Pavement Management Program (PMP). Unit costs are used within the to predict annual pavement maintenance and repair (M&R) budgets for paved airports within Alaska.

Derivation of appropriate pavement M&R unit costs is not trivial. First, pavement unit costs were derived from a sample of actual construction projects completed by Alaska DOT&PF during the period 2005 to 2024. We carefully reviewed the projects, assigned them to a category of work, removed any costs unrelated to pavement M&R, and computed a unit cost for the pavement treatment based on the pavement area constructed. We then developed a method of standardizing pavement M&R costs around the state to a single location—Anchorage—by use of published heating fuel prices. Lastly, we ensured that unit costs were adjusted to a standard year of analysis—2023. Upon further analysis, we developed modified fuel factor groups to better account for outlier airports.

Through this process, we developed unit costs for a variety of pavement M&R treatments in four categories: Pavement Preservation and Corrective Maintenance, Rehabilitation, Reconstruction and Permafrost Reconstruction and Repair.

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Appendix D

Alaska Airport
Pavement Management Program

2023 Pavement Classification Ratings

May 2024

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INTRODUCTION

The Aircraft Classification Rating - Pavement Classification Rating (ACR-PCR) method for reporting pavement strength was developed by the International Civil Aviation Organization (ICAO). The purpose of the ACR-PCR method is to provide aviation authorities around the globe with a unified and straightforward method of reporting and evaluating pavement strength.

In the ACR-PCR method, one compares the relative loading effect of an aircraft (Aircraft Classification Rating or ACR) to the relative strength of the pavement for unrestricted operations (Pavement Classification Rating or PCR). ACRs and PCRs are computed for a specific combination of pavement type, aircraft tire pressure, and subgrade soil strength. ACRs and PCRs may be computed for two types of pavements, four tire pressure categories, four subgrade strength categories, and two evaluation types, as shown in Table 1.

Table 1—PCR Codes [1]

Pavement Category	Code	Notes	
Rigid	R	Portland Cement Concrete	
Flexible	F	Asphalt Concrete	
Tire Pressure Category	**Code**	**Tire Pressure Range**	
Unlimited	W	No pressure limit	
High	X	Pressure limited to 254 psi	
Medium	Y	Pressure limited to 181 psi	
Low	Z	Pressure limited to 73 psi	
Subgrade Strength Category	**Code**	**Elastic Modulus (E) (psi)**	**Represents E (psi)**
High	A	29,008	E > 21,756
Medium	B	17,405	14,504 < E < 21,756
Low	C	11,603	8,702 < E < 14,504
Ultra Low	D	7,252	E < 8,702
Evaluation Category	**Code**	**Notes**	
Technical Study	T	Computation used to determine PCR	
Using Aircraft	U	Maximum ACR from among current fleet	

[1] Federal Aviation Administration (2022), *Standardized Method of Reporting Airport Pavement Strength – PCR*, Advisory Circular 150/5335-5D, US Department of Transportation, Washington, DC, April 29, 2022.

Aircraft manufacturers typically publish ACRs for aircraft at a range of aircraft weights. Airport authorities then must compute a PCR for the public-use airport pavements. As a member of ICAO, the FAA is obligated to report runway pavement strength using the ACR-PCR system and has developed a method for computing PCR to be used by airport authorities in the United States.

Furthermore, the FAA has tied US airports' future eligibility for AIP funding to the requirement to assign and publish PCRs for paved runways. This requirement appears in a letter from the FAA Office of Safety and Standards to Airport Sponsors, dated April 29, 2022, based on the following statement:

> *"Effective with the publication of AC 150/5335-5D, the FAA requires all public use paved runways at all 14 CFR Part 139 certificated airports to be assigned gross weight and PCR data by September 30, 2024. Furthermore, the FAA requires that all airports assign gross weight and PCR data to airport pavements as part of projects funded with federal grant monies that* ***include pavement management****, rehabilitation or reconstruction."* [2] ***(bold emphasis added)***

To fulfill this requirement, PCRs are being computed for each airport in the Alaska Airport PMP. Generally, PCRs have been computed at the same time PCI inspections were performed. Runway PCRs are published in the individual airport reports beginning in 2023.

METHODOLOGY

FAA Advisory Circular 150/5335-5D, Standardized Method of Reporting, Airport Pavement Strength – PCR, establishes the methodologies for computed PCRs for FAA-funded airport pavements. For technical evaluations of PCR, the FAA method is embodied within FAARFIELD, which is the FAA software that conducts both airport pavement thickness design and pavement strength reporting using the ACR/PCR.

Computation of the runway pavement PCR follows a stepwise process, as follows:

1. The pavement must be divided into individual sections of the same age, pavement type, and structural section.
2. For each pavement section on the runway, the following inputs are required:
    a. Pavement surface type and thickness.
    b. Base layer material type and thickness (and whether stabilized or not).
    c. Subbase layer material type and thickness (and whether stabilized or not).
    d. Subgrade soil type and strength or stiffness.
3. Develop an aircraft fleet mix for the airport.
4. Compute PCR for each runway section using FAARFIELD.
5. Typically, the lowest section PCR is selected to be published for the runway.

[2] Federal Aviation Administration (2022). Letter to Airport Sponsors, Office of Airport Safety and Standards, AAS-110, US Department of Transportation, Washington DC, April 29, 2022.

PHYSICAL PROPERTY DATA

For this study, we established the physical property data (thickness, type, and strength properties) of each runway pavement section based upon on desktop review of available Alaska DOT&PF as-built construction records and other reports. Careful review of as-built construction plans, geologic studies, geotechnical engineering project reports, and related documents allowed the development of an understanding of the current runway structure. This required our engineers to consider how the airport was constructed over time, including strengthening, lengthening, widening, and otherwise reconfiguring the airport pavement system over a period of several decades. Based on our review of the available documents, we established a physical property data (PPD) table to summarize our understanding of the pavement sections for the airport runway. The following is the PPD established for Gustavus Airport which is presented as an example of the PPD tables developed for this project.

Table 2—Gustavus Airport Physical Property Data Table

		Pavement		Base		Subbase		Subgrade	
Branch ID	Section ID	Thick (in)	Type	Thick (in)	Type	Thick (in)	Type	Type	CBR
Runway 11/29 6100	6100-01	4.5	P-401	6	P-209	-	-	SP-SM	10
	6100-03	4.5	P-401	6	P-209	-	-	SP-SM	10
	6100-05	4.5	P-401	6	P-209	-	-	SP-SM	10
	6100-06	3	P-401	8	P-209	-	-	SP-SM	10
	6100-07	2	P-401	8	P-209	-	-	SP-SM	10
Runway 2/20 6200	6200-01	4	P-401	10	P-209	5	P-154	SP-SM	10
	6200-02	4	P-401	6	P-209	9	P-154	SP-SM	10
	6200-03	4	P-401	6	P-209	9	P-154	SP-SM	10

The data from the PPD was then entered into the FAARFIELD software. We entered each unique runway section into FAARFIELD separately. In the case that more than one section shared the same section as reported in the PPD, we only entered one section. For the Gustavus Airport PPD shown above, a total of five sections were entered into FAARFIELD, three sections for RW 11/29 and two sections for RW 2/20.

AIRCRAFT FLEET MIX

The aircraft fleet mix for each airport was established based on review of the previous five years of data from two separate sources. The primary source was a report produced from an analysis of FAA Aviation System Performance Metrics (ASPM) records for the period 2016 to 2022, with the data grouped by airport calendar year. This data included a list of each aircraft that filed a flight plan with the FAA to travel to or from one of the airports of interest in the Alaska Airport PMP. The second source was a produced from the Traffic Flow Management System Counts (TFMSC), which is affiliated with FAA ASPM system but includes only DoD aircraft. Due to the proximity of two large air bases in Alaska, there are frequent training missions to Alaska public use airports by military aircraft. Using the data from these two sources, we established a fleet mix for each airport and entered that fleet mix into FAARFIELD.

A FAARFIELD screenshot is presented in Figure 1 to demonstrate how the PPD and aircraft fleet mix data were entered into FAARFIELD.

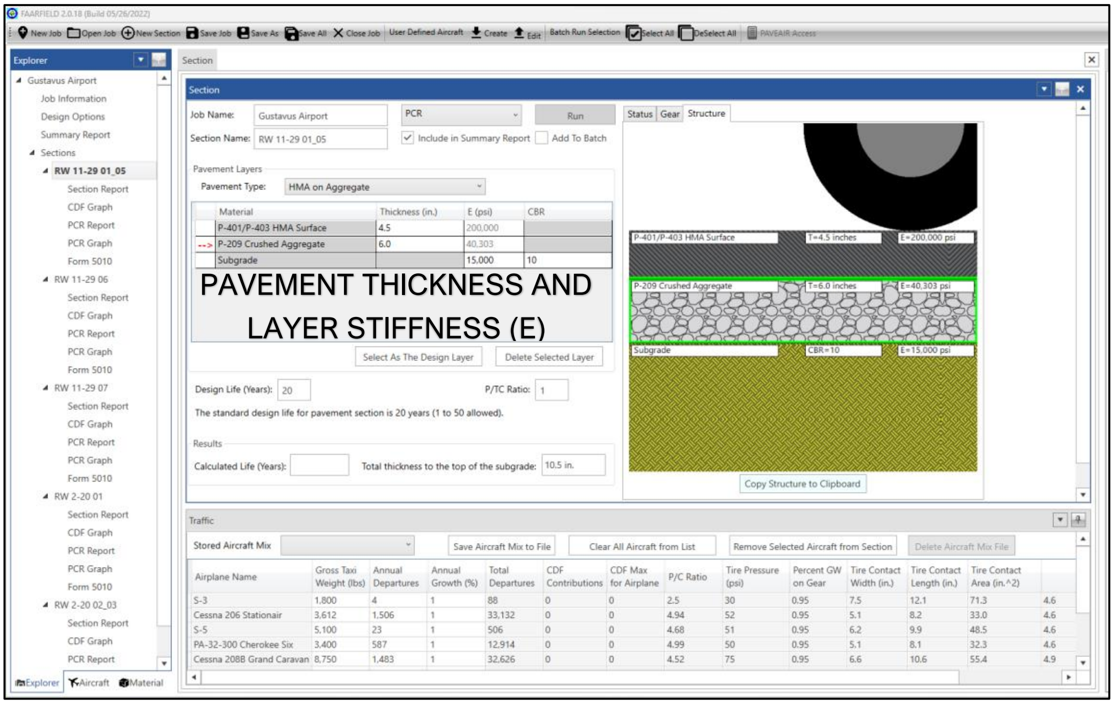

Figure 1—FAARFIELD Screenshot Showing PCR Input Data for Gustavus Airport

FAARFIELD OUTPUT

We ran FAARFIELD to compute PCR for each runway at the airports under consideration during the study year. FAARFIELD computes the PCR and identifies the controlling aircraft for the PCR. We computed PCRs for 22 runways evaluated in 2023, which are presented in Table 3.

Table 3—Runway PCRs Computed for Alaska Airports in 2023

Airport	Runway	PCR	Airport	Runway	PCR
Adak	5/23	2482/F/B/W/T	Klawock	2/20	575/F/B/X/T
Atka	16/34	509/F/C/X/T	Kodiak	1/19	1424/F/C/W/T
Cold Bay	8/26	1137/F/B/W/T	Kodiak	8/26	1301/F/C/W/T
Cold Bay	15/33	1023/F/B/W/T	Kodiak	11/29	739/F/C/W/T
Deadhorse	6/24	403/F/A/X/T	McGrath	16/34	991/F/C/W/T
Dillingham	1/19	738/F/C/W/T	Petersburg	5/23	418/F/B/X/T
Gustavus	11/29	418/F/B/X/T	Sand Point	13/31	1018/F/A/W/T
Gustavus	2/20	237/F/B/X/T	Sitka	11/29	461/F/B/X/T
Iliamna	8/26	334/F/C/W/T	St George	11/29	520/F/C/W/T
Iliamna	18/36	334/F/C/W/T	St Paul	18/36	878/F/C/W/T
Ketchikan	11/29	635/F/B/X/T	Wrangell	10/28	384/F/A/X/T

LIMITATIONS

The preferred method for establishing the PPD for runway sections is to conduct a program of pavement coring and testing to measure layer thickness and estimate layer strength. Rather than perform field testing as described above, we conducted a desktop review of the available construction records. In the case of conflicting or missing data, we completed the PPD based on conservative assumptions and estimates. In addition, for airports with pavement base, subbase, or subgrade layers constructed of frost-susceptible materials, we conservatively reduced the reported strength of the layer to the strength during the thaw-weakened condition. For these reasons, the PCRs presented in Table 3 are considered to be conservatively low in some cases.

In one or two cases, when we compared the computed PCRs to the ACRs of the using aircraft on a runway, and the runway did not exhibit any load-related damage, it became clear that the conservative assumptions and estimates used in our calculations had resulted in a PCR that did not represent the actual runway strength. In these cases, we reverted to the ACR of the using aircraft as the PCR. The one or two cases where this occurred are noted in the individual airport reports.

SUMMARY

Runway PCRs were computed in conformance with the guidance in FAA AC 150/5335-5D and have been published for airports inspected in 2022 and 2023. The PCRs are published in the individual airport reports for each airport.

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Appendix E
Alaska Airport
Pavement Management Program
2023 PAVER Work Plan Details

May 2024

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INTRODUCTION

We recommend that Alaska DOT&PF strive to maintain the current PCI of the Alaska airport pavement system which is Budget Scenario No. 3—Maintain Current PCI as the most cost-effective budget alternative for long-term maintenance and rehabilitation (M&R). At an annual cost of $111M, the Maintain Current PCI budget is approximately 17 percent higher than the current annual budget of $95M for pavement M&R. The Maintain Current PCI budget will reduce backlog growth by nearly $90M over the five-year period.

However, in the event that Alaska DOT&PF continues with their historic $95M annual budget into the five-year period from 2024 to 2028, we are providing the PAVER recommended M&R details for Budget Scenario No. 4—Maintain Current Budget. The following tables and figures summarize how the PMP recommends allocating funds given the current annual budget.

MAINTAIN CURRENT BUDGET WORK PLAN DETAILS

Summary of Budget Scenario 4 - Maintain Current Budget ($M)

Alaska DOT&PF expends approximately $95M per year for pavement M&R on the pavements at its 54 airports. Funding sources for this budget include federal AIP funds in addition to state funds. At this funding level, the M&R backlog will increase to $1.3B and the PCI will be 70. An overall summary of this budget is shown in Table 1. Table 2 and 3 depict the total funded per airport by M&R work type and by year, respectively. Tables 4 through 8 display the major M&R per section for each year.

Table 1 - Budget Scenario 4 - Maintain Current Budget ($M)

Date of Plan	Funded M&R Work Type				Total Funded	Total Unfunded	Total Funded and Unfunded	PCI	
	Localized Stopgap	Localized Preventive	Global	Major				Before Work	After Work
5/1/2024	$11.31	$3.88	$4.81	$74.92	$95	$1,120	$1,215	70	72
5/1/2025	$11.27	$3.87	$0.36	$79.47	$95	$1,032	$1,127	72	73
5/1/2026	$12.47	$3.98	$0.95	$77.60	$95	$1,115	$1,210	71	72
5/1/2027	$14.12	$3.79	$1.01	$76.06	$95	$1,245	$1,340	70	71
5/1/2028	$15.52	$3.93	$0.15	$75.39	$95	$1,321	$1,416	69	70
Total	**$65**	**$19**	**$7**	**$383**	**$475**	-	**$1,795**	**70**	**70**

The total cost over the five-year analysis period, including funded and unfunded M&R is $1.80B. Figure 1 displays the impact to the PCI (overall network and each section rank) over time with respect to the total funded and unfunded M&R.

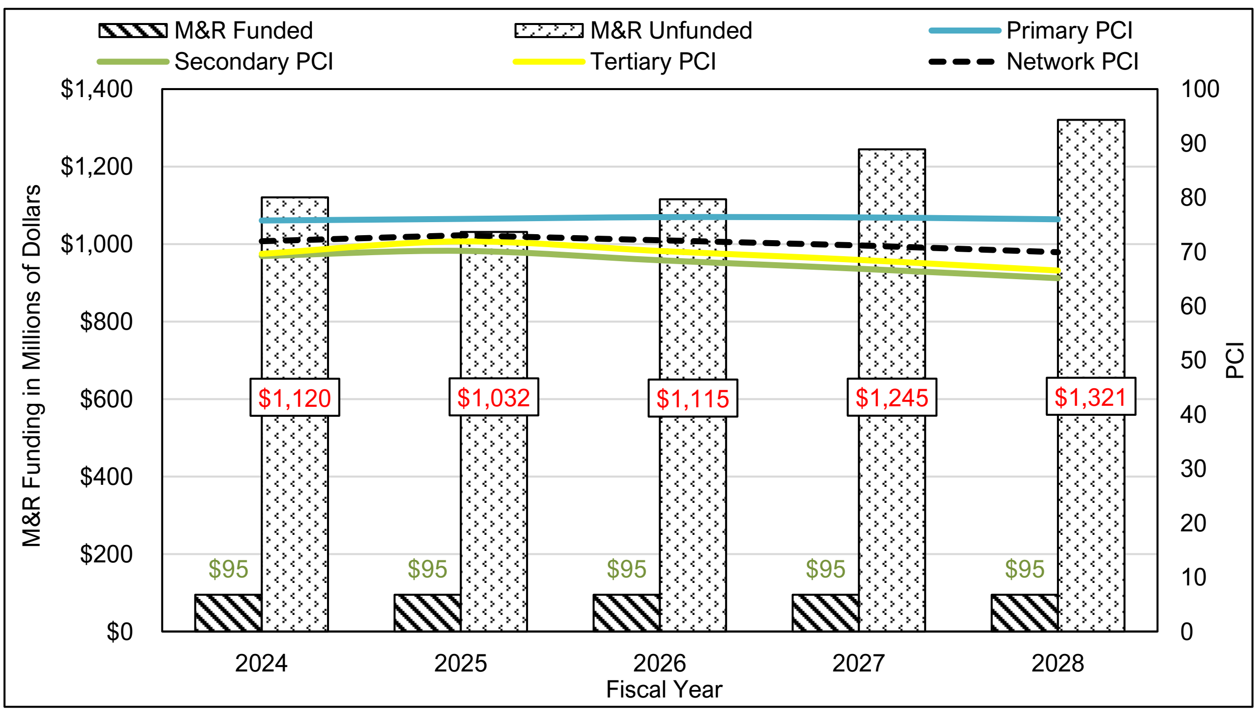

Figure 1 - Budget Scenario 4—Maintain Current Budget

Table 2 - Total Funded per Airport by M&R Work Type (2024 through 2028)

Network ID	Funding by M&R Work Type				Total
	Localized Stopgap	Localized Preventive	Global	Major	
Adak	$3,776,140	$100,805	$28,296	$51,310,844	$55,216,085
Akutan	$0	$43,138	$0	$0	$43,138
Aniak	$170,158	$297,078	$0	$0	$467,236
Atka	$164,159	$84,879	$33,000	$0	$282,038
Barrow	$1,288,472	$358,284	$0	$28,661,960	$30,308,716
Bethel	$648,962	$1,590,207	$104,813	$2,683,683	$5,027,666
Birchwood	$1,621,692	$253,485	$240,470	$0	$2,115,647
Clear	$618,055	$42,240	$5,330	$0	$665,625
Cold Bay	$278,588	$437,365	$219,219	$0	$935,172
Cordova	$137,085	$169,572	$155,202	$27,563,567	$28,025,426
Deadhorse	$123,855	$1,175,509	$329,053	$21,121,243	$22,749,660
Dillingham	$34,477	$590,277	$280,637	$20,099,976	$21,005,367
Fairbanks	$2,182,557	$1,865,697	$68,524	$48,325,198	$52,441,976
Galena	$1,078,832	$652,927	$382,836	$0	$2,114,595
Gambell	$247,794	$60,643	$32,370	$0	$340,808
Gulkana	$0	$262,746	$119,903	$0	$382,649
Gustavus	$0	$200,897	$0	$0	$200,897
Haines	$634,324	$73,929	$155,291	$185,878	$1,049,423
Healy R.	$777,471	$0	$0	$0	$777,471
Homer	$196,006	$174,003	$128,255	$0	$498,265
Hoonah	$526,360	$26,615	$23,075	$0	$576,050
Iliamna	$952,741	$309,946	$40,275	$0	$1,302,962
Juneau	$2,843,931	$661,894	$63,060	$645,002	$4,213,886
Kake	$96,122	$87,331	$679	$0	$184,132
Kenai	$2,689,753	$1,114,819	$659,420	$0	$4,463,993
Ketchikan	$248,159	$253,898	$333,934	$23,146,630	$23,982,622
KingSalmon	$501,326	$475,856	$175,002	$0	$1,152,183
Klawock	$120,765	$277,917	$3,270	$0	$401,953
Kodiak	$1,962,761	$496,073	$99,191	$48,741,172	$51,299,196
Kotzebue	$76,383	$603,408	$48,126	$18,054,545	$18,782,462
McGrath	$553,310	$341,502	$180,342	$0	$1,075,155
Merrill	$402,702	$732,922	$719,868	$289,487	$2,144,980
Nenana	$448,846	$35,440	$0	$0	$484,286
Nome	$1,186,047	$727,802	$142,589	$35,281,854	$37,338,292
Northway	$2,380,340	$0	$0	$0	$2,380,340
Palmer	$729,122	$829,593	$379,982	$0	$1,938,696
Petersburg	$78,637	$139,506	$97,436	$17,992,155	$18,307,735
Point Hope	$369,338	$133,531	$0	$0	$502,869
Sand Point	$0	$409,120	$174,196	$0	$583,316
Seward	$912,892	$135,741	$12,242	$0	$1,060,874
Shishmaref	$465,624	$26,983	$15,570	$0	$508,177
Sitka	$442,926	$424,681	$254,299	$0	$1,121,906
Skagway	$596,812	$42,267	$0	$0	$639,079
Soldotna	$523,004	$389,527	$601,898	$0	$1,514,430
StGeorge	$0	$262,155	$57,467	$0	$319,621
StPaul	$369,057	$339,102	$89,153	$0	$797,313
Talkeetna	$0	$201,181	$159,867	$0	$361,049
Tok	$1,007,702	$30,375	$40,442	$0	$1,078,519
Unalakleet	$838,741	$113,983	$0	$0	$952,724
Unalaska	$12,517,480	$39,024	$0	$0	$12,556,504
Valdez	$1,180,235	$435,947	$305,970	$0	$1,922,153
Wasilla	$204,718	$437,650	$158,954	$0	$801,321
Wrangell	$51,982	$191,530	$122,895	$17,591,216	$17,957,623
Yakutat	$15,426,739	$289,629	$39,211	$21,746,377	$37,501,956
Total:	$64,683,181	$19,450,634	$7,281,615	$383,440,786	$474,856,215

Table 3 - Total Funded per Airport by Year (2024 through 2028)

Network ID	Funding by Year					Total
	2024	2025	2026	2027	2028	
Adak	$811,000	$867,158	$26,342,029	$840,012	$26,355,885	$55,216,085
Akutan	$7,255	$7,912	$8,605	$9,314	$10,053	$43,138
Aniak	$80,715	$91,650	$81,020	$99,210	$114,641	$467,236
Atka	$90,578	$37,910	$45,056	$51,504	$56,989	$282,038
Barrow	$285,671	$344,730	$2,398,957	$26,932,223	$347,136	$30,308,716
Bethel	$446,372	$1,478,862	$461,988	$504,142	$2,136,301	$5,027,666
Birchwood	$284,154	$325,839	$378,778	$594,893	$531,983	$2,115,647
Clear	$100,572	$111,504	$129,059	$148,685	$175,804	$665,625
Cold Bay	$292,288	$122,097	$140,749	$157,830	$222,208	$935,172
Cordova	$6,035,783	$21,762,719	$99,936	$56,781	$70,208	$28,025,426
Deadhorse	$7,289,093	$6,122,349	$6,717,816	$306,208	$2,314,194	$22,749,660
Dillingham	$403,279	$133,155	$156,043	$12,844,595	$7,468,294	$21,005,367
Fairbanks	$20,778,534	$1,764,527	$14,580,346	$1,228,390	$14,090,178	$52,441,976
Galena	$489,896	$313,627	$527,399	$369,514	$414,159	$2,114,595
Gambell	$83,232	$51,652	$59,548	$68,349	$78,026	$340,808
Gulkana	$148,690	$52,509	$66,597	$55,047	$59,806	$382,649
Gustavus	$22,405	$31,748	$40,057	$48,512	$58,176	$200,897
Haines	$105,269	$121,271	$143,917	$285,889	$393,076	$1,049,423
Healy R.	$117,474	$132,940	$150,012	$175,147	$201,899	$777,471
Homer	$375,643	$13,563	$24,421	$36,478	$48,161	$498,265
Hoonah	$107,885	$94,215	$108,580	$124,057	$141,313	$576,050
Iliamna	$246,274	$218,316	$245,188	$273,125	$320,059	$1,302,962
Juneau	$572,092	$644,904	$1,337,291	$782,920	$876,680	$4,213,886
Kake	$25,881	$30,502	$35,653	$42,620	$49,475	$184,132
Kenai	$1,266,573	$654,520	$739,824	$837,430	$965,645	$4,463,993
Ketchikan	$7,413,865	$16,132,017	$214,275	$97,808	$124,657	$23,982,622
KingSalmon	$341,493	$174,535	$193,776	$210,334	$232,045	$1,152,183
Klawock	$76,456	$67,787	$74,223	$85,824	$97,663	$401,953
Kodiak	$1,296,931	$17,485,678	$26,670,775	$474,788	$5,371,024	$51,299,196
Kotzebue	$17,024,814	$414,897	$136,654	$178,652	$1,027,445	$18,782,462
McGrath	$184,124	$174,087	$186,442	$346,847	$183,655	$1,075,155
Merrill	$450,816	$235,249	$551,372	$658,530	$249,012	$2,144,980
Nenana	$77,683	$82,300	$90,957	$107,329	$126,017	$484,286
Nome	$472,812	$978,675	$569,914	$32,412,708	$2,904,183	$37,338,292
Northway	$273,991	$360,806	$455,371	$578,235	$711,937	$2,380,340
Palmer	$556,651	$283,433	$313,566	$433,099	$351,948	$1,938,696
Petersburg	$18,058,835	$52,388	$39,752	$87,343	$69,416	$18,307,735
Point Hope	$369,338	$11,777	$26,188	$41,215	$54,351	$502,869
Sand Point	$249,905	$76,757	$81,059	$85,507	$90,088	$583,316
Seward	$180,647	$187,084	$207,353	$230,321	$255,469	$1,060,874
Shishmaref	$89,530	$83,841	$97,614	$110,783	$126,410	$508,177
Sitka	$303,651	$252,208	$169,030	$188,245	$208,771	$1,121,906
Skagway	$110,897	$106,908	$121,618	$138,431	$161,225	$639,079
Soldotna	$284,937	$195,270	$455,325	$384,722	$194,176	$1,514,430
StGeorge	$59,616	$50,024	$98,174	$54,526	$57,282	$319,621
StPaul	$214,687	$132,474	$141,045	$149,959	$159,148	$797,313
Talkeetna	$193,496	$34,942	$38,582	$44,190	$49,838	$361,049
Tok	$178,825	$165,960	$204,436	$243,081	$286,218	$1,078,519
Unalakleet	$149,970	$171,246	$175,448	$206,668	$249,392	$952,724
Unalaska	$2,339,672	$2,422,259	$2,507,627	$2,595,622	$2,691,324	$12,556,504
Valdez	$545,697	$266,318	$311,449	$368,811	$429,878	$1,922,153
Wasilla	$275,994	$115,171	$125,830	$136,655	$147,671	$801,321
Wrangell	$190,188	$15,925,819	$62,492	$40,757	$1,738,367	$17,957,623
Yakutat	$2,486,896	$2,802,838	$5,656,087	$7,412,274	$19,143,861	$37,501,956
Total:	$94,919,025	$94,972,929	$94,995,300	$94,976,141	$94,992,820	$474,856,215

Table 4 - 2024 Major M&R by Section

Network ID	Branch ID	Branch Use	Section ID	Section Rank	PCI Before Work	Major Cost
Cordova	6100	Runway	6100-01	Primary	62	$5,175,133
Cordova	6100	Runway	6100-04	Primary	64	$655,233
Deadhorse	6100	Runway	6100-02	Primary	67	$6,718,564
Fairbanks	6100	Runway	6100-01	Primary	65	$9,746,998
Fairbanks	6100	Runway	6100-05	Primary	65	$9,783,276
Ketchikan	6100	Runway	6100-01	Primary	64	$7,245,542
Kodiak	6200	Runway	6200-04	Primary	65	$351,186
Kodiak	6200	Runway	6200-06	Primary	67	$329,440
Kotzebue	6100	Runway	6100-01	Primary	69	$5,521,528
Kotzebue	6100	Runway	6100-02	Primary	68	$5,592,922
Kotzebue	6100	Runway	6100-03	Primary	69	$5,521,528
Kotzebue	6100	Runway	6100-06	Primary	55	$283,591
Petersburg	6100	Runway	6100-01	Primary	64	$5,791,578
Petersburg	6100	Runway	6100-01W	Primary	65	$376,074
Petersburg	6100	Runway	6100-03	Primary	66	$5,323,169
Petersburg	6100	Runway	6100-03W	Primary	66	$354,878
Petersburg	6100	Runway	6100-05	Primary	64	$5,791,578
Petersburg	6100	Runway	6100-05W	Primary	66	$354,878
					2024 Total:	$74,917,097

Table 5 - 2025 Major M&R by Section

Network ID	Branch ID	Branch Use	Section ID	Section Rank	PCI Before Work	Major Cost
Bethel	0700	Taxiway	0700-02	Primary	60	$1,080,281
Cordova	6100	Runway	6100-02	Primary	55	$13,541,049
Cordova	6100	Runway	6100-03	Primary	54	$7,155,510
Cordova	6100	Runway	6100-05	Primary	49	$1,036,642
Deadhorse	6100	Runway	6100-03	Primary	70	$5,906,256
Fairbanks	0170	Taxiway	0170-01	Primary	60	$283,810
Fairbanks	0700	Taxiway	0700-02	Primary	58	$768,385
Ketchikan	6100	Runway	6100-03	Primary	62	$7,950,544
Ketchikan	6100	Runway	6100-05	Primary	62	$7,950,544
Kodiak	6200	Runway	6200-01	Primary	55	$5,009,464
Kodiak	6200	Runway	6200-02	Primary	44	$6,730,151
Kodiak	6200	Runway	6200-03	Primary	61	$4,750,358
Kodiak	6200	Runway	6200-05	Primary	57	$491,456
Kotzebue	6100	Runway	6100-07	Primary	51	$319,358
Nome	0500	Taxiway	0500-01	Primary	57	$598,559
Wrangell	6100	Runway	6100-01	Primary	69	$4,738,957
Wrangell	6100	Runway	6100-03	Primary	62	$6,422,324
Wrangell	6100	Runway	6100-05	Primary	69	$4,738,957
					2025 Total:	$79,472,606

Table 6 - 2026 Major M&R by Section

Network ID	Branch ID	Branch Use	Section ID	Section Rank	PCI Before Work	Major Cost
Adak	6100	Runway	6100-02	Primary	32	$25,596,548
Barrow	0300	Taxiway	0300-01	Primary	56	$2,009,108
Deadhorse	6100	Runway	6100-01	Primary	68	$6,476,092
Fairbanks	0100	Taxiway	0100-04	Primary	56	$1,290,338
Fairbanks	0100	Taxiway	0100-05	Primary	54	$1,653,305
Fairbanks	0120	Taxiway	0120-HS	Primary	53	$173,427
Fairbanks	0160	Taxiway	0160-01	Primary	55	$329,043
Fairbanks	0200	Taxiway	0200-03	Primary	56	$1,023,362
Fairbanks	0600	Taxiway	0600-02	Primary	59	$1,007,562
Fairbanks	6100	Runway	6100-03	Primary	69	$8,422,968
Juneau	0310	Taxiway	0310-02	Primary	59	$235,354
Juneau	0510	Taxiway	0510-04	Primary	52	$409,648
Kodiak	6100	Runway	6100-01	Primary	70	$5,794,224
Kodiak	6100	Runway	6100-02	Primary	68	$6,391,561
Kodiak	6100	Runway	6100-03	Primary	68	$6,391,561
Kodiak	6300	Runway	6300-02	Primary	69	$3,894,585
Kodiak	6300	Runway	6300-03	Primary	70	$3,761,230
Merrill	0600	Taxiway	0600-01a	Secondary	43	$123,154
Nome	0500	Taxiway	0500-03	Primary	55	$121,591
Yakutat	6100	Runway	6100-03	Primary	69	$860,261
Yakutat	6100	Runway	6100-10	Primary	69	$831,163
Yakutat	6100	Runway	6100-11	Primary	69	$804,328
					2026 Total:	$77,600,414

Table 7 - 2027 Major M&R by Section

Network ID	Branch ID	Branch Use	Section ID	Section Rank	PCI Before Work	Major Cost
Barrow	6100	Runway	6100-01	Primary	69	$7,878,740
Barrow	6100	Runway	6100-03	Primary	69	$7,858,914
Barrow	6100	Runway	6100-05	Primary	69	$7,858,914
Barrow	6100	Runway	6100-06	Primary	69	$437,614
Barrow	6100	Runway	6100-07	Primary	69	$440,273
Barrow	6100	Runway	6100-08	Primary	69	$2,178,398
Dillingham	6100	Runway	6100-01	Primary	68	$6,573,023
Dillingham	6100	Runway	6100-03	Primary	69	$6,171,965
Fairbanks	0800	Taxiway	0800-01	Primary	60	$493,667
Merrill	0400	Taxiway	0400-01a	Secondary	51	$166,334
Nome	6100	Runway	6100-01C	Primary	69	$592,298
Nome	6100	Runway	6100-01E	Primary	69	$1,610,757
Nome	6100	Runway	6100-01W	Primary	69	$3,286,154
Nome	6100	Runway	6100-02C	Primary	69	$604,980
Nome	6100	Runway	6100-02E	Primary	69	$1,611,026
Nome	6100	Runway	6100-02W	Primary	69	$3,285,962
Nome	6100	Runway	6100-03C	Primary	69	$597,140
Nome	6100	Runway	6100-03E	Primary	69	$1,611,026
Nome	6100	Runway	6100-03W	Primary	69	$3,286,846
Nome	6200	Runway	6200-05	Primary	69	$5,199,362
Nome	6200	Runway	6200-06	Primary	69	$5,196,211
Nome	6200	Runway	6200-07	Primary	69	$5,202,821
Yakutat	6100	Runway	6100-01	Primary	67	$978,514
Yakutat	6100	Runway	6100-02	Primary	68	$924,685
Yakutat	6100	Runway	6100-04	Primary	68	$672,498
Yakutat	6100	Runway	6100-05	Primary	68	$692,759
Yakutat	6100	Runway	6100-06	Primary	69	$650,520
					2027 Total:	$76,061,399

Table 8 - 2028 Major M&R by Section

Network ID	Branch ID	Branch Use	Section ID	Section Rank	PCI Before Work	Major Cost
Adak	6100	Runway	6100-01	Primary	25	$25,714,296
Bethel	0500	Taxiway	0500-02	Primary	50	$1,603,402
Deadhorse	0900	Taxiway	0900-01	Primary	60	$1,221,821
Deadhorse	1000	Taxiway	1000-01	Primary	58	$798,510
Dillingham	6100	Runway	6100-02	Primary	66	$7,354,988
Fairbanks	0110	Taxiway	0110-02	Primary	60	$383,956
Fairbanks	0120	Taxiway	0120-01	Primary	54	$4,017,431
Fairbanks	0130	Taxiway	0130-01	Primary	59	$359,689
Fairbanks	0130	Taxiway	0130-02	Primary	50	$284,840
Fairbanks	0500	Taxiway	0500-01	Primary	58	$621,376
Fairbanks	0700	Taxiway	0700-01	Primary	59	$442,867
Fairbanks	1400	Taxiway	1400-02	Primary	60	$878,275
Fairbanks	1400	Taxiway	1400-03	Primary	53	$793,259
Fairbanks	1600	Taxiway	1600-01	Primary	59	$1,037,343
Fairbanks	1600	Taxiway	1600-02	Primary	53	$1,144,630
Fairbanks	1600	Taxiway	1600-03	Primary	59	$3,385,390
Haines	0200	Taxiway	0200-02	Secondary	47	$185,878
Kodiak	6300	Runway	6300-01	Primary	65	$4,845,954
Kotzebue	0400	Taxiway	0400-01	Primary	59	$815,617
Nome	0500	Taxiway	0500-02	Primary	58	$767,124
Nome	0600	Taxiway	0600-01	Primary	57	$1,709,997
Wrangell	0100	Taxiway	0100-01	Primary	57	$374,314
Wrangell	0100	Taxiway	0100-02	Primary	57	$913,745
Wrangell	0100	Taxiway	0100-03	Primary	48	$402,918
Yakutat	6100	Runway	6100-07	Primary	66	$4,738,521
Yakutat	6100	Runway	6100-08	Primary	66	$4,738,521
Yakutat	6100	Runway	6100-09	Primary	65	$4,825,048
Yakutat	6100	Runway	6100-12	Primary	65	$1,029,557
					2028 Total:	$75,389,269

SUMMARY

Maintenance and Rehabilitation (M&R) plans were generated using the PAVER software which utilizes basic inventory data combined with inspection information, maintenance policies, maintenance costs, and predictions about future pavement conditions. Alaska DOT&PF staff will need to consider the geographic location of each individual airport along with any mobilization factors when developing future projects.

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