Audubon County Airport

PAVEMENT MANAGEMENT REPORT

PREPARED BY

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applied pavement TECHNOLOGY

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AUDUBON COUNTY AIRPORT
PAVEMENT MANAGEMENT REPORT

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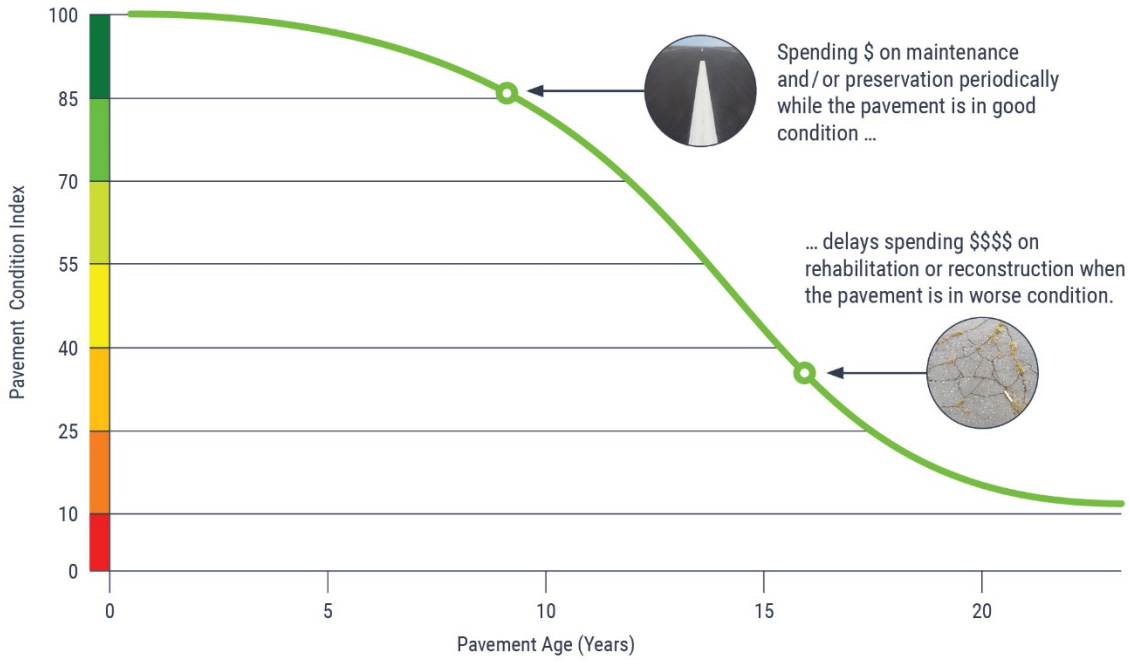
INTRODUCTION

Applied Pavement Technology, Inc. (APTech), with assistance from Robinson Engineering Company, updated the Airport Pavement Management System (APMS) for the Iowa Department of Transportation, Aviation Bureau (Iowa DOT). The APMS provides a means to monitor the condition of the pavements within the state of Iowa and to proactively plan for their preservation.

As part of this project, pavement conditions at Audubon County Airport were assessed in November 2020 using the Pavement Condition Index (PCI) procedure. During a PCI inspection, the types, severities, and amounts of distress present in a pavement are quantified. This information is then used to develop a composite index that represents the overall condition of the pavement in numerical terms, ranging from 0 (failed) to 100 (excellent). The PCI provides an overall measure of condition and an indication of the level of work that will be required to maintain or repair a pavement. The distress information also provides insight into what is causing the pavement to deteriorate, which is the first step in selecting the appropriate repair action to correct the problem.

Programmed into an APMS, PCI information is used to determine when preventive maintenance actions (such as crack or joint sealing) are advisable and to identify the most cost-effective time to perform major rehabilitation (such as an overlay or whitetopping). Delaying maintenance and rehabilitation (M&R) until a pavement structure has seriously degraded can cost many times more than if M&R was applied earlier in a pavement's life cycle, as shown in Figure 1. From a safety perspective, pavement distresses, such as cracks and loose debris, may pose risks in terms of the potential for aircraft tire damage and the ability of a pilot to safely control aircraft.

Figure 1. Pavement condition versus cost of repair.



The pavement evaluation results for Audubon County Airport are presented within this report and can be used by Audubon County Airport, the Iowa DOT and the Federal Aviation Administration (FAA) to identify, prioritize, and schedule pavement M&R actions at the airport.

In addition to this report, the interactive pavement management data visualization tool IDEA, containing the pavement management information collected during this project, was updated and may be accessed from the Iowa DOT's website (https://iowadot.gov/aviation).

PAVEMENT INVENTORY

The project began with a review of the existing inventory information pertaining to the pavements at Audubon County Airport. The date of original construction, along with the date of any subsequent rehabilitation; the location of completed work; and the type of work undertaken were gathered. The information was used to update the pavement management database and associated maps as necessary to account for pavement-related work that had been undertaken since the last time the airport was evaluated in 2017.

The pavement network at Audubon County Airport was then divided into branches, sections, and sample units. A branch is a single entity that serves a distinct function. For example, a runway is considered a branch because it serves a single function (allowing aircraft to take off and land). Taxiways and aprons are also separate branches.

Each branch was further divided into sections. Traditionally, sections are defined as parts of the branch that share common attributes, such as cross-section, date of last construction, traffic level, and performance. Using this approach, if a runway was built in 1968 and then extended in 1984, it would contain two separate sections.

To estimate the overall condition of a pavement section, each section was subdivided into sample units. Portions of these sample units were evaluated during the pavement inspection, and the collected information was extrapolated to predict the overall section condition and quantities of distress.

Approximately 343,000 square feet of pavement were evaluated at Audubon County Airport, as illustrated in Figure 2. This figure also shows the area-weighted age, in years of the pavements, at the time of the inspection. Figure 3 provides a map that details how the pavement network was divided into management units and identifies the sample units that were evaluated during the pavement inspection at Audubon County Airport.

Figure 2. Pavement area by branch use at Audubon County Airport.

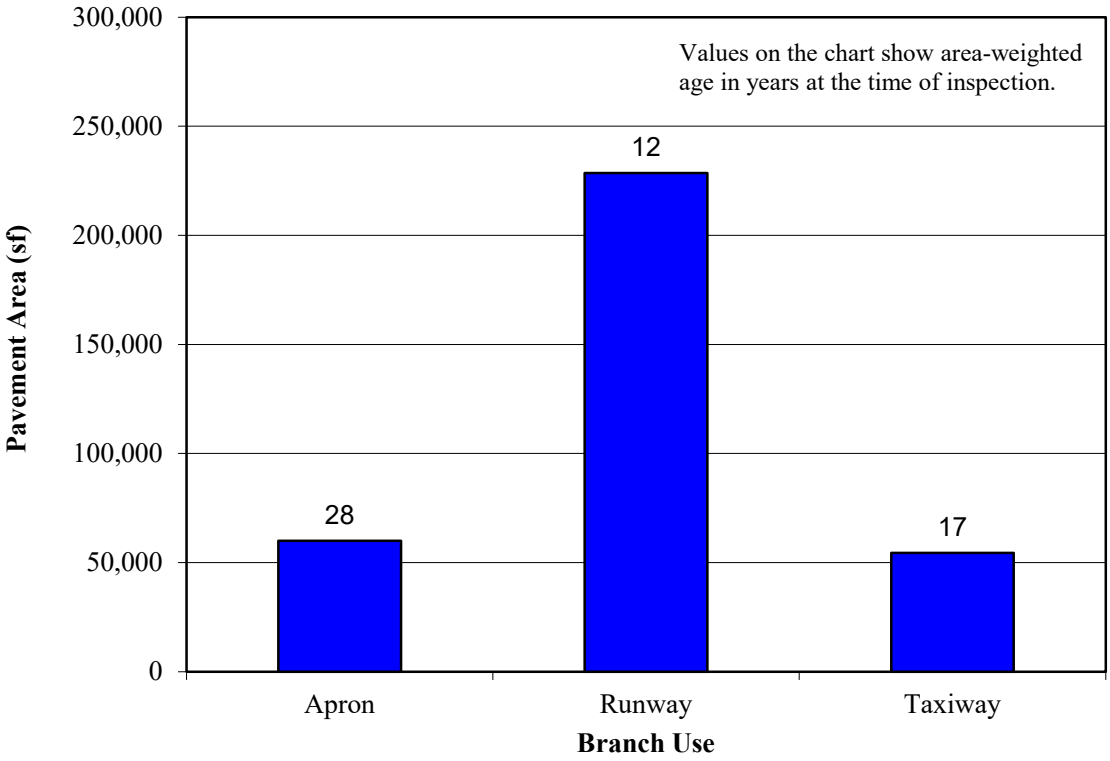
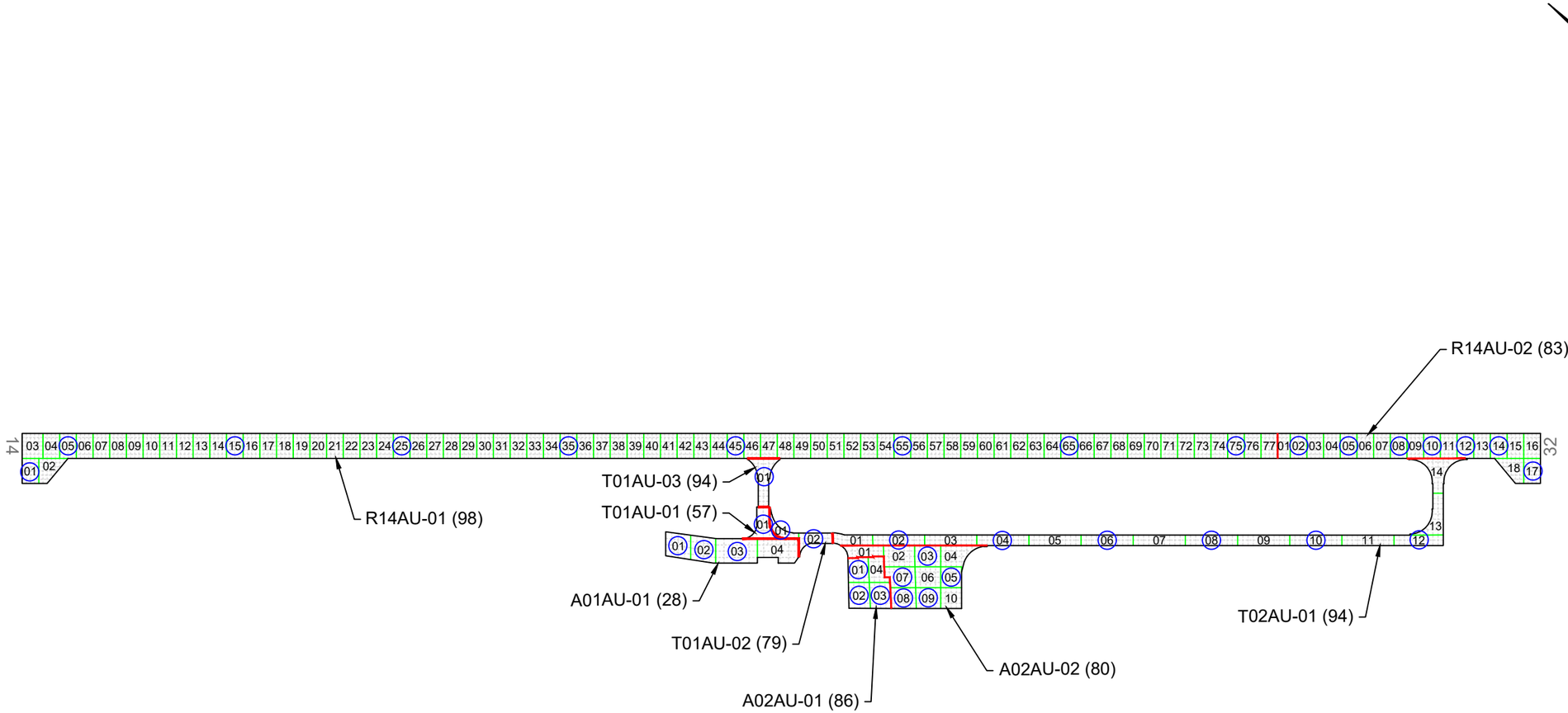


FIGURE 3. NETWORK DEFINITION MAP.



NETWORK DEFINITION LEGEND

- BRANCH IDENTIFIER / SECTION IDENTIFIER / PCI VALUE — R14AU-01 (98)
- SECTION BREAK LINE
- SAMPLE UNIT BREAK LINE
- SLAB JOINT
- 03 — SAMPLE UNIT NUMBER
- 03 — SAMPLE UNIT INSPECTED
- 03 — ADDITIONAL SAMPLE UNIT

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AGENCY: Iowa Department of Transportation, Aviation Bureau			
LOCATION: Audubon County Airport, Audubon, Iowa			
PAGE TITLE: Network Definition Map			
PROJECT DATE: SEP. 2020	CREATION DATE: SEP. 2020	PROJECT MANAGER: LJR	JOB NUMBER: 2017-020-AM04
DRAWING SCALE: 1"=300'	LAST MODIFIED DATE: MAR. 2021	REVISED BY: KEW	DRAWN BY: DSP
FILENAME: Audubon.dwg		LAYOUT NAME/NUMBER: NET. DEF.	PAGE NUMBER: 5

PAVEMENT EVALUATION

Pavement Evaluation Procedure

APTech inspected the pavements at Audubon County Airport using the PCI procedure described in:

- FAA Advisory Circular 150/5380-6C, *Guidelines and Procedures for Maintenance of Airport Pavements* (https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5380-6C.pdf).
- FAA Advisory Circular 150/5380-7B, *Airport Pavement Management Program (PMP)* (https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5380-7B.pdf).
- ASTM D5340-20, *Standard Test Method for Airport Pavement Condition Index Surveys*.

The PCI provides a numerical indication of overall pavement condition, as illustrated in Figure 4. The types and amounts of deterioration are used to calculate the PCI of the section. The PCI ranges from a value of 0, which represents a pavement in a failed condition, to a value of 100, which represents a pavement in excellent condition. It is important to note that factors other than overall PCI need to be considered when identifying the appropriate type of repair, including types of distress present and rate of deterioration. Also, since the PCI does not assess the structural integrity or capacity of the pavement structure, further testing may be needed to validate and refine the treatment strategy.

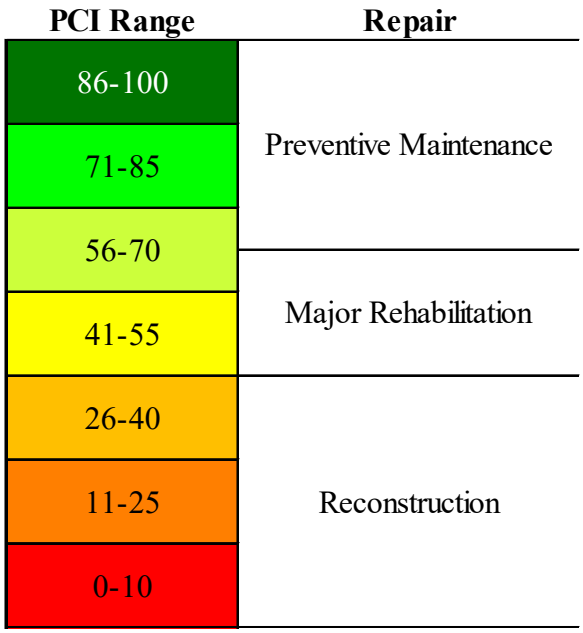
Figure 4. Visual representation of PCI scale on typical pavement surfaces.

PCI = 100 PCI = 60 PCI = 35

Note: Photographs shown are not specific to Audubon County Airport.

Generally, pavements with relatively high PCIs that are not exhibiting significant load-related distress will benefit from preventive maintenance actions, such as crack sealing or joint resealing. As the PCI drops, the pavements may require major rehabilitation, such as an overlay or whitetopping. In some situations where the PCI has dropped low enough, reconstruction may be the only viable alternative due to the substantial damage to the pavement structure. Figure 5 illustrates how the appropriate repair type varies with the PCI of a pavement section and provides the corresponding colors used for the maps and charts in this report for each range of PCIs.

Figure 5. PCI versus repair type.



The types of distress identified during the PCI inspection provide insight into the cause of pavement deterioration which in turn helps in selecting a rehabilitation alternative that corrects the cause and thus eliminates or delays its recurrence. PCI distress types are characterized as load-related (such as alligator cracking on asphalt-surfaced pavements or shattered slabs on portland cement concrete [PCC] pavements), climate/durability-related (such as weathering [a climate-related distress type on asphalt-surfaced pavements] and durability cracking [a durability-related distress type on PCC pavements]), and other (distress types that cannot be attributed solely to load or climate/durability).

Appendix A identifies the distress types considered during a PCI inspection and describes the likely cause of each distress type. It should be noted that a PCI is based on visual signs of pavement deterioration and does not provide a measure of structural capacity.

Pavement Evaluation Results

The pavements at Audubon County Airport were inspected in November 2020. The 2020 area-weighted condition of Audubon County Airport is 89, with conditions ranging from 28 to 98 (on a scale of 0 [failed] to 100 [excellent]). During the previous pavement inspection in 2017, the area-weighted PCI of the airport was 91.

Figure 6 summarizes the overall condition of the pavements at Audubon County Airport, and Figure 7 presents area-weighted condition (average PCI adjusted to account for the relative size of the pavement sections) by branch use. Figure 8 is a map that displays the condition of the evaluated pavements. Table 1 summarizes the results of the pavement evaluation. Appendix B presents photographs taken during the PCI inspection, and Appendix C contains detailed information on the distresses observed during the visual survey. Appendix D includes detailed work history information that was collected during the record review process.

Figure 6. Pavement area by PCI range at Audubon County Airport.

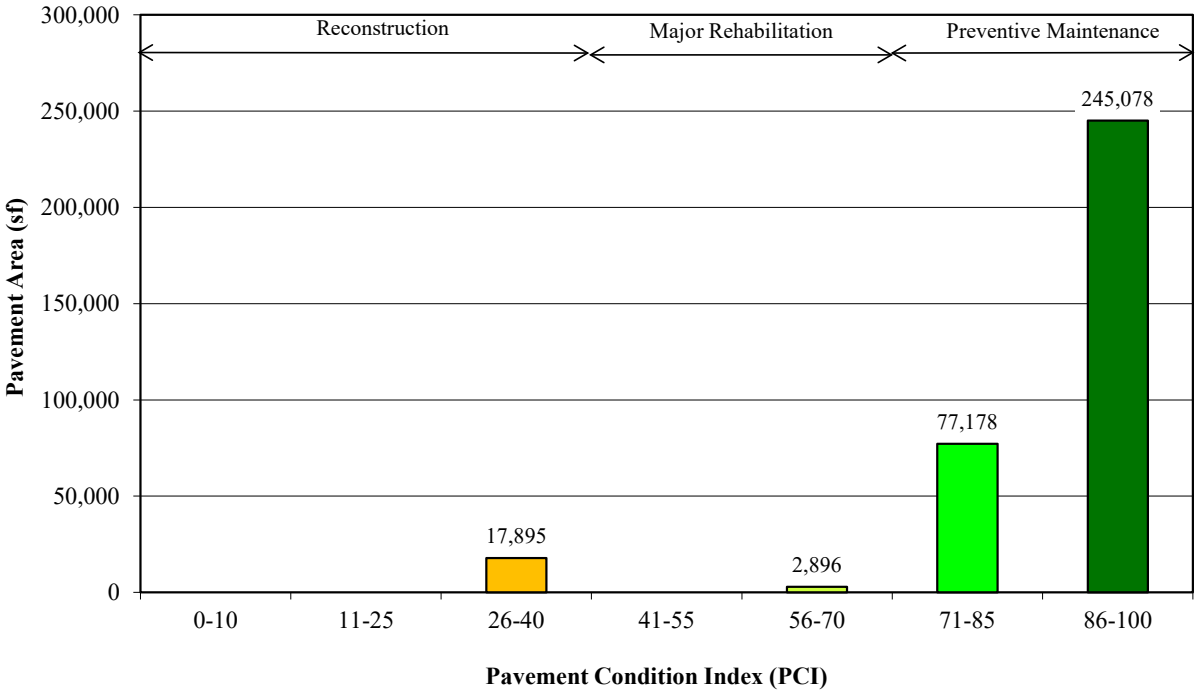


Figure 7. Area-weighted PCI by branch use at Audubon County Airport.
(Values on chart are area-weighted)

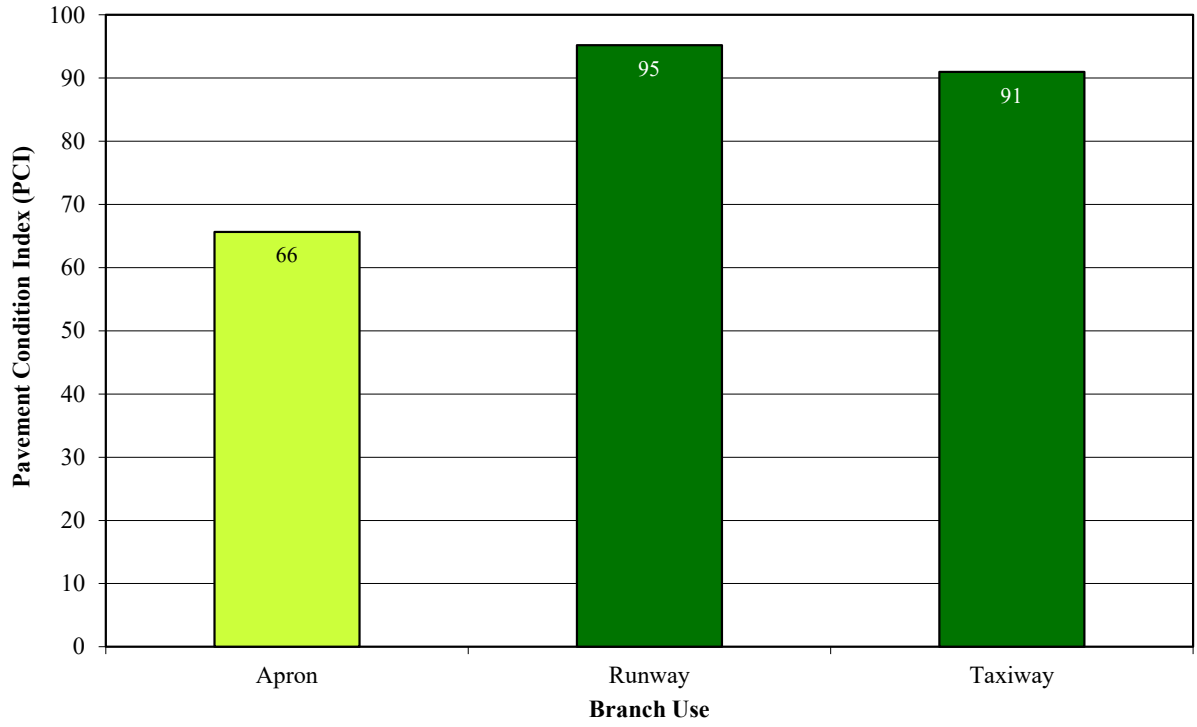
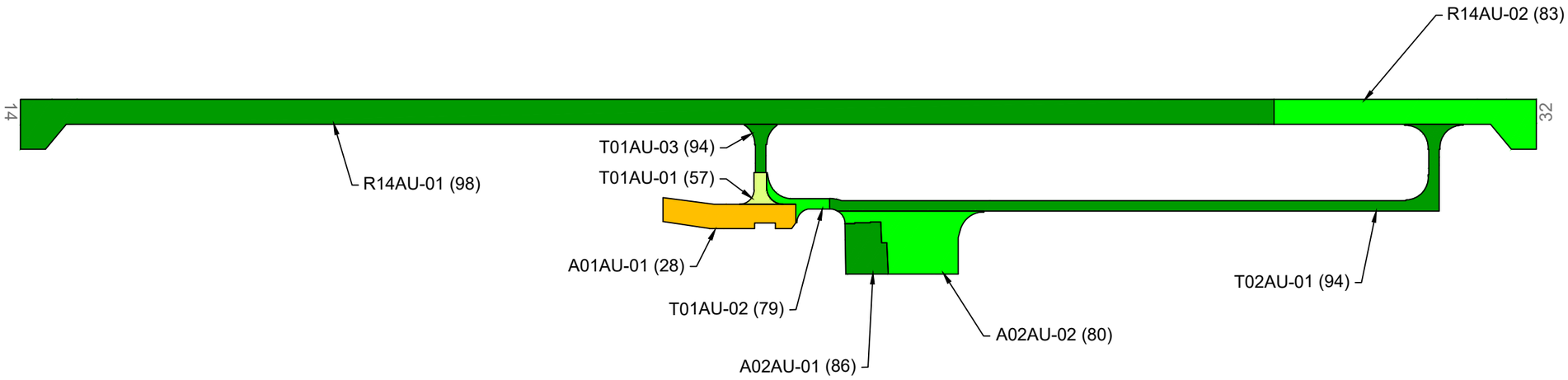


FIGURE 8. PCI MAP.



LEGEND

BRANCH IDENTIFIER
SECTION IDENTIFIER
PCI VALUE
R14AU-01 (98)

SECTION BREAK LINE

PAVEMENT CONDITION INDEX

PCI

86-100
71-85
56-70
41-55
26-40
11-25
0-10

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AGENCY: Iowa Department of Transportation, Aviation Bureau			
LOCATION: Audubon County Airport, Aububon, Iowa			
PAGE TITLE: 2020 Pavement Condition Index Map			
PROJECT DATE: SEP. 2020	CREATION DATE: SEP. 2020	PROJECT MANAGER: LJR	JOB NUMBER: 2017-020-AM04
DRAWING SCALE: 1"=300'	LAST MODIFIED DATE: MAR. 2021	REVISED BY: ABF	DRAWN BY: DSP
FILENAME: Audubon.dwg		LAYOUT NAME/NUMBER: PCI	PAGE NUMBER: 9

Table 1. 2020 pavement evaluation results.

Branch	Section	Surface Type	Section Area (sf)	LCD	2020 PCI	% Distress Due to Load	% Distress Due to Climate/ Durability	% Distress Due to Other	Type of Distresses
A01AU	01	PCC	17,895	11/1/1970	28	80	6	14	Corner Spalling, Faulting, Joint Seal Damage, Joint Spalling, Large Patch, LTD Cracking, Popouts, Scaling, Shattered Slab, Shrinkage Cracking
A02AU	01	PCC	11,700	6/1/1990	86	0	13	87	Faulting, Joint Seal Damage, Joint Spalling, Small Patch
A02AU	02	PCC	30,408	11/3/2006	80	36	30	34	Corner Break, Corner Spalling, Faulting, Joint Seal Damage, Joint Spalling, LTD Cracking, Shrinkage Cracking
R14AU	01	PCC	185,700	6/3/2012	98	0	85	15	Joint Seal Damage, Joint Spalling
R14AU	02	PCC	42,900	6/1/1990	83	40	50	10	Corner Break, Faulting, Joint Seal Damage, Joint Spalling, LTD Cracking, Shrinkage Cracking
T01AU	01	PCC	2,896	11/1/1970	57	50	4	46	Corner Spalling, Faulting, Joint Seal Damage, Joint Spalling, LTD Cracking
T01AU	02	PCC	3,870	6/1/1990	79	51	29	20	Corner Spalling, Joint Seal Damage, Joint Spalling, LTD Cracking
T01AU	03	PCC	3,894	6/3/2012	94	45	31	24	Corner Break, Corner Spalling, Joint Seal Damage
T02AU	01	PCC	43,784	11/3/2006	94	16	31	53	Joint Seal Damage, Joint Spalling, Large Patch, LTD Cracking, Shrinkage Cracking

Table 1. 2020 pavement evaluation results (continued).

Table Notes:

1. See Figure 3 for the location of the branch and section.
2. Surface Type: AC = asphalt cement concrete; AAC = asphalt overlay on AC; PCC = portland cement concrete; APC = asphalt overlay on PCC.
3. LCD = last construction date.
4. Distress due to load includes distress types that are attributed to a structural deficiency in the pavement, such as alligator cracking or rutting on asphalt-surfaced pavements or shattered slabs on PCC pavements.
5. Distress due to climate or durability includes distress types that are attributed to either the aging of the pavement and the effects of the environment (such as weathering, raveling, or block cracking on asphalt-surfaced pavements) or to a materials-related problem (such as durability cracking or alkali-silica reaction [ASR] on PCC pavements). If materials-related distresses were recorded during the inspection, further laboratory testing is required to definitively determine the type present.
6. Distress due to other refers to distress types that are not attributed to one factor but rather may be caused by a combination of factors.
7. Distress types are defined by ASTM D5340-20. L&T Cracking = Longitudinal and Transverse Cracking; LTD Cracking = Longitudinal, Transverse, and Diagonal Cracking; ASR = Alkali-Silica Reaction.

Inspection Comments

Audubon County Airport was inspected on November 13, 2020. There were nine pavement sections defined during the inspection.

Runway

Runway 14/32 consisted of two sections. Section 01, which comprised most of the runway, was in excellent condition with low-severity joint seal damage recorded throughout, along with a small amount of low-severity joint spalling. Section 02 was located at the 32 approach and contained shrinkage cracking; low-severity corner break, faulting, and joint spalling; high-severity joint seal damage; and low- and medium-severity longitudinal, transverse, and diagonal (LTD) cracking.

Taxiways

Taxiway 01 contained three sections. Low- and medium-severity corner spalling, joint spalling and LTD cracking, and low-severity faulting and joint seal damage were identified in Section 01. Section 02 had medium-severity corner spalling, joint seal damage and joint spalling, and low- and medium-severity LTD cracking recorded at the time of the inspection. Low-severity corner break, corner spalling, and joint seal damage were recorded in Section 03.

Taxiway 02 consisted of one section with low-severity joint seal damage noted throughout, along with areas of shrinkage cracking, low-severity LTD cracking and large patching, and medium-severity joint spalling.

Aprons

Apron 01 was defined by one section in poor condition. Low-severity corner spalling, large patching, and scaling; medium-severity faulting and joint seal damage; low- and medium-severity joint spalling and LTD cracking; all severity LTD cracking; popouts; and shrinkage cracking were recorded in Section 01.

Apron 02 consisted of two sections. In Section 01, areas of low-severity faulting and joint seal damage, medium-severity joint spalling, and high-severity small patching were identified. Shrinkage cracking, low-severity corner break and faulting, medium-severity joint seal damage, and low- and medium-severity corner spalling, joint spalling, and LTD cracking were observed in Section 02.

PAVEMENT MAINTENANCE AND REHABILITATION PROGRAM

Using the information collected during the pavement inspection, the PAVER pavement management software was used to develop a 5-year M&R program for Audubon County Airport. In addition, a 1-year plan for localized preventive maintenance (such as crack sealing and patching) was prepared.

Analysis Parameters

Critical PCIs

PAVER uses critical PCIs to determine whether localized preventive maintenance or major rehabilitation is the appropriate repair action. Above the critical PCI, localized preventive maintenance activities are recommended. Below the critical PCI, major rehabilitation actions, such as an overlay or reconstruction, are recommended. The Iowa DOT set the critical PCIs at 65 for runways, 60 for taxiways, and 55 for aprons.

Localized Preventive Maintenance Policies and Unit Costs

Localized preventive maintenance policies were developed for asphalt-surfaced and PCC pavements. These policies, shown in Appendix E, identify the localized preventive maintenance actions that the Iowa DOT considered appropriate to correct for the different distress types and severities. The Iowa DOT provided unit costs for each of the localized preventive maintenance actions included in these policies, and these costs are detailed in Appendix E. Please note that this information is of a general nature for the entire state. The localized preventive maintenance policies and unit costs may require adjustment to reflect specific conditions at Audubon County Airport.

Major Rehabilitation Unit Costs

PAVER estimates the cost of major rehabilitation based on the predicted PCI of the pavement section. The Iowa DOT provided the costs for major rehabilitation and they are presented in Appendix E. If major rehabilitation is recommended in the 5-year program, further engineering investigation will be needed to identify the most appropriate rehabilitation action and to more accurately estimate the cost of such work.

Budget and Inflation Rate

An unlimited budget with a start date of July 1, 2021 and an inflation rate of 1.4 percent was used during the analysis.

Analysis Approach

The 5-year M&R program was prepared with the goal of maintaining the pavements above established critical PCIs. During this analysis, major rehabilitation was recommended for pavements in the year they dropped below their critical PCI. For the first year (2021) of the analysis only, a localized preventive maintenance plan was developed for those pavement sections that were above their critical PCI. If major rehabilitation was triggered for a section in 2022 or 2023, then localized preventive maintenance was not recommended for 2021. While localized preventive maintenance should be an annual undertaking at Audubon County Airport, it is not possible to accurately predict the propagation of cracking and other distress types. Therefore, the airport should budget for maintenance every year and can use the 2021 localized

preventive maintenance plan as a baseline for that work. As the pavements age, it can be assumed that the amount of localized preventive maintenance required will increase.

Analysis Results

A summary of the M&R program for Audubon County Airport is presented in Table 2. Detailed information on the recommended localized preventive maintenance plan for 2021 is provided in Appendix F.

Table 2. 5-year M&R program under an unlimited funding analysis scenario.

Year	Branch	Section	Surface Type	Type of Repair	Estimated Cost
2021	A01AU	01	PCC	Major Rehabilitation	$299,025
2021	A02AU	01	PCC	Localized Maintenance	$941
2021	A02AU	02	PCC	Localized Maintenance	$12,015
2021	R14AU	02	PCC	Localized Maintenance	$20,660
2021	T01AU	01	PCC	Major Rehabilitation	$22,878
2021	T01AU	02	PCC	Localized Maintenance	$2,749
2021	T01AU	03	PCC	Localized Maintenance	$24
2021	T02AU	01	PCC	Localized Maintenance	$1,615
				Total Estimated Cost: $360,000	

Table Notes:

1. See Figure 3 for the location of the branch and section.
2. Surface Type: AC = asphalt cement concrete; AAC = asphalt overlay on AC; PCC = portland cement concrete; APC = asphalt overlay on PCC.
3. Type of Repair: Major Rehabilitation such as pavement reconstruction or an overlay; Localized Preventive Maintenance such as crack sealing or patching.
4. The estimated costs provided are of a general nature for the entire state and may require adjustment to reflect specific conditions at Audubon County Airport.

The recommendations made in this report are based on a broad network-level analysis and meant to provide Audubon County Airport with an indication of the type of pavement-related work required during the next 5 years. Further engineering investigation may be necessary to identify which repair action is most appropriate. In addition, the cost estimates provided are based on overall unit costs for the entire state, and Audubon County Airport should adjust the plan to reflect local costs.

Because an unlimited budget was used in the analysis, it is possible that the pavement repair program may need to be adjusted to consider economic or operational constraints. The identification of a project need does not necessarily mean that state or federal funding will be available in the year it is indicated. It is important to remember that regardless of the recommendations presented within this report, Audubon County Airport is responsible for repairing pavements where existing conditions pose a hazard to safe operations.

General Maintenance Recommendations

In addition to the specific maintenance actions presented in Appendix F, it is recommended that the following strategies be considered for prolonging pavement life:

1. Regularly inspect all safety areas of the airport and document all inspection activity. A sample form that can be used to perform these inspections is provided in Table 3 of this report.
2. Provide a method of tracking all maintenance activities that occur as a result of inspections. These need to be reported to the FAA and the Iowa DOT. This information is used to update the APMS records and is required to remain in compliance with Public Law 103-305 (see the next section of this report for further information on this law).
3. Conduct an aggressive campaign against weed growth through timely herbicide applications and mowing programs of the safety areas. Vegetation growth in pavement cracks is destructive and significantly increases the rate of pavement deterioration.
4. Implement a periodic crack and joint sealing program. Keeping water and debris out of the pavement system by sealing cracks and joints is a proven and cost-effective method of extending the life of the pavement system.
5. Ensure that dirt does not build up along the edges of the pavements. This can create a "bathtub" effect, reducing the ability of water to drain away from the pavement system.
6. Closely monitor the movement of heavy equipment (particularly farming, construction, and fueling equipment) to make sure it is only operating on pavements that are designed to accommodate heavy loads. Failure to restrict heavy equipment to appropriate areas may result in the premature failure of airport pavements.

FAA Requirements (Public Law 103-305)

Because Audubon County Airport is in the National Plan of Integrated Airport Systems (NPIAS), the airport sponsor is required to keep the airport in a viable operating condition. This includes maintaining airport pavements in accordance with Public Law 103-305. Public Law 103-305 states that after January 1, 1995, NPIAS airport sponsors must provide assurances or certifications that an airport has implemented an effective airport pavement maintenance management system (PMMS) before the airport will be considered for federal funding of pavement replacement or reconstruction projects. To be in full compliance with the federal law, the PMMS must include the following components at minimum: pavement inventory, pavement inspections, record keeping, information retrieval, and program funding.

This report serves as a complete pavement inventory and detailed inspection. To remain in compliance with the law, Audubon County Airport will also need to undertake monthly drive-by inspections of pavement conditions and track pavement-related maintenance activities.

FAA Advisory Circular 150/5380-7B provides detailed guidance pertaining to the requirements for an acceptable pavement management program (PMP). Appendix A of the FAA Advisory Circular 150/5380-7B outlines what needs to be included in a PMP to remain in compliance with this law and Grant Assurance #11. Following is a copy of this Appendix, along with instructions for supplementing this report so that all requirements are met. Note that the italicized words are direct quotations from the FAA Advisory Circular.

FAA Advisory Circular 150/5830-7B, Appendix A. Pavement Management Program (PMP)

A-1.0. *An effective PMP specifies the procedures to follow to assure that proper preventative and remedial pavement maintenance is performed. The program should identify funding or anticipated funding and other resources available to provide remedial and preventive maintenance activities. An airport sponsor may use any format deemed appropriate, but the program needs to, as a minimum, include the following:*

A-1.1. Pavement Inventory. *The following must be depicted:*

a. *Identification of all runways, taxiways, and aprons with pavement broken down into sections each having similar properties.*

   The network definition map provided in Figure 3 of this report shows the location of all runways, taxiways, and aprons at *Audubon County Airport*. If any new pavements are constructed or any pavement areas are permanently closed, this map must be updated. Project plans should be submitted to the Iowa DOT after project completion.

b. *Dimensions of pavement sections.*

   The dimensions of all runways, taxiways, and aprons are stored in the PAVER database. Appendix C provides information on length, width, and area. In addition, the network definition map (Figure 3) is drawn to scale. Any changes to pavement dimensions must be recorded.

c. *Type of pavement surface.*

   The type of pavement for each section at *Audubon County Airport* is listed in Table 1 of this report and is also stored in the PAVER database. Any changes to pavement type (through an overlay or reconstruction) must be recorded.

d. *Year of construction and/or most recent major rehabilitation.*

   Dates for pavement construction, rehabilitation, or reconstruction must be recorded. The current pavement history for *Audubon County Airport* is provided in Appendix D of this report.

e. *Whether AIP [Airport Improvement Program] or PFC [Passenger Facility Charge] funds were used to construct, reconstruct, or repair the pavement.*

   Funding sources for all pavement projects should be recorded.

A-1.2. PMP Pavement Inspection Schedule. *Airports must perform a detailed inspection of airfield pavements at least once a year for the PMP. If a pavement condition index (PCI) survey is performed, as set forth in ASTM D5340, Standard Test Method for Airport Pavement Condition Index Surveys, the frequency of the detailed inspection by PCI surveys may be extended to three years. Less comprehensive routine daily, weekly, and monthly maintenance inspections required for operations should be addressed.*

This report consists of a detailed inspection that will extend the inspection period to 3 years. It is the airport sponsor's responsibility to perform monthly drive-by inspections. A sample pavement inspection report form is provided in Table 3 of this report.

A-1.3. Record Keeping. *The airport must record and keep on file complete information about all detailed inspections and maintenance performed until the pavement system is replaced. The types of distress, their locations, and remedial action, scheduled or performed, must be documented. The minimum information recorded includes:*

a. *Inspection date*

b. Location

c. Distress types

d. Maintenance scheduled or performed

Items a through c are satisfied by this inspection report. Item d is the responsibility of the airport, as is record keeping of the monthly drive-by inspections.

A-1.4. Information Retrieval. *An airport sponsor may use any form of record keeping it deems appropriate so long as the information and records from the pavement survey can generate required reports, as necessary.*

Keep this report, monthly drive-by inspection reports, construction updates, and all records of maintenance activities in a readily accessible location so that they can be easily retrieved as requested by the FAA.

Table 3. Pavement inspection report.

Inspected By: _____

Date Inspected: _____

Branch	Section	Distress Description/Dimensions/Severity/ Recommended Action	Description of Repair	Date Performed	Cost	Funding Source
A01AU	01					
A02AU	01					
A02AU	02					
R14AU	01					
R14AU	02					
T01AU	01					

Table 3. Pavement inspection report (continued).

Inspected By: _____

Date Inspected: _____

Branch	Section	Distress Description/Dimensions/Severity/ Recommended Action	Description of Repair	Date Performed	Cost	Funding Source
T01AU	02					
T01AU	03					
T02AU	01					

Table Notes:

1. See Figure 3 for the location of the branch and section.

SUMMARY

This report documents the results of the pavement evaluation conducted at Audubon County Airport. A visual inspection of the pavements in 2020 found that the overall condition of the pavement network is a PCI of 89. A 5-year pavement repair program, shown in Table 2, was generated for Audubon County Airport, which revealed that approximately $360,000 needs to be expended on M&R. Audubon County Airport should utilize these study results to assist in planning for future maintenance needs as part of the airport CIP planning process.

APPENDIX A

CAUSE OF DISTRESS TABLES

Table A-1. Cause of pavement distress, asphalt-surfaced pavements.

Distress Type	Probable Cause of Distress
Alligator Cracking	Fatigue failure of the asphalt surface under repeated traffic loading.
Bleeding	Excessive amounts of asphalt cement or tars in the mix or low air void content, or both.
Block Cracking	Shrinkage of the asphalt and daily temperature cycling; it is not load associated.
Corrugation	Traffic action combined with an unstable pavement layer.
Depression	Settlement of the foundation soil or can be "built up" during construction.
Jet-Blast Erosion	Bituminous binder has been burned or carbonized.
Joint Reflection Cracking	Movement of the concrete slab beneath the asphalt surface due to thermal and moisture changes.
L&T Cracking	Cracks may be caused by (1) a poorly constructed paving lane joint, (2) shrinkage of the asphalt surface due to low temperatures or hardening of the asphalt, or (3) reflective cracking caused by cracks in an underlying PCC slab.
Oil Spillage	Deterioration or softening of the pavement surface caused by the spilling of oil, fuel, or other solvents.
Patching	N/A
Polished Aggregate	Repeated traffic applications.
Raveling	Asphalt binder may have hardened significantly, causing coarse aggregate pieces to dislodge.
Rutting	Usually caused by consolidation or lateral movement of the materials due to traffic loads.
Shoving	Where PCC pavements adjoin flexible pavements, PCC "growth" may shove the asphalt pavement.
Slippage Cracking	Low strength surface mix or poor bond between the surface and the next layer of the pavement structure.
Swelling	Usually caused by frost action or by swelling soil.
Weathering	Asphalt binder and/or fine aggregate may wear away as the pavement ages and hardens.

Table A-2. Cause of pavement distress, PCC pavements.

Distress Type	Probable Cause of Distress
ASR	Chemical reaction of alkalis in the portland cement with certain reactive silica minerals. ASR may be accelerated by the use of chemical pavement deicers.
Blowup	Incompressible materials in the joints.
Corner Break	Load repetition combined with loss of support and curling stresses.
Durability Cracking	Concrete's inability to withstand environmental factors such as freeze-thaw cycles.
Faulting	Upheaval or consolidation.
Joint Seal Damage	Stripping of joint sealant, extrusion of joint sealant, weed growth, hardening of the filler (oxidation), loss of bond to the slab edges, or absence of sealant in the joint.
LTD Cracking	Combination of load repetition, curling stresses, and shrinkage stresses.
Patching (Small and Large)	N/A
Popouts	Freeze-thaw action in combination with expansive aggregates.
Pumping	Poor drainage, poor joint sealant.
Scaling	Over finishing of concrete, deicing salts, improper construction, freeze-thaw cycles, and poor aggregate.
Shattered Slab	Load repetition.
Shrinkage Cracking	Setting and curing of the concrete.
Spalling (Joint and Corner)	Excessive stresses at the joint caused by infiltration of incompressible materials or traffic loads; weak concrete at the joint combined with traffic loads.

APPENDIX B

INSPECTION PHOTOGRAPHS

A01AU-01. Overview.

A01AU-01. LTD Cracking (Sample Unit No. 03).

A01AU-01. Scaling (Sample Unit No. 01).

A01AU-01. Shattered Slab (Sample Unit No. 03).

A02AU-01. Overview.

A02AU-01. Joint Spalling (Sample Unit No. 03).

A02AU-01. Small Patching (Sample Unit No. 02).

A02AU-02. Overview.

A02AU-02. Joint Spalling (Sample Unit No. 09).

A02AU-02. LTD Cracking (Sample Unit No. 08).

A02AU-02. LTD Cracking (Sample Unit No. 09).

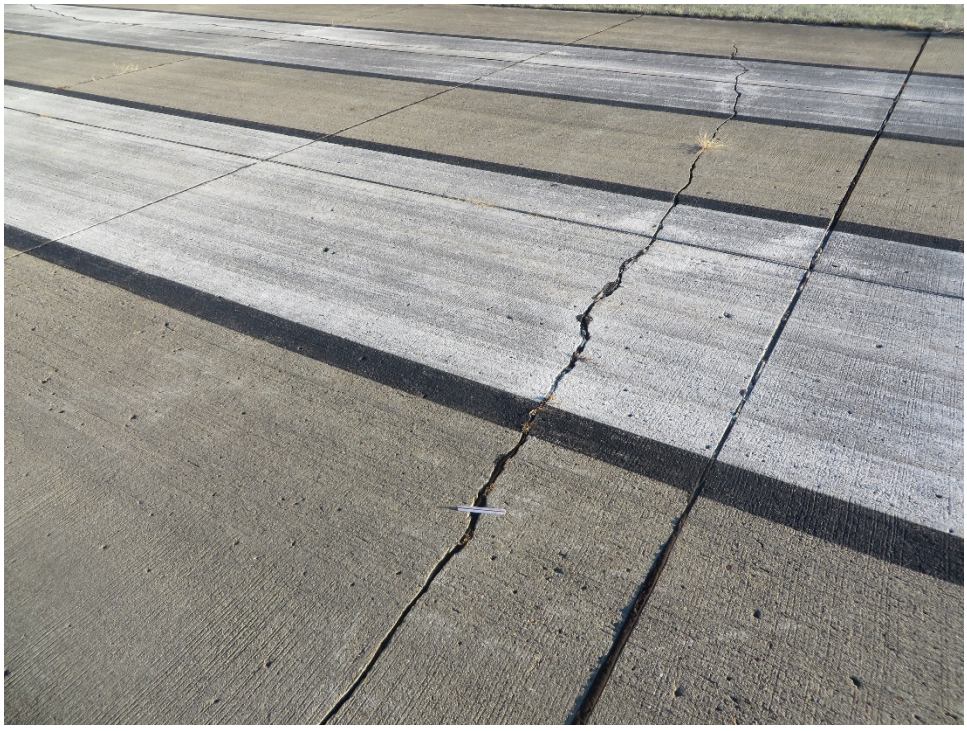
R14AU-01. Overview.

R14AU-01. Joint Spalling (Sample Unit No. 65).

R14AU-02. Overview.

R14AU-02. Joint Seal Damage (Sample Unit No. 14).

R14AU-02. LTD Cracking (Sample Unit No. 14).



T01AU-01. Overview.

T01AU-01. LTD Cracking (Sample Unit No. 01).

T01AU-02. Overview.

T01AU-02. Corner Spalling (Sample Unit No. 01).

T01AU-02. Joint Spalling (Sample Unit No. 01).

T01AU-03. Overview.

T01AU-03. Corner Break (Sample Unit No. 01).

T02AU-01. Overview.

T02AU-01. Shrinkage Cracking (Sample Unit No. 12).

APPENDIX C

INSPECTION REPORT

Re-inspection Report

IA 2020
Report Generated Date: April 08, 2021

Network: ADU Name: AUDUBON COUNTY AIRPORT

Branch: A01AU Name: APRON 01 Use: APRON Area: 5,395.00SqFt

Section: 01 of 1 From: SEE MAP To: TAXIWAY 01 Last Const.: 11/01/1970
Surface: PCC Family: IowaPCCAPSC Zone: Category: Rank: P
Area: 17,895.00SqFt Length: 305.00Ft Width: 60.00Ft
Slabs: 76 Slab Width: 12.50Ft Slab Length: 20.00Ft Joint Length: 2,014.00Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 11/13/2020 Total Samples: 4 Surveyed: 3
Conditions: PCI : 28
Inspection Comments:

Sample Number: 01 Type: R Area: 16.00Slabs PCI = 23
Sample Comments:

72 SHATTERED SLAB	H	1.00 Slabs	Comments:	
63 LINEAR CRACKING	M	3.00 Slabs	Comments:	
63 LINEAR CRACKING	L	1.00 Slabs	Comments:	
71 FAULTING	M	1.00 Slabs	Comments:	
67 LARGE PATCH/UTILITY	L	1.00 Slabs	Comments:	
65 JOINT SEAL DAMAGE	M	16.00 Slabs	Comments:	
72 SHATTERED SLAB	L	2.00 Slabs	Comments:	
70 SCALING/CRAZING	L	1.00 Slabs	Comments:	
74 JOINT SPALLING	M	1.00 Slabs	Comments:	

Sample Number: 02 Type: R Area: 16.00Slabs PCI = 50
Sample Comments:

63 LINEAR CRACKING	M	2.00 Slabs	Comments:	
63 LINEAR CRACKING	L	5.00 Slabs	Comments:	
72 SHATTERED SLAB	L	1.00 Slabs	Comments:	
75 CORNER SPALLING	L	3.00 Slabs	Comments:	
73 SHRINKAGE CRACKING	N	1.00 Slabs	Comments:	
65 JOINT SEAL DAMAGE	M	16.00 Slabs	Comments:	
74 JOINT SPALLING	L	2.00 Slabs	Comments:	

Sample Number: 03 Type: R Area: 20.00Slabs PCI = 15
Sample Comments:

68 POPOUTS	N	2.00 Slabs	Comments:	
63 LINEAR CRACKING	M	1.00 Slabs	Comments:	
72 SHATTERED SLAB	L	4.00 Slabs	Comments:	
63 LINEAR CRACKING	M	5.00 Slabs	Comments:	
73 SHRINKAGE CRACKING	N	1.00 Slabs	Comments:	
74 JOINT SPALLING	M	2.00 Slabs	Comments:	
72 SHATTERED SLAB	M	3.00 Slabs	Comments:	
65 JOINT SEAL DAMAGE	M	20.00 Slabs	Comments:	
63 LINEAR CRACKING	L	1.00 Slabs	Comments:	

Re-inspection Report

IA 2020
Report Generated Date: April 08, 2021

Network: ADU Name: AUDUBON COUNTY AIRPORT

Branch: A02AU Name: APRON 02 Use: APRON Area: 42,108.00SqFt

Section: 01 of 2 From: SEE MAP To: END OF APRON Last Const.: 06/01/1990
Surface: PCC Family: IowaPCCAPSC Zone: Category: Rank: P
Area: 11,700.00SqFt Length: 125.00Ft Width: 100.00Ft
Slabs: 76 Slab Width: 12.50Ft Slab Length: 12.50Ft Joint Length: 1,775.00Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 11/13/2020 Total Samples: 4 Surveyed: 3
Conditions: PCI : 86
Inspection Comments:

Sample Number: 01 Type: R Area: 20.00Slabs PCI = 91
Sample Comments:

74 JOINT SPALLING	M	2.00 Slabs	Comments:	
65 JOINT SEAL DAMAGE	L	20.00 Slabs	Comments:	

Sample Number: 02 Type: R Area: 20.00Slabs PCI = 92
Sample Comments:

65 JOINT SEAL DAMAGE	L	20.00 Slabs	Comments:	
66 SMALL PATCH	H	1.00 Slabs	Comments:	

Sample Number: 03 Type: R Area: 20.00Slabs PCI = 77
Sample Comments:

74 JOINT SPALLING	M	1.00 Slabs	Comments:	
71 FAULTING	L	5.00 Slabs	Comments:	
65 JOINT SEAL DAMAGE	L	20.00 Slabs	Comments:	

Re-inspection Report

IA 2020
Report Generated Date: April 08, 2021

Network: ADU Name: AUDUBON COUNTY AIRPORT

Branch: A02AU Name: APRON 02 Use: APRON Area: 42,108.00SqFt

Section: 02 of 2 From: SEE MAP To: SEE MAP Last Const.: 11/03/2006
Surface: PCC Family: IowaPCCAPSC Zone: Category: Rank: P
Area: 30,408.00SqFt Length: 175.00Ft Width: 150.00Ft
Slabs: 193 Slab Width: 12.50Ft Slab Length: 12.50Ft Joint Length: 3,875.00Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 11/13/2020 Total Samples: 10 Surveyed: 5
Conditions: PCI : 80
Inspection Comments:

Sample Number: 03 Type: R Area: 20.00Slabs PCI = 74
Sample Comments:

75 CORNER SPALLING	M	1.00 Slabs	Comments:
65 JOINT SEAL DAMAGE	M	20.00 Slabs	Comments:
71 FAULTING	L	5.00 Slabs	Comments:

Sample Number: 05 Type: R Area: 16.00Slabs PCI = 85
Sample Comments:

65 JOINT SEAL DAMAGE	M	16.00 Slabs	Comments:
63 LINEAR CRACKING	L	2.00 Slabs	Comments:

Sample Number: 07 Type: R Area: 22.00Slabs PCI = 75
Sample Comments:

63 LINEAR CRACKING	M	1.00 Slabs	Comments:
62 CORNER BREAK	L	1.00 Slabs	Comments:
75 CORNER SPALLING	L	1.00 Slabs	Comments:
63 LINEAR CRACKING	L	1.00 Slabs	Comments:NOT 74
65 JOINT SEAL DAMAGE	M	22.00 Slabs	Comments:

Sample Number: 08 Type: R Area: 20.00Slabs PCI = 84
Sample Comments:

63 LINEAR CRACKING	L	1.00 Slabs	Comments:
74 JOINT SPALLING	M	1.00 Slabs	Comments:
65 JOINT SEAL DAMAGE	M	20.00 Slabs	Comments:

Sample Number: 09 Type: R Area: 20.00Slabs PCI = 84
Sample Comments:

63 LINEAR CRACKING	L	1.00 Slabs	Comments:NOT 74
74 JOINT SPALLING	L	2.00 Slabs	Comments:
73 SHRINKAGE CRACKING	N	1.00 Slabs	Comments:
65 JOINT SEAL DAMAGE	M	20.00 Slabs	Comments:

Re-inspection Report

IA 2020
Report Generated Date: April 08, 2021

Network: ADU Name: AUDUBON COUNTY AIRPORT

Branch: R14AU Name: RUNWAY 14/32 Use: RUNWAY Area: 187,938.00SqFt

Section: 01 of 2 From: RUNWAY 14 APPROACH To: R14AU-02 Last Const.: 06/03/2012
Surface: PCC Family: IowaPCCRWSC_Local Zone: Category: Rank: P
Area: 185,700.00SqFt Length: 3,000.00Ft Width: 60.00Ft
Slabs: 1,800 Slab Width: 10.00Ft Slab Length: 10.00Ft Joint Length: 32,940.00Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 11/13/2020 Total Samples: 77 Surveyed: 9
Conditions: PCI : 98
Inspection Comments:

Sample Number: 01 Type: R Area: 24.00Slabs PCI = 98
Sample Comments:
65 JOINT SEAL DAMAGE L 24.00 Slabs Comments:

Sample Number: 05 Type: R Area: 24.00Slabs PCI = 98
Sample Comments:
65 JOINT SEAL DAMAGE L 24.00 Slabs Comments:

Sample Number: 15 Type: R Area: 24.00Slabs PCI = 98
Sample Comments:
65 JOINT SEAL DAMAGE L 24.00 Slabs Comments:

Sample Number: 25 Type: R Area: 24.00Slabs PCI = 98
Sample Comments:
65 JOINT SEAL DAMAGE L 24.00 Slabs Comments:

Sample Number: 35 Type: R Area: 24.00Slabs PCI = 98
Sample Comments:
65 JOINT SEAL DAMAGE L 24.00 Slabs Comments:

Sample Number: 45 Type: R Area: 24.00Slabs PCI = 98
Sample Comments:
65 JOINT SEAL DAMAGE L 24.00 Slabs Comments:

Sample Number: 55 Type: R Area: 24.00Slabs PCI = 98
Sample Comments:
65 JOINT SEAL DAMAGE L 24.00 Slabs Comments:

Sample Number: 65 Type: R Area: 24.00Slabs PCI = 97
Sample Comments:
65 JOINT SEAL DAMAGE L 24.00 Slabs Comments:
74 JOINT SPALLING L 1.00 Slabs Comments:

Sample Number: 75 Type: R Area: 24.00Slabs PCI = 98
Sample Comments:
65 JOINT SEAL DAMAGE L 24.00 Slabs Comments:

Re-inspection Report

IA 2020
Report Generated Date: April 08, 2021

Network: ADU Name: AUDUBON COUNTY AIRPORT

Branch: R14AU Name: RUNWAY 14/32 Use: RUNWAY Area: 187,938.00SqFt

Section: 02 of 2 From: RUNWAY 32 APPROACH To: R14AU-01 Last Const.: 06/01/1990
Surface: PCC Family: IowaPCCRWSC_Local Zone: Category: Rank: P
Area: 42,900.00SqFt Length: 639.00Ft Width: 60.00Ft
Slabs: 438 Slab Width: 10.00Ft Slab Length: 10.00Ft Joint Length: 6,969.00Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 11/13/2020 Total Samples: 18 Surveyed: 7
Conditions: PCI : 83
Inspection Comments:

Sample Number: 02 Type: R Area: 24.00Slabs PCI = 87
Sample Comments:

65 JOINT SEAL DAMAGE	H	24.00	Slabs	Comments:
73 SHRINKAGE CRACKING	N	1.00	Slabs	Comments:

Sample Number: 05 Type: R Area: 24.00Slabs PCI = 88
Sample Comments:

65 JOINT SEAL DAMAGE	H	24.00	Slabs	Comments:

Sample Number: 08 Type: R Area: 24.00Slabs PCI = 88
Sample Comments:

65 JOINT SEAL DAMAGE	H	24.00	Slabs	Comments:

Sample Number: 10 Type: R Area: 24.00Slabs PCI = 87
Sample Comments:

65 JOINT SEAL DAMAGE	H	24.00	Slabs	Comments:
74 JOINT SPALLING	L	1.00	Slabs	Comments:

Sample Number: 12 Type: R Area: 24.00Slabs PCI = 88
Sample Comments:

65 JOINT SEAL DAMAGE	H	24.00	Slabs	Comments:

Sample Number: 14 Type: R Area: 24.00Slabs PCI = 61
Sample Comments:

63 LINEAR CRACKING	M	5.00	Slabs	Comments:
65 JOINT SEAL DAMAGE	H	24.00	Slabs	Comments:
71 FAULTING	L	3.00	Slabs	Comments:

Sample Number: 17 Type: R Area: 24.00Slabs PCI = 79
Sample Comments:

65 JOINT SEAL DAMAGE	H	24.00	Slabs	Comments:
63 LINEAR CRACKING	L	3.00	Slabs	Comments:
62 CORNER BREAK	L	1.00	Slabs	Comments:

Re-inspection Report

IA 2020
Report Generated Date: April 08, 2021

Network: ADU Name: AUDUBON COUNTY AIRPORT

Branch: T01AU Name: TAXIWAY 01 Use: TAXIWAY Area: 5,410.00SqFt

Section: 01 of 3 From: APRON 01 To: SEE MAP Last Const.: 11/01/1970
Surface: PCC Family: IowaPCCTWSC_Local Zone: Category: Rank: P
Area: 2,896.00SqFt Length: 80.00Ft Width: 30.00Ft
Slabs: 17 Slab Width: 15.00Ft Slab Length: 20.00Ft Joint Length: 170.00Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 11/13/2020 Total Samples: 1 Surveyed: 1
Conditions: PCI : 57
Inspection Comments:

Sample Number: 01 Type: R Area: 17.00Slabs PCI = 57
Sample Comments:

71	FAULTING	L	2.00 Slabs	Comments:
74	JOINT SPALLING	L	1.00 Slabs	Comments:
63	LINEAR CRACKING	L	4.00 Slabs	Comments:
74	JOINT SPALLING	M	1.00 Slabs	Comments:
75	CORNER SPALLING	L	2.00 Slabs	Comments:
63	LINEAR CRACKING	M	1.00 Slabs	Comments:
65	JOINT SEAL DAMAGE	L	17.00 Slabs	Comments:
75	CORNER SPALLING	M	1.00 Slabs	Comments:

Re-inspection Report

IA 2020
Report Generated Date: April 08, 2021

Network: ADU Name: AUDUBON COUNTY AIRPORT

Branch: T01AU Name: TAXIWAY 01 Use: TAXIWAY Area: 5,410.00SqFt

Section: 02 of 3 From: SEE MAP To: SEE MAP Last Const.: 06/01/1990
Surface: PCC Family: IowaPCCTWSC_Local Zone: Category: Rank: P
Area: 3,870.00SqFt Length: 220.00Ft Width: 25.00Ft
Slabs: 35 Slab Width: 10.60Ft Slab Length: 10.00Ft Joint Length: 823.87Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 11/13/2020 Total Samples: 2 Surveyed: 2
Conditions: PCI : 79
Inspection Comments:

Sample Number: 01 Type: R Area: 16.00Slabs PCI = 67
Sample Comments:

63 LINEAR CRACKING	L	1.00 Slabs	Comments:
65 JOINT SEAL DAMAGE	M	16.00 Slabs	Comments:
63 LINEAR CRACKING	M	1.00 Slabs	Comments:
74 JOINT SPALLING	M	1.00 Slabs	Comments:
75 CORNER SPALLING	M	1.00 Slabs	Comments:

Sample Number: 02 Type: R Area: 19.00Slabs PCI = 88
Sample Comments:

63 LINEAR CRACKING	L	1.00 Slabs	Comments:
65 JOINT SEAL DAMAGE	M	19.00 Slabs	Comments:

Re-inspection Report

IA 2020
Report Generated Date: April 08, 2021

Network: ADU Name: AUDUBON COUNTY AIRPORT

Branch: T01AU Name: TAXIWAY 01 Use: TAXIWAY Area: 5,410.00SqFt

Section: 03 of 3 From: SEE MAP To: SEE MAP Last Const.: 06/03/2012
Surface: PCC Family: IowaPCCTWSC_Local Zone: Category: Rank: P
Area: 3,894.00SqFt Length: 115.00Ft Width: 25.00Ft
Slabs: 28 Slab Width: 12.50Ft Slab Length: 12.75Ft Joint Length: 315.49Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 11/13/2020 Total Samples: 1 Surveyed: 1
Conditions: PCI : 94
Inspection Comments:

Sample Number: 01 Type: R Area: 28.00Slabs PCI = 94
Sample Comments:

65	JOINT SEAL DAMAGE	L	28.00 Slabs	Comments:
62	CORNER BREAK	L	1.00 Slabs	Comments:
75	CORNER SPALLING	L	1.00 Slabs	Comments:

Re-inspection Report

IA 2020
Report Generated Date: April 08, 2021

Network: ADU Name: AUDUBON COUNTY AIRPORT

Branch: T02AU Name: TAXIWAY 02 Use: TAXIWAY Area: 43,784.00SqFt

Section: 01 of 1 From: SEE MAP To: SEE MAP Last Const.: 11/03/2006
Surface: PCC Family: IowaPCCTWSC_Local Zone: Category: Rank: P
Area: 43,784.00SqFt Length: 1,600.00Ft Width: 25.00Ft
Slabs: 277 Slab Width: 12.50Ft Slab Length: 12.50Ft Joint Length: 4,775.00Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 11/13/2020 Total Samples: 14 Surveyed: 6
Conditions: PCI : 94
Inspection Comments:

Sample Number: 02 Type: R Area: 20.00Slabs PCI = 91
Sample Comments:

65 JOINT SEAL DAMAGE	L	20.00 Slabs	Comments:
74 JOINT SPALLING	M	2.00 Slabs	Comments:

Sample Number: 04 Type: R Area: 20.00Slabs PCI = 98
Sample Comments:

65 JOINT SEAL DAMAGE	L	20.00 Slabs	Comments:

Sample Number: 06 Type: R Area: 20.00Slabs PCI = 98
Sample Comments:

65 JOINT SEAL DAMAGE	L	20.00 Slabs	Comments:

Sample Number: 08 Type: R Area: 20.00Slabs PCI = 98
Sample Comments:

65 JOINT SEAL DAMAGE	L	20.00 Slabs	Comments:

Sample Number: 10 Type: R Area: 20.00Slabs PCI = 94
Sample Comments:

65 JOINT SEAL DAMAGE	L	20.00 Slabs	Comments:
74 JOINT SPALLING	M	1.00 Slabs	Comments:

Sample Number: 12 Type: R Area: 20.00Slabs PCI = 86
Sample Comments:

63 LINEAR CRACKING	L	1.00 Slabs	Comments:
67 LARGE PATCH/UTILITY	L	2.00 Slabs	Comments:
73 SHRINKAGE CRACKING	N	1.00 Slabs	Comments:
65 JOINT SEAL DAMAGE	L	20.00 Slabs	Comments:

APPENDIX D

WORK HISTORY REPORT

Work History Report

Pavement Database:IA 2020

Network: ADU **Branch:** A01AU (APRON 01 AT AUDUBON) **Section:** 01 **Surface:** PCC
L.C.D.: 11/01/1970 **Use:** APRON **Rank** P **Length:** 305.00 Ft **Width:** 60.00 Ft **True Area:** 17,895.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/2016	CS-PC	Crack Sealing - PCC	$0	0.00	False	P-605
06/01/2016	JS-LC	Joint Seal (Localized)	$0	0.00	False	P-605
06/01/2016	SL-PC	Slab Replacement - PCC	$0	6.00	False	P-505 over 4" P-154 Agg Base, over P-152
11/01/1970	NC-PC	New Construction - PCC	$0	0.00	True	-

Network: ADU **Branch:** A02AU (APRON 02 AT AUDUBON) **Section:** 01 **Surface:** PCC
L.C.D.: 06/01/1990 **Use:** APRON **Rank** P **Length:** 125.00 Ft **Width:** 100.00 Ft **True Area:** 11,700.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/2016	CS-PC	Crack Sealing - PCC	$0	0.00	False	P-605
06/01/2016	JS-LC	Joint Seal (Localized)	$0	0.00	False	P-605
06/01/1990	NC-PC	New Construction - PCC	$0	0.00	True	-

Network: ADU **Branch:** A02AU (APRON 02 AT AUDUBON) **Section:** 02 **Surface:** PCC
L.C.D.: 11/03/2006 **Use:** APRON **Rank** P **Length:** 175.00 Ft **Width:** 150.00 Ft **True Area:** 30,408.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/2016	CS-PC	Crack Sealing - PCC	$0	0.00	False	P-605
06/01/2016	JS-LC	Joint Seal (Localized)	$0	0.00	False	P-605
11/03/2006	NC-PC	New Construction - PCC	$0	6.00	True	P-505
11/02/2006	BA-AG	Base Course - Aggregate	$0	4.00	False	P-209
11/01/2006	SG-ST	Subgrade - Stabilized	$0	10.00	False	P-158 Fly Ash Treated

Network: ADU **Branch:** R14AU (RUNWAY 14/32 AT AUDUBON) **Section:** 01 **Surface:** PCC
L.C.D.: 06/03/2012 **Use:** RUNWAY **Rank** P **Length:** 3,000.00 Ft **Width:** 60.00 Ft **True Area:** 185,700.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/03/2012	CR-PC	Complete Reconstruction - PC	$0	6.00	True	6" P501 PCC
06/02/2012	BA-AG	Base Course - Aggregate	$0	4.00	False	4" AGG BASE (P209 OR P219)
06/01/2012	SG-ST	Subgrade - Stabilized	$0	9.00	False	9" P158 FLY ASH TREATED SUBGRADE
11/01/1970	NC-PC	New Construction - PCC	$0	0.00	True	-

Network: ADU **Branch:** R14AU (RUNWAY 14/32 AT AUDUBON) **Section:** 02 **Surface:** PCC
L.C.D.: 06/01/1990 **Use:** RUNWAY **Rank** P **Length:** 639.00 Ft **Width:** 60.00 Ft **True Area:** 42,900.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/2012	JS-LC	Joint Seal (Localized)	$0	0.00	False	-
06/01/1990	NC-PC	New Construction - PCC	$0	0.00	True	-

Network: ADU **Branch:** T01AU (TAXIWAY 01 AT AUDUBON) **Section:** 01 **Surface:** PCC
L.C.D.: 11/01/1970 **Use:** TAXIWAY **Rank** P **Length:** 80.00 Ft **Width:** 30.00 Ft **True Area:** 2,896.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/2016	SL-PC	Slab Replacement - PCC	$0	0.00	False	P-505
06/01/2016	CS-PC	Crack Sealing - PCC	$0	0.00	False	P-605
06/01/2016	JS-LC	Joint Seal (Localized)	$0	0.00	False	P-605
11/01/1970	NC-PC	New Construction - PCC	$0	0.00	True	-

Network: ADU **Branch:** T01AU (TAXIWAY 01 AT AUDUBON) **Section:** 02 **Surface:** PCC
L.C.D.: 06/01/1990 **Use:** TAXIWAY **Rank** P **Length:** 220.00 Ft **Width:** 25.00 Ft **True Area:** 3,870.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/2016	JS-LC	Joint Seal (Localized)	$0	0.00	False	P-605

06/01/2016	CS-PC	Crack Sealing - PCC	$0	0.00	False	P-605
06/01/1990	NC-PC	New Construction - PCC	$0	0.00	True	-

Network: ADU **Branch:** T01AU (TAXIWAY 01 AT AUDUBON) **Section:** 03 **Surface:** PCC
L.C.D.: 06/03/2012 **Use:** TAXIWAY **Rank** P **Length:** 115.00 Ft **Width:** 25.00 Ft **True Area:** 3,894.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/03/2012	CR-PC	Complete Reconstruction - PC	$0	6.00	True	6" P501 PCC
06/02/2012	BA-AG	Base Course - Aggregate	$0	4.00	False	4" AGG BASE (P209 OR P219)
06/01/2012	SG-ST	Subgrade - Stabilized	$0	9.00	False	9" FLY ASH TREATED SUBGRADE
11/01/1970	NC-PC	New Construction - PCC	$0	0.00	True	-

Network: ADU **Branch:** T02AU (TAXIWAY 02 AT AUDUBON) **Section:** 01 **Surface:** PCC
L.C.D.: 11/03/2006 **Use:** TAXIWAY **Rank** P **Length:** 1,600.00 Ft **Width:** 25.00 Ft **True Area:** 43,784.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/2016	PA-PP	Patching - PCC Partial Depth	$0	0.00	False	-
06/01/2016	CS-PC	Crack Sealing - PCC	$0	0.00	False	P-605
06/01/2016	JS-LC	Joint Seal (Localized)	$0	0.00	False	P-605
11/03/2006	NC-PC	New Construction - PCC	$0	6.00	True	P-505
11/02/2006	BA-AG	Base Course - Aggregate	$0	4.00	False	P-209
11/01/2006	SG-ST	Subgrade - Stabilized	$0	10.00	False	P-158 Fly Ash Treated

Summary:

Work Description	Section Count	Area Total (SqFt)	Thickness Avg (in)	Thickness STD (in)
Base Course - Aggregate	4	263,786.00	4.00	.00
Complete Reconstruction - PCC	2	189,594.00	6.00	.00
Crack Sealing - PCC	6	110,553.00	.00	.00
Joint Seal (Localized)	7	153,453.00	.00	.00
New Construction - PCC	9	343,047.00	1.33	2.65
Patching - PCC Partial Depth	1	43,784.00	.00	-
Slab Replacement - PCC	2	20,791.00	3.00	4.24
Subgrade - Stabilized	4	263,786.00	9.50	.58

APPENDIX E

LOCALIZED PREVENTIVE MAINTENANCE POLICIES AND UNIT COST TABLES

Table E-1. Localized preventive maintenance policy, asphalt-surfaced pavements.

Distress Type	Severity Level	Maintenance Action
Alligator Cracking	Low	Monitor
Alligator Cracking	Medium	Asphalt Patch
Alligator Cracking	High	Asphalt Patch
Bleeding	N/A	Monitor
Block Cracking	Low	Monitor
Block Cracking	Medium	Crack Seal—Asphalt
Block Cracking	High	Crack Seal—Asphalt
Corrugation	Low	Monitor
Corrugation	Medium	Asphalt Patch
Corrugation	High	Asphalt Patch
Depression	Low	Monitor
Depression	Medium	Monitor
Depression	High	Asphalt Patch
Jet-Blast Erosion	N/A	Asphalt Patch
Joint Reflection Cracking	Low	Monitor
Joint Reflection Cracking	Medium	Crack Seal—Asphalt
Joint Reflection Cracking	High	Crack Seal—Asphalt
L&T Cracking	Low	Monitor
L&T Cracking	Medium	Crack Seal—Asphalt
L&T Cracking	High	Crack Seal—Asphalt
Oil Spillage	N/A	Asphalt Patch
Patching	Low	Monitor
Patching	Medium	Asphalt Patch
Patching	High	Asphalt Patch
Polished Aggregate	N/A	Monitor
Raveling	Low	Monitor
Raveling	Medium	Asphalt Patch
Raveling	High	Asphalt Patch
Rutting	Low	Monitor
Rutting	Medium	Monitor
Rutting	High	Asphalt Patch
Shoving	Low	Monitor
Shoving	Medium	Asphalt Patch
Shoving	High	Asphalt Patch
Slippage Cracking	N/A	Asphalt Patch
Swelling	Low	Monitor
Swelling	Medium	Monitor
Swelling	High	Asphalt Patch
Weathering	Low	Monitor
Weathering	Medium	Monitor
Weathering	High	Asphalt Patch

Table E-2. Localized preventive maintenance policy, PCC pavements.

Distress Type	Severity Level	Maintenance Action
ASR	Low	Monitor
ASR	Medium	Slab Replacement
ASR	High	Slab Replacement
Blowup	Low	Slab Replacement
Blowup	Medium	Slab Replacement
Blowup	High	Slab Replacement
Corner Break	Low	Crack Seal—PCC
Corner Break	Medium	Full Depth PCC Patch
Corner Break	High	Full Depth PCC Patch
Durability Cracking	Low	Monitor
Durability Cracking	Medium	Full Depth Patch
Durability Cracking	High	Slab Replacement
Faulting	Low	Monitor
Faulting	Medium	Grinding
Faulting	High	Slab Replacement
Joint Seal Damage	Low	Monitor
Joint Seal Damage	Medium	Joint Seal
Joint Seal Damage	High	Joint Seal
LTD Cracking	Low	Monitor
LTD Cracking	Medium	Crack Seal—PCC
LTD Cracking	High	Slab Replacement
Patching (Small and Large)	Low	Monitor
Patching (Small and Large)	Medium	Full Depth PCC Patch
Patching (Small and Large)	High	Full Depth PCC Patch
Popouts	N/A	Monitor
Pumping	N/A	Monitor
Scaling	Low	Monitor
Scaling	Medium	Partial Depth PCC Patch
Scaling	High	Slab Replacement
Shattered Slab	Low	Crack Seal—PCC
Shattered Slab	Medium	Slab Replacement
Shattered Slab	High	Slab Replacement
Shrinkage Cracking	N/A	Monitor
Spalling (Joint and Corner)	Low	Monitor
Spalling (Joint and Corner)	Medium	Partial Depth PCC Patch
Spalling (Joint and Corner)	High	Partial Depth PCC Patch

Table E-3. 2021 unit costs for preventive maintenance actions.

Maintenance Action	Unit Cost
Asphalt Patch—Asphalt-Surfaced Pavement	$14.10/sf
Crack Sealing—Asphalt-Surfaced Pavement	$2.41/lf
Partial Depth PCC Patch—PCC Pavement	$36.10/sf
Full Depth PCC Patch—PCC Pavement	$16.12/sf
Crack Sealing—PCC Pavement	$2.90/lf
Joint Sealing—PCC Pavement	$2.90/lf
Grinding—PCC Pavement	$0.35/sf
Slab Replacement—PCC Pavement	$16.12/sf

Table E-4. 2021 unit costs (per square foot) based on pavement type and PCI ranges.

Pavement Type	PCI Range 0–40	PCI Range 40–50	PCI Range 50–60	PCI Range 60–70	PCI Range 70–80	PCI Range 80–90	PCI Range 90–100
AC	$10.01	$4.74	$4.74	$4.74	$0.00	$0.00	$0.00
PCC	$16.71	$7.90	$7.90	$7.90	$0.00	$0.00	$0.00

APPENDIX F

YEAR 2021 LOCALIZED PREVENTIVE MAINTENANCE DETAILS

Table F-1. Year 2021 localized preventive maintenance details.

Branch	Section	Distress Type	Severity	Distress Quantity	Distress Unit	Maintenance Action	Unit Cost	2021 Estimated Cost
A02AU	01	Joint Spalling	Medium	4	Slabs	Patching - PCC Partial Depth	$36.10	$886
A02AU	01	Small Patch	High	1	Slabs	Patching - PCC Full Depth	$16.12	$55
A02AU	02	Corner Break	Low	2	Slabs	Crack Sealing - PCC	$2.90	$47
A02AU	02	Corner Spalling	Medium	2	Slabs	Patching - PCC Partial Depth	$36.10	$191
A02AU	02	Joint Seal Damage	Medium	193	Slabs	Joint Seal (Localized)	$2.90	$11,247
A02AU	02	Joint Spalling	Medium	2	Slabs	Patching - PCC Partial Depth	$36.10	$459
A02AU	02	LTD Cracking	Medium	2	Slabs	Crack Sealing - PCC	$2.90	$71
R14AU	02	Corner Break	Low	3	Slabs	Crack Sealing - PCC	$2.90	$62
R14AU	02	Joint Seal Damage	High	438	Slabs	Joint Seal (Localized)	$2.90	$20,220
R14AU	02	LTD Cracking	Medium	13	Slabs	Crack Sealing - PCC	$2.90	$378
T01AU	02	Corner Spalling	Medium	1	Slabs	Patching - PCC Partial Depth	$36.10	$97
T01AU	02	Joint Seal Damage	Medium	35	Slabs	Joint Seal (Localized)	$2.90	$2,389
T01AU	02	Joint Spalling	Medium	1	Slabs	Patching - PCC Partial Depth	$36.10	$233
T01AU	02	LTD Cracking	Medium	1	Slabs	Crack Sealing - PCC	$2.90	$30
T01AU	03	Corner Break	Low	1	Slabs	Crack Sealing - PCC	$2.90	$24
T02AU	01	Joint Spalling	Medium	7	Slabs	Patching - PCC Partial Depth	$36.10	$1,615

Table Notes:

1. See Figure 3 for the location of the branch and section.
2. Distress types are defined by ASTM D5340-20. L&T Cracking = Longitudinal and Transverse Cracking; LTD Cracking = Longitudinal, Transverse, and Diagonal Cracking; ASR = Alkali-Silica Reaction.
3. The costs provided are of a general nature for the entire state and may require adjustment to reflect specific conditions at Audubon County Airport.

PREPARED FOR

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