Winterset Municipal Airport

PAVEMENT MANAGEMENT REPORT

PREPARED BY

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JUNE 2018

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WINTERSET MUNICIPAL AIRPORT PAVEMENT MANAGEMENT REPORT

PREPARED FOR:

IOWA DEPARTMENT OF TRANSPORTATION
OFFICE OF AVIATION

PREPARED BY:

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IN ASSOCIATION WITH:

ROBINSON ENGINEERING COMPANY

June 2018

The preparation of this document was financed in part through an Airport Improvement Program grant from the Federal Aviation Administration (Project Number 3-19-0000-023-2017) as provided under Section 505 of the Airport and Airway Improvement Act of 1982, as amended. The contents do not necessarily reflect the DOT's official views or the policy of the FAA. Acceptance of this report by the FAA does not in any way constitute a commitment on the part of the United States to participate in any development depicted therein nor does it indicate the proposed development is environmentally acceptable in accordance with appropriate public laws.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDIXES

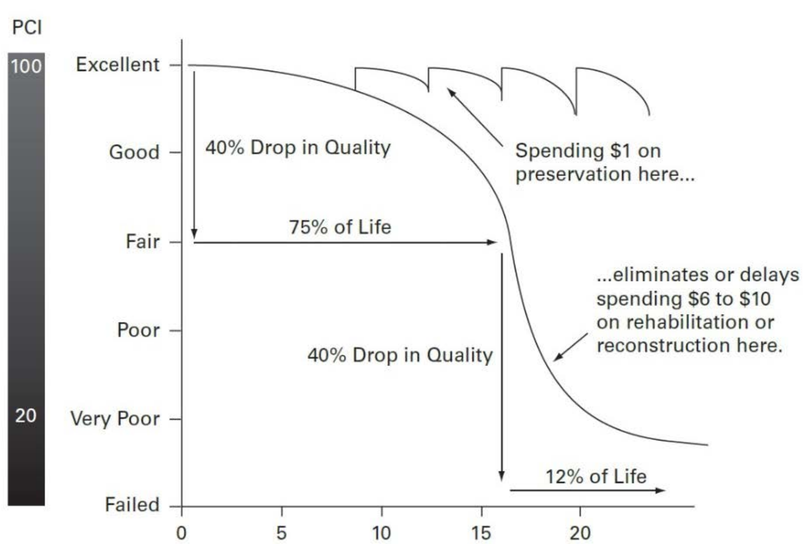
INTRODUCTION

Applied Pavement Technology, Inc. (APTech), with assistance from Robinson Engineering Company, updated the airport pavement management system (APMS) for the Iowa Department of Transportation, Office of Aviation (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 Winterset Municipal Airport were assessed in December 2017 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 also to identify the most cost-effective time to perform major rehabilitation (such as an overlay or whitetopping). The importance of identifying not only the type of repair, but also the optimal time of repair is illustrated in Figure 1 (taken from http://www.fhwa.dot.gov/pavement/preservation/ppc0621.cfm). This figure shows that there is a point in a pavement's life cycle where the rate of deterioration increases. The financial impact of delaying repairs beyond this point can be severe.

Figure 1. Pavement condition versus cost of repair.



The pavement evaluation results for Winterset Municipal Airport are presented within this report and can be used by the Iowa DOT, the Federal Aviation Administration (FAA), and Winterset Municipal Airport to identify, prioritize, and schedule pavement maintenance and rehabilitation (M&R) actions at the airport. In addition to this report, the web-based Interactive Data Exchange Application (IDEA) containing the pavement management information collected during this project was updated and may be accessed from the Iowa DOT's website.

PAVEMENT INVENTORY

The pavement network at Winterset Municipal Airport was divided into branches, sections, and sample units for pavement management purposes. 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, aprons, and T-hangars 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, last construction date, traffic level, and performance. Using this approach, if a runway was built in 1968 and then extended in 1984, it would be comprised of 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 condition of the section as a whole.

Approximately 254,873 square feet of pavement were evaluated at Winterset Municipal Airport, as illustrated in Figure 2. This figure also shows the area-weighted age in years of the pavements at the time of 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 Winterset Municipal Airport.

Figure 2. Pavement area by branch use.

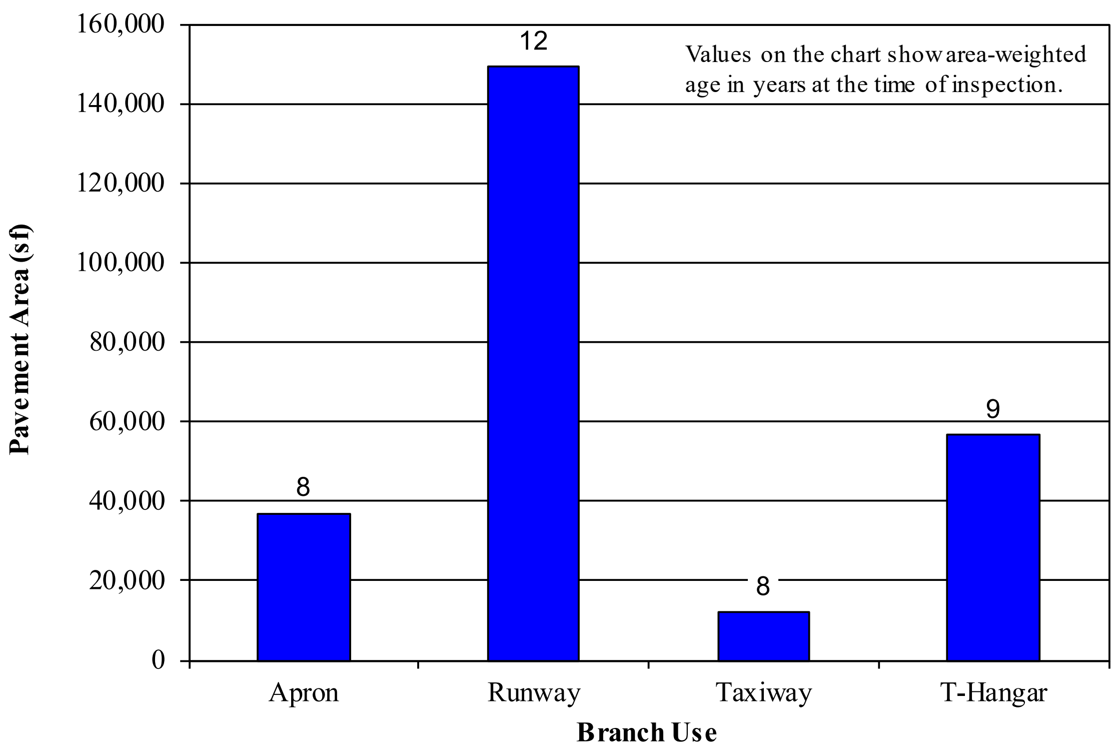
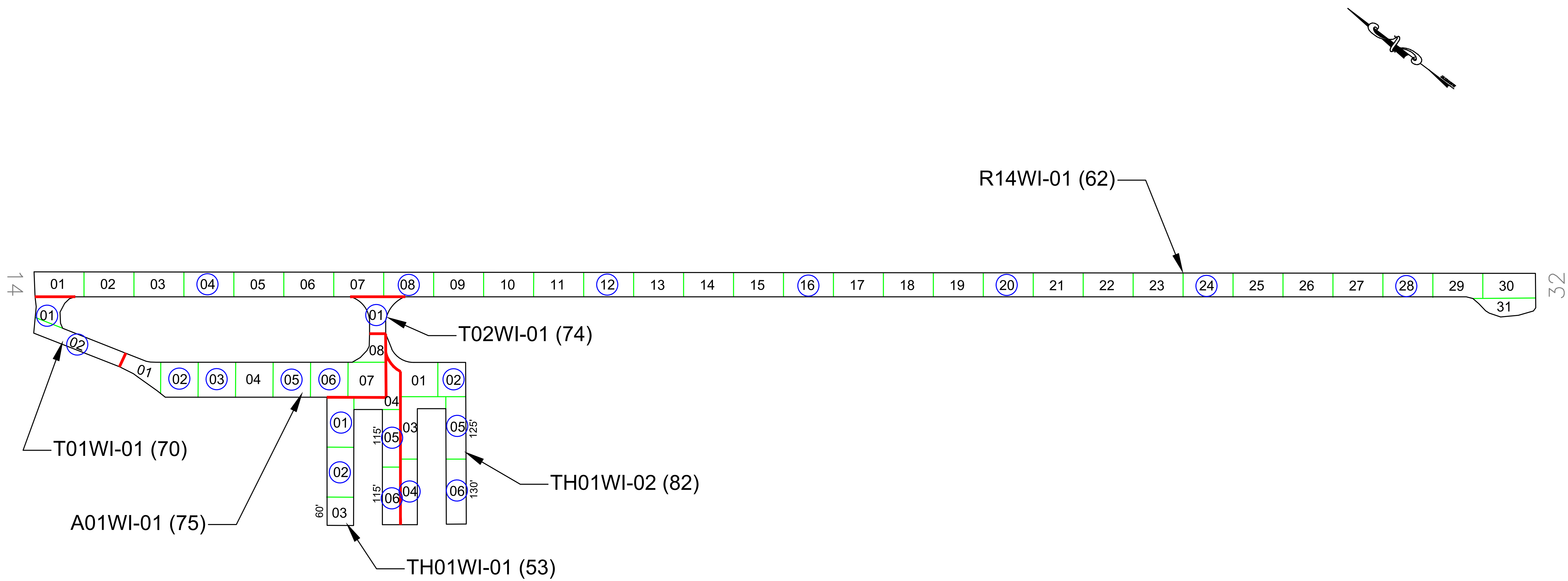


FIGURE 3. NETWORK DEFINITION MAP.



NETWORK DEFINITION LEGEND

R14WI-01 (62)
BRANCH IDENTIFIER
SECTION IDENTIFIER
PCI VALUE

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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Office of Aviation

LOCATION: Winterset Municipal Airport
Winterset, Iowa

PAGE TITLE: Network Definition Map

PROJECT DATE:	CREATION DATE:	PROJECT MANAGER:	JOB NUMBER:
SEP. 2017	SEP. 2017	LJR	2017-020-AM01
DRAWING SCALE: 1"=200'	LAST MODIFIED DATE: MAY 2018	REVISED BY: DSP	DRAWN BY: DSP
FILENAME: Winterset.dwg		LAYOUT NAME/NUMBER: NET. DEF.	PAGE NUMBER: 3

PAVEMENT EVALUATION

Pavement Evaluation Procedure

APTech inspected the pavements at Winterset Municipal Airport using the PCI procedure described in:

- FAA Advisory Circular (AC) 150/5380-6C, *Guidelines and Procedures for Maintenance of Airport Pavements* (https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5380-6C.pdf)
- FAA AC 150/5380-7B, *Airport Pavement Management Program (PMP)* (https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5380-7B.pdf)
- ASTM D5340-12, *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 (representing a pavement in a failed condition) to a value of 100 (representing a pavement in excellent condition).

Figure 4. Visual representation of PCI scale on typical pavement surfaces[1].

PCI = 100 PCI = 60 PCI = 35

[1]Photographs shown are not specific to Winterset Municipal Airport.

In general terms, 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 also provides the corresponding colors used for the maps and charts in this report for each range of PCIs.

Figure 5. PCI versus repair type.

PCI Range	Repair
86-100	Preventive Maintenance
71-85	
56-70	
41-55	Major Rehabilitation
26-40	Reconstruction
11-25	
0-10	

The types of distress identified during the PCI inspection provide insight into the cause of pavement deterioration. 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). Understanding the cause of distress helps in selecting a rehabilitation alternative that corrects the cause and thus eliminates its recurrence.

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 Winterset Municipal Airport were inspected on December 5, 2017. The 2017 area-weighted condition of Winterset Municipal Airport is 66, with conditions ranging from 53 to 82 (on a scale of 0 [failed] to 100 [excellent]). During the previous pavement inspection in 2014, the area-weighted PCI of the airport was 89.

Figure 6 summarizes the overall condition of the pavements at Winterset Municipal 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 Winterset Municipal Airport.

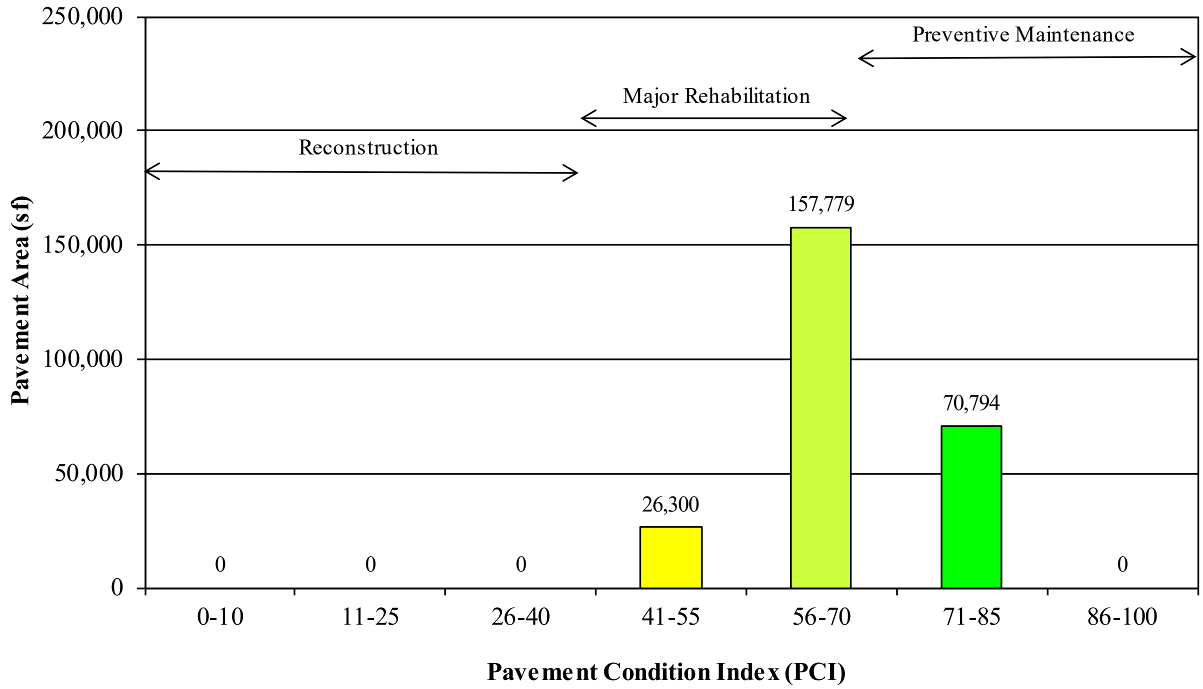


Figure 7. PCI by branch use at Winterset Municipal Airport.
(Values on chart are area-weighted)

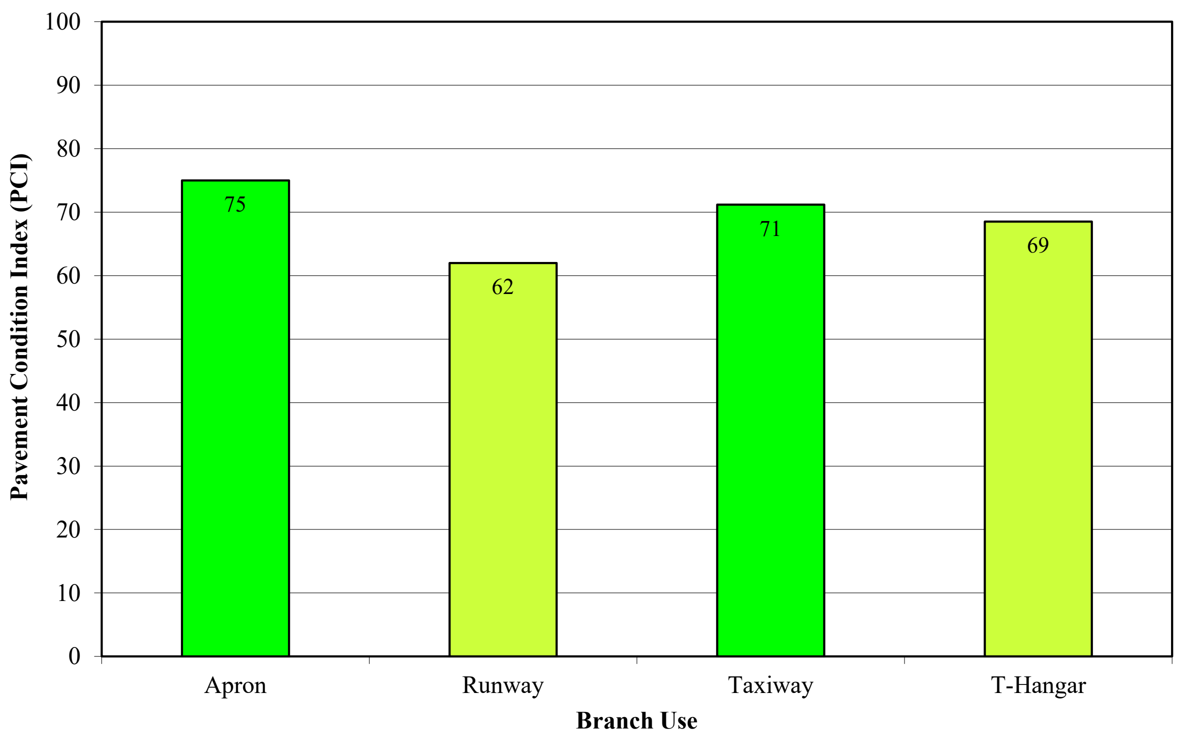
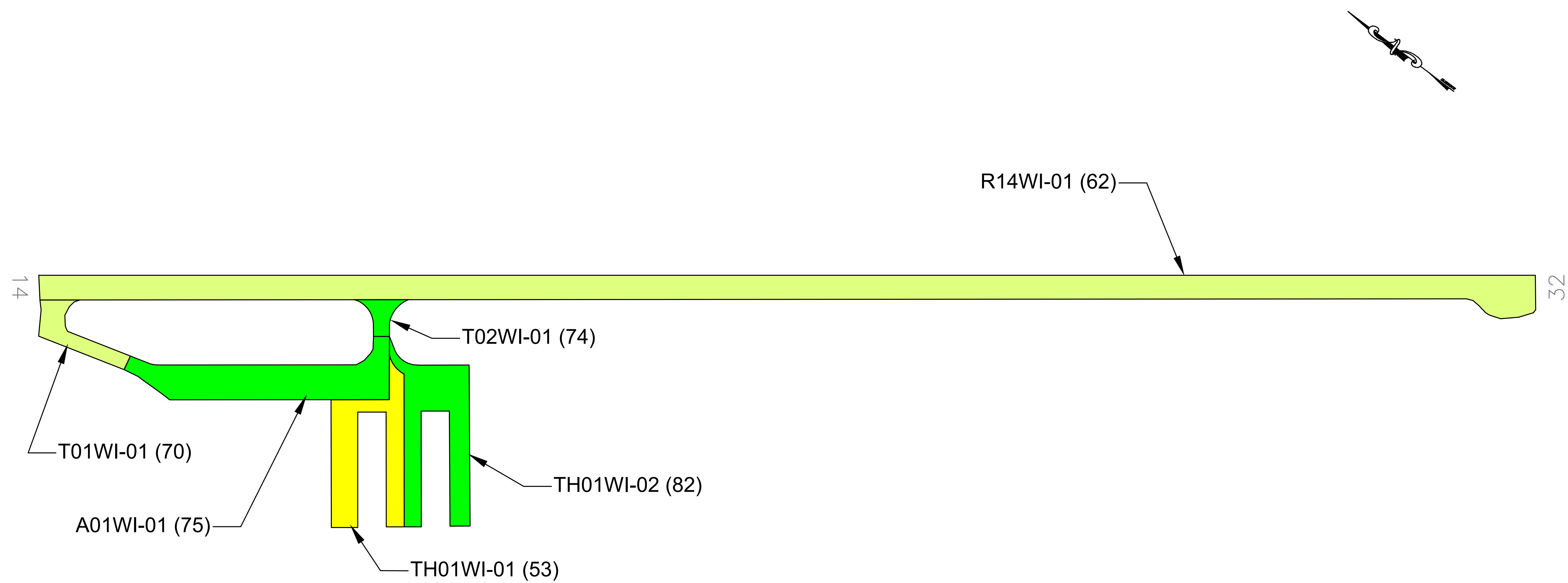
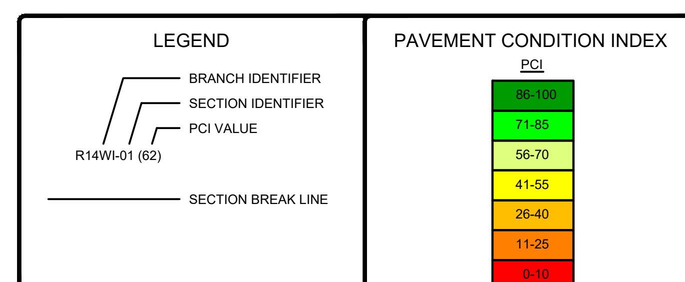


FIGURE 8. PCI MAP.





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AGENCY: Iowa Department of Transportation Office of Aviation

LOCATION: Winterset Municipal Airport
Winterset, Iowa

PAGE TITLE: 2017 Pavement Condition Index Map

PROJECT DATE: SEP. 2017	CREATION DATE: SEP. 2017	PROJECT MANAGER: LJR	JOB NUMBER: 2017-020-AM01
DRAWING SCALE: 1"=200'	LAST MODIFIED DATE: MAY 2018	REVISED BY: ABF	DRAWN BY: DSP
FILENAME: Winterset.dwg		LAYOUT NAME/NUMBER: PCI	PAGE NUMBER: 8

Table 1. 2017 pavement evaluation results.

Branch[1]	Section[1]	Surface Type[2]	Section Area (sf)	LCD[3]	2017 PCI	% Distress due to Load[4]	% Distress due to Climate/ Durability[5]	% Distress due to Other[6]	Type of Distresses[7]
A01WI	01	AC	37,013	6/4/2009	75	0	100	0	L&T Cracking, Raveling, Weathering
R14WI	01	AAC	149,219	6/1/2005	62	60	38	2	Alligator Cracking, L&T Cracking, Swelling, Weathering
T01WI	01	AAC	8,560	6/1/2009	70	31	55	14	Alligator Cracking, L&T Cracking, Swelling, Weathering
T02WI	01	AAC	3,487	6/1/2009	74	43	57	0	Alligator Cracking, L&T Cracking, Weathering
TH01WI	01	AC	26,300	1/1/2003	53	33	63	4	Alligator Cracking, Depression, L&T Cracking, Raveling, Rutting, Swelling, Weathering
TH01WI	02	AC	30,294	1/1/2013	82	0	74	26	L&T Cracking, Swelling, Weathering

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

[2]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 those distresses attributed to a structural deficiency in the pavement, such as alligator cracking or rutting on AC-surfaced pavements or shattered slabs on a PCC pavement.

[5]Distress due to climate or durability includes those distresses attributed to either the aging of the pavement and the effects of the environment (such as weathering, raveling, or block cracking in AC-surfaced pavements) or to a materials-related problem (such as durability cracking or alkali-silica reaction [ASR] in a PCC pavement). If materials-related distresses were recorded during the inspection, further laboratory testing is required to definitively determine the type present.

[6]Other refers to distresses not attributed to one factor but rather may be caused by a combination of factors.

[7]Distress types are defined by ASTM D5340-12. L&T Cracking = Longitudinal and Transverse Cracking; LTD Cracking = Longitudinal, Transverse, and Diagonal Cracking; ASR = Alkali-Silica Reaction.

Inspection Comments

Winterset Municipal Airport was inspected on December 5, 2017. There were six pavement sections defined during the inspection.

Runway

Runway 14-32 was defined by one section. Low- and medium-severity alligator cracking and longitudinal and transverse (L&T) cracking and low-severity swelling and weathering were observed in Section 01. The low-severity alligator cracking was recorded at the edge of the pavement. The low-severity L&T cracking was identified in both the sealed and unsealed conditions while the medium-severity L&T cracking was recorded due to either the development of secondary cracking, unsealed crack widths greater than ¼ inch, or crack sealant no longer performing satisfactorily.

Taxiways

Taxiway 01 consisted of one section, located between the Runway 14 approach and the apron area. Low-severity weathering, swelling and alligator cracking and low- and medium-severity L&T cracking were identified. The low-severity L&T cracking was identified in an unsealed condition while the medium-severity L&T cracking was recorded where either crack sealant was no longer performing satisfactorily, unsealed crack widths exceeded ¼ in, or secondary cracking associated with the primary cracking was observed. The low-severity alligator cracking was observed at the edge of the pavement.

Taxiway 02 contained one section, located between Runway 14-32 and the apron area. Low-severity L&T cracking was observed in Section 01 in both the sealed and unsealed conditions along with medium-severity L&T cracking that was due to the development of secondary cracking. Low-severity weathering was also recorded along with low-severity alligator cracking where secondary cracking was greater than 1 foot wide.

Apron

The apron area consisted of one section. Low-severity L&T cracking was observed in an unsealed condition along with medium-severity L&T cracking that was due to either unsatisfactory crack sealant, the development of secondary cracking, or unsealed crack widths greater than ¼ in. An isolated area of high-severity raveling was recorded where mechanical damage was observed. Low-severity weathering was also recorded throughout the section.

T-Hangar

The T-Hangar area was defined by two sections. Section 01 was observed with low-severity alligator cracking, rutting, weathering, and depression; low- and medium-severity L&T cracking; and medium- and high-severity raveling were recorded. The low-severity alligator cracking was located at the edge of the pavement. Low-severity L&T cracking was recorded in both the sealed and unsealed conditions, while the medium-severity L&T cracking was observed where either crack sealant was no longer performing satisfactorily, unsealed crack widths exceeded ¼ inch, or secondary cracking associated with the primary cracking was identified. Isolated amounts of low-severity swelling were observed at the L&T cracking and at a drainage structure. Section 02 was identified with low-severity L&T cracking in both the sealed and unsealed conditions, along with medium-severity L&T cracking that was due to either unsatisfactory crack sealant or unsealed crack widths greater than ¼ inch. Much of the cracking in this section was filled with vegetation. Low-severity swelling and weathering were also identified.

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 Winterset Municipal 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 and T-hangars.

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 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 maintenance policies and unit costs may require adjustment to reflect specific conditions at Winterset Municipal 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, 2018 and an inflation rate of 2 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 (2018) 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 2019 or 2020, then localized maintenance was not recommended for 2018. While localized preventive maintenance should be an annual undertaking at Winterset Municipal 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 2018 localized preventive maintenance plan as a baseline for that work. As the pavements age, it can be assumed that the amount of localized maintenance required will increase.

Analysis Results

A summary of the M&R program for Winterset Municipal Airport is presented in Table 2. Detailed information on the recommended localized preventive maintenance plan for 2018 is contained in Appendix F.

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

Year	Branch[1]	Section[1]	Surface Type[2]	Type of Repair[3]	Estimated Cost[4]
2018	A01WI	01	AC	Localized Maintenance	$1,055
2018	R14WI	01	AAC	Major Rehabilitation	$684,915
2018	T01WI	01	AAC	Localized Maintenance	$183
2018	T02WI	01	AAC	Localized Maintenance	$12
2018	TH01WI	01	AC	Major Rehabilitation	$120,717
2018	TH01WI	02	AC	Localized Maintenance	$111

Total Estimated Cost: $807,000

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

[2]AC = asphalt cement concrete; AAC = asphalt overlay on AC; PCC = portland cement concrete; APC = asphalt overlay on PCC.

[3]Major Rehabilitation: such as pavement reconstruction or an overlay. Localized Preventive Maintenance: such as crack sealing or patching.

[4]The costs provided are of a general nature for the entire state and may require adjustment to reflect specific conditions at the airport.

The recommendations made in this report are based on a broad network-level analysis and are meant to provide Winterset Municipal 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 Winterset Municipal 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 take into account economic and/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, Winterset Municipal 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 are 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 is important because 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/or mowing programs of the safety areas. Vegetation growth in pavement cracks is very 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)

Since Winterset Municipal 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, Winterset Municipal Airport will also need to undertake monthly drive-by inspections of pavement conditions and track pavement-related maintenance activities.

FAA AC 150/5380-7B provide detailed guidance pertaining to the requirements for an acceptable pavement management program (PMP). Appendix A of FAA AC 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 AC.**

FAA AC 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, aprons, and T-hangars at Winterset Municipal Airport. If any new pavements are constructed or any pavement areas are permanently closed, this map must be updated. Maps can be updated by submitting the project plans to the Iowa DOT after project completion.

b. *Dimensions of pavement sections.*

   The dimensions of all runways, taxiways, aprons, and T-hangars 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 the 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 Winterset Municipal 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 a monthly drive-by inspection. 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[1]	**Section**[1]	**Distress Description/Dimensions/Severity/ Recommended Action**	**Description of Repair**	**Date Performed**	**Cost**	**Funding Source**
A01WI	01					
R14WI	01					
T01WI	01					
T02WI	01					
TH01WI	01					
TH01WI	02					

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

SUMMARY

This report documents the results of the pavement evaluation conducted at Winterset Municipal Airport. During a visual inspection of the pavements in 2017, it was found that the overall condition of the pavement network is a PCI of 66. A 5-year pavement repair program, shown in Table 2, was generated for Winterset Municipal Airport, which revealed that approximately $807,000 needs to be expended on M&R. Winterset Municipal 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 AC surface under repeated traffic loading.
Bleeding	Excessive amounts of AC cement or tars in the mix and/or low air void content.
Block Cracking	Shrinkage of the AC 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 AC 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 AC surface due to low temperatures or hardening of the AC, 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	AC 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 AC 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	AC 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.
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.
Settlement	Upheaval or consolidation.
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

A01WI-01. Overview.

A01WI-01. L&T Cracking (Sample Unit No. 05).

A01WI-01. Raveling (Sample Unit No. 05).

R14WI-01. Overview.

R14WI-01. Alligator Cracking (Sample Unit No. 12).

R14WI-01. L&T Cracking (Sample Unit No. 16).

R14WI-01. Weathering (Sample Unit No. 16).

T01WI-01. Overview.

T01WI-01. Alligator Cracking (Sample Unit No. 01).

T01WI-01. Swelling (Sample Unit No. 02).

T01WI-01. Weathering (Sample Unit No. 01).

T02WI-01. Overview.

T02WI-01. Alligator Cracking (Sample Unit No. 01).

T02WI-01. L&T Cracking (Sample Unit No. 01).

TH01WI-01. Overview.

TH01WI-01. L&T Cracking (Sample Unit No. 05).

TH01WI-01. Rutting (Sample Unit No. 05).

TH01WI-01. Weathering (Sample Unit No. 05).

TH01WI-02. Overview.

TH01WI-02. L&T Cracking (Sample Unit No. 02).

TH01WI-02. Swelling (Sample Unit No. 06).

APPENDIX C

INSPECTION REPORT

Re-inspection Report

Iowa2017_All
Report Generated Date: May 23, 2018

Network: 3Y3 Name: WINTERSET MUNICIPAL AIRPORT

Branch: A01WI Name: APRON AT WINTERSET Use: APRON Area: 37,013.00SqFt

Section: 01 of 1 From: HANGERS To: TAXIWAYS 01 & 02 Last Const.: 06/04/2009
Surface: AC Family: IowaACAPSouthern Zone: Category: Rank: P
Area: 37,013.00SqFt Length: 485.00Ft Width: 70.00Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/05/2017 Total Samples: 8 Surveyed: 4
Conditions: PCI : 75
Inspection Comments:

Sample Number: 02 Type: R Area: 5,212.00SqFt PCI = 72
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	M	75.00	Ft	Comments:2NDY FS
48 LONGITUDINAL/TRANSVERSE CRACKING	L	137.00	Ft	Comments:LU
52 RAVELING	H	1.00	SqFt	Comments:
57 WEATHERING	L	5,211.00	SqFt	Comments:

Sample Number: 03 Type: R Area: 5,250.00SqFt PCI = 73
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	M	63.00	Ft	Comments:FS 2NDY W
48 LONGITUDINAL/TRANSVERSE CRACKING	L	120.00	Ft	Comments:LU
52 RAVELING	H	1.00	SqFt	Comments:
57 WEATHERING	L	5,249.00	SqFt	Comments:

Sample Number: 05 Type: R Area: 5,250.00SqFt PCI = 78
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	52.00	Ft	Comments:LU
48 LONGITUDINAL/TRANSVERSE CRACKING	M	20.00	Ft	Comments:W; 2NDY; @ EDGE
52 RAVELING	H	2.00	SqFt	Comments:MD
57 WEATHERING	L	5,248.00	SqFt	Comments:

Sample Number: 06 Type: R Area: 5,250.00SqFt PCI = 77
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	M	74.00	Ft	Comments:W; FS
48 LONGITUDINAL/TRANSVERSE CRACKING	L	75.00	Ft	Comments:LU
57 WEATHERING	L	5,250.00	SqFt	Comments:

Re-inspection Report

Iowa2017_All
Report Generated Date: May 23, 2018

Network: 3Y3 Name: WINTERSET MUNICIPAL AIRPORT

Branch: R14WI Name: RUNWAY 14/32 AT WINTERSET Use: RUNWAY Area: 149,219.00SqFt

Section: 01 of 1 From: RUNWAY END 14 To: RUNWAY END 32 Last Const.: 06/01/2005
Surface: AAC Family: IowaAACRWSouthern Zone: Category: Rank: P
Area: 149,219.00SqFt Length: 3,005.00Ft Width: 50.00Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/05/2017 Total Samples: 31 Surveyed: 7
Conditions: PCI : 62
Inspection Comments:

Sample Number: 04 Type: R Area: 5,000.00SqFt PCI = 71
Sample Comments:

57 WEATHERING	L	5,000.00	SqFt	Comments:
48 LONGITUDINAL/TRANSVERSE CRACKING	M	148.00	Ft	Comments:2NDY; FS
41 ALLIGATOR CRACKING	L	30.00	SqFt	Comments:@ EDGE

Sample Number: 08 Type: R Area: 5,000.00SqFt PCI = 61
Sample Comments:

57 WEATHERING	L	5,000.00	SqFt	Comments:
41 ALLIGATOR CRACKING	L	84.00	SqFt	Comments:@ EDGE
48 LONGITUDINAL/TRANSVERSE CRACKING	M	46.00	Ft	Comments:FS; 2NDY
56 SWELLING	L	1.00	SqFt	Comments:
48 LONGITUDINAL/TRANSVERSE CRACKING	L	9.00	Ft	Comments:LU

Sample Number: 12 Type: R Area: 5,000.00SqFt PCI = 63
Sample Comments:

41 ALLIGATOR CRACKING	L	160.00	SqFt	Comments:@ EDGE
57 WEATHERING	L	5,000.00	SqFt	Comments:

Sample Number: 16 Type: R Area: 5,000.00SqFt PCI = 54
Sample Comments:

57 WEATHERING	L	5,000.00	SqFt	Comments:
41 ALLIGATOR CRACKING	L	105.00	SqFt	Comments:@ EDGE
48 LONGITUDINAL/TRANSVERSE CRACKING	L	12.00	Ft	Comments:LS
48 LONGITUDINAL/TRANSVERSE CRACKING	M	97.00	Ft	Comments:FS; 2NDY; W
41 ALLIGATOR CRACKING	M	7.00	SqFt	Comments:

Sample Number: 20 Type: R Area: 5,000.00SqFt PCI = 71
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	M	47.00	Ft	Comments:FS; 2NDY
41 ALLIGATOR CRACKING	L	44.00	SqFt	Comments:@ EDGE
57 WEATHERING	L	5,000.00	SqFt	Comments:

Sample Number: 24 Type: R Area: 5,000.00SqFt PCI = 58
Sample Comments:

57 WEATHERING	L	5,000.00	SqFt	Comments:
48 LONGITUDINAL/TRANSVERSE CRACKING	M	76.00	Ft	Comments:FS; W; 2NDY
48 LONGITUDINAL/TRANSVERSE CRACKING	L	15.00	Ft	Comments:LS
41 ALLIGATOR CRACKING	L	110.00	SqFt	Comments:@ EDGE

Sample Number: 28 Type: R Area: 5,000.00SqFt PCI = 56
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	72.00	Ft	Comments:
48 LONGITUDINAL/TRANSVERSE CRACKING	L	11.00	Ft	Comments:
48 LONGITUDINAL/TRANSVERSE CRACKING	M	66.00	Ft	Comments:2NDY; W; FS
41 ALLIGATOR CRACKING	L	120.00	SqFt	Comments:@ EDGE
57 WEATHERING	L	5,000.00	SqFt	Comments:

Re-inspection Report

Iowa2017_All
Report Generated Date: May 23, 2018

Network: 3Y3 Name: WINTERSET MUNICIPAL AIRPORT

Branch: T01WI Name: TAXIWAY 01 AT WINTERSET Use: TAXIWAY Area: 8,560.00SqFt

Section: 01 of 1 From: APRON 01 To: RUNWAY END 14 Last Const.: 06/01/2009
Surface: AAC Family: IowaAACTWSouthern Zone: Category: Rank: P
Area: 8,560.00SqFt Length: 255.00Ft Width: 25.00Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/05/2017 Total Samples: 2 Surveyed: 2
Conditions: PCI : 70
Inspection Comments:

Sample Number: 01 Type: R Area: 2,858.00SqFt PCI = 75
Sample Comments:

41 ALLIGATOR CRACKING	L	16.00 SqFt	Comments:@ EDGE
57 WEATHERING	L	2,858.00 SqFt	Comments:
56 SWELLING	L	90.00 SqFt	Comments:

Sample Number: 02 Type: R Area: 5,702.00SqFt PCI = 68
Sample Comments:

56 SWELLING	L	90.00 SqFt	Comments:
48 LONGITUDINAL/TRANSVERSE CRACKING	L	65.00 Ft	Comments:LU
48 LONGITUDINAL/TRANSVERSE CRACKING	M	78.00 Ft	Comments:FS; 2NDY; W
41 ALLIGATOR CRACKING	L	16.00 SqFt	Comments:@ EDGE
57 WEATHERING	L	5,702.00 SqFt	Comments:

Re-inspection Report

Iowa2017_All
Report Generated Date: May 23, 2018

Network: 3Y3 Name: WINTERSET MUNICIPAL AIRPORT

Branch: T02WI Name: TAXIWAY 02 AT WINTERSET Use: TAXIWAY Area: 3,487.00SqFt

Section: 01 of 1 From: APRON 01 To: RUNWAY 14/32 Last Const.: 06/01/2009
Surface: AAC Family: IowaAACTWSouthern Zone: Category: Rank: P
Area: 3,487.00SqFt Length: 75.00Ft Width: 37.00Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/05/2017 Total Samples: 1 Surveyed: 1
Conditions: PCI : 74
Inspection Comments:

Sample Number: 01 Type: R Area: 3,487.00SqFt PCI = 74
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	M	5.00	Ft	Comments:2NDY
48 LONGITUDINAL/TRANSVERSE CRACKING	L	23.00	Ft	Comments:LS
48 LONGITUDINAL/TRANSVERSE CRACKING	L	13.00	Ft	Comments:LU
41 ALLIGATOR CRACKING	L	12.00	SqFt	Comments:@ EDGE
57 WEATHERING	L	3,487.00	SqFt	Comments:

Re-inspection Report

Iowa2017_All
Report Generated Date: May 23, 2018

Network: 3Y3 Name: WINTERSET MUNICIPAL AIRPORT

Branch: TH01WI Name: T-HANGAR 01 Use: T-HANGAR Area: 56,594.00SqFt

Section: 01 of 2 From: SEE MAP To: SEE MAP Last Const.: 01/01/2003
Surface: AC Family: IowaASPHALTTH Zone: Category: Rank: P
Area: 26,300.00SqFt Length: 610.00Ft Width: 53.00Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/05/2017 Total Samples: 6 Surveyed: 4
Conditions: PCI : 53
Inspection Comments:

Sample Number: 01 Type: R Area: 5,500.00SqFt PCI = 46
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	M	108.00	Ft	Comments:FS 2NDY W
48 LONGITUDINAL/TRANSVERSE CRACKING	L	200.00	Ft	Comments:LU
52 RAVELING	H	10.00	SqFt	Comments:
41 ALLIGATOR CRACKING	L	12.00	SqFt	Comments:@EDGE
45 DEPRESSION	L	20.00	SqFt	Comments:
56 SWELLING	L	10.00	SqFt	Comments:@DRAIN
52 RAVELING	M	75.00	SqFt	Comments:
53 RUTTING	L	200.00	SqFt	Comments:
57 WEATHERING	L	5,415.00	SqFt	Comments:

Sample Number: 02 Type: R Area: 5,500.00SqFt PCI = 60
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	M	211.00	Ft	Comments:FS W 2NDY
48 LONGITUDINAL/TRANSVERSE CRACKING	L	97.00	Ft	Comments:LU
56 SWELLING	L	48.00	SqFt	Comments:@48
53 RUTTING	L	100.00	SqFt	Comments:
57 WEATHERING	L	5,500.00	SqFt	Comments:

Sample Number: 05 Type: R Area: 4,025.00SqFt PCI = 55
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	M	190.00	Ft	Comments:FS W 2NDY
48 LONGITUDINAL/TRANSVERSE CRACKING	L	97.00	Ft	Comments:LU
52 RAVELING	H	10.00	SqFt	Comments:
53 RUTTING	L	50.00	SqFt	Comments:
57 WEATHERING	L	4,015.00	SqFt	Comments:

Sample Number: 06 Type: R Area: 4,025.00SqFt PCI = 53
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	M	115.00	Ft	Comments:FS; 2NDY; @ BREAK
48 LONGITUDINAL/TRANSVERSE CRACKING	L	30.00	Ft	Comments:LU
41 ALLIGATOR CRACKING	L	12.00	SqFt	Comments:@ EDGE
52 RAVELING	M	30.00	SqFt	Comments:
45 DEPRESSION	L	15.00	SqFt	Comments:
56 SWELLING	L	90.00	SqFt	Comments:
48 LONGITUDINAL/TRANSVERSE CRACKING	M	8.00	Ft	Comments:FS
48 LONGITUDINAL/TRANSVERSE CRACKING	L	32.00	Ft	Comments:LS
57 WEATHERING	L	3,995.00	SqFt	Comments:

Re-inspection Report

Iowa2017_All
Report Generated Date: May 23, 2018

Network: 3Y3 Name: WINTERSET MUNICIPAL AIRPORT

Branch: TH01WI Name: T-HANGAR 01 Use: T-HANGAR Area: 56,594.00SqFt

Section: 02 of 2 From: SEE MAP To: SEE MAP Last Const.: 01/01/2013
Surface: AC Family: IowaASPHALTTH Zone: Category: Rank: P
Area: 30,294.00SqFt Length: 610.00Ft Width: 35.00Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/05/2017 Total Samples: 6 Surveyed: 4
Conditions: PCI : 82
Inspection Comments:

Sample Number: 02 Type: R Area: 3,825.00SqFt PCI = 83
Sample Comments:

57 WEATHERING	L	3,825.00 SqFt	Comments:
48 LONGITUDINAL/TRANSVERSE CRACKING	L	43.00 Ft	Comments:LU
48 LONGITUDINAL/TRANSVERSE CRACKING	M	12.00 Ft	Comments:FS W/ VEG

Sample Number: 04 Type: R Area: 4,550.00SqFt PCI = 76
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	56.00 Ft	Comments:LU
56 SWELLING	L	330.00 SqFt	Comments:NOT AN ERROR
57 WEATHERING	L	4,550.00 SqFt	Comments:

Sample Number: 05 Type: R Area: 5,000.00SqFt PCI = 84
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	31.00 Ft	Comments:LU
48 LONGITUDINAL/TRANSVERSE CRACKING	M	17.00 Ft	Comments:W W/ VEG
57 WEATHERING	L	5,000.00 SqFt	Comments:

Sample Number: 06 Type: R Area: 5,200.00SqFt PCI = 84
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	92.00 Ft	Comments:LU
56 SWELLING	L	75.00 SqFt	Comments:
57 WEATHERING	L	5,200.00 SqFt	Comments:

APPENDIX D

WORK HISTORY REPORT

Work History Report

Pavement Database:IOWA2017_ALL

Network: 3Y3 **Branch:** A01WI (APRON AT WINTERSET) **Section:** 01 **Surface:** AC
L.C.D.: 06/04/2009 **Use:** APRON **Rank:** P **Length:** 485.00 Ft **Width:** 70.00 Ft **True Area:** 37,013.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/04/2009	CR-AC	Complete Reconstruction - AC	$0	2.00	True	P-405
06/03/2009	BA-BI	Base Course - Bituminous	$0	2.00	False	P-405
06/02/2009	SB-AG	Subbase - Aggregate	$0	6.00	False	modified material/Iowa DOT 4123
06/01/2009	SG-CO	Subgrade - Compacted	$0	12.00	False	Fly Ash Treated
06/01/1981	SU-AC	Surface Course - AC	-	-	True	-

Network: 3Y3 **Branch:** R14WI (RUNWAY 14/32 AT WINTERSET) **Section:** 01 **Surface:** AAC
L.C.D.: 06/01/2005 **Use:** RUNWAY **Rank:** P **Length:** 3,005.00 Ft **Width:** 50.00 Ft **True Area:** 149,219.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/2005	OL-AS	Overlay - AC Structural	$0	3.00	True	-
06/01/1981	SU-AC	Surface Course - AC	-	-	True	-

Network: 3Y3 **Branch:** T01WI (TAXIWAY 01 AT WINTERSET) **Section:** 01 **Surface:** AAC
L.C.D.: 06/01/2009 **Use:** TAXIWAY **Rank:** P **Length:** 255.00 Ft **Width:** 25.00 Ft **True Area:** 8,560.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/2009	OL-AS	Overlay - AC Structural	$0	2.00	True	-
06/01/1981	SU-AC	Surface Course - AC	-	-	True	-

Network: 3Y3 **Branch:** T02WI (TAXIWAY 02 AT WINTERSET) **Section:** 01 **Surface:** AAC
L.C.D.: 06/01/2009 **Use:** TAXIWAY **Rank:** P **Length:** 75.00 Ft **Width:** 37.00 Ft **True Area:** 3,487.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/2009	OL-AS	Overlay - AC Structural	$0	2.00	True	-
06/01/2005	OL-AS	Overlay - AC Structural	$0	0.00	True	-
01/01/1981	INITIAL	Initial Construction	$0	0.00	True	-

Network: 3Y3 **Branch:** TH01WI (T-HANGAR 01) **Section:** 01 **Surface:** AC
L.C.D.: 01/01/2003 **Use:** T-HANGAR **Rank:** P **Length:** 610.00 Ft **Width:** 53.00 Ft **True Area:** 26,300.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
01/01/2003	NC-AC	New Construction - AC	$0	0.00	True	EST. VIA GOOGLE EARTH; CONSTRUCTED BETWEEN 9/1995-4/2003

Network: 3Y3 **Branch:** TH01WI (T-HANGAR 01) **Section:** 02 **Surface:** AC
L.C.D.: 01/01/2013 **Use:** T-HANGAR **Rank:** P **Length:** 610.00 Ft **Width:** 35.00 Ft **True Area:** 30,294.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
01/01/2013	NC-AC	New Construction - AC	$0	0.00	True	LCD VIA GOOGLE EARTH

Summary:

Work Description	Section Count	Area Total (SqFt)	Thickness Avg (in)	Thickness STD (in)
Base Course - Bituminous	1	37,013.00	2.00	-
Complete Reconstruction - AC	1	37,013.00	2.00	-
Initial Construction	1	3,487.00	.00	-
New Construction - AC	2	56,594.00	.00	.00
Overlay - AC Structural	4	164,753.00	1.75	1.26
Subbase - Aggregate	1	37,013.00	6.00	-
Subgrade - Compacted	1	37,013.00	12.00	-
Surface Course - AC	3	194,792.00	-	-

-

APPENDIX E

LOCALIZED PREVENTIVE MAINTENANCE POLICIES AND UNIT COST TABLES

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

Distress Type	**Severity Level**	**Maintenance Action**
Alligator Cracking	Low	Monitor
Alligator Cracking	Medium	AC Patch
Alligator Cracking	High	AC Patch
Bleeding	N/A	Monitor
Block Cracking	Low	Monitor
Block Cracking	Medium	Crack Seal – AC
Block Cracking	High	Crack Seal – AC
Corrugation	Low	Monitor
Corrugation	Medium	AC Patch
Corrugation	High	AC Patch
Depression	Low	Monitor
Depression	Medium	Monitor
Depression	High	AC Patch
Jet-Blast Erosion	N/A	AC Patch
Joint Reflection Cracking	Low	Monitor
Joint Reflection Cracking	Medium	Crack Seal – AC
Joint Reflection Cracking	High	Crack Seal – AC
L&T Cracking	Low	Monitor
L&T Cracking	Medium	Crack Seal – AC
L&T Cracking	High	Crack Seal – AC
Oil Spillage	N/A	AC Patch
Patching	Low	Monitor
Patching	Medium	AC Patch
Patching	High	AC Patch
Polished Aggregate	N/A	Monitor
Raveling	Low	Monitor
Raveling	Medium	AC Patch
Raveling	High	AC Patch
Rutting	Low	Monitor
Rutting	Medium	Monitor
Rutting	High	AC Patch
Shoving	Low	Monitor
Shoving	Medium	AC Patch
Shoving	High	AC Patch
Slippage Cracking	N/A	AC Patch
Swelling	Low	Monitor
Swelling	Medium	Monitor
Swelling	High	AC Patch
Weathering	Low	Monitor
Weathering	Medium	Monitor
Weathering	High	AC 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
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
Settlement	Low	Monitor
Settlement	Medium	Grinding
Settlement	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. 2018 unit costs for preventive maintenance actions.

Maintenance Action	Unit Cost
AC Patch – AC-Surfaced Pavement	$13.66/sf
Crack Sealing – AC-Surfaced Pavement	$2.34/lf
Partial Depth PCC Patch – PCC Pavement	$34.97/sf
Full Depth PCC Patch – PCC Pavement	$15.62/sf
Crack Sealing – PCC Pavement	$2.81/lf
Joint Sealing – PCC Pavement	$2.81/lf
Grinding – PCC Pavement	$0.34/sf
Slab Replacement – PCC Pavement	$15.62/sf

Table E-4. 2018 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	$9.70	$4.59	$4.59	$4.59	$0.00	$0.00	$0.00
PCC	$16.19	$7.65	$7.65	$7.65	$0.00	$0.00	$0.00

APPENDIX F

YEAR 2018 LOCALIZED PREVENTIVE MAINTENANCE DETAILS

Table F-1. Year 2018 localized preventive maintenance details.

Branch[1]	Section[1]	Distress Type[2]	Severity	Distress Quantity	Distress Unit	Maintenance Action	Unit Cost[3]	2018 Estimated Cost[3]
A01WI	01	L&T Cracking	Medium	410	Ft	Crack Sealing - AC	$2.34	$959
A01WI	01	Raveling	High	7	SqFt	Patching - AC Deep	$13.66	$96
T01WI	01	L&T Cracking	Medium	78	Ft	Crack Sealing - AC	$2.34	$183
T02WI	01	L&T Cracking	Medium	5	Ft	Crack Sealing - AC	$2.34	$12
TH01WI	02	L&T Cracking	Medium	47	Ft	Crack Sealing - AC	$2.34	$111

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

[2]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 the airport.

PREPARED FOR

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JUNE 2018