GDOT
Georgia Department of Transportation

Report:

Millen Airport Pavement Management Plan

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MILLEN AIRPORT

PAVEMENT MANAGEMENT REPORT

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INTRODUCTION

During 2018 and 2019 the Georgia Department of Transportation (GDOT) Aviation Programs Office completed an update of the Georgia Airport Pavement Management System (APMS). The work was completed as part of the Georgia Aviation System Plan Update led by Jviation, Inc. Applied Pavement Technology, Inc. (APTech) conducted the APMS update, assisted by Aulick Engineering LLC (Aulick). The principal objective of this study was to provide the airports, GDOT, and the Federal Aviation Administration (FAA) with the data and analytical tools needed to assess current and projected pavement conditions and identify maintenance and rehabilitation (M&R) strategies for addressing pavement-related needs.

As part of this study, pavement conditions at Millen Airport were evaluated using the Pavement Condition Index (PCI) procedure. During a PCI inspection, the types, severities, and amounts of pavement distress are visually quantified in accordance with a standardized methodology. This information is then used to develop a composite index that represents the overall condition of the pavement in numerical terms, ranging from 100 (excellent) to 0 (failed). The PCI in combination with the type of distress observed provides insight into the extent and cause of pavement deterioration, which is the first step in determining the timing of repair as well as in selecting the appropriate repair action.

Programmed into an APMS, PCI information is used to identify the most cost-effective strategy for preserving the pavement infrastructure. The importance of identifying not only the type of repair but also the optimal time of repair is critical because at some point the rate of pavement deterioration will typically increase and the financial impact of delaying repairs beyond this point can be significant. This is illustrated in FIGURE 1.

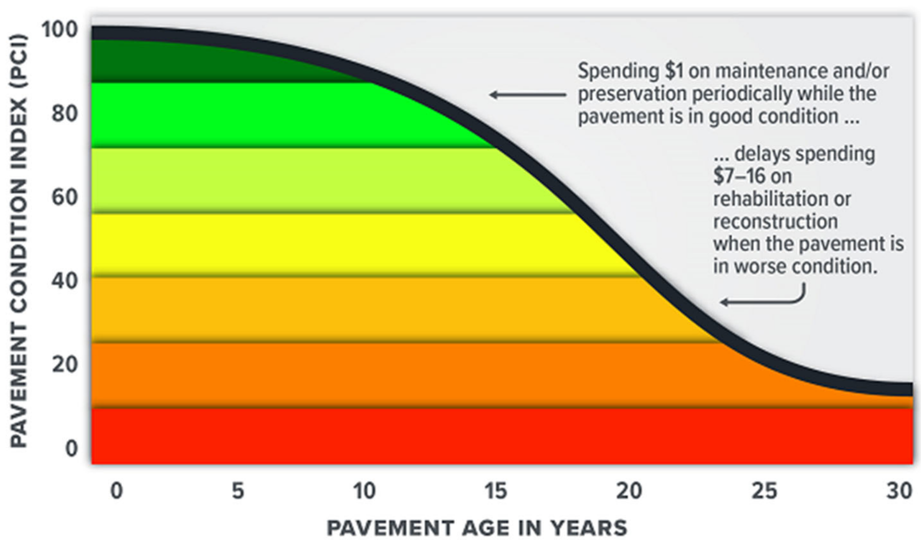


FIGURE 1 PAVEMENT CONDITION VERSUS COST OF REPAIR

During the APMS update, pavement work history information was collected, maps were updated using computer-aided design and drafting (CADD) software, pavement conditions evaluated, and the APMS updated. The APMS was then used to develop a 5-year pavement M&R program. Individual airport, statewide, and executive summary reports were prepared to communicate the findings and recommendations of the study.

METHODOLOGY

The study consisted of three major work elements: records review and network definition, pavement condition evaluation, and the development of an M&R plan for the preservation of the pavement infrastructure. Details of each work element are further described below.

Records Review and Network Definition

The project began with a review of the existing inventory information for each of the airports. This 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 airports were evaluated in 2012. The date of original construction, date of any subsequent rehabilitation, location of completed work, and the type of work undertaken were gathered.

The pavement system was then divided into management units—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, aprons, T-Hangars, and helipads are also separate branches.

A branch is further divided into sections. Traditionally, section breaks are identified when there is a change in pavement cross-section, pavement age, or pavement condition. GDOT uses a modified approach to sectioning, where a section is considered the management unit of the APMS and represents a pavement area that would receive the same maintenance or rehabilitation at the same time. For example, if a runway was built in 1968 and then extended and overlaid in 1984, this runway might be represented by a single section even though there are two distinct construction periods. However, if the condition of one part of the runway was significantly different than the other, the runway would be divided into two sections because in that situation the entire runway may not be rehabilitated at the same time or using the same treatment.

For inspection purposes, each section is further subdivided into sample units. A percentage of these sample units is evaluated during pavement inspections, and the collected information is extrapolated to predict overall section condition and quantities of distress.

Pavement Evaluation Procedure

Pavements were evaluated at Millen Airport using the PCI methodology. This procedure is described in FAA Advisory Circular (AC) 150/5380-6C, *Guidelines and Procedures for Maintenance of Airport Pavements*, and ASTM Standard D5340-12, *Standard Test Method for Airport Pavement Condition Index Surveys*.

The PCI ranges from 100 to 0, with 100 representing a pavement in excellent condition, as illustrated in FIGURE 2. FIGURE 3 illustrates how the level of repair varies with the PCI of a pavement section in general terms. 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 refine the treatment strategy.

Typical Pavement Surface[1]	**PCI**
	100
	60
	20

[1]Photographs shown are not specific to Millen Airport.

FIGURE 2 VISUAL REPRESENTATION OF PCI SCALE

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

FIGURE 3 PCI VERSUS REPAIR TYPE

The types of distress identified during the PCI inspection provide insight into the cause of pavement deterioration, which is useful when selecting M&R strategies. PCI distress types are characterized as:

- Load-related—These distress types are defined as being caused by aircraft or vehicular traffic and may indicate a structural deficiency. Examples of load-related distress include alligator cracking on asphalt concrete (AC)–surfaced pavements and corner breaks on portland cement concrete (PCC) pavements.
- Climate/durability-related—These distress types often signify the presence of aged and/or environment-susceptible material and include durability-related issues. Examples of climate/durability-related distress include weathering on AC-surfaced pavements, which is climate-related, and durability cracking on PCC pavements which is durability-related.
- Other—Distress types that fall into this category cannot be attributed solely to load or climate/durability. Examples of this type of distress include depressions on AC-surfaced pavements and shrinkage cracking on PCC pavements.

APPENDIX A contains tables for AC and PCC pavements listing the typical types of distresses that may be identified during a PCI survey, the likely cause of each distress type, and feasible maintenance strategies for addressing each distress type.

Development of Maintenance and Rehabilitation Program

Using the information collected during the 2018 pavement inspection, a M&R 5-year program for 2020 through 2024 was developed with a start date of January 1, 2020. The PAVER pavement management software was used to perform this analysis.

Analysis Parameters

Several parameters were defined prior to running the analysis and are further explained below.

Critical PCI

A critical PCI is established to estimate whether preventive maintenance or major rehabilitation is the most cost-effective strategy for addressing pavement needs. In general terms, pavements above a critical PCI that are not exhibiting significant load-related distress will typically benefit from preventive maintenance actions, such as crack sealing and surface treatments. Pavements falling below a critical PCI may require major rehabilitation, such as an overlay or even reconstruction.

For each year of the analysis, PAVER applies the performance models and estimates the future condition of the pavement sections. The program compares the PCI to the established critical PCIs to determine whether preventive maintenance or major rehabilitation will be triggered. GDOT established the critical PCIs, which vary by pavement use and airport classification, shown in TABLE 1.

TABLE 1 CRITICAL PCIs

Airport Classification	Runway	Taxiway/ T-Hangar	Apron/Helipad
General Aviation	70	60	60
Commercial Service	75	65	65

Budget and Inflation Rate

An unlimited budget and an inflation rate of 5 percent were used during the analysis.

Maintenance Policies

Localized and global preventive maintenance policies were developed for GDOT and are used to determine recommended treatments for pavements above the critical PCI. Localized maintenance policies, shown in APPENDIX B, identify the actions that GDOT considers appropriate to apply to specific distress types, such as sealing cracks.

Global maintenance is a treatment that is applied over the entire section area. Global maintenance includes surface treatments, such as emulsified seal coats (P-608), emulsified asphalt slurry seals (P-626), and asphalt pavement rejuvenators (P-632). Since the determination of which surface treatment will be most effective in what situation is best made on a project-level basis, the global maintenance is generically identified as surface treatment during this network-level analysis. The following criteria must be met before a surface treatment is triggered for further consideration:

- The application of surface treatments is restricted to those sections where load-related distresses identified during the pavement inspection have a density of less than 0.5%.
- The resulting PCI after surface treatment application must be predicted to be at least 15 points above the set critical values.
- Only one surface treatment can be triggered during the 5-year analysis period.

Unit Costs

Unit costs for localized and global maintenance as well as major rehabilitation treatments are presented in APPENDIX B. PAVER calculates the cost for localized maintenance based on the unit cost of the specific maintenance action (such as crack sealant) multiplied by the quantity of distress present. The cost for global maintenance is calculated by multiplying the pavement area by the unit cost of the global treatment. However, the cost of major rehabilitation (such as an overlay or reconstruction) is more broadly calculated based on the area of pavement multiplied by the unit cost for major rehabilitation, which is estimated based on the PCI of the pavement section. For example, if the PCI is predicted to be less than 40, the cost for reconstruction is used in the calculations. Therefore, if the analysis results in a recommendation for major rehabilitation, further engineering investigation will be needed to identify the most appropriate rehabilitation action (such as the thickness of an overlay needed to accommodate current and future loads) and to more accurately estimate the cost of such work.

Analysis Approach

The goals of the 2020 through 2024 M&R program are first to cost-effectively preserve the existing pavement structure for as long as possible through the timely application of localized and global maintenance and second to estimate the point in time when maintenance is no longer a cost-effective option and major rehabilitation is warranted. To achieve these goals, the first step is to determine current pavement condition, and the second is to estimate when the PCI of the section will drop below the critical PCI. Above the critical PCI, localized and global maintenance is recommended. Below the critical PCI, major rehabilitation is triggered.

The initial analysis was simply to calculate the current condition and then to estimate future condition for each year of the analysis. This information was then used to identify the level of work (maintenance or major rehabilitation) needed for each section for each year of the analysis period and to quantify the type of work and associated cost. The M&R program was further refined through the application of a few additional constraints.

- For the first year of the analysis, 2020, if a pavement section was above its critical PCI and major rehabilitation was not estimated to be needed through 2022, the localized preventive maintenance policy was applied, and the recommended localized maintenance treatments and associated costs were calculated.
- For the analysis years 2021 through 2024, the only localized maintenance activity calculated was for crack sealing. It was assumed that if a pavement section remained above the critical PCI that crack resealing would need to be conducted in 2024. No other localized maintenance activities were estimated for years 2021 through 2024.

RESULTS

Pavement Inventory

Millen Airport has more than 532,611 square feet of pavement, as shown in FIGURE 4. FIGURE 5 presents a network definition map of the airport showing the pavement system broken down into management units, as described on page 2 of this report. It also shows the nomenclature used in the PAVER pavement management database to identify the different pavement areas and identifies the sample units inspected during the visual survey. The associated work history of the pavement areas is provided in APPENDIX C.

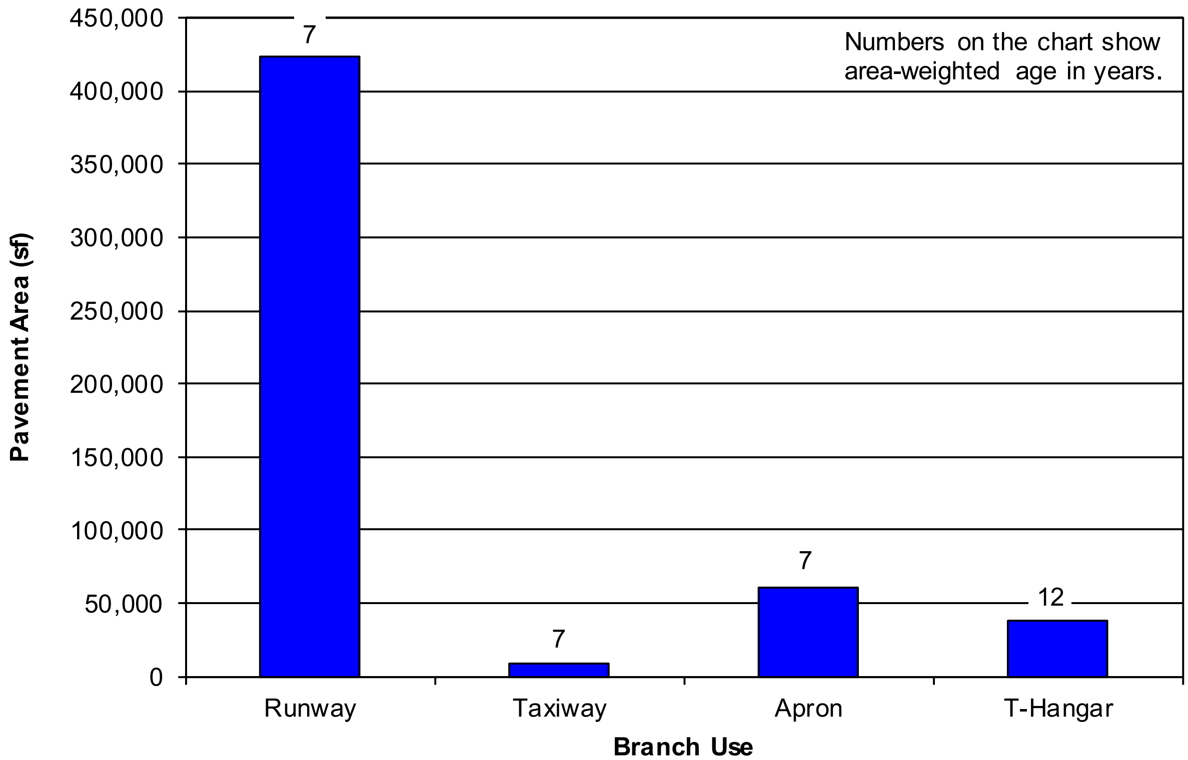
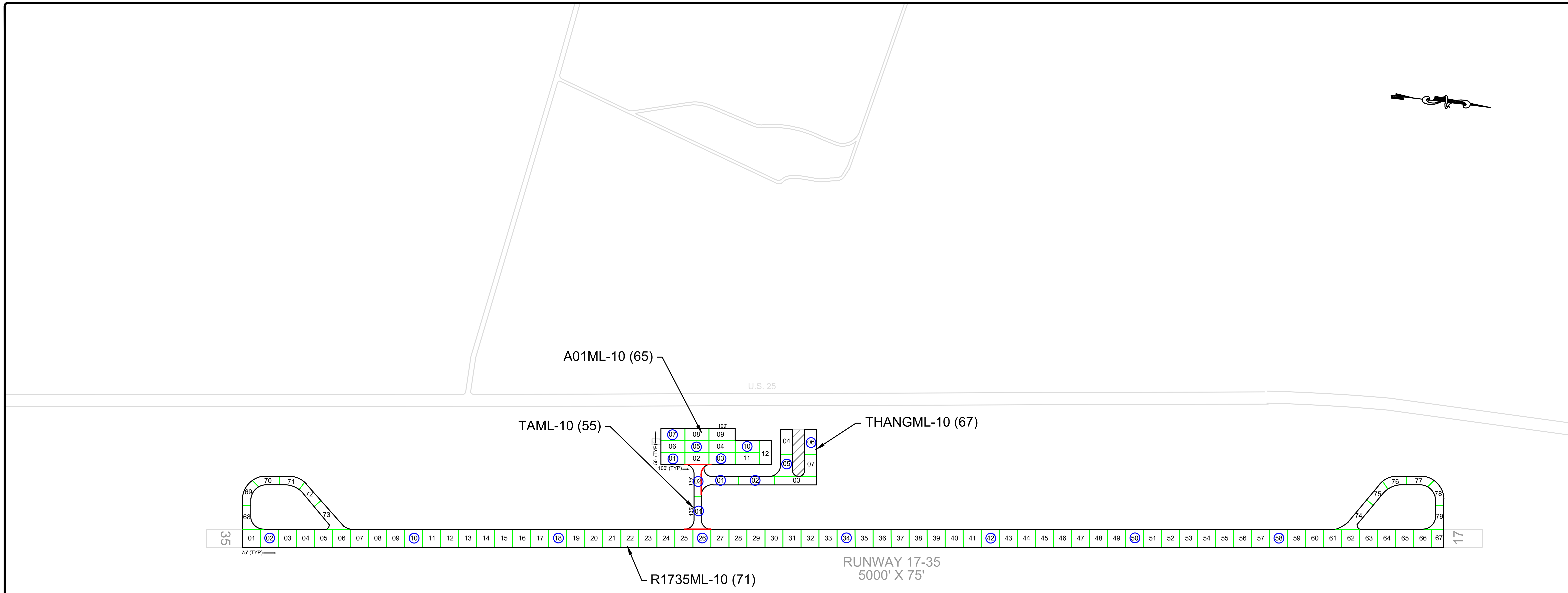


FIGURE 4 PAVEMENT INVENTORY



NETWORK DEFINITION LEGEND

- RW1533AL-10 (77): 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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AGENCY: Georgia Department of Transportation Aviation Programs

LOCATION: Millen Airport, Millen, GA

PAGE TITLE: NETWORK DEFINITION MAP

PROJECT DATE:	CREATION DATE:	PROJECT MANAGER:	JOB NUMBER:
MAY 2018	SEP. 2018	MRC	15-021-AM01
DRAWING SCALE:	LAST MODIFIED DATE:	REVISED BY:	DRAWN BY:
1"= 400'	NOV. 2018	DSP	TMM
FILENAME:		LAYOUT NAME/NUMBER:	FIGURE:
Millen.dwg		NET. DEF.	5

Pavement Evaluation

The inspection of Millen Airport was completed on December 6, 2018 using the PCI procedure described previously. The map presented in FIGURE 5 identifies the sample units inspected during the pavement evaluation.

Overall Condition

The 2018 area-weighted condition of Millen Airport is 70, with conditions ranging from 55 to 71 [on a scale of 0 (failed) to 100 (excellent)]. This compares to a 2012 PCI of 100.

FIGURES 6 and 7 summarize the pavement condition distribution and overall condition of the pavements broken down by branch use, respectively, at Millen Airport. FIGURE 8 presents a PCI map that displays the condition of the evaluated pavements based on sectioning rules described earlier in this report. TABLE 2 summarizes the results of the pavement evaluation as well as the 2012 and 2018 PCIs.

APPENDIX D includes photographs taken during the PCI inspection, and APPENDIX E contains a detailed inspection report. The detailed inspection report provides information on the quantity of the different types and severities of distresses observed during the visual survey.

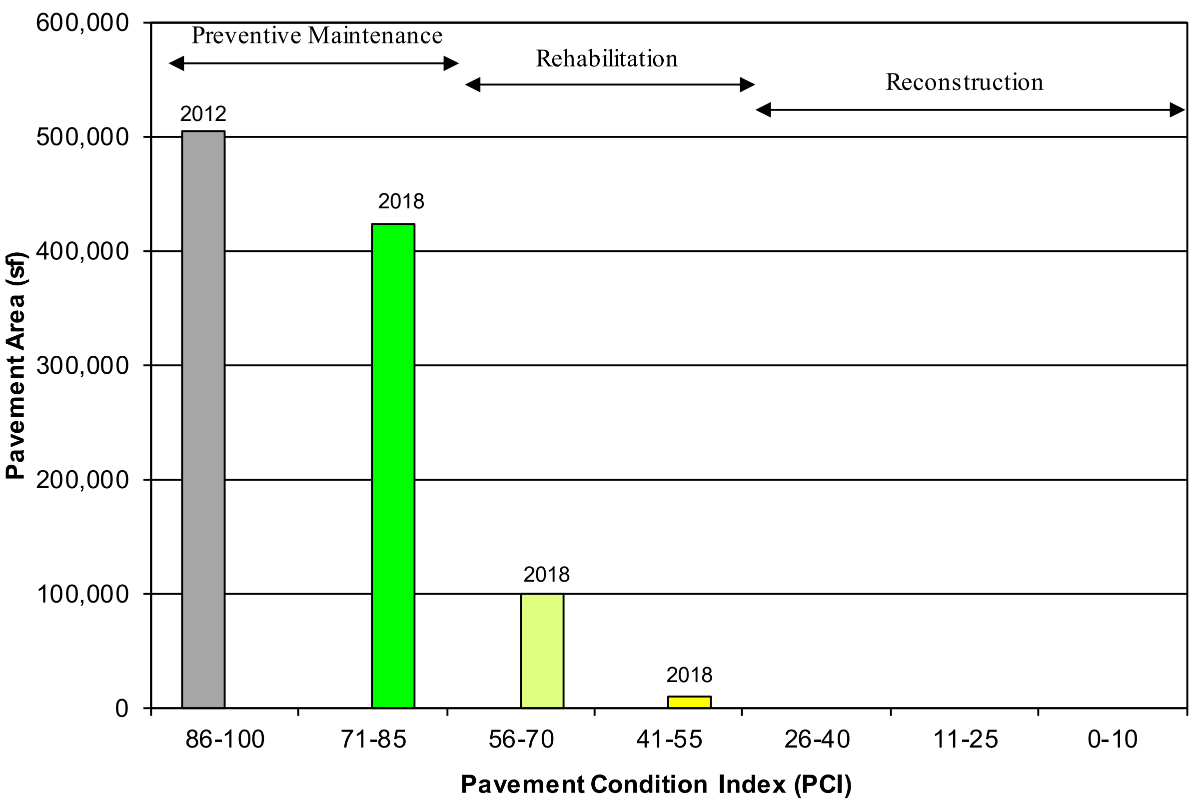


FIGURE 6 CONDITION DISTRIBUTION

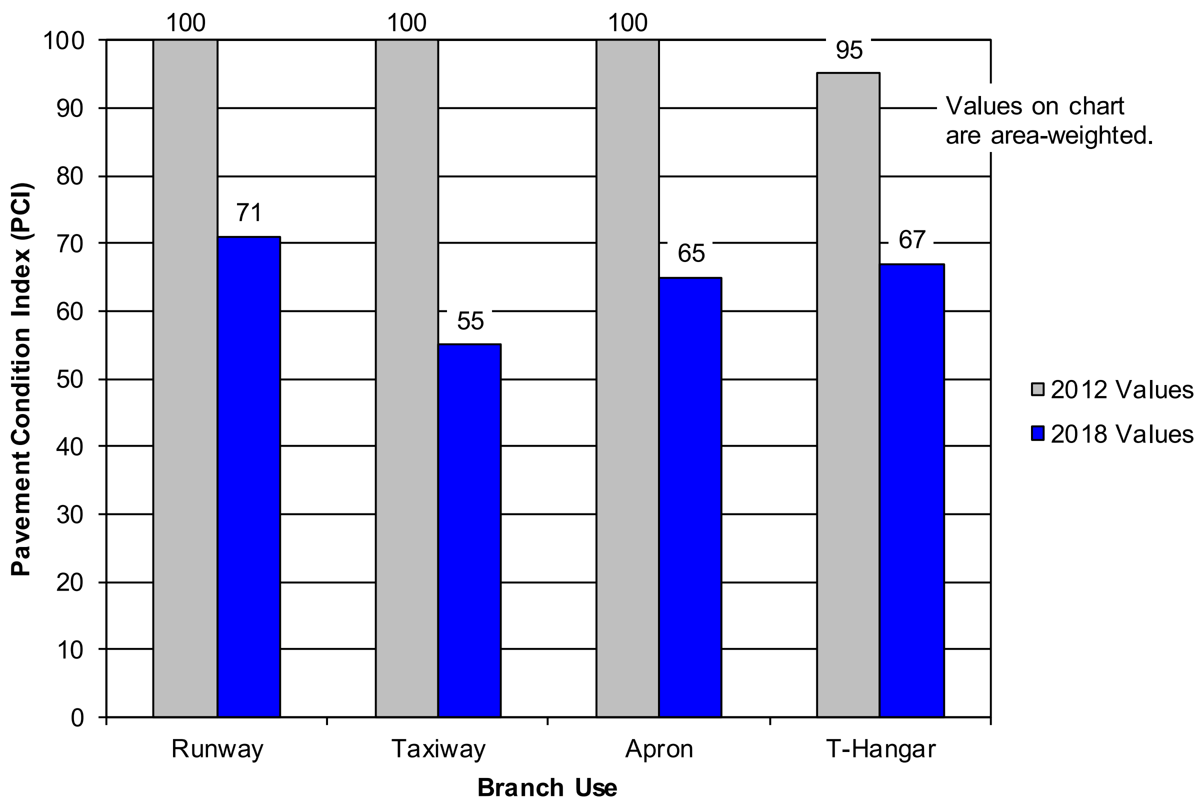
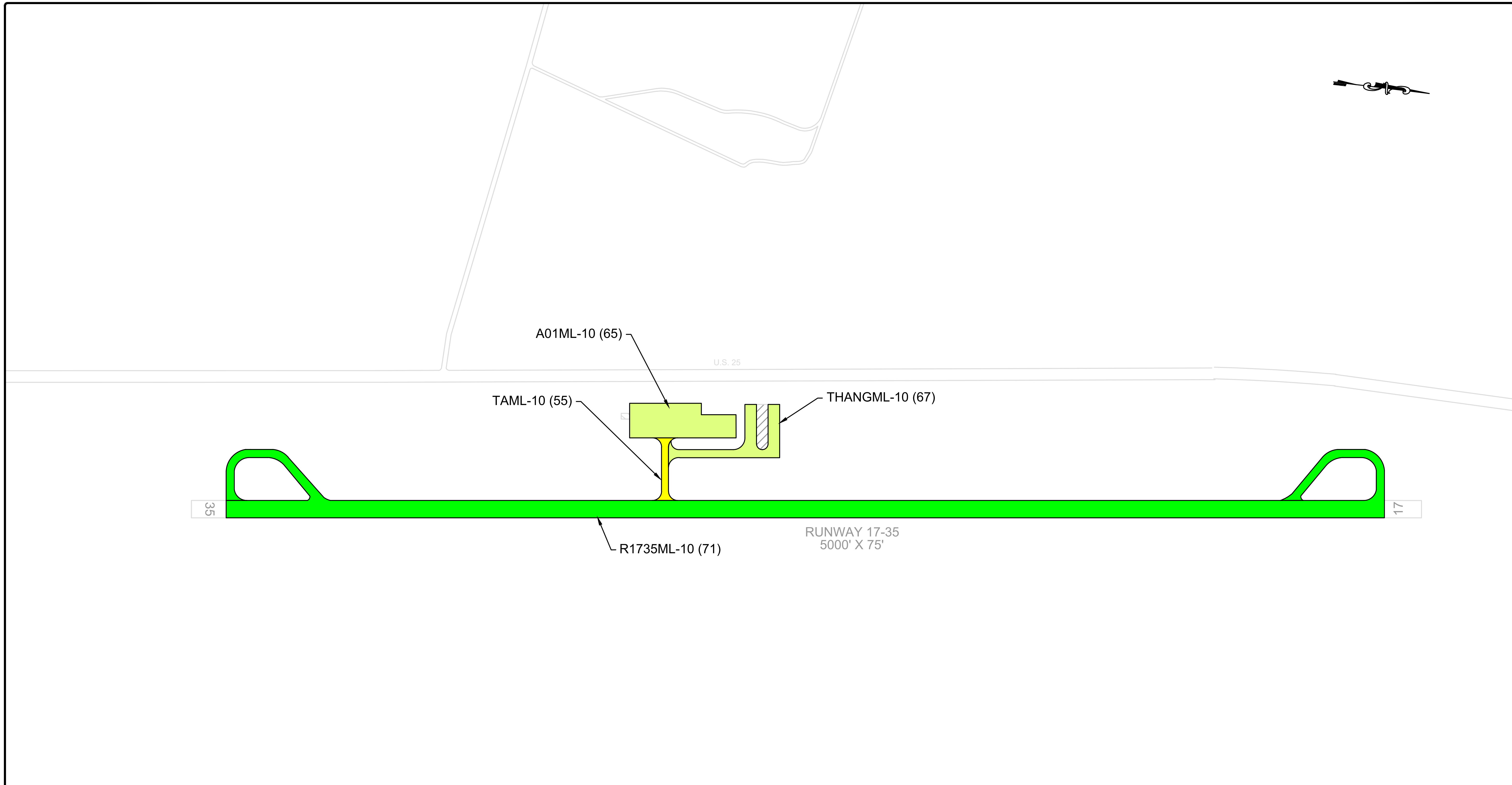


FIGURE 7 CONDITION BY USE



LEGEND

RW1533AL-10 (77)
- BRANCH IDENTIFIER
- SECTION IDENTIFIER
- PCI VALUE
- SECTION BREAK LINE

PAVEMENT CONDITION INDEX

PCI	REPAIR
100	
85	PREVENTIVE MAINTENANCE
70	
55	MAJOR REHABILITATION
40	
25	RECONSTRUCTION
10	
0	

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AGENCY: Georgia Department of Transportation Aviation Programs			
LOCATION: Millen Airport Millen, GA			
PAGE TITLE: PAVEMENT CONDITION INDEX MAP			
PROJECT DATE: MAY 2018	CREATION DATE: SEP. 2018	PROJECT MANAGER: MRC	JOB NUMBER: 15-021-AM01
DRAWING SCALE: 1"= 400'	LAST MODIFIED DATE: FEB. 2019	REVISED BY: DSP	DRAWN BY: TMM
FILENAME: Millen.dwg		LAYOUT NAME/NUMBER: PCI	FIGURE: 8

TABLE 2 PAVEMENT EVALUATION RESULTS

Branch[1]	Section[1]	Surface Type[2]	Section Area (sf)	LCD[3]	2012 PCI	2018 PCI	% Distress due to: Load[4]	% Distress due to: Climate or Durability[5]	Distress Types[6]
A01ML	10	AC	61,278	6/5/2011	100	65	15	81	L&T Cracking, Raveling, Rutting, Swelling, Weathering
R1735ML	10	AC	423,813	6/5/2011	100	71	0	97	L&T Cracking, Raveling, Swelling, Weathering
TAML	10	AC	9,455	6/5/2011	100	55	0	96	L&T Cracking, Raveling, Swelling, Weathering
THANGML	10	AC	38,065	6/3/2006	95	67	0	95	Depression, L&T Cracking, Raveling, Swelling, Weathering

[1]See FIGURE 5 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 distresses attributed to a structural deficiency in the pavement, such as alligator (fatigue) cracking, rutting on AC-surfaced pavements, or shattered concrete slabs.

[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 or block cracking in AC-surfaced pavements) or to a materials-related problem (such as durability cracking in a PCC pavement).

[6]L&T Cracking = longitudinal and transverse cracking.

Maintenance and Rehabilitation Program

The 5-year M&R program developed for Millen Airport is described on page 14 of this report.

A summary of the M&R program is presented in TABLE 3. Detailed information on the localized maintenance plan for 2020 is provided in APPENDIXES F and G, organized by section and repair type, respectively. While localized preventive maintenance should be an annual undertaking at Millen Airport, it is not possible to accurately predict the propagation of cracking and other distresses. The airport should budget for localized maintenance every year and can use the 2020 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.

Because an unlimited budget was used in the analysis, it is probable that the pavement repair program will need to be adjusted to account for economic or operational constraints. Further, the identification of the need for a major rehabilitation project does not mean that federal or state funding will be available to complete the work in the year shown. It is important to remember that regardless of the recommendations presented within this report, Millen Airport is responsible for repairing pavements where existing conditions pose a hazard to safe operations.

It should be noted that the presented recommendations are based on a broad network-level analysis and are meant to provide Millen Airport with an indication of the type of pavement-related work required during the analysis period. Further engineering investigation will need to be performed to identify exactly which repair action is most appropriate and to more accurately estimate the cost of such work. In addition, the cost estimates provided were based on a statewide policy, and each airport should adjust the maintenance policies and unit costs to match its own approach to pavement maintenance and to reflect local costs.

TABLE 3 5-YEAR PROGRAM UNDER AN UNLIMITED FUNDING ANALYSIS SCENARIO

Branch[1]	**Section**	**Year**	**Type of Repair**[2]	**Estimated Cost**[3]
A01ML	10	2020	Preventive Maintenance	$677
R1735ML	10	2020	Major M&R	$957,816
TAML	10	2020	Major M&R	$44,459
THANGML	10	2020	Preventive Maintenance	$1,821
		2020	Surface Treatment	$23,220
A01ML	10	2023	Major M&R	$180,588
THANGML	10	2024	Preventive Maintenance	$54,008
TOTAL ESTIMATED COST 2020-2024				**$1,263,000**

[1]See FIGURE 5 for the location of the branch and section.

[2]Major Rehabilitation: overlay, mill and overlay, reconstruction, and so on;
Localized Maintenance: crack sealing, patching, joint resealing, and so on;
Global Maintenance: surface treatments, rejuvenators, and so on.

[3]Cost estimates based on broad, statewide policy and should be adjusted to reflect local costs.

GENERAL RECOMMENDATIONS

Maintenance

In addition to the specific maintenance actions presented in APPENDIXES F and G, the following strategies are recommended to prolong pavement life:

1. Conduct an aggressive campaign against weed growth through timely herbicide applications and/or mowing programs for the safety areas. Vegetation growth in pavement cracks is very destructive and significantly increases the rate of pavement deterioration.
2. 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.
3. 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.
4. Closely monitor heavy equipment movement, particularly construction, emergency, mowing, and fueling equipment, to make sure that they are only operating on pavements designed to accommodate the heavy loads this type of equipment often applies. Failure to restrict heavy equipment to appropriate areas may result in the premature failure of airport pavements.
5. Other maintenance necessities include keeping all pavement markings well painted, keeping safety signage clear of debris and weeds, ensuring the continuous operation of lighting systems (bulb replacement), and the frequent removal of any debris found in any of the operating areas. In addition, failed pavement areas should be remediated as necessary.
6. Regularly inspect all safety areas of the airport and document all inspection activity.
7. Provide a method of tracking all maintenance activities that occur as a result of these inspections. 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.

Remaining in Compliance with Public Law 103-305

Public Law 103-305 states that after January 1, 1995, airport sponsors at NPIAS airports 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 a minimum: pavement inventory, pavement inspections, record keeping, information retrieval, and program funding.

By undertaking this project, GDOT has provided Millen Airport with an excellent basis for meeting the requirements of this law. The airport now has a complete pavement inventory and a detailed inspection. To remain in compliance with the law, the airport will also need to undertake monthly drive-by inspections of pavement conditions and track pavement-related maintenance activities.

FAA AC 150/5380-6C provides further information on Public Law 103-305. Specifically, Appendix 1 of this AC addresses what is needed to remain in compliance with FAA Grant Assurance 11 and is provided in APPENDIX H.

SUMMARY

This report documents the results of the pavement evaluation conducted at Millen Airport. During a visual inspection of the pavements in 2018, it was found that the overall condition of the pavement network is a PCI of 70. A 5-year pavement repair program was generated for Millen Airport, which revealed that approximately $1,263,000 needs to be expended on the pavement system to maintain and/or improve its condition.

APPENDIX A

CAUSE OF DISTRESS TABLES

TABLE A-1 CAUSE OF PAVEMENT DISTRESS, AC PAVEMENTS

Distress Type	Probable Cause of Distress	Feasible Maintenance Strategies
Alligator Cracking	Fatigue failure of the asphalt concrete surface under repeated traffic loading.	If localized, partial- or full-depth asphalt patch. If extensive, major rehabilitation needed.
Bleeding	Excessive amounts of asphalt cement or tars in the mix or low air void content.	Spread heated sand, roll, and sweep. Another option is to plane excess asphalt or remove and replace.
Block Cracking	Shrinkage of the asphalt concrete and daily temperature cycling; it is not load associated.	At low severity levels, crack seal and/or surface treatment. At higher severities, consider overlay.
Corrugation	Traffic action combined with an unstable pavement layer.	If localized, mill. If extensive, remove and replace.
Depression	Settlement of the foundation soil or can be "built up" during construction.	Patch.
Jet Blast	Bituminous binder has been burned or carbonized.	Patch.
Joint Reflection Cracking	Movement of the concrete slab beneath the asphalt concrete surface due to thermal and moisture changes.	At low and medium severities, crack seal. At higher severities, especially if extensive, consider overlay.
Longitudinal and Transverse Cracking	Cracks may be caused by (1) poorly constructed paving lane joint, (2) shrinkage of the AC surface due to low temperatures or hardening of the asphalt, or (3) reflective crack caused by cracks in an underlying PCC slab.	At low and medium severity, crack seal. At higher severities, especially if extensive, consider overlay options.
Oil Spillage	Deterioration or softening of the pavement surface caused by the spilling of oil, fuel, or other solvents.	Patch.
Patching	N/A	Replace patch if deteriorated.
Polished Aggregate	Repeated traffic applications.	Aggregate seal coat is one option. Could also groove or mill. Overlay is another option.
Raveling	Asphalt binder may have hardened significantly, causing coarse aggregate pieces to dislodge.	Patch if isolated. At higher severity levels, consider major rehabilitation if extensive.
Rutting	Usually caused by consolidation or lateral movement of the materials due to traffic loads.	Patch medium- and high-severity levels if localized. If extensive, consider major rehabilitation.
Shoving	Where PCC pavements adjoin flexible pavements, PCC "growth" may shove the asphalt pavement.	Mill and patch as needed.
Slippage Cracking	Low-strength surface mix or poor bond between the surface and next layer of pavement structure.	Partial- or full-depth patch.
Swelling	Usually caused by frost action or by swelling soil.	Patch if localized. Major rehabilitation if extensive.
Weathering	Asphalt binder and fine aggregate may wear away as the pavement ages and hardens.	Patch if isolated. Consider a surface treatment if extensive.

TABLE A-2 CAUSE OF PAVEMENT DISTRESS, PCC PAVEMENTS

Distress Type	Probable Cause of Distress	Feasible Maintenance Strategies
Alkali Silica Reaction (ASR)	Chemical reaction of alkalis in the portland cement with certain reactive silica minerals. ASR may be accelerated by use of chemical pavement deicers.	At medium and high severities, slab replacement is recommended.
Blow-Up	Incompressibles in joints.	Partial- or full-depth patch. Slab replacement.
Corner Break	Load repetition combined with loss of support and curling stresses.	Seal cracks at low-severity. Full-depth patch.
Cracks	Combination of load repetition, curling stresses, and shrinkage stresses.	Seal cracks. At high-severity, may need full-depth patch or slab replacement.
Durability Cracking	Concrete's inability to withstand environmental factors such as freeze-thaw cycles.	Full-depth patch if present on small amount of slab. At higher severity levels, once it has appeared on most of slab, slab replacement.
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 joint.	Replace joint seal.
Patching (Small and Large)	N/A	Replace patches if deteriorated.
Popouts	Freeze-thaw action in combination with expansive aggregates.	Monitor.
Pumping	Poor drainage, poor joint sealant.	Seal cracks and joints. Underseal is an option if voids have developed. Establish good drainage.
Scaling	Overfinishing of concrete, deicing salts, improper construction, freeze-thaw cycles, and poor aggregate.	At low severity, do nothing. At medium and high severities, partial-depth patches or slab replacement.
Settlement	Upheaval or consolidation.	At higher severity levels, leveling patch or grind to restore smooth ride.
Shattered Slab	Load repetition.	Replace slab.
Shrinkage	Setting and curing of the concrete.	Monitor.
Spalling (Joint and Corner)	Excessive stresses at the joint caused by infiltration of incompressible materials or traffic loads; weak concrete at joint combined with traffic loads.	Partial-depth patch.

APPENDIX B

MAINTENANCE POLICIES AND UNIT COSTS

TABLE B-1 LOCALIZED MAINTENANCE POLICY, AC PAVEMENTS

Distress Type	Severity Level	Maintenance Action
Alligator Cracking	Low	Monitor
	Medium	AC Patching
	High	AC Patching
Bleeding	N/A	Monitor
Block Cracking	Low	Monitor
	Medium	Crack Sealing—AC
	High	Crack Sealing—AC
Corrugation	Low	Monitor
	Medium	AC Patching
	High	AC Patching
Depression	Low	Monitor
	Medium	AC Patching
	High	AC Patching
Jet Blast	N/A	AC Patching
Joint Reflection Cracking	Low	Monitor
	Medium	Crack Sealing—AC
	High	Crack Sealing—AC
Longitudinal and Transverse Cracking	Low	Monitor
	Medium	Crack Sealing—AC
	High	Crack Sealing—AC
Oil/Fuel Damage	N/A	AC Patching
Patching	Low	Monitor
	Medium	Monitor
	High	AC Patching
Polished Aggregate	N/A	Monitor
Raveling	Low	Monitor
	Medium	AC Patching
	High	AC Patching
Rutting	Low	Monitor
	Medium	AC Patching
	High	AC Patching
Shoving	Low	Monitor
	Medium	AC Patching
	High	AC Patching
Slippage Cracking	N/A	AC Patching
Swelling	Low	Monitor
	Medium	AC Patching
	High	AC Patching
Weathering	Low	Monitor
	Medium	Monitor
	High	AC Patching

TABLE B-2 LOCALIZED MAINTENANCE POLICY, PCC PAVEMENTS

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

TABLE B-3 2019 UNIT COSTS FOR LOCALIZED MAINTENANCE ACTIONS, GENERAL AVIATION AIRPORTS

Maintenance Action	Unit Cost		
	Metro	North	South
AC Patching	$3.99/sf	$4.00/sf	$3.66/sf
Crack Sealing—AC	$1.49/lf	$0.78/lf	$1.50/lf
Crack Sealing—PCC	$9.54/lf	$9.48/lf	$9.48/lf
Joint Sealing—PCC	$9.54/lf	$9.48/lf	$9.48/lf
PCC Partial-Depth Patch	$16.05/sf	$15.54/sf	$23.27/lf
PCC Full-Depth Patch	$53.50/sf	$56.27/sf	$29.51/sf
Slab Replacement	$53.50/sf	$56.27/sf	$29.51/sf

TABLE B-4 2019 UNIT COSTS FOR LOCALIZED MAINTENANCE ACTIONS, COMMERCIAL SERVICE AIRPORTS

Maintenance Action	Unit Cost
AC Patching	$2.83/sf
Crack Sealing—AC	$2.46/lf
Crack Sealing—PCC	$9.46/lf
Joint Sealing—PCC	$9.46/lf
PCC Partial Depth Patch	$15.09/lf
PCC Full Depth Patch	$51.35/sf
Slab Replacement	$51.35/sf

TABLE B-5 2019 UNIT COSTS FOR GLOBAL MAINTENANCE ACTIONS, GENERAL AVIATION AIRPORTS

Maintenance Action	Unit Cost		
	Metro	North	South
Single Surface Treatment	$0.98/sf	$0.38/sf	$0.61/sf
Pavement Rejuvenator	$0.53/sf	$0.33/sf	$0.41/sf

TABLE B-6 2019 UNIT COSTS FOR GLOBAL MAINTENANCE ACTIONS, COMMERCIAL SERVICE AIRPORTS

Maintenance Action	Unit Cost
Single Surface Treatment	$1.50/sf
Pavement Rejuvenator	$0.60/sf

TABLE B-7 2019 MAJOR REHABILITATION UNIT COSTS BASED ON PCI RANGES FOR AC PAVEMENTS

Type of Airport[1]	PCI Range							
	0–29	**30–39**	**40–49**	**50–59**	**60–69**	**70–79**	**80–89**	**> 89**
G.A., Metro	$7.03/sf	$7.03/sf	$6.49/sf	$2.82/sf	$2.82/sf	$2.82/sf	$2.82/sf	$2.82/sf
G.A., North	$5.87/sf	$5.87/sf	$5.97/sf	$2.01/sf	$2.01/sf	$2.01/sf	$2.01/sf	$2.01/sf
G.A., South	$6.31/sf	$6.31/sf	$5.78/sf	$2.15/sf	$2.15/sf	$2.15/sf	$2.15/sf	$2.15/sf
Commercial Service	$10.62/sf	$10.62/sf	$10.62/sf	$3.45/sf	$3.45/sf	$3.45/sf	$3.45/sf	$3.45/sf

[1]G.A. = General Aviation

TABLE B-8 2019 MAJOR REHABILITATION UNIT COSTS BASED ON PCI RANGES FOR PCC-SURFACED PAVEMENTS

Type of Airport[1]	PCI Range							
	0—29	**30—39**	**40—49**	**50—59**	**60—69**	**70—79**	**80—89**	**> 89**
G.A., Metro	$17.82/sf	$17.82/sf	$2.82/sf	$2.82/sf	$2.82/sf	$2.82/sf	$2.82/sf	$2.82/sf
G.A., North	$18.93/sf	$18.93/sf	$2.01/sf	$2.01/sf	$2.01/sf	$2.01/sf	$2.01/sf	$2.01/sf
G.A., South	$27.87/sf	$27.87/sf	$2.15/sf	$2.15/sf	$2.15/sf	$2.15/sf	$2.15/sf	$2.15/sf
Commercial Service	$17.76/sf	$17.76/sf	$3.45/sf	$3.45/sf	$3.45/sf	$3.45/sf	$3.45/sf	$3.45/sf

[1]G.A. = General Aviation

APPENDIX C

WORK HISTORY REPORT

Work History Report

Pavement Database:GA2018FINAL

Network: MILLEN **Branch:** A01ML (APRON 01) **Section:** 10 **Surface:** AC
L.C.D.: 06/05/2011 **Use:** APRON **Rank** P **Length:** 459.00 Ft **Width:** 150.00 Ft **True Area:** 61,278.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/2018	CS-AC	Crack Sealing - AC	$0	0.00	False	
06/05/2011	CR-AC	Complete Reconstruction - AC	$0	2.00	True	2" GDOT 402 RECYCLED AC
06/04/2011	CO-PR	Coat - Prime	$0	0.00	False	P-602 BIT. PRIME COAT
06/03/2011	BA-AG	Base Course - Aggregate	$0	8.00	False	P-209 AGG. BASE
06/02/2011	SG-CO	Subgrade - Compacted	$0	8.00	False	COMPACTED TO 100% PROCTOR
06/01/2006	CS-AC	Crack Sealing - AC	$0	0.00	False	
06/01/2000	CS-AC	Crack Sealing - AC (Localized			False	
06/01/1990	OL-F	ASPHALT OVERLAY - TYPE I		1.50	True	SURFACE COURSE

Network: MILLEN **Branch:** R1735ML (RUNWAY 17/35) **Section:** 10 **Surface:** AC
L.C.D.: 06/05/2011 **Use:** RUNWAY **Rank** P **Length:** 5,000.00 Ft **Width:** 75.00 Ft **True Area:** 423,813.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/2018	CS-AC	Crack Sealing - AC	$0	0.00	False	
06/05/2011	CR-AC	Complete Reconstruction - AC	$0	2.00	True	2" GDOT 402 RECYCLED AC
06/04/2011	CO-PR	Coat - Prime	$0	0.00	False	P-602 BIT. PRIME COAT
06/03/2011	BA-AG	Base Course - Aggregate	$0	8.00	False	P-209 AGG. BASE
06/02/2011	SG-CO	Subgrade - Compacted	$0	8.00	False	COMPACTED TO 100% PROCTOR
06/01/2006	CS-AC	Crack Sealing - AC	$0	0.00	False	
06/01/2000	CS-AC	Crack Sealing - AC (Localized			False	
06/01/1990	OL-F	ASPHALT OVERLAY - TYPE I		1.50	True	SURFACE COURSE, ORIG CONST UNKNOWN
06/01/1967	NC-AC	New Construction - AC			True	

Network: MILLEN **Branch:** TAML (TAXIWAY A) **Section:** 10 **Surface:** AC
L.C.D.: 06/05/2011 **Use:** TAXIWAY **Rank** P **Length:** 270.00 Ft **Width:** 30.00 Ft **True Area:** 9,455.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/2018	CS-AC	Crack Sealing - AC	$0	0.00	False	
06/05/2011	CR-AC	Complete Reconstruction - AC	$0	2.00	True	2" GDOT 402 RECYCLED AC
06/04/2011	CO-PR	Coat - Prime	$0	0.00	False	P-602 BIT. PRIME COAT
06/03/2011	BA-AG	Base Course - Aggregate	$0	8.00	False	P-209 AGG. BASE
06/02/2011	SG-CO	Subgrade - Compacted	$0	8.00	False	COMPACTED TO 100% PROCTOR
06/01/2006	CS-AC	Crack Sealing - AC	$0	0.00	False	
06/01/2000	CS-AC	Crack Sealing - AC (Localized			False	
06/01/1990	OL-F	ASPHALT OVERLAY - TYPE I		1.50	True	SURFACE COURSE

Network: MILLEN **Branch:** THANGML (T-HANGAR AREA) **Section:** 10 **Surface:** AC
L.C.D.: 06/03/2006 **Use:** THANGAR **Rank** P **Length:** 480.00 Ft **Width:** 35.00 Ft **True Area:** 38,065.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/2018	CS-AC	Crack Sealing - AC	$0	0.00	False	
06/03/2006	NC-AC	New Construction - AC	$0	2.00	True	GDOT-400 SUPERPAVE
06/02/2006	BA-AG	Base Course - Aggregate	$0	8.00	False	GRADED AGG BASE
06/01/2006	SG-CO	Subgrade - Compacted	$0	6.00	False	GDOT-208 COMPACTED SUBGRADE

Date:05/22/2019

Work History Report

Pavement Database:GA2018FINAL

Summary:

Work Description	Section Count	Area Total (SqFt)	Thickness Avg (in)	Thickness STD (in)
ASPHALT OVERLAY - TYPE F	3	494,546.00	1.50	.00
Base Course - Aggregate	4	532,611.00	8.00	.00
Coat - Prime	3	494,546.00	.00	.00
Complete Reconstruction - AC	3	494,546.00	2.00	.00
Crack Sealing - AC	7	1,027,157.00	.00	.00
Crack Sealing - AC (Localized MR)	3	494,546.00		
New Construction - AC	2	461,878.00	2.00	
Subgrade - Compacted	4	532,611.00	7.50	1.00

APPENDIX D

PHOTOGRAPHS

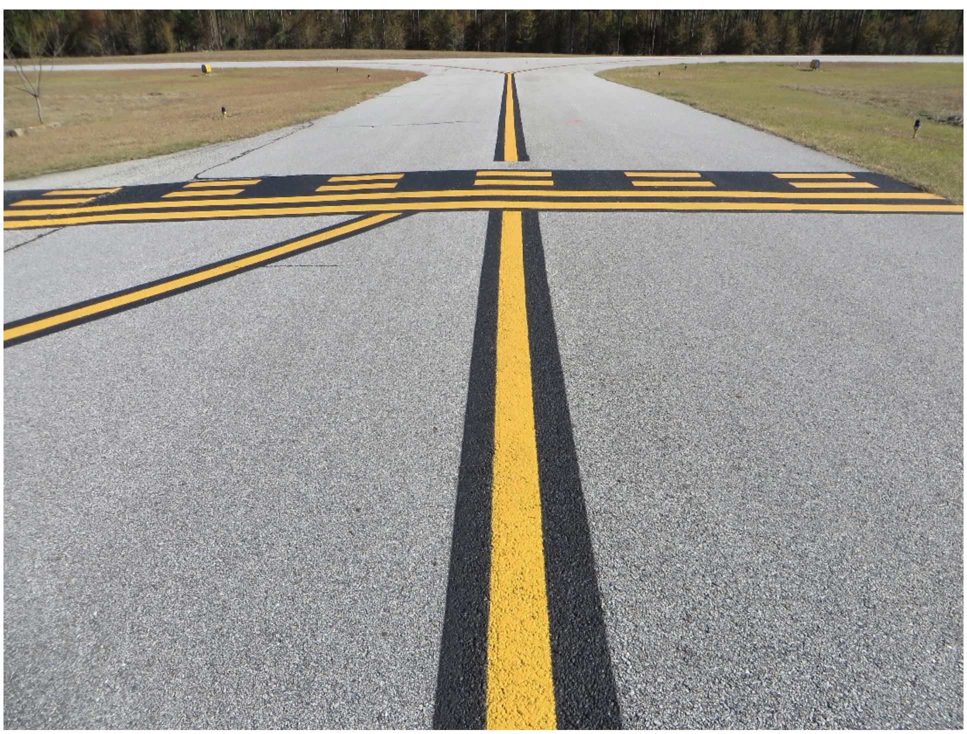
A01ML-10. Overview.

A01ML-10. L&T Cracking (Sample Unit No. 05).

R1735ML-10. Overview.

R1735ML-10. L&T Cracking (Sample Unit No. 10).

R1735ML-10. Weathering (Sample Unit No. 02).



TAML-10. Overview.

TAML-10. Raveling (Sample Unit No. 02) (1).

TAML-10. Raveling (Sample Unit No. 02) (2).

THANGML-10. Overview.

THANGML-10. Depression (Sample Unit No. 01).

THANGML-10. L&T Cracking (Sample Unit No. 05).

THANGML-10. Raveling (Sample Unit No. 05).

APPENDIX E

INSPECTION REPORT

Re-inspection Report

GA2018final
Report Generated Date: May 22, 2019

Network: MILLEN Name: MILLEN AIRPORT

Branch: A01ML Name: APRON 01 Use: APRON Area: 61,278.00SqFt

Section: 10 of 1 From: ACCESS ROAD To: TAXIWAY A Last Const.: 06/05/2011
Surface: AC Family: GAACAPGA1 Zone: SAT Category: Rank: P
Area: 61,278.00SqFt Length: 459.00Ft Width: 150.00Ft
Shoulder: NO Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/06/2018 Total Samples: 12 Surveyed: 5
Conditions: PCI : 65
Inspection Comments:

Sample Number: 01 Type: R Area: 5,000.00SqFt PCI = 50
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	630.00	Ft	Comments:LS
48 LONGITUDINAL/TRANSVERSE CRACKING	M	80.00	Ft	Comments:W; FS
56 SWELLING	L	60.00	SqFt	Comments:
52 RAVELING	L	300.00	SqFt	Comments:
52 RAVELING	H	20.00	SqFt	Comments:
57 WEATHERING	L	4,980.00	SqFt	Comments:

Sample Number: 03 Type: R Area: 5,475.00SqFt PCI = 63
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	615.00	Ft	Comments:LS
48 LONGITUDINAL/TRANSVERSE CRACKING	L	85.00	Ft	Comments:LU
56 SWELLING	L	50.00	SqFt	Comments:
52 RAVELING	L	70.00	SqFt	Comments:
57 WEATHERING	L	5,475.00	SqFt	Comments:

Sample Number: 05 Type: R Area: 5,000.00SqFt PCI = 62
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	605.00	Ft	Comments:LS
48 LONGITUDINAL/TRANSVERSE CRACKING	L	69.00	Ft	Comments:LU
52 RAVELING	L	100.00	SqFt	Comments:
57 WEATHERING	L	5,000.00	SqFt	Comments:
56 SWELLING	L	30.00	SqFt	Comments:

Sample Number: 07 Type: R Area: 4,950.00SqFt PCI = 69
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	190.00	Ft	Comments:LS
48 LONGITUDINAL/TRANSVERSE CRACKING	M	50.00	Ft	Comments:FS
53 RUTTING	L	5.00	SqFt	Comments:
56 SWELLING	L	7.00	SqFt	Comments:
52 RAVELING	L	60.00	SqFt	Comments:
57 WEATHERING	L	4,950.00	SqFt	Comments:

Sample Number: 10 Type: R Area: 5,000.00SqFt PCI = 83
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	187.00	Ft	Comments:LS
57 WEATHERING	L	5,000.00	SqFt	Comments:

Re-inspection Report

GA2018final
Report Generated Date: May 22, 2019

Network: MILLEN Name: MILLEN AIRPORT

Branch: R1735ML Name: RUNWAY 17/35 Use: RUNWAY Area: 423,813.00SqFt

Section: 10 of 1 From: 17 APPROACH To: 35 APPROACH Last Const.: 06/05/2011
Surface: AC Family: GAACRWYGA1 Zone: SAT Category: Rank: P
Area: 423,813.00SqFt Length: 5,000.00Ft Width: 75.00Ft
Shoulder: NO Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/06/2018 Total Samples: 79 Surveyed: 8
Conditions: PCI : 71
Inspection Comments:

Sample Number: 02 Type: R Area: 5,625.00SqFt PCI = 83
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	225.00 Ft	Comments:LS
48 LONGITUDINAL/TRANSVERSE CRACKING	L	9.00 Ft	Comments:LU
57 WEATHERING	L	2,475.00 SqFt	Comments:-3150 FOR PAINT

Sample Number: 10 Type: R Area: 5,625.00SqFt PCI = 67
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	36.00 Ft	Comments:LU
48 LONGITUDINAL/TRANSVERSE CRACKING	M	10.00 Ft	Comments:W
48 LONGITUDINAL/TRANSVERSE CRACKING	L	345.00 Ft	Comments:LS
57 WEATHERING	L	5,585.00 SqFt	Comments:
52 RAVELING	M	40.00 SqFt	Comments:

Sample Number: 18 Type: R Area: 5,625.00SqFt PCI = 71
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	71.00 Ft	Comments:LU
48 LONGITUDINAL/TRANSVERSE CRACKING	L	300.00 Ft	Comments:LS
48 LONGITUDINAL/TRANSVERSE CRACKING	M	40.00 Ft	Comments:FS
52 RAVELING	L	20.00 SqFt	Comments:
57 WEATHERING	L	5,625.00 SqFt	Comments:

Sample Number: 26 Type: R Area: 5,625.00SqFt PCI = 66
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	69.00 Ft	Comments:LU
48 LONGITUDINAL/TRANSVERSE CRACKING	L	409.00 Ft	Comments:LS
57 WEATHERING	L	5,625.00 SqFt	Comments:
48 LONGITUDINAL/TRANSVERSE CRACKING	M	25.00 Ft	Comments:W
52 RAVELING	L	50.00 SqFt	Comments:

Sample Number: 34 Type: R Area: 5,625.00SqFt PCI = 71
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	17.00 Ft	Comments:LU
48 LONGITUDINAL/TRANSVERSE CRACKING	L	351.00 Ft	Comments:LS
57 WEATHERING	L	5,610.00 SqFt	Comments:
52 RAVELING	M	15.00 SqFt	Comments:
52 RAVELING	L	20.00 SqFt	Comments:

Sample Number: 42 Type: R Area: 5,625.00SqFt PCI = 72
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	15.00 Ft	Comments:LU
48 LONGITUDINAL/TRANSVERSE CRACKING	M	5.00 Ft	Comments:FS
48 LONGITUDINAL/TRANSVERSE CRACKING	L	300.00 Ft	Comments:LS

52 RAVELING	L	75.00	SqFt	Comments:
57 WEATHERING	L	5,625.00	SqFt	Comments:

Sample Number: 50 Type: R Area: 5,625.00SqFt PCI = 72

Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	325.00	Ft	Comments:LS
48 LONGITUDINAL/TRANSVERSE CRACKING	L	49.00	Ft	Comments:LU
52 RAVELING	L	260.00	SqFt	Comments:
57 WEATHERING	L	5,625.00	SqFt	Comments:

Sample Number: 58 Type: R Area: 5,625.00SqFt PCI = 68

Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	91.00	Ft	Comments:LU
48 LONGITUDINAL/TRANSVERSE CRACKING	L	417.00	Ft	Comments:LS
56 SWELLING	L	28.00	SqFt	Comments:
52 RAVELING	L	60.00	SqFt	Comments:
57 WEATHERING	L	5,625.00	SqFt	Comments:

Re-inspection Report

GA2018final
Report Generated Date: May 22, 2019

Network: MILLEN   Name: MILLEN AIRPORT

Branch: TAML   Name: TAXIWAY A   Use: TAXIWAY   Area: 9,455.00SqFt

Section: 10   of 1   From: APRON 01   To: RUNWAY 17/35   Last Const.: 06/05/2011
Surface: AC   Family: GAACTWYGA1SOUTH   Zone: SAT   Category: Rank: P
Area: 9,455.00SqFt   Length: 270.00Ft   Width: 30.00Ft
Shoulder: NO   Street Type: Grade: 0.00   Lanes: 0

Section Comments:

Last Insp. Date: 12/06/2018 Total Samples: 2   Surveyed: 2
Conditions: PCI : 55
Inspection Comments:

Sample Number: 01   Type: R   Area: 4,727.00SqFt   PCI = 69
Sample Comments:

52 RAVELING	H	10.00	SqFt	Comments:
48 LONGITUDINAL/TRANSVERSE CRACKING	L	105.00	Ft	Comments:LS @ BREAK
48 LONGITUDINAL/TRANSVERSE CRACKING	L	138.00	Ft	Comments:LS
48 LONGITUDINAL/TRANSVERSE CRACKING	L	42.00	Ft	Comments:LU
56 SWELLING	L	70.00	SqFt	Comments:
57 WEATHERING	L	4,717.00	SqFt	Comments:

Sample Number: 02   Type: R   Area: 4,728.00SqFt   PCI = 42
Sample Comments:

52 RAVELING	H	200.00	SqFt	Comments:
52 RAVELING	L	360.00	SqFt	Comments:
48 LONGITUDINAL/TRANSVERSE CRACKING	M	20.00	Ft	Comments:W
48 LONGITUDINAL/TRANSVERSE CRACKING	L	50.00	Ft	Comments:LU
48 LONGITUDINAL/TRANSVERSE CRACKING	L	135.00	Ft	Comments:LS
57 WEATHERING	L	4,528.00	SqFt	Comments:

Re-inspection Report

GA2018final
Report Generated Date: May 22, 2019

Network: MILLEN Name: MILLEN AIRPORT

Branch: THANGML Name: T-HANGAR AREA Use: THANGAR Area: 38,065.00SqFt

Section: 10 of 1 From: . To: . Last Const.: 06/03/2006
Surface: AC Family: GAACTHGA1 Zone: U-FA Category: Rank: P
Area: 38,065.00SqFt Length: 480.00Ft Width: 35.00Ft
Shoulder: ST Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/06/2018 Total Samples: 6 Surveyed: 4
Conditions: PCI : 67
Inspection Comments:

Sample Number: 01 Type: R Area: 5,670.00SqFt PCI = 68
Sample Comments:

45 DEPRESSION	L	40.00	SqFt	Comments:@ BREAK
48 LONGITUDINAL/TRANSVERSE CRACKING	L	250.00	Ft	Comments:LS
48 LONGITUDINAL/TRANSVERSE CRACKING	L	11.00	Ft	Comments:LU
56 SWELLING	L	80.00	SqFt	Comments:
52 RAVELING	L	150.00	SqFt	Comments:
57 WEATHERING	L	5,670.00	SqFt	Comments:

Sample Number: 02 Type: R Area: 5,235.00SqFt PCI = 75
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	258.00	Ft	Comments:LS
52 RAVELING	L	150.00	SqFt	Comments:
57 WEATHERING	L	5,235.00	SqFt	Comments:

Sample Number: 05 Type: R Area: 5,240.00SqFt PCI = 56
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	L	511.00	Ft	Comments:LS
48 LONGITUDINAL/TRANSVERSE CRACKING	L	55.00	Ft	Comments:LU
48 LONGITUDINAL/TRANSVERSE CRACKING	M	25.00	Ft	Comments:W
52 RAVELING	M	220.00	SqFt	Comments:
52 RAVELING	L	400.00	SqFt	Comments:
57 WEATHERING	L	5,020.00	SqFt	Comments:

Sample Number: 06 Type: R Area: 5,125.00SqFt PCI = 70
Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING	M	85.00	Ft	Comments:FS
48 LONGITUDINAL/TRANSVERSE CRACKING	L	195.00	Ft	Comments:LS
52 RAVELING	L	360.00	SqFt	Comments:
45 DEPRESSION	L	3.00	SqFt	Comments:
57 WEATHERING	L	5,125.00	SqFt	Comments:

APPENDIX F

YEAR 2020
LOCALIZED MAINTENANCE PLAN
ORGANIZED BY SECTION

TABLE F-1 2020 LOCALIZED MAINTENANCE PLAN ORGANIZED BY SECTION

Branch[1]	Section[1]	Distress Type[2]	Severity	Maintenance Action	Maintenance Quantity	Maintenance Unit	Unit Cost	Estimated Cost
A01ML	10	L&T Cracking	Medium	Crack Sealing - AC	313	Ft	$1.57	$492
		Raveling	High	Patching - AC Deep	48	SqFt	$3.84	$185
THANGML	10	L&T Cracking	Medium	Crack Sealing - AC	197	Ft	$1.57	$309
		Raveling	Medium	Patching - AC Deep	394	SqFt	$3.84	$1,512

[1]See FIGURE 5 for the location of the branch and section.
[2]L&T Cracking = longitudinal and transverse cracking.

APPENDIX G

YEAR 2020
LOCALIZED MAINTENANCE PLAN
ORGANIZED BY REPAIR TYPE

TABLE G-1 2020 LOCALIZED MAINTENANCE PLAN ORGANIZED BY REPAIR TYPE

Branch[1]	Section[1]	Distress Type[2]	Severity	Maintenance Action	Maintenance Quantity	Maintenance Unit	Unit Cost	Estimated Cost
A01ML	10	L&T Cracking	Medium	Crack Sealing - AC	313	Ft	$1.57	$492
THANGML	10	L&T Cracking	Medium	Crack Sealing - AC	197	Ft	$1.57	$309
A01ML	10	Raveling	High	Patching - AC Deep	48	SqFt	$3.84	$185
THANGML	10	Raveling	Medium	Patching - AC Deep	394	SqFt	$3.84	$1,512

[1]See FIGURE 5 for the location of the branch and section.

[2]L&T Cracking = longitudinal and transverse cracking.

APPENDIX H

MONITORING PAVEMENT CONDITION

MONITORING PAVEMENT CONDITION

The pavements at an airport directly impact the safety of operations and represent a large capital investment that should be carefully preserved. Therefore, it is critical for the airport sponsor to actively monitor the condition of the pavement infrastructure and track pavement maintenance needed and completed at the airport. This section of the manual provides information on what an airport needs to do to remain in compliance with Public Law 103-305. In addition, it provides guidance on what pavement conditions require immediate attention or notification (or both) of GDOT and the FAA.

FAA Requirements (Public Law 103-305)

If an 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, an 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 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 5 of this report shows the location of all runways, taxiways, aprons, helipads, and T-hangars at this airport. If any new pavements are constructed or any pavement areas are permanently closed, this map must be updated.

b. Dimensions of pavement sections.

The dimensions of all runways, taxiways, aprons, helipads, 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 5) 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 2 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 this airport is provided in APPENDIX C 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 H-1 of this appendix.

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 H-1 PAVEMENT INSPECTION REPORT

Inspected By: ___________________________

Date Inspected: ___________________________

Inspection Record			**Maintenance Action**			
Location[1]		**Distress Description/Dimensions/Severity/ Recommended Action**	**Description of Repair**	**Date Performed**	**Cost**	**Funding Source**
Branch	**Section**					

TABLE H-1 PAVEMENT INSPECTION REPORT (CONTINUED)

Inspected By: ___________________________
Date Inspected: __________________________

Inspection Record			**Maintenance Action**			
Location[1]		**Distress Description/Dimensions/Severity/ Recommended Action**	**Description of Repair**	**Date Performed**	**Cost**	**Funding Source**
Branch	**Section**					

[1]See FIGURE 5 for the location of the branch and section.

Conditions Requiring Immediate Attention

Some pavement distress types warrant immediate remedial action or notification (or both) of the FAA and GDOT as to pavement condition. These are situations that can lead to tire damage, foreign object debris (FOD), loss of friction, or hydroplaning. Following is a description of these situations. The occurrences of these distresses on runways or other areas where pilots are maneuvering, especially at high speeds, are obviously more critical.

AC Distress Types

The following is a list of the PCI distress type and severity combinations for AC-surfaced pavements that warrant immediate attention or notification (or both) of the FAA and GDOT about the problem. Note that text taken directly from the ASTM D5340-12 is presented below in italics. There are many other PCI distress type and severity combinations that are not mentioned herein that may be found on Georgia airfields. For a complete listing of airfield PCI distresses, please refer to ASTM D5340-12 or FAA Advisory Circular 150/5380-6C. A copy of the FAA Advisory Circular 150/5380-6C can be found at the following website: http://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5380-6C.pdf.

Alligator Cracking

Alligator cracking appears *as a series of interconnecting cracks caused by fatigue failure of the AC surface*. The fatigue failure is most often the result of repeated traffic loading. *After repeated traffic loading, the cracks connect, forming many-sided, sharp-angled pieces that develop a pattern resembling chicken wire or the skin of an alligator*.

At the high-severity level, *the pieces are well defined and spalled at the edges*; there is definite FOD potential. If extensive, the only recourse is to overlay or reconstruct the pavement. If localized, full-depth patching is an appropriate repair. FIGURE H-1 illustrates what alligator cracking looks like at the high-severity level.

FIGURE H-1 HIGH-SEVERITY ALLIGATOR CRACKING

Bleeding

Bleeding is a film of bituminous material on the pavement surface that creates a shiny, glass-like, reflecting surface that usually becomes quite sticky. Bleeding is caused by excessive amounts of asphaltic cement or tars in the mix or low-air void content, or both. It occurs when asphalt fills the voids of the mix during hot weather and then expands out onto the surface of the pavement. Since the bleeding process is not reversible during cold weather, asphalt or tar will accumulate on the surface.

At its most severe, bleeding can result in a severe reduction in skid resistance. If bleeding is extensive and severe, as shown in FIGURE H-2, the AC layer should be removed and replaced.

FIGURE H-2 EXTENSIVE BLEEDING

Depressions

Depressions are localized pavement surface areas having elevations slightly lower than those of the surrounding pavement. Depressions can be caused by settlement of the foundation soil or can be built during construction. Depressions cause roughness and, when filled with water of sufficient depth, could cause hydroplaning of aircraft.

High-severity depressions in areas where aircraft maneuver at high speeds should be patched. An example of a high-severity depression is shown in FIGURE H-3.

FIGURE H-3 HIGH-SEVERITY DEPRESSION

Joint Reflection Cracking and Longitudinal and Transverse (L&T) Cracking

Joint reflection cracking occurs on pavements that have an AC overlay over PCC pavement. This type of cracking is caused by the movement of the underlying PCC slabs.

Longitudinal cracking is parallel to the pavement's center line. Transverse cracking is approximately perpendicular to the pavement's center line or direction of laydown. L&T cracking can be caused by separation of the pavement at the paving lane joints, shrinkage of the AC pavement due to temperature differentials in older or brittle pavements, or reflection cracking from underlying existing cracks in overlaid pavements.

At the high-severity level, the cracks are severely spalled and pieces are loose or missing, causing FOD potential. These cracks need to be sealed. If the crack width is extensive, consider patching the affected area. FIGURE H-4 shows a crack that needs immediate attention.

FIGURE H-4 HIGH-SEVERITY CRACKING

Patching

At high-severity, a *patch is badly deteriorated and affects ride quality significantly or has high FOD potential.* High-severity patches need to be replaced to avoid FOD and tire damage potential. FIGURE H-5 shows a high-severity patch.

FIGURE H-5 HIGH-SEVERITY PATCHING

Raveling

Raveling occurs as the coarse aggregate pieces begin to dislodge and produce loose pieces of material. It may indicate that the AC binder has hardened significantly.

At high-severity, the aggregate has worn away, which causes a high FOD potential and safety hazard since it could be ingested by aircraft engines. The surface texture is severely rough and pitted. If localized, high-severity raveling can be corrected with a patch; if extensive, an overlay will probably be needed. FIGURE H-6 shows high-severity raveling.

FIGURE H-6 HIGH-SEVERITY RAVELING

Rutting

Rutting is a surface depression in the pavement that is caused by repeated wheel loading in excess of the structural capacity of any or all of the pavement layers. Rutting is a load-related distress and is typically found in the wheel paths of aircraft.

At the high-severity level, the mean depth of the rutting is greater than 1 inch. If localized, this distress can be corrected with a patch. If it is an extensive problem, consider major rehabilitation. High-severity rutting is shown below in FIGURE H-7.

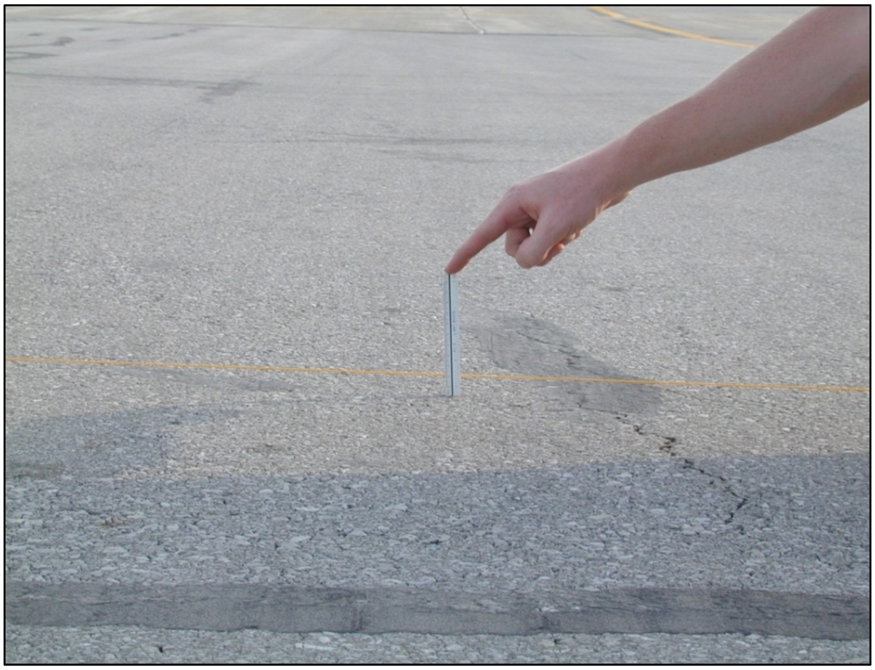


FIGURE H-7 HIGH-SEVERITY RUTTING

Shoving

Pavement expands as its temperature increases. Due to its greater strength, when PCC pavement expands adjacent to AC pavement, it can cause a permanent vertical deformation in the AC pavement. Additionally, PCC pavement has a tendency to grow as gradual openings at the joint widen and are filled with incompressible material or distresses such as alkali-silica reaction (ASR) cause the pavement to expand. This is referred to as pavement growth and can also produce vertical deformation in adjacent AC pavements. This deformation is called shoving.

At high-severity, *a large amount of shoving has occurred, causing severe roughness or break-up of the asphalt pavement*. This situation can be corrected by milling the AC surface to restore smoothness and patching as needed. Installing an expansion joint may minimize the potential for recurrence of the distress. FIGURE H-8 depicts high-severity shoving.

FIGURE H-8 HIGH-SEVERITY SHOVING AT AC/PCC INTERFACE

Swelling

Swell is characterized by an upward bulge in the pavement's surface. A swell may occur sharply over a small area or as a longer, gradual wave. Either type of swell can be accompanied by surface cracking. A swell is usually caused by frost action in the subgrade or by swelling soil, but a small swell can also occur on the surface of an asphalt overlay (over PCC) as a result of a blowup in the PCC slab.

At the high-severity level, the height differential is greater than 1.5 inches. This distress can be corrected with a patch, or if it is an extensive problem, the pavement can be reconstructed. Consideration should be made to stabilizing and draining the subgrade and adding a frost protection layer if that is a factor. High-severity swelling is shown in FIGURE H-9.

FIGURE H-9 HIGH-SEVERITY SWELLING

PCC Distress Types

The following is a list of the PCI distress type and severity combinations for PCC pavements that warrant immediate attention or notification (or both) of the FAA and GDOT about the problem. Note that text taken directly from the ASTM D5340-12 is presented below in italics. There are many other PCI distress type and severity combinations that are not mentioned herein that may be found on Georgia airfields. For a complete listing of airfield PCI distresses, please refer to ASTM D5340-12 or FAA Advisory Circular 150/5380-6C. A copy of the FAA Advisory Circular 150/5380-6C can be found at the following website: http://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5380-6C.pdf.

Blowups

Blowups occur in hot weather, usually at a transverse crack or joint that is not wide enough to permit expansion of the concrete slabs. The insufficient width is usually caused by infiltration of incompressible materials into the joint space. When expansion cannot relieve enough pressure, a localized upward movement of the slab edges (buckling) or shattering will occur in the vicinity of the joint. Blowups can also occur at utility cuts and drainage inlets. This type of distress is almost always repaired immediately because of severe damage potential to aircraft.

Depending on the situation, a full-depth patch or slab replacement will be required. An expansion joint must be provided during the repair. FIGURE H-10 shows this distress type.

FIGURE H-10 HIGH-SEVERITY BLOWUP IN THE PROCESS OF BEING REPAIRED

Corner Break

A corner break is a crack that intersects the joints at a distance less than or equal to one half of the slab length on both sides, measured from the corner of the slab. Load repetition combined with loss of support and curling stresses usually cause corner breaks.

At high-severity, the *crack is severely spalled, causing definite FOD potential; a nonfilled crack has a mean width greater than approximately 1 inch, creating tire damage potential; or the area between the corner break and the joints is severely cracked.* This distress needs to be repaired with a full-depth patch or in some cases with a slab replacement. This distress type is shown below in FIGURE H-11.

FIGURE H-11 HIGH-SEVERITY CORNER BREAKING

Longitudinal, Transverse, and Diagonal (LTD) Cracking

LTD cracks divide a slab into two or more pieces. These types of cracks are usually caused by a combination of repeated loading, curling stresses, and/or shrinkage stresses. Low-severity cracks are usually caused by curling or warping stresses (or both) and are not considered serious structural problems. Medium- and high-severity cracks are usually working cracks and typically constitute structural problems. At the high-severity level, the slab will often require replacement or large, full-depth patches. FIGURE H-12 depicts a high-severity LTD crack.

FIGURE H-12 HIGH-SEVERITY LTD CRACKING

Durability Cracking

Durability cracking is usually caused by a pavement's inability to withstand the forces created by freeze-thaw cycles in PCC pavements that are susceptible to moisture penetration, and it can lead to the disintegration of a pavement along joints and cracks. At high-severity levels, significant FOD potential can exist, and the slab should be replaced. High-severity durability cracking is shown below in FIGURE H-13.

FIGURE H-13 HIGH-SEVERITY DURABILITY CRACKING

Patching

A patch is an area where the original pavement has been removed and replaced by a filler material. High-severity patches must be replaced. An example of a high-severity patch is shown in FIGURE H-14.

FIGURE H-14 HIGH-SEVERITY PATCHING

Scaling

Scaling is the breakdown of the slab surface to a depth of approximately 0.25 to 0.5 in. (6 to 13 mm). Scaling appears as a flaking away of the pavement's surface and presents FOD potential. The over-finishing of the concrete surface during construction usually causes this distress. Other causes of scaling include improper construction, reactions to deicing salts, poor aggregate, and the impact of multiple freeze-thaw cycles.

At the high-severity level, there is substantial FOD potential, and slab replacement is usually the only viable alternative. FIGURE H-15 is a photograph of high-severity scaling.

FIGURE H-15 HIGH-SEVERITY SCALING

Faulting/Settlement

ASTM D5340-12 defines faulting/settlement as *a difference of elevation at a joint or crack caused by upheaval or consolidation*. Instability in load transfer mechanisms, softening or loss of underlying support, or expanding materials in the subgrade are common causes of this type of distress. At the high-severity level, shown in FIGURE H-16, faulting/settlement can cause tire damage potential. Grinding may be considered to restore a smooth ride quality.

FIGURE H-16 HIGH-SEVERITY FAULTING/SETTLEMENT

Shattered Slabs

A shattered slab is defined as intersecting cracks *that break a slab into four or more pieces due to overloading or inadequate support, or both*. The only option at the high-severity level is to replace the slab. An example of a high-severity shattered slab is shown in FIGURE H-17.

FIGURE H-17 HIGH-SEVERITY SHATTERED SLAB

Joint Spalling

ASTM D5340-12 defines this distress *as the breakdown of the slab edges within 2 feet of the side of the joint. A joint spall usually does not extend vertically through the slab but intersects the joint at an angle*. Spalling is typically caused by the introduction of incompressible material in the joint, weaker pavement at the joint caused by overworking of the pavement during construction, traffic loading, or a combination of these.

For a joint spall to be recorded at high-severity, it must be greater than 2 feet long. The joint spall is either *broken into more than three pieces defined by one or more high-severity cracks with high FOD potential and high possibility of the pieces becoming dislodged*, or the *joint is severely frayed with high FOD potential*. This distress should be repaired with a partial-depth patch. FIGURE H-18 shows this distress type.

FIGURE H-18 HIGH-SEVERITY JOINT SPALLING

Corner Spalling

Corner spalling is defined as *the raveling or breakdown of the slab within approximately 2 feet of the corner.* Corner spalling has the same causes as joint spalling and must be greater than 3 inches wide to be considered a spall.

For a corner spall to be recorded at high-severity, *one of the following conditions exists: (1) spall is broken into two or more pieces defined by high-severity fragmented crack(s) with loose or absent fragments; (2) pieces of the spall have been displaced to the extent that a tire damage hazard exists; or (3) spall has deteriorated to the point where loose material is causing high FOD potential*. Due to the high FOD potential, this distress should be repaired with a partial-depth patch. FIGURE H-19 shows this distress type.

FIGURE H-19 HIGH-SEVERITY CORNER SPALLING

Alkali-Silica Reaction (ASR)

ASR is caused by chemical reaction between alkalis and certain reactive silica minerals which form a gel. This gel expands in the presence of water, causing the fracturing of the aggregates and paste. *Visual indicators that ASR may be present include: (1) cracking of the concrete pavement (often in a map pattern); (2) white, brown, gray or other colored gel or staining may be present at the crack surface; (3) aggregate popouts; or (4) increase in concrete volume (expansion) that may result in distortion of adjacent or integral structures or physical elements*.

For ASR to be recorded at high-severity, *one or both of the following exist: (1) loose or missing concrete fragments and poses high FOD potential, (2) slab surface integrity and function significantly degraded and pavement requires immediate repairs; may also require repairs to adjacent structures or elements*. This distress should be repaired with a slab replacement. If extensive, reconstruction may be the only viable option. FIGURE H-20 depicts this distress type.

FIGURE H-20 HIGH-SEVERITY ASR

Preserving Georgia's Critical Airport Pavement Infrastructure

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