

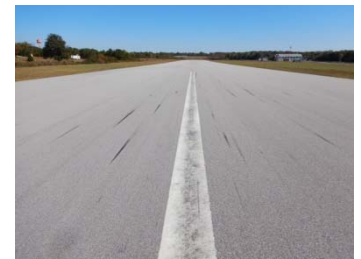
Alabama Statewide Airport Pavement Management Program Update



Chilton County Airport (02A)

Final Report

February 2022



Submitted to

Alabama Aeronautics Bureau

Submitted by



All About Pavements, Inc (API)
www.allaboutpavements.com

Pavement Management – Evaluation – Testing - Design

**ALABAMA STATEWIDE AIRPORT PAVEMENT MANAGEMENT
PROGRAM UPDATE**

Chilton County Airport, Clanton (02A)

FINAL REPORT

Prepared For:

Alabama Aeronautics Bureau
1409 Coliseum Blvd.
Montgomery, AL 36110

Prepared By:

ALL ABOUT PAVEMENTS, INC.
205 Ramblewood Drive
Chatham, Illinois 62629

February 2022

This Page Intentionally Left Blank

Executive Summary

The Aviation Inc. team, which included All About Pavements, Inc., (API) was awarded a contract by the Alabama Department of Transportation’s Aeronautics Bureau (ALDOT) in 2018 to update the existing Alabama Statewide Airport Pavement Management Program (APMP). The scope of this project includes the airside pavement network at Chilton County Airport (O2A).

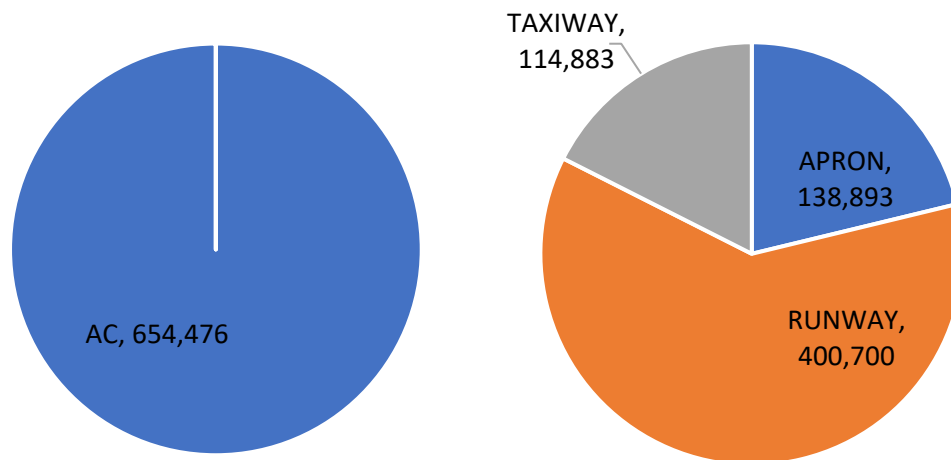
The following APMP tasks were completed to achieve the project objectives at O2A:

- Update the PAVER work history with records review information provided by ALDOT
- Conduct a visual pavement condition survey of the airfield pavements
- Update the PAVER database with inventory and condition data
- Update Maintenance and Rehabilitation (M&R) policies and unit costs
- Develop a 7-Year Pavement Capital Improvement Program (PCIP) with associated cost estimates

ES.1 Pavement Inventory

There are 4 branches and 5 sections within O2A’s pavement network with a total surface area of approximately 0.65 million square feet (sf). Figure ES-1 shows the distribution of the pavement network by surface type and branch use.

Figure ES-1: Pavement Area (sf) by Surface Type and Branch Use.



ES.2 Pavement Condition

Visual pavement inspections were conducted in November 2019 using the Pavement Condition Index (PCI) method as specified in ASTM D5340-12 and FAA AC 150/5380-6C. The PCI is a numerical rating scale from 0 to 100 that provides a measure of the pavement’s functional surface condition. The overall



area-weighted network PCI (AW PCI) for the O2A pavement network is 87, representing a “Good” condition. The network area-weighted pavement age (AW Age) is 16 years.

Table ES-1 is a listing of the section PCI values and ratings.

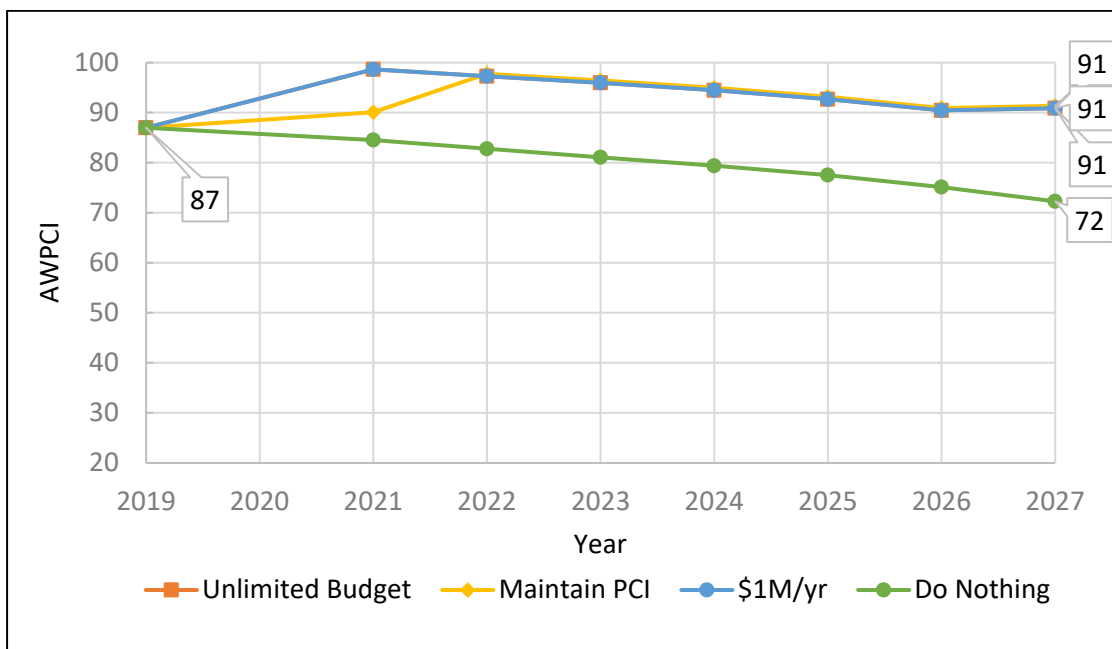
Table ES-1: O2A Section PCI Values and Ratings.

Branch ID	Name	Section ID	Surface	Area, sf	PCI	PCI Category
A01	Apron 1	01	AC	138,893	63	Fair
R0826	Runway 08-26	01	AC	400,700	100	Good
TC01	Taxiway Connector 01	01	AC	24,797	51	Poor
THANG01	Taxiway Hangar 01	01	AC	54,934	65	Fair
THANG01	Taxiway Hangar 01	02	AC	35,152	99	Good

ES.3 Pavement Maintenance and Repair Funding Levels

The PAVER database was updated with 2019 condition data, maintenance and repair (M&R) policies, and unit costs; which were then used to evaluate the effect of multiple funding levels on the overall future pavement condition. Figure ES-2 presents the forecasted O2A network PCI values for each funding level.

Figure ES-2: M&R Funding Levels.



ES.4 Pavement Capital Improvement Program (PCIP)

The analysis output from the unlimited funding budget scenario was used as a starting point in developing the PCIP. For this scenario, sections were grouped into projects to allow for a logical construction sequence. Table ES-2 summarizes the 7-year PCIP, which has an estimated total cost of approximately \$1.3 million. These recommendations are based on a network-level evaluation. Project-level evaluations should be conducted prior to developing design and bid package documents.

Table ES-2: Summary of Pavement Capital Improvement Program.

Project Year	CIP Project	Total Project Cost	Total Project Area, sf	AWPCI Before	AWPCI After
2021	02A_21-01_Taxiway Rehabilitation	\$344,027	79,731	54	100
2022	02A_22-01_Apron Rehabilitation	\$575,319	138,893	57	100
2024	02A_24-01_Taxiway Surface Treatment	\$104,177	163,690	96	100
2027	02A_27-01_Runway 08-26 Preservation	\$278,665	400,700	88	93
	02A_27-02_Taxiway Hangar Preservation	\$36,793	35,152	83	91
Total		\$1,338,981			

In addition to the major rehabilitation needs that are identified in the PCIP, PAVER was used to develop maintenance activities to repair specific PCI distresses in Year 1. The estimated costs for these maintenance activities are \$818 as summarized in Table ES-3.

Table ES-3: Summary of Localized Maintenance Plan.

Policy	Work Description	Work Quantity	Work Unit	Work Cost
Safety	Patching - AC Full-Depth	33	SqFt	\$818
Total				\$818

TABLE OF CONTENTS

1 INTRODUCTION 1-1

1.1. OVERVIEW 1-1

1.2. WORK SCOPE 1-1

1.3. PAVEMENT MANAGEMENT CONCEPT 1-2

2 AIRFIELD PAVEMENT INVENTORY 2-1

2.1. INTRODUCTION 2-1

2.2. PAVEMENT INVENTORY 2-1

2.3. CLIMATIC CONDITIONS 2-1

2.4. PAVEMENT NETWORK DEFINITION 2-2

2.5. INVENTORY SUMMARY 2-3

3 PAVEMENT CONDITION 3-1

3.1. INTRODUCTION 3-1

3.2. PAVEMENT CONDITION RATING METHODOLOGY 3-1

3.3. DISTRESS TYPES 3-2

3.4. ADDITIONAL PCI-BASED INDICES 3-3

3.5. PCI SURVEY RESULTS 3-4

3.6. PCC PAVEMENTS 3-5

4 PAVEMENT CAPITAL IMPROVEMENT PROGRAM 4-1

4.1. INTRODUCTION 4-1

4.2. PERFORMANCE MODELING 4-1

4.3. CRITICAL PCI VALUES 4-3

4.4. M&R POLICIES AND UNIT COSTS 4-3

4.5. PAVEMENT CIP DEVELOPMENT 4-4

4.6. PAVEMENT CAPITAL IMPROVEMENT PROGRAM 4-6



LIST OF TABLES

Table 2.1: Average Annual Temperatures and Rainfall for O2A.....	2-2
Table 2.2: PCI Sampling Rate for AC Surfaces.....	2-3
Table 2.3: O2A Pavement Branches.....	2-3
Table 2.4: O2A Pavement Age.....	2-3
Table 3.1: Pavement Condition Index Rating Scale.....	3-2
Table 3.2: Section PCI.....	3-5
Table 4.1: M&R Activities and Unit Costs.....	4-4
Table 4.2: Summary of M&R Funding Level Analyses.....	4-6
Table 4.3: Summary of 7-Year PCIP by Project.....	4-7
Table 4.4: Summary of 7-Year PCIP by Project and Section.....	4-7
Table 4.5: Summary of Year-1 Maintenance Plan.....	4-8

LIST OF FIGURES

Figure 1.1: Pavement Management Concept.....	1-2
Figure 2.1: Chilton County Airport.....	2-1
Figure 2.2: O2A Pavement Area by Surface Type.....	2-4
Figure 2.3: O2A Pavement Area by Branch Use.....	2-4
Figure 3.1: FOD Potential Rating Scale.....	3-3
Figure 3.2: Pavement Condition by Branch Use.....	3-4
Figure 3.3: Pavement Condition by Percent of Area.....	3-4
Figure 4.1: PCI Forecasting.....	4-2
Figure 4.2: Family Curves.....	4-2
Figure 4.3: Budget Analysis Process.....	4-5
Figure 4.4: M&R Funding Levels.....	4-5

APPENDICES

- Appendix A:** Pavement Inventory Report
- Appendix B:** PMP Maps
- B1: Inventory Maps
 - B1A: Branch Identification
 - B1B: Section Identification
 - B1C: Sample Unit Layout
 - B1D: Pavement Type
 - B1E: Branch Use
 - B1F: Pavement Age
 - B2: Surface Condition Maps
 - B2A: 7-Color PCI
 - B2B: 3-Color PCI
 - B2C: FOD Rating
 - B2D: Survey Photo Locations
 - B3: Pavement Capital Improvement Program (PCIP) Maps
 - B3A: 2027 Forecasted PCI without PCIP
 - B3B: Repair Type
 - B3C: PCIP Recommendations
- Appendix C:** Overview of Pavement Distresses
- Appendix D:** Detailed Pavement Condition Data (electronic version only)
- Appendix E:** Distress Summary Report
- Appendix F:** Pavement Condition Reports
- F1: Section Forecasted Pavement Condition Rating
 - F2: Branch PCI Rating
 - F3: Branch FOD Rating
- Appendix G:** Safety and Preventive Maintenance Policies
- Appendix H:** M&R Unit Costs
- Appendix I:** Pavement Capital Improvement Program (PCIP)
- I1: CIP Summary
 - I2: Year 1 Maintenance Plan
- Appendix J:** USB Thumb Drive – FINAL ONLY
- Final Report in PDF format
 - Geo-referenced Field Photos

1 Introduction

1.1. Overview

The Alabama Department of Transportation's Aeronautics Bureau (ALDOT) is responsible for preserving and enhancing Alabama's air transportation system, which consists of 74 general aviation airports throughout the State. ALDOT implemented an Airport Pavement Management Program (APMP) in 2008 using the PAVER system. ALDOT awarded a project in 2018 to Aviation Inc. (Aviation) to update the System Plan and conduct an Economic Analysis for the Alabama airports. The scope of work also included an update of the APMP for 59 general aviation airports, which was conducted by All About Pavements, Inc., (API), a Aviation team member.

With this update of the APMP, the Alabama airports continue to be eligible for FAA funding for major pavement rehabilitation work under the Airport Improvement Program (AIP) since an APMP meets the pavement maintenance management requirements described in Appendix A of AC 150/5380-6C.

This report discusses the evaluation of the airside pavements at Chilton County Airport (02A), the current and forecasted pavement condition, and the development of the Pavement Capital Improvement Program (PCIP).

1.2. Work Scope

The goals of the Alabama Statewide Airport Pavement Management Update program are as follows:

- Conduct a visual pavement inspection of the asphalt surfaced pavements for 59 of the 74 general aviation airports in Alabama.
- Based on the visual inspection analysis results, develop a 7-year PCIP for each airport.

The scope of work is as shown below:

- Conduct a Records Review
- Update Pavement Network Definition
- Conduct Pavement Condition Surveys
- Update and customize existing APMP PAVER database
- Develop PCIP and associated project cost estimates
- Prepare Draft and Final Reports
- Develop a web-based viewer for reporting APMP data

As required in the Scope of Work, a detailed pavement condition survey was not conducted for any Portland Cement Concrete (PCC) aprons and PCC taxiways longer than 2,000 ft. Instead, a condition rating of "Good", "Fair", or "Poor" was assigned based on the overall pavement condition.

The deliverable products include a PAVER 7.0 database, individual airport evaluation reports, a statewide summary report, and the web viewer. The 02A report will be one of the 59 individual airport reports that will be available on ALDOT's website.



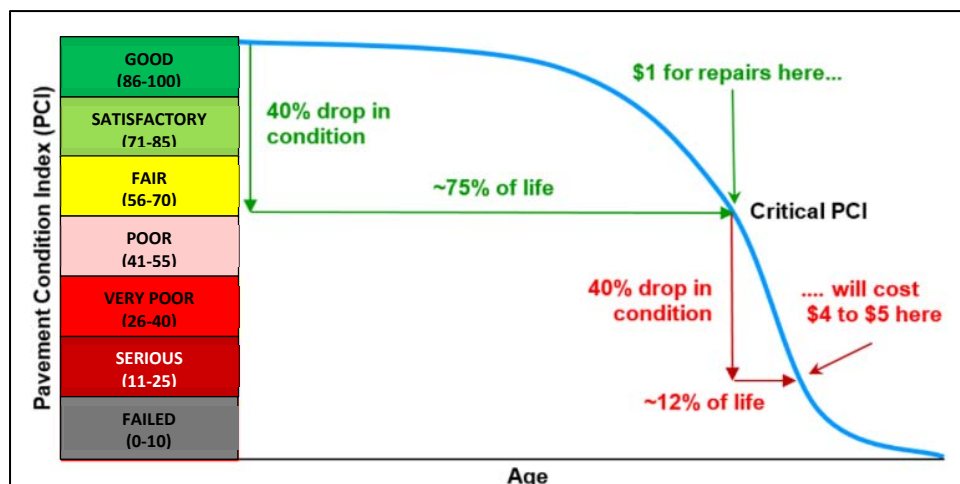
1.3. Pavement Management Concept

An APMP provides an integrated framework for comprehensive evaluation and decision making for managing airfield pavements. The essential components of an effective APMP provide for an objective evaluation of the condition of existing pavements, identification of short-term and long-range major rehabilitation work, necessary improvements in the pavement structural capacity, and the recurring maintenance work that should be completed each year. The APMP will also provide a budget for each of these types of pavement construction.

Historically, most organizations have made maintenance decisions based on past experience, without the benefit of documented data or analysis. This practice does not encourage life cycle cost analysis, nor the evaluation of cost effectiveness of alternate scenarios, and can lead to the inefficient use of funds. With limited allocated funding for Maintenance and Repair (M&R) Program projects, a defined procedure for setting priorities and schedules that will maximize the funds available is more important than ever.

In examining the lifespan of a 20-year pavement, a “Good” to “Fair” condition rating may last only 5 to 15 years. After that point, the rate of deterioration of pavements accelerates sharply as the age of the pavement increases, and within five years, the pavement may deteriorate to the point of failure. In order to extend pavement life, maintenance and repairs need to be scheduled and performed before the pavement surface declines to a “fair” condition. The point at which rehabilitation can be done before the steep decline occurs is called the “critical PCI”, and is generally considered to occur when the Pavement Condition Index (PCI) is between 60 and 70 for general aviation airports. If the work is done before deterioration accelerates, the cost of rehabilitation can be reduced as shown in Figure 1.1.

Figure 1.1: Pavement Management Concept.



2 Airfield Pavement Inventory

2.1. Introduction

02A is a General Aviation (GA) airport located approximately 1 mile east of Clanton. The airport was activated in March 1940 and is owned and operated by the Chilton County Airport Authority. Figure 2.1 shows an aerial image of the airport.

Figure 2.1: Chilton County Airport.



(Source: Google Earth)

2.2. Pavement Inventory

02A consists of one runway, a connector taxiway, and an apron. The total pavement area is approximately 0.65 million square feet. All pavements at 02A are Asphalt Concrete (AC) surfaced. A complete listing of the pavement sections is included in Appendix A. Runway 08-26 is 4,007 ft. long and 100 ft. wide.

A records search was undertaken to identify any preservation or rehabilitation work that has occurred at 02A since the last APMP update in 2009. The records for the 2013 runway rehabilitation that were provided by ALDOT were reviewed, and the PAVER database was updated with work history information.

2.3. Climatic Conditions

Table 3.1 provides a summary of the climatic data for the geographic region that includes 02A. As the table shows, the pavements at 02A are exposed to freeze-thaw cycles in January. The mean air temperature for January ranges from an average low of 32 degrees °F to an average high of 53 degrees °F. The average annual rainfall at 02A is near 60 inches.

**Table 2.1: Average Annual Temperatures and Rainfall for 02A.**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High Temp (°F)	53	59	67	75	81	87	90	89	84	75	65	56
Low Temp (°F)	32	35	42	48	57	65	69	67	62	49	41	34
Precip. (in)	6.0	5.5	7.0	5.4	4.4	4.2	5.8	3.7	4.7	3.1	5.0	5.0

Source: www.intellicast.com

2.4. Pavement Network Definition

A key element in developing an APMP system is defining the pavement network, which is the process of dividing an agency’s pavements into a hierarchical order that facilitates inspection and M&R planning. The 02A network (e.g. all airside pavements) is then divided into branches, which are a readily identifiable part of the pavement system and have distinct functions. For airports, branches typically consist of individual runways, taxiways and aprons. Figure B1A in Appendix B shows the branches at 02A.

Once branches have been defined, pavement evaluation and analysis techniques require the airfield pavement system to be broken up into discrete sections. A pavement “section” is the smallest management unit that is used when considering the application and selection of maintenance and rehabilitation (M&R) treatments, and is defined in Section 2.1.8 of ASTM D 5340-12 as *“a contiguous pavement area having uniform construction, maintenance, usage history, and condition. A section should also have the same traffic volume and load intensity.”* A complete list of the pavement inventory and the corresponding section designations are included in Appendix A. Figure B1B presents the section layout.

To facilitate the visual survey of the airside pavement, each section is further subdivided into conveniently defined sub-section areas, or sample units. Similar sizing is critical as studies have found that maintaining the size of the sample units to within 40 percent of the established norm may reduce the standard error of the average PCI values. To meet that criteria, ASTM recommends that sample units for asphalt pavements be 5,000 square feet ($\pm 2,000$).

Table 2.2 was used as a guideline in developing sampling rates that reflect typical rates that are used for other large pavement networks. In general, this sampling rate will not provide a 95% confidence level with a standard error of 5 PCI points. A higher level of sampling is recommended before a project-level rehabilitation design is developed for a pavement section or facility.

Sample units that include a one-time occurrence of a distress (i.e. a large patch) or an unusual severity or quantity of a distress seen elsewhere, were designated as “additional” sample units as described in the ASTM D5340 PCI procedure. This allows the PCI to be calculated without extrapolating the aberrant distress throughout the section as a whole. In Appendix B, Figure B1C shows the sample unit layout for 02A.

Table 2.2: PCI Sampling Rate for AC Surfaces.

Total Samples	Samples to Inspect
1	1
2	2
3 – 6	3
7 – 13	4
14 – 39	5
> 39	15 percent, but less than 12

2.5. Inventory Summary

There are 4 branches (facilities) at O2A that include 5 pavement sections and a total area of approximately 0.65 million square feet of paved surfaces, as shown in Table 2.3.

Table 2.3: O2A Pavement Branches.

Branch ID	Branch Name	Branch Use	Area, sf	Number of Sections
A01	Apron 1	APRON	138,893	1
R0826	Runway 08-26	RUNWAY	400,700	1
TC01	Taxiway Connector 01	TAXIWAY	24,797	1
THANG01	Taxiway Hangar 01	TAXIWAY	90,086	2
Total			654,476	5

Table 2.4 shows the distribution of airfield pavement by age with the area-weighted age being 16 years for all airside pavements at O2A.

Table 2.4: O2A Pavement Age.

Age (Years)	Number of Sections	Percent of Area	Area, sf
0 – 5	0	0	0
6 – 10	2	67	435,852
11 – 15	0	0	0
16 – 20	0	0	0
> 20	3	33	218,624

Figure 2.2 shows the distribution by surface type. Figure 2.3 presents the distribution by pavement use (e.g. runway, taxiway, and apron).



Figure 2.2: O2A Pavement Area by Surface Type.

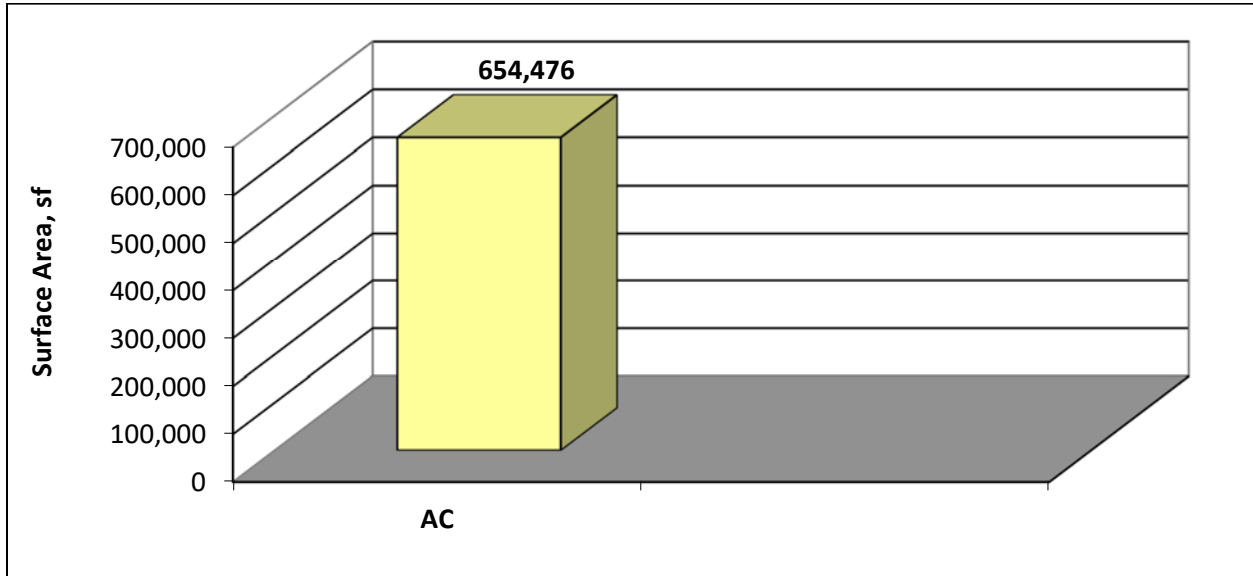
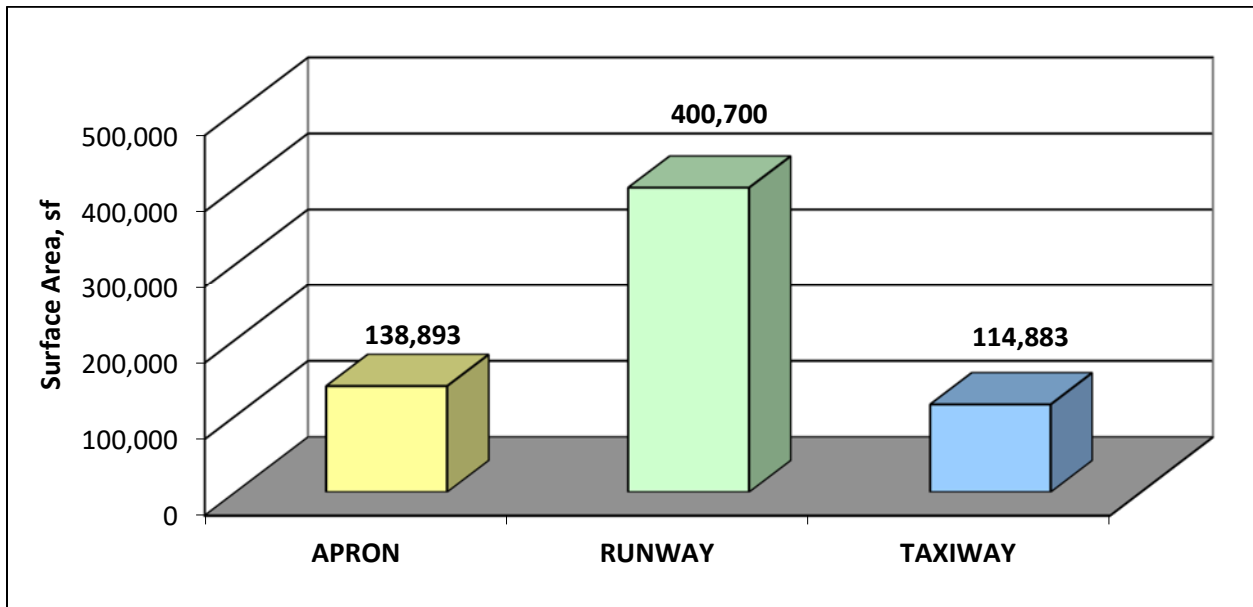


Figure 2.3: O2A Pavement Area by Branch Use.



Maps B1D, B1E, and B1F show the pavement type, branch use, and pavement age, respectively.

3 Pavement Condition

3.1. Introduction

A visual PCI survey of the airside pavements at O2A was conducted in order to assist in the development of a realistic PCIP. The PCI survey measures and records pavement distresses that exist within each of the inspected sample units. This survey was conducted in November 2019 by a 2-person team. The survey was performed in accordance with the methods described in ASTM D 5340-12 and FAA AC 150/5380-7B, using the sampling rates from Chapter 2 of this API report.

During the pavement survey, Quality Control (QC) and data verification were performed on both the individual distresses and the calculated section PCI values. QC included the following activities;

- Review of distress quantities to identify data entry errors (100% review at the sample unit level). General guidance was used from ASTM D5340-12, section 13, which addresses the precision of distress quantities that are recorded during PCI surveys.
- Duplicate surveys were performed to ensure consistency between each of the inspectors in a 2-person PCI survey team.

3.2. Pavement Condition Rating Methodology

The PCI is a measure of the pavement's functional surface condition. It provides insight into the causes of each distress, and whether the distress is primarily caused by load, climatic conditions, and other material related deficiencies. The PCI is a numerical rating (on a scale of 0 to 100) that is based on the type, severity and quantity of each distress that is found in an inspected sample unit.

The PCI survey results are displayed using seven categories and ratings in accordance with the ASTM, but can also be presented using a simplified 3-category rating system for use in comparing with other distress related indices, as shown in Table 3.1.



Table 3.1: Pavement Condition Index Rating Scale.

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

3.3. Distress Types

The ASTM D5340 standard considers 17 distresses, which tend to fall into one of the following four cause categories:

- Load related: AC distresses include alligator cracking, corrugation, depression, polished aggregate, rutting and slippage cracking; PCC distresses include corner breaks, longitudinal cracking, divided slabs, polished aggregate, pumping and joint spalling.
- Climate and durability related: AC distresses include bleeding, block cracking, joint reflection cracking, longitudinal and transverse (L&T) cracking, swelling, raveling, and weathering; PCC distresses include blow-ups, “D” cracking, longitudinal cracking, pop-outs, pumping, scaling, shrinkage cracks, and joint and corner spalling.
- Moisture & Drainage related: AC distresses include alligator cracking, depressions, potholes and swelling; PCC distresses include corner breaks, divided slabs and pumping.
- Other factors: Oil spillage, jet blast erosion, bleeding, patching and concrete slab joint faulting.

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

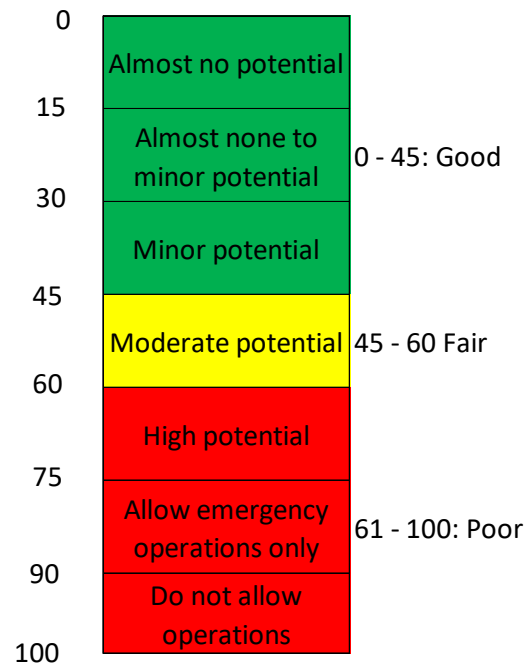
Distress descriptions provided in Appendix C were taken from the “PCI Field Manual,” developed by the U.S. Army Construction Engineering Research Lab (CERL), latest edition. Appendix C provides a detailed explanation of each type of AC and PCC surface distress.

3.4. Additional PCI-based Indices

The distress data used to compute PCI can also be used to calculate additional indices that are helpful in understanding the condition of the pavement and developing PCIP recommendations. One additional index that was computed is the Foreign Object Damage (FOD) potential index.

The FOD index was developed by the US Air Force and is described in detail in the US Army Corp of Engineers Engineering Technical Letter (ETL) 04-09, Pavement Engineering Assessment (EA) Standards. Loose objects on an airfield pavement surface resulting from pavement distresses can be detrimental to aircraft engines, specifically engines that are low to the ground. The objects are ingested into the engines causing costly damage and presenting a safety hazard. Not all pavement distresses create a FOD potential. Therefore, an additional index was identified that uses the results of the PCI distress survey. As shown in Figure 3.1, the scale ranges from 0 to 100 with 0 being no FOD potential. Note that the FOD index uses a simplified three color scale.

Figure 3.1: FOD Potential Rating Scale.





3.5. PCI Survey Results

The airside pavements at O2A include 5 sections with 131 sample units. The sample number of sample units that were surveyed in the field is 31, which is 24 percent of the total samples. Data from the inspected sample units were input into the PAVER database and a resultant PCI for each section was computed.

Figure 3.2 presents the area-weighted PCI by use and the overall airside network.

Figure 3.2: Pavement Condition by Branch Use.

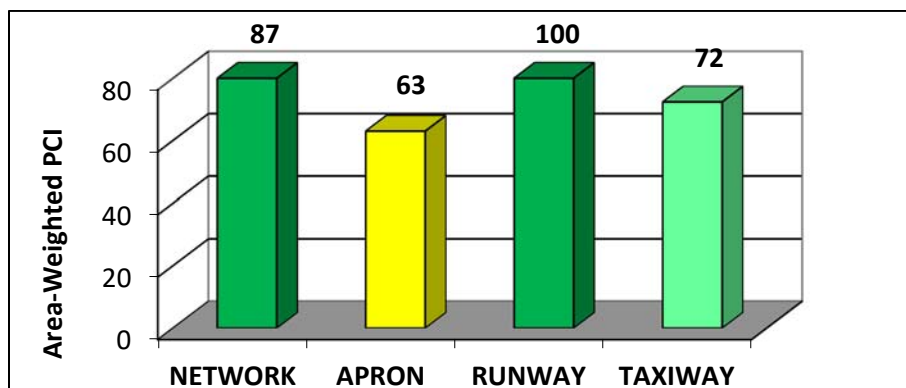


Figure 3.3 shows the distribution of the O2A pavement network by condition. Approximately 4 percent of the network is in “Poor” or worse condition.

Figure 3.3: Pavement Condition by Percent of Area.

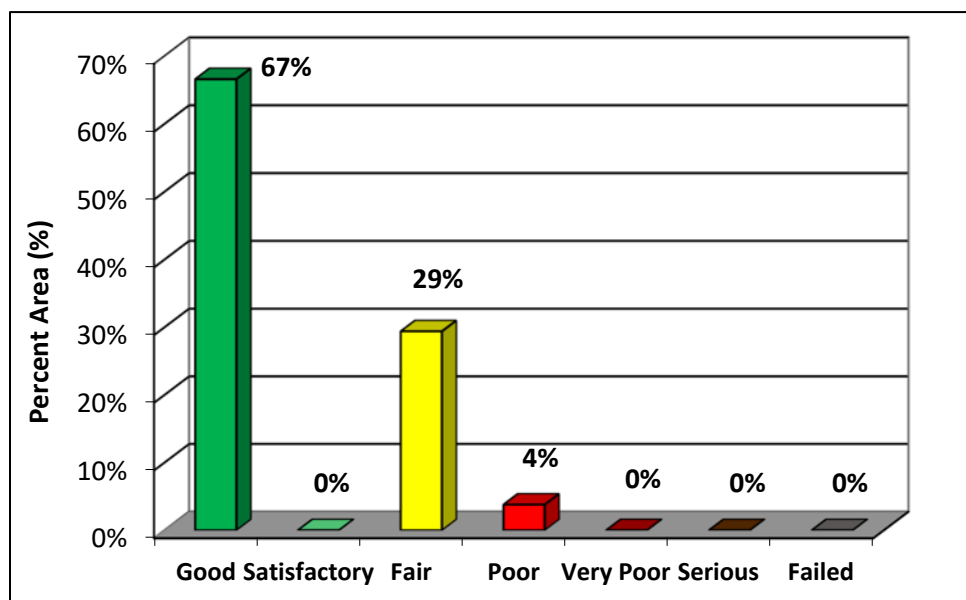


Table 3.2 is a listing of the section PCI.

Table 3.2: Section PCI.

Branch ID	Name	Section ID	Surface	Area, sf	PCI	PCI Category	FOD
A01	Apron 1	01	AC	138,893	63	Fair	51
R0826	Runway 08-26	01	AC	400,700	100	Good	0
TC01	Taxiway Connector 01	01	AC	24,797	51	Poor	64
THANG01	Taxiway Hangar 01	01	AC	54,934	65	Fair	48
THANG01	Taxiway Hangar 01	02	AC	35,152	99	Good	10

Figure B2A and B2B in Appendix B are maps of the section PCI in 7- and 3-scale categories, respectively. Figure B2C is a map of the FOD rating. Appendix D contains a detailed report of the PCI values and distress type, quantity, and severity data for each sample unit that was surveyed in a section. Appendix E is a summary report of the extrapolated distress data at the section level.

Appendix F contains current section and branch PCI data and forecasted section PCI values. FOD values by section and branch are also presented. Figure B2D in Appendix B shows the locations of the photos that were taken during the survey. Photos are included in Appendix J.

3.6. PCC Pavements

As stated earlier, the project scope did not include a detailed pavement condition survey for any Portland Cement Concrete (PCC) aprons. For these pavements, a rating of “Good”, “Fair”, or “Poor” was assigned based on the overall pavement condition. There are no PCC aprons at O2A.

This Page Intentionally Left Blank

4 Pavement Capital Improvement Program

4.1. Introduction

PCI data were collected and entered into the PAVER database. In addition, the database customization included the following components, which are described in detail in this chapter.

1. Performance Modeling
2. Maintenance & Repair (M&R) Triggers (Critical PCI)
3. M&R Policies
4. Unit Costs

Once the database was customized, it was used to run budget analysis scenarios and develop a 7-year PCIP.

4.2. Performance Modeling

To determine long-term M&R needs, a APMP must be able to predict future pavement condition. Future pavement condition is predicted using equation models that are generated from current and historical PCI data. Equation models are developed by grouping pavements based on similar performance characteristics such as region, construction history, surface type, traffic, priority and use. Mathematical techniques such as straight-line extrapolation and regression that include boundary and outlier filters are used to develop models that provide the best fit equation for the pavement condition data. PAVER's Prediction Modeling module was used to develop pavement performance models that are commonly referred to as 'Family Curves'.

Prediction models are used at the section level to compute future conditions based on the typical performance of the pavement sections that are included in each model. Future condition is computed by defining its position relative to the prediction model. The section prediction curve, or equation, is drawn through the current PCI-age point for each specific section. Since the shifted curve will run parallel to the computed prediction model, the predicted condition can be computed for any future age. Figure 4.1 is an illustration of this process.

Prediction models provide an effective way to compute future pavement performance based on past and current conditions, and pavement maintenance and rehabilitation practices. As new PCI inspection surveys are conducted, these models should be updated accordingly. In the case of the Alabama statewide airport pavement network, the best fit family curves were developed for each region by grouping pavements according to branch use (e.g. runway, taxiway) and surface type (e.g. AC, AAC, and APC). The family curves for ALDOT were developed based on branch use and are presented in Figure 4.2.



Figure 4.1: PCI Forecasting.

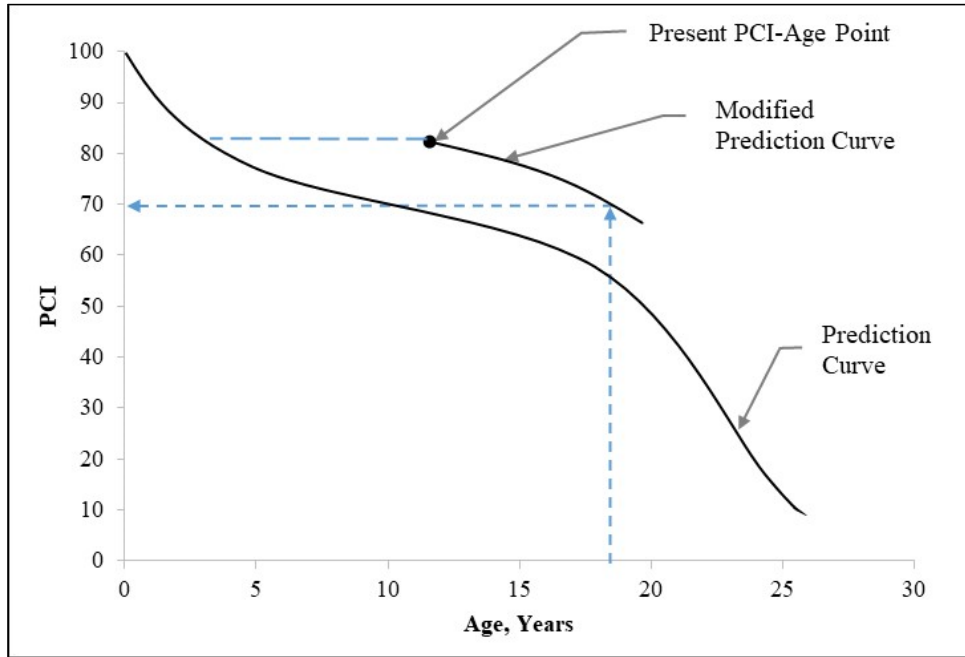
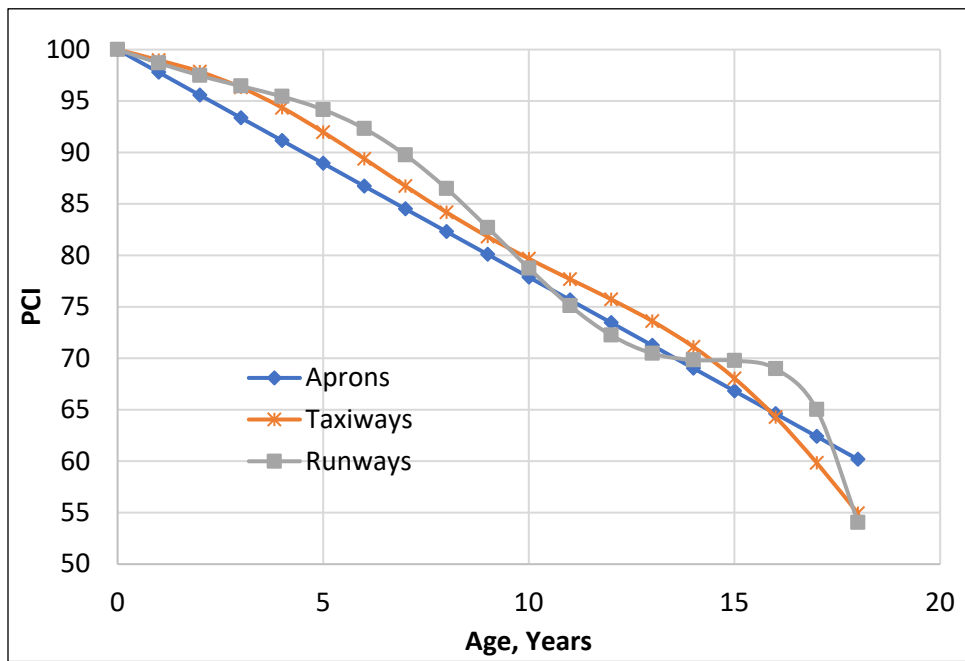


Figure 4.2: Family Curves.



4.3. Critical PCI Values

The Critical PCI value is defined as “the PCI value at which the rate of PCI loss increases with time, or the cost of applying localized preventive maintenance increases significantly.” This definition is incorporated into PAVER in defining and measuring the critical PCI values. These values, or M&R triggers, are assigned for each prediction model. As such, the critical PCI values are directly related to the branch use.

These critical PCI levels are selected based on several factors including a review of performance models; experience; other airport triggers; and acknowledge that time is required for funding approval and design. Note that preventive maintenance is recommended, and it should generally be performed above the critical PCI (trigger) values and Major M&R is generally performed below them. The critical PCI (CP) values were set at 70 for runways and taxiways, and 65 for other pavements.

4.4. M&R Policies and Unit Costs

M&R policies refer to the activities that are applied at different condition levels to maintain and repair a pavement section.

Maintenance activities are localized activities which are typically assigned in the first year of the M&R plan based on the observed distresses. Safety (stopgap) maintenance addresses distresses that would affect operational safety if left unrepaired and is applied to pavements below the critical PCI. Preventive maintenance activities are aimed at slowing the rate of deterioration through consistent maintenance of existing pavements and are generally applied to pavements above the critical PCI. Appendix G presents the policies for preventive and safety maintenance.

Repair activities are conducted for larger areas, typically at the section level and are assigned based on the critical PCI. Repair activities broadly consist of three categories: preservation, rehabilitation, and reconstruction. Pavement preservation involves activities like surface treatments that are used to extend pavement service life and to delay more expensive rehabilitation work. These are applied when the pavement is in relatively good condition and does not exhibit any structural distress. Rehabilitation activities are used to repair pavements below or around the critical PCI and typically include mill and overlay. Reconstruction is recommended when the pavement has deteriorated to a level where rehabilitation is no longer cost effective.

Table 4.1 lists the pavement activity types, the individual activities within each type, and their associated 2020 unit costs. A more detailed description of the M&R activities and the development of the M&R unit costs is presented in Appendix H.

In accordance with ALDOT’s focus on preservation, surface treatment is applied to all resurfaced and reconstructed runways, taxiways, and aprons three years after construction work is complete. Taxilanes and T-Hangar pavements are excluded from this requirement. This policy is applicable for projects in the PCIP between 2021 and 2024. For cost estimating, this surface treatment is assumed to have the same cost as the runway surface treatment.



Table 4.1: M&R Activities and Unit Costs.

Activity Type	PCI	Activity	Cost/sf
Maintenance	Note 1	Seal Cracks – AC (\$/lf)	\$3.95
		AC Full-Depth Patching	\$25.05
		AC Partial-Depth Patching	\$16.28
Preservation	75-90	Runway Surface Treatment	\$0.57
		Taxiway and Apron Surface Treatment	\$0.85
Rehabilitation	> CP	2" AC OL ²	\$3.54
	55 - CP	Mill 2" & 2" AC OL	\$3.90
	45 - 55	Mill 2" & 2" AC OLP (With Pre-Overlay Repairs)	\$4.82
Reconstruction	0 - 45	AC Reconstruction	\$8.25

¹ Preventive > CP; Safety (Stopgap) < CP

² For sections with structural distress and PCI > CP

4.5. Pavement CIP Development

The PAVER database, updated with condition data and customized with condition performance priorities, policies, and costs; was used to evaluate the effect of multiple funding levels on the overall future pavement condition. This output was further used to develop the PCIP. Figure 4.3 illustrates the process that PAVER uses in the funding analysis.

The following M&R funding levels were used for the O2A pavement network to help establish the 7-Year PCIP. Figure 4.4 presents the network area-weighted average PCI for each of the following funding scenarios at the end of the analysis period:

- Unlimited Funding: Unlimited funding is available for all pavement needs. The PCI increases to 91 by 2027.
- Maintain PCI: Maintain existing PCI of 87.
- Constrained Funding: This scenario constrains the funding to \$1 million each year (total of \$7 million). The PCI increases to 91 in 2027.
- Do Nothing: Performing no M&R would reduce the network PCI from 87 to 72 by 2027.

Figure 4.3: Budget Analysis Process.

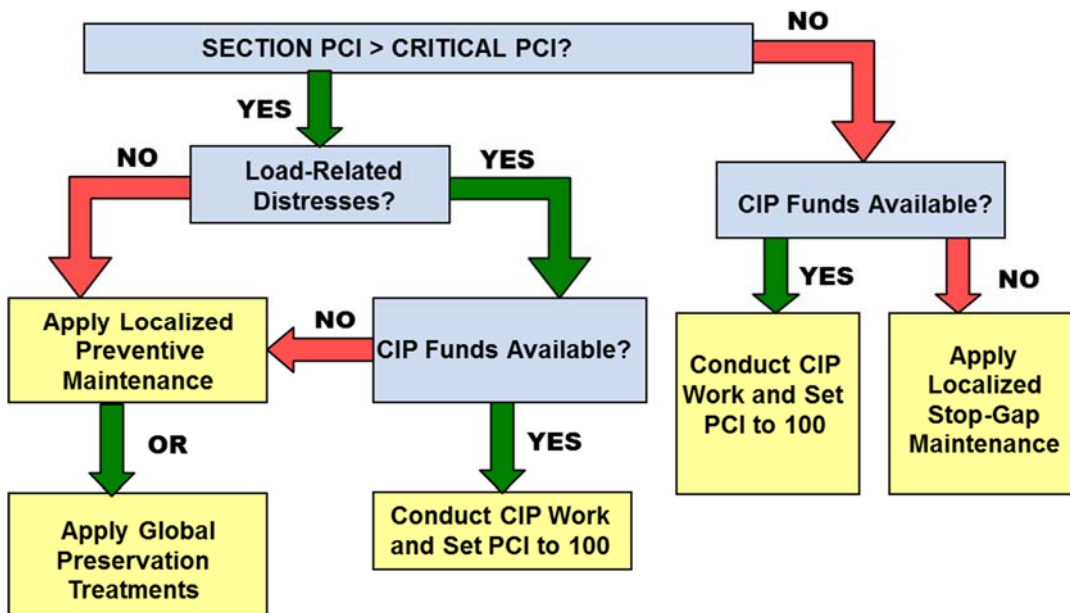


Figure 4.4: M&R Funding Levels.

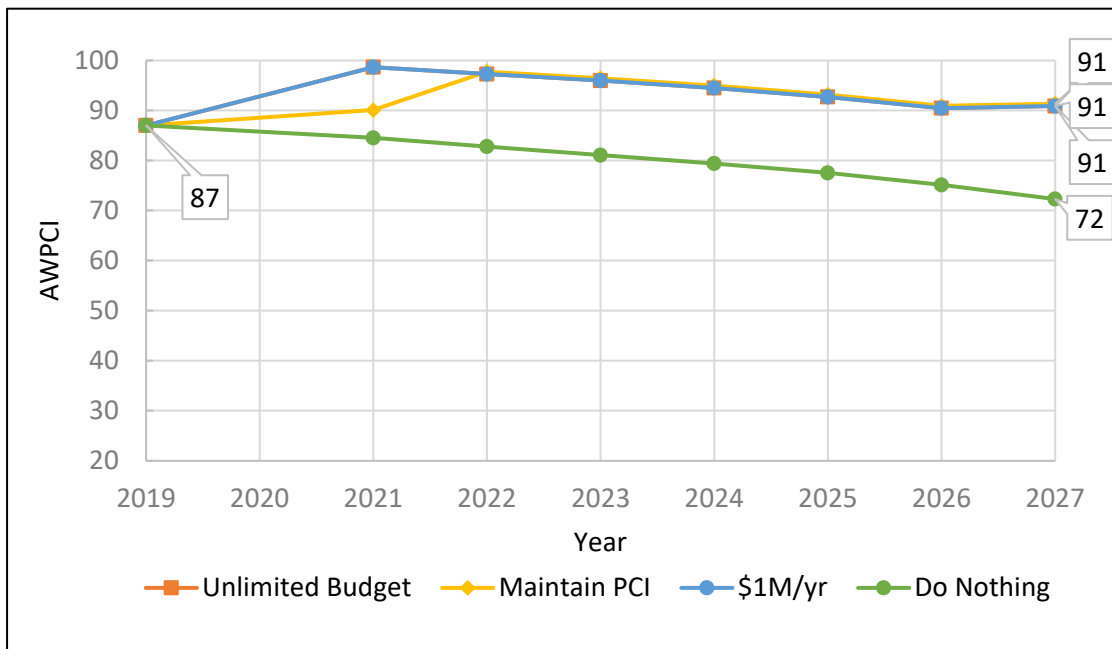


Table 4.2 summarizes the annual funding required for the above analyses. For the unlimited analysis, all pavement needs are funded in the year they are required. Therefore, the unfunded costs are zero. The total funded amount over the 7-year period is approximately \$1.2 million. For the annual funding level of \$1 million per year, funding is prioritized based on the prioritization matrix. When the needs exceed the funding for any year, the remaining sections are transferred to the succeeding year and the amount



for these activities are represented as “unfunded”. There are no “unfunded” repairs in 2027 for this funding level.

Table 4.2: Summary of M&R Funding Level Analyses.

Year	Unlimited	Maintain PCI	Constrained \$1M/year	Do Nothing
2021	\$927,000	\$384,000	\$927,000	\$0
2022	\$2,000	\$593,000	\$2,000	\$0
2023	\$3,000	\$3,000	\$3,000	\$0
2024	\$4,000	\$4,000	\$4,000	\$0
2025	\$6,000	\$5,000	\$6,000	\$0
2026	\$7,000	\$7,000	\$7,000	\$0
2027	\$283,000	\$282,000	\$283,000	\$0
Total	\$1,231,000	\$1,278,000	\$1,231,000	\$0
Unfunded	-	-	-	\$2,089,000

Map B3A in Appendix B presents the 2027 forecasted PCI by section when the M&R activities recommended in the CIP are not conducted.

4.6. Pavement Capital Improvement Program

The unlimited funding analysis contains rehabilitation activities for sections from the same branch spread out over the seven-year period, which is not always operationally feasible to construct. The analysis output was treated as a starting point in developing the CIP. Sections were often integrated together to account for construction feasibility and other factors, resulting in larger projects which were more realistic. In addition, each project could contain sections whose condition did not trigger rehabilitation but were included to provide a logical plan which would avoid creating “islands” of newer pavement within a particular feature. For example, if the PAVER analysis showed rehabilitation was required for eight out of 10 sections on a runway, the entire runway would be recommended for rehabilitation to provide a continuous new pavement surface.

Table 4.3 shows the projects and the associated costs for the recommended 7-year PCIP. Table 4.4 is a more detailed view of the PCIP. This table lists the individual pavement section, section level M&R work, section repair cost, surface area and the PCI before the M&R is applied. The costs that are presented represent an annual escalation rate of 3% for the unit costs. The total 7-year PCIP cost is approximately \$1.3 million. Map B3B shows the recommended repair types, while Map B3C presents the recommended projects and activities in the PCIP. Appendix I1 presents a summary of the recommended activities and cost by year for each section at O2A.



Table 4.3: Summary of 7-Year PCIP by Project.

Project Year	CIP Project	Total Project Cost	Total Project Area, sf	AWPCI Before	AWPCI After
2021	02A_21-01_Taxiway Rehabilitation	\$344,027	79,731	54	100
2022	02A_22-01_Apron Rehabilitation	\$575,319	138,893	57	100
2024	02A_24-01_Taxiway Surface Treatment	\$104,177	163,690	96	100
2027	02A_27-01_Runway 08-26 Preservation	\$278,665	400,700	88	93
	02A_27-02_Taxiway Hangar Preservation	\$36,793	35,152	83	91
Total		\$1,338,981			

Table 4.4: Summary of 7-Year PCIP by Project and Section.

Branch	Section	Area, sf	PCI Before Rehab	Activity	Activity Type	Cost
02A_21-01_Taxiway Rehabilitation						\$344,027
TC01	01	24,797	46	Mill 2" & 2" AC OLP	Rehabilitation	\$123,109
THANG01	01	54,934	60	Mill 2" & 2" AC OL	Rehabilitation	\$220,919
02A_22-01_Apron Rehabilitation						\$575,319
A01	01	138,893	58	Mill 2" & 2" AC OL	Rehabilitation	\$575,319
02A_24-01_Taxiway Surface Treatment						\$104,177
A01	01	138,893	-	Surface Treatment	Preservation	\$88,396
TC01	01	24,797	-	Surface Treatment	Preservation	\$15,782
02A_27-01_Runway 08-26 Preservation						\$278,665
R0826	01	400,700	89	Runway Surface Treatment	Preservation	\$278,665
02A_27-02_Taxiway Hangar Preservation						\$36,793
THANG01	02	35,152	84	Taxiway & Apron Surface Treatment	Preservation	\$36,793
Total						\$1,338,981

The FAA, under the Airport Improvement Program (AIP) provides approximately 90 percent of eligible costs for planning and development of public-use airports included in the NPIAS as grants. The remaining 10 percent of costs are shared between ALDOT and the airport sponsor. The following is the distribution of the 7-yr PCIP cost of \$1.3 million for 02A:

- FAA (90%): \$1.1 million
- ALDOT (5%): \$0.1 million
- Airport Sponsor (5%): \$0.1 million

The recommendations within the PCIP are based on a network-level study and should be used for planning purposes only. A detailed project-level assessment should be conducted for each project to determine the appropriate repair activities and develop more accurate cost estimates.



Table 4.5 summarizes the maintenance activities that are recommended for Year 1 (2021). The estimated cost is approximately \$818. A complete listing of the maintenance activities by section is presented in Appendix I2. This may be used as a basis for establishing an annual maintenance budget for the O2A pavements.

Table 4.5: Summary of Year-1 Maintenance Plan.

Policy	Work Description	Work Quantity	Work Unit	Work Cost
Safety	Patching - AC Full-Depth	33	SqFt	\$818
Total				\$818

APPENDIX A
INVENTORY



Appendix A
Pavement Inventory Report
Chilton County Airport (02A)

Branch ID	Name	Branch Use	Section ID	Rank ¹	Length (ft)	Width (ft)	Area (sf)	LCD ²	Surface ³
A01	Apron 1 Clanton	APRON	01	S	356	418	138,893	1/1/1985	AC
R0826	Runway 08-26 Clanton	RUNWAY	01	P	4,007	100	400,700	6/2/2014	AC
TC01	Taxiway Connector 01 Clanton	TAXIWAY	01	S	542	40	24,797	1/1/1985	AC
THANG01	Taxiway Hangar 01 Clanton	TAXIWAY	01	T	401	132	54,934	1/1/1995	AC
THANG01	Taxiway Hangar 01 Clanton	TAXIWAY	02	T	400	130	35,152	6/1/2013	AC

¹ P = Primary pavement, S = Secondary pavement, T = Tertiary pavement

² LCD = Last construction date. The date of the last major pavement rehabilitation (e.g. AC overlay)

³ AC = Asphalt Cement Concrete, AAC = Asphalt Overlay AC, PCC = Portland cement Concrete, APC = Asphalt Overlay PCC

APPENDIX B

PMP Maps

B1: Inventory Maps

B1A: Branch Identification

B1B: Section Identification

B1C: Sample Unit Layout

B1D: Pavement Type

B1E: Branch Use

B1F: Pavement Age

B2: Surface Condition Maps

B2A: 7-Color PCI

B2B: 3-Color PCI

B2C: FOD Rating

B2D: Survey Photo Locations

B3: Pavement Capital Improvement Plan (PCIP) Maps

B3A: 2027 Forecasted PCI without PCIP

B3B: M&R Needs

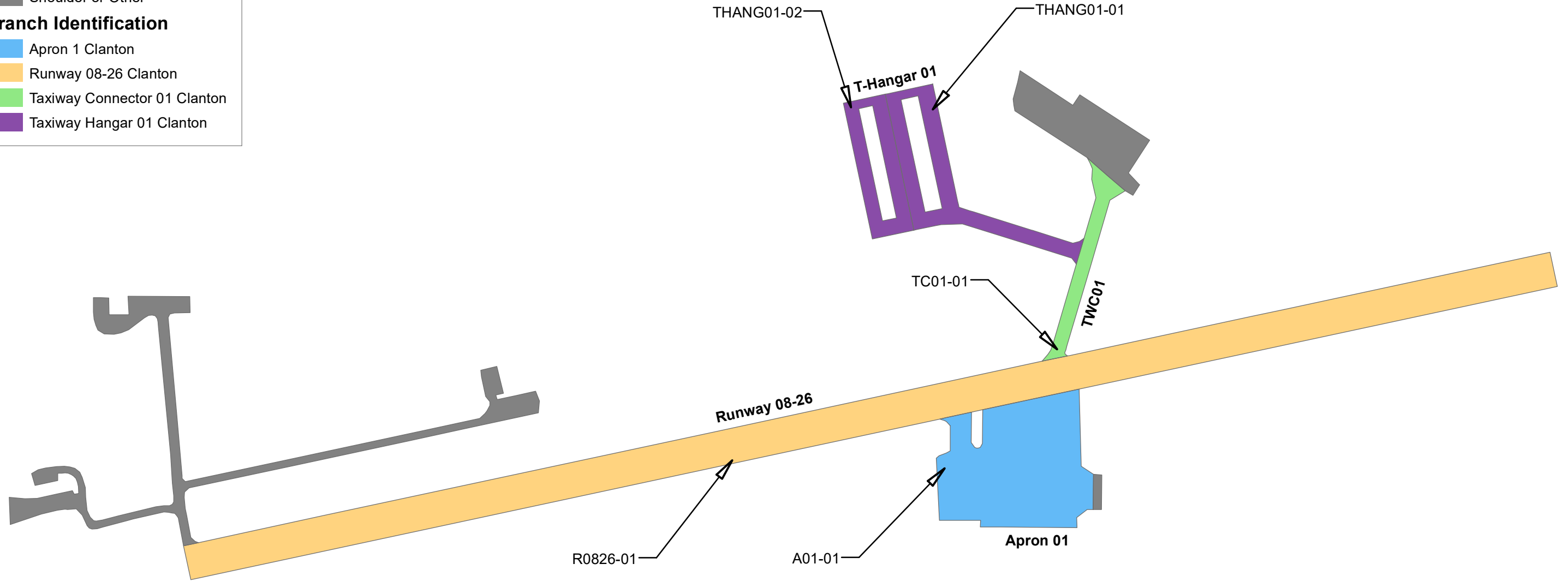
B3C: PCIP Recommendations

Legend

- Section Boundary
- Shoulder or Other

Branch Identification

- Apron 1 Clanton
- Runway 08-26 Clanton
- Taxiway Connector 01 Clanton
- Taxiway Hangar 01 Clanton



**Alabama Statewide
Pavement Management Program Update
Chilton (02A) County Airport
Clanton, AL**

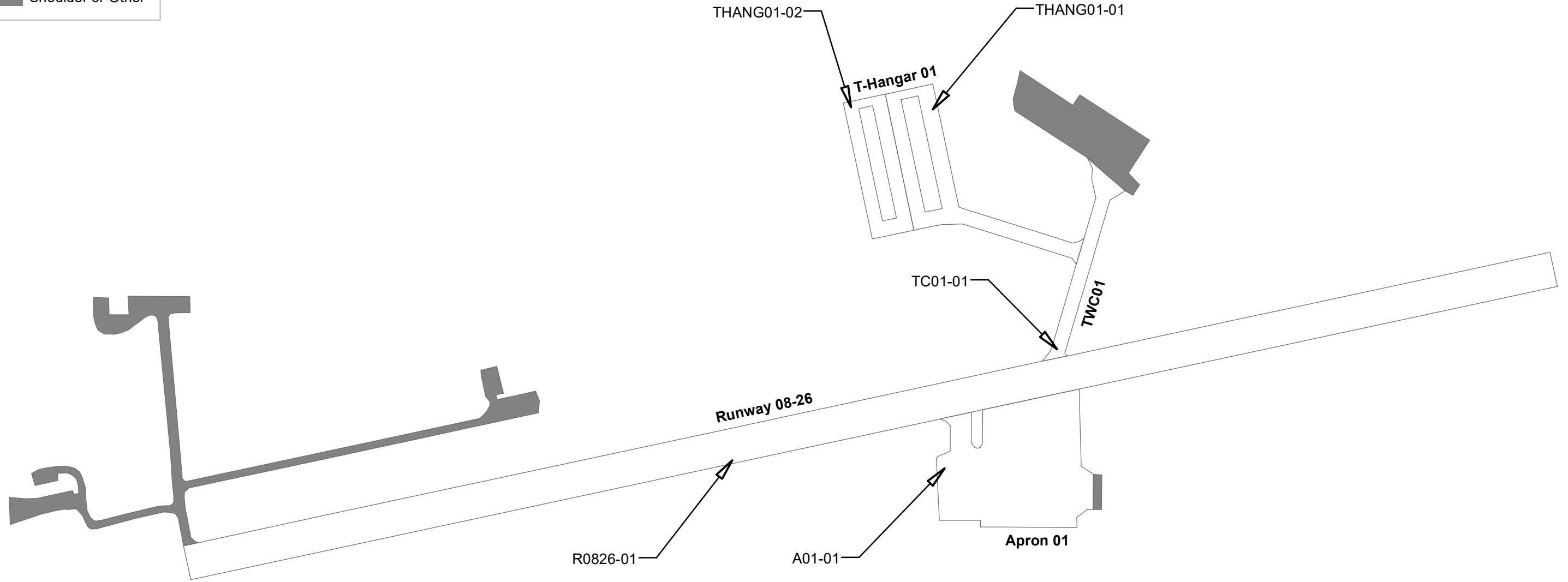
Figure B1A

Branch Identification

	All About Pavements, Inc. (API) <small>www.allaboutpavements.com Telephone: 217-586-2765 FAX: 217-586-1967</small>	ENGINEER KP/MR	DATE May 2021	MAP NUMBER Page 1
		REVISED JMA	SCALE 1 in = 300 ft	FINAL

Legend

- Section Boundary
- Shoulder or Other





**Alabama Statewide
Pavement Management Program Update
Chilton (02A) County Airport
Clanton, AL**

Figure B1B



Section Identification

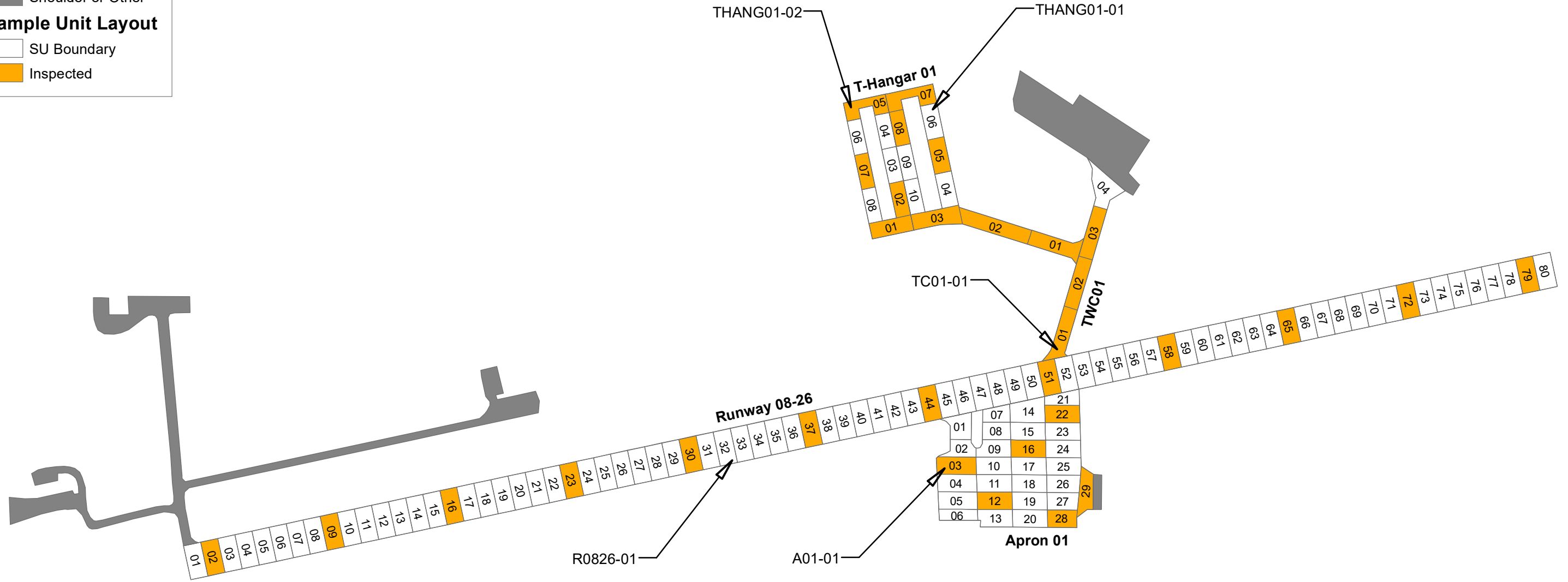
	ENGINEER KP/MR	DATE May 2021	MAP NUMBER Page 2
<small>All About Pavements, Inc. (API) www.allaboutpavements.com Telephone: 217-586-2765 FAX: 217-586-1967</small>	REVISOR JMA	SCALE 1 in = 300 ft	FINAL

Legend

-  Section Boundary
-  Shoulder or Other

Sample Unit Layout

-  SU Boundary
-  Inspected



**Alabama Statewide
Pavement Management Program Update
Chilton (02A) County Airport
Clanton, AL**

Figure B1C

Sample Unit Layout

All About Pavements, Inc. (API) <small>www.allaboutpavements.com Telephone: 217-586-2765 FAX: 217-586-1967</small>	ENGINEER	DATE	MAP NUMBER
	KP/MR	May 2021	Page 3
	REVISOR	SCALE	
	JMA	1 in = 300 ft	FINAL

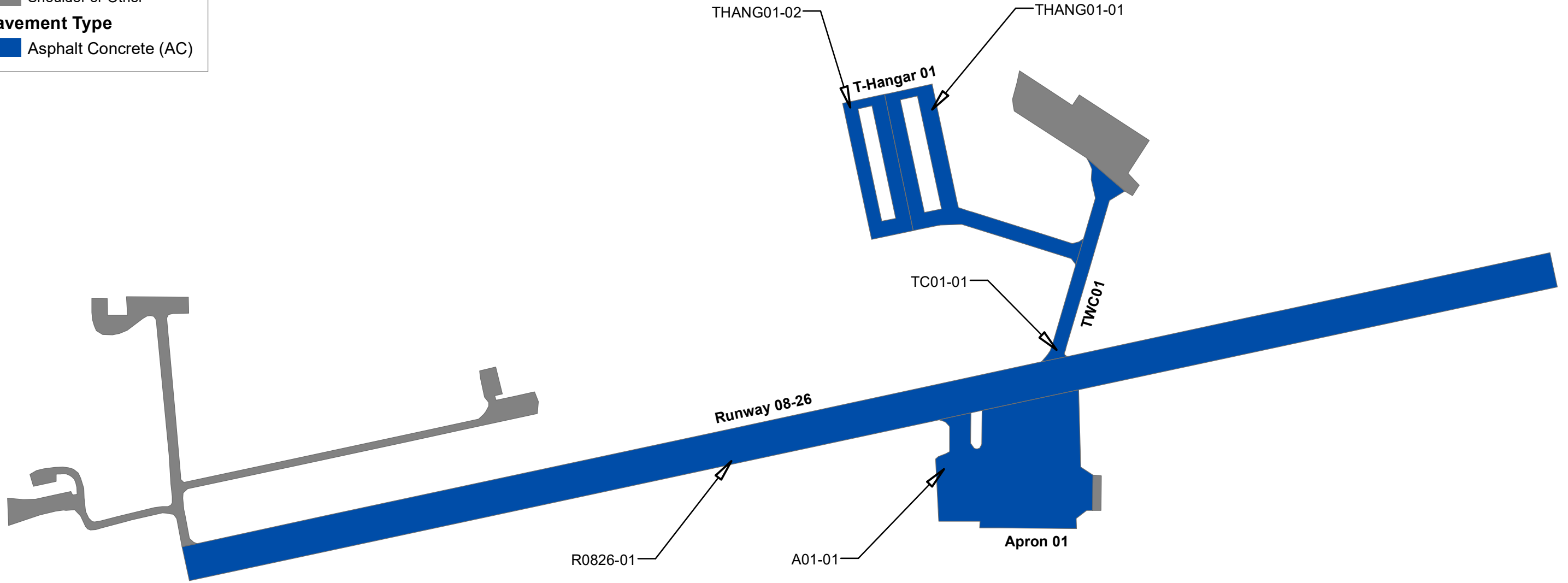
Legend

□ Section Boundary

■ Shoulder or Other

Pavement Type

■ Asphalt Concrete (AC)



Alabama Statewide
 Pavement Management Program Update
 Chilton (02A) County Airport
 Clanton, AL

Figure B1D

Pavement Type		
ENGINEER KP/MR	DATE May 2021	MAP NUMBER Page 4
REVISED JMA	SCALE 1 in = 300 ft	FINAL

All About
 Pavements, Inc. (API)
 www.allaboutpavements.com
 Telephone: 217-586-2765 FAX: 217-586-1967

Legend

Section Boundary

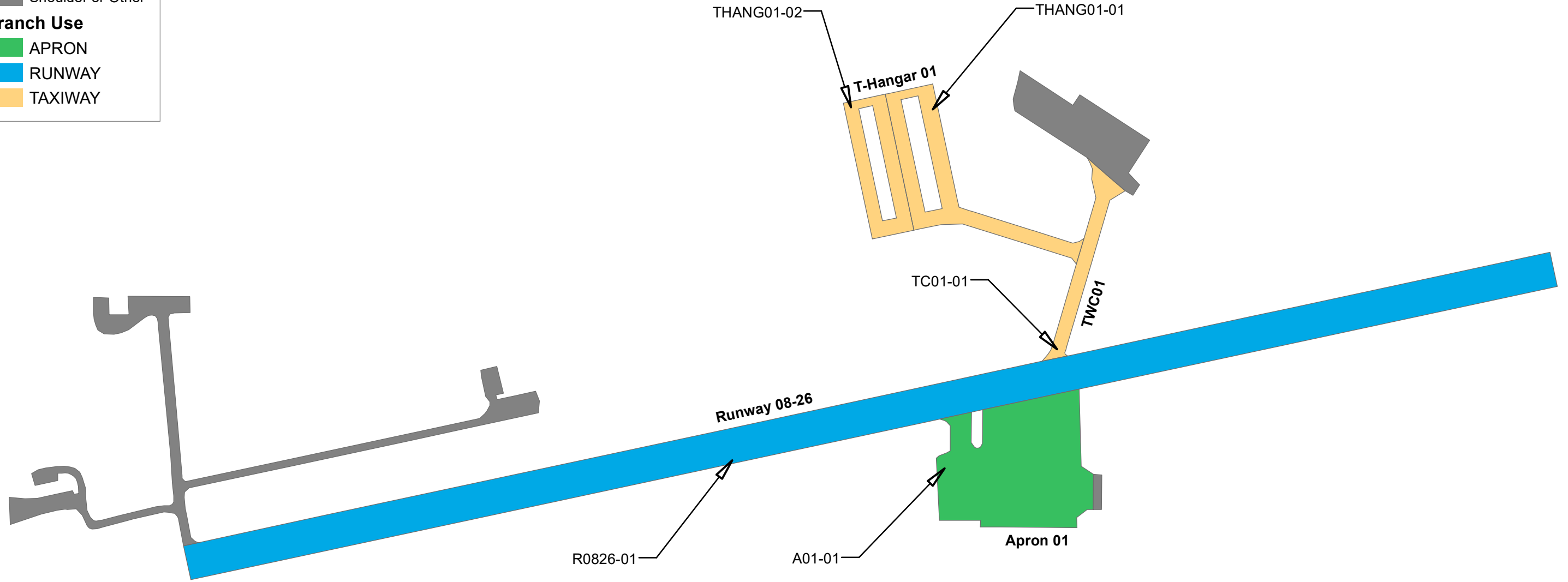
Shoulder or Other

Branch Use

APRON

RUNWAY

TAXIWAY



Alabama Statewide
Pavement Management Program Update
Chilton (02A) County Airport
Clanton, AL

Figure B1E

<p>All About Pavements, Inc. (API) www.allaboutpavements.com Telephone: 217-586-2765 FAX: 217-586-1967</p>	ENGINEER	DATE	MAP NUMBER
	KP/MR	May 2021	Page 5
	REVISOR	SCALE	FINAL
	JMA	1 in = 300 ft	

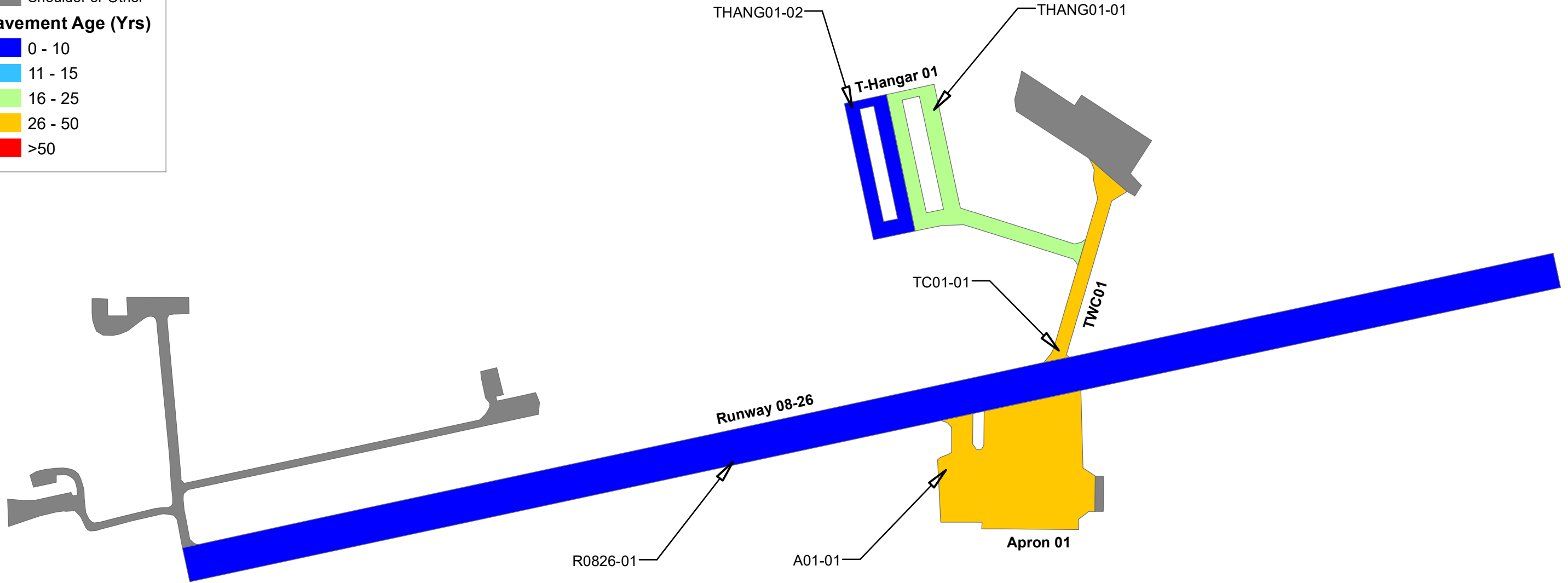
Legend

Section Boundary

Shoulder or Other

Pavement Age (Yrs)

- 0 - 10
- 11 - 15
- 16 - 25
- 26 - 50
- >50



Alabama Statewide
Pavement Management Program Update
Chilton (02A) County Airport
Clanton, AL

Figure B1F

Pavement Age

<p>All About Pavements, Inc. (API) www.allaboutpavements.com Telephone: 217-586-2765 FAX: 217-586-1967</p>	ENGINEER	DATE	MAP NUMBER
	KP/MR	May 2021	Page 6
	REVISOR	SCALE	FINAL
	JMA	1 in = 300 ft	

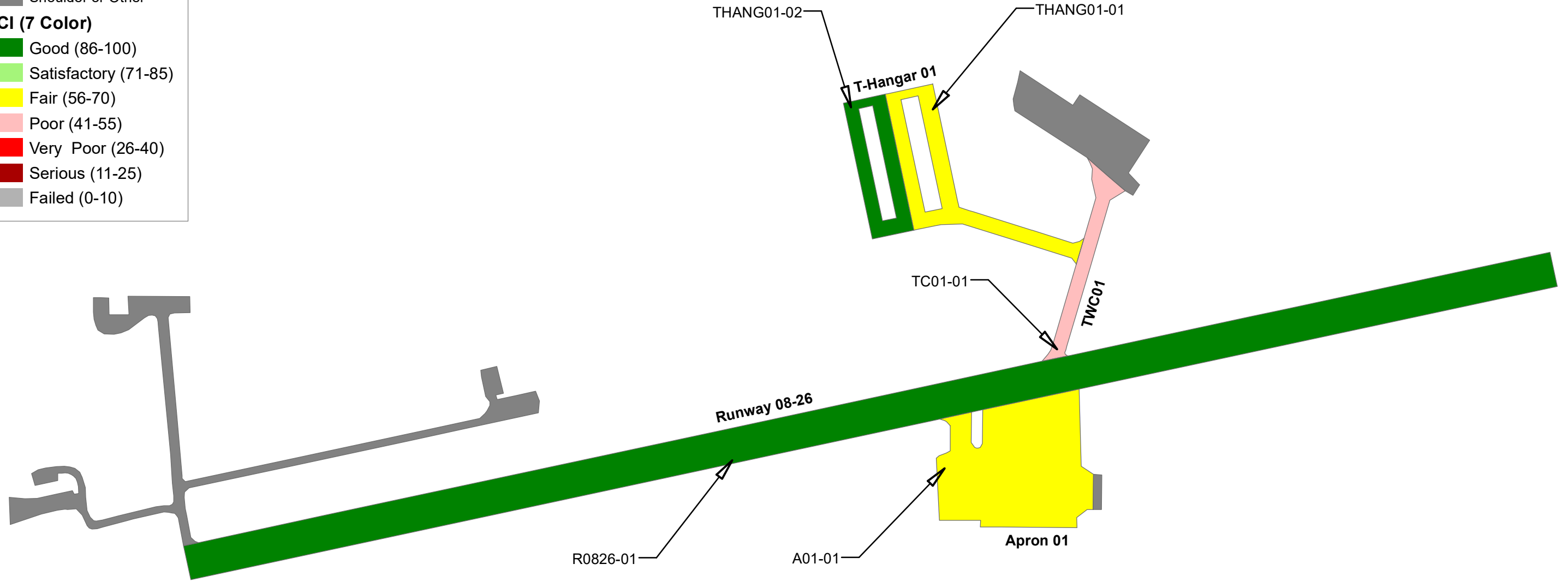
Legend

Section Boundary

Shoulder or Other

PCI (7 Color)

- Good (86-100)
- Satisfactory (71-85)
- Fair (56-70)
- Poor (41-55)
- Very Poor (26-40)
- Serious (11-25)
- Failed (0-10)



Alabama Statewide
Pavement Management Program Update
Chilton (02A) County Airport
Clanton, AL

Figure B2A

7-Color PCI

<p>All About Pavements, Inc. (API) <small>www.allaboutpavements.com Telephone: 217-586-2765 FAX: 217-586-1967</small></p>	<p>ENGINEER KP/MR</p>	<p>DATE May 2021</p>	<p>MAP NUMBER Page 7</p>
	<p>REVISED JMA</p>	<p>SCALE 1 in = 300 ft</p>	<p>FINAL</p>

Legend

Section Boundary

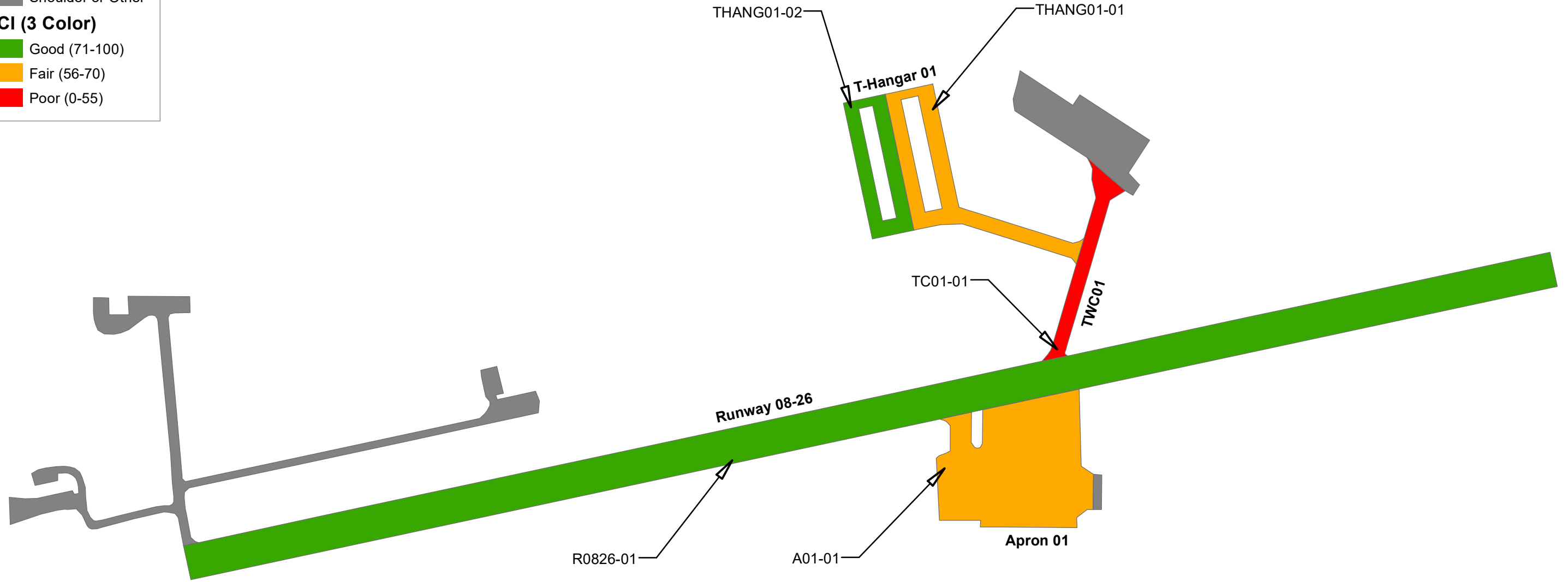
Shoulder or Other

PCI (3 Color)

Good (71-100)

Fair (56-70)

Poor (0-55)



Alabama Statewide
 Pavement Management Program Update
 Chilton (02A) County Airport
 Clanton, AL

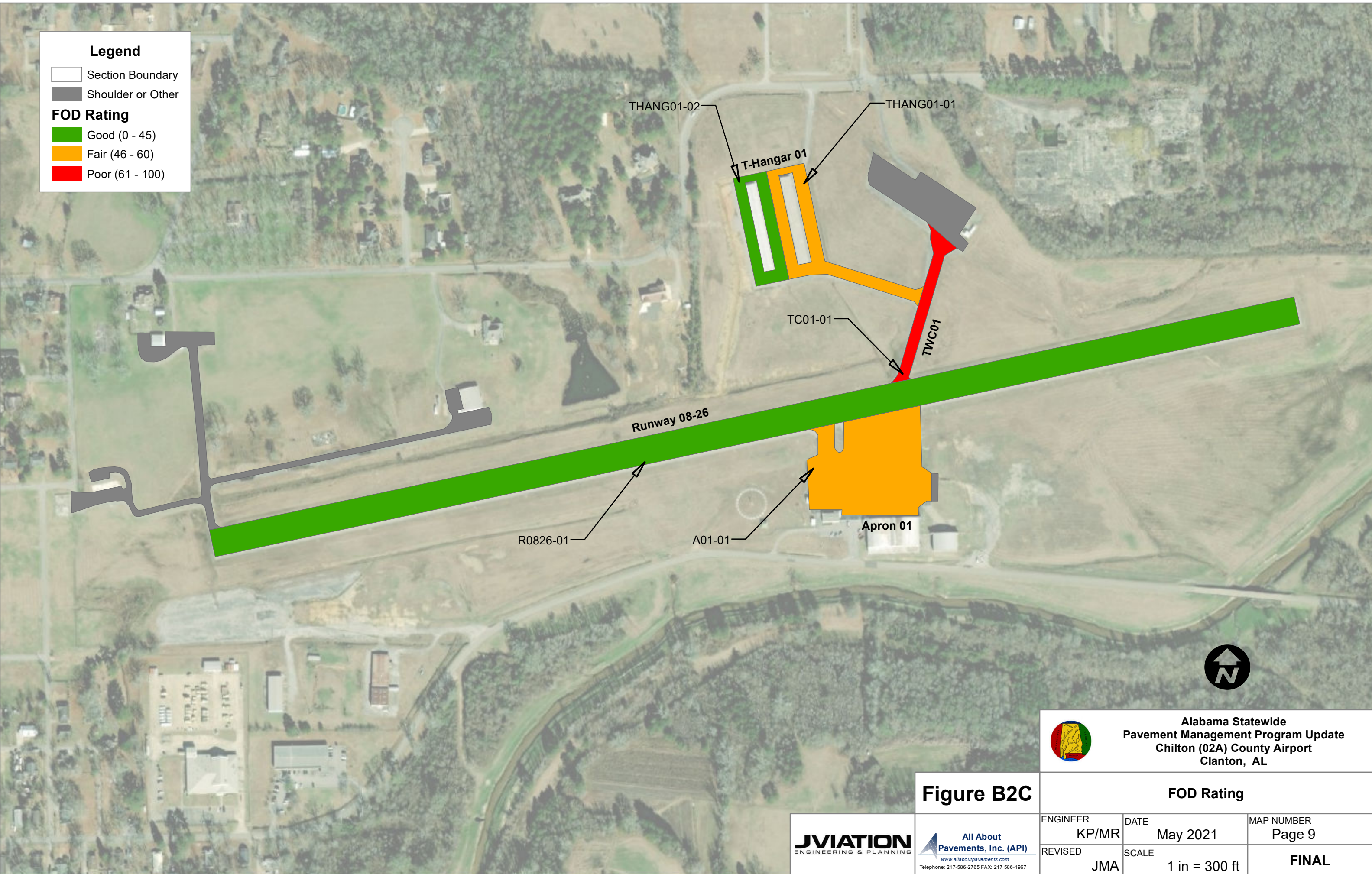
Figure B2B

3-Color PCI

All About Pavements, Inc. (API) <small>www.allaboutpavements.com Telephone: 217-586-2765 FAX: 217-586-1967</small>	ENGINEER	DATE	MAP NUMBER
	KP/MR	May 2021	Page 8
	REVISOR	SCALE	FINAL
	JMA	1 in = 300 ft	

Legend

- Section Boundary
- Shoulder or Other
- FOD Rating**
- Good (0 - 45)
- Fair (46 - 60)
- Poor (61 - 100)



**Alabama Statewide
Pavement Management Program Update
Chilton (02A) County Airport
Clanton, AL**

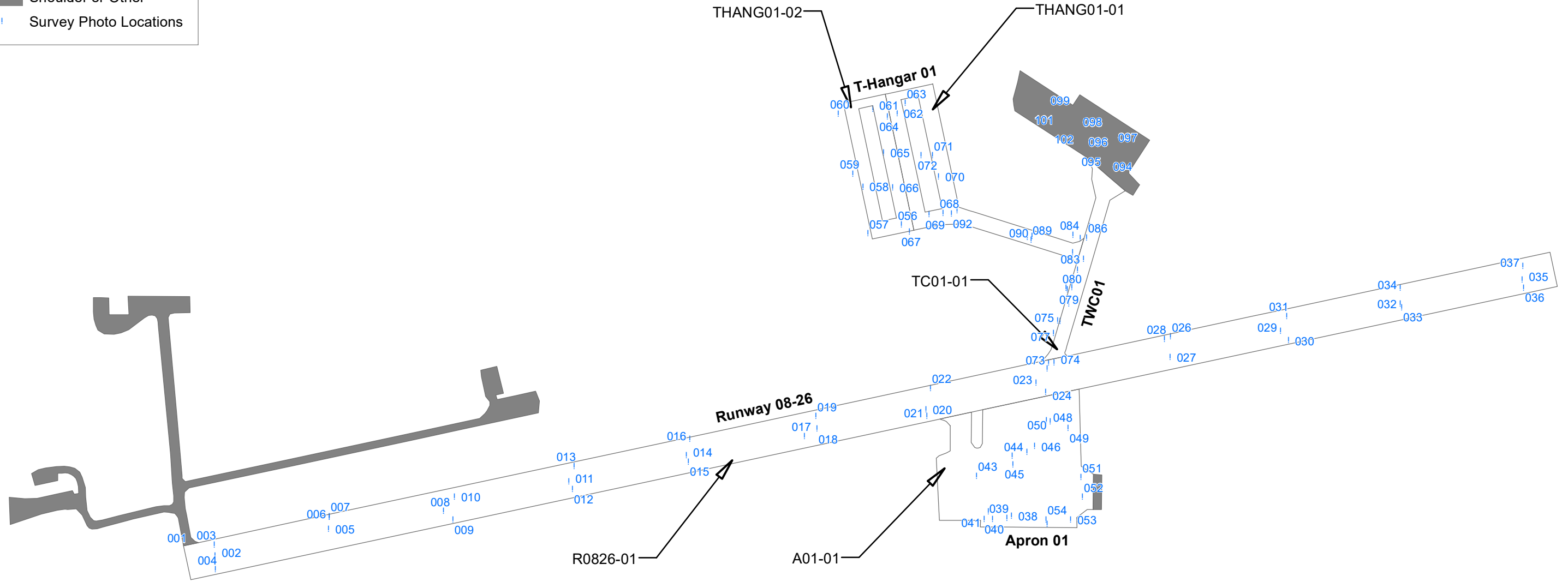
Figure B2C

FOD Rating		
ENGINEER KP/MR	DATE May 2021	MAP NUMBER Page 9
REVISED JMA	SCALE 1 in = 300 ft	FINAL



Legend

- Section Boundary
- Shoulder or Other
- Survey Photo Locations



**Alabama Statewide
Pavement Management Program Update
Chilton (02A) County Airport
Clanton, AL**

Figure B2D

Survey Photo Locations

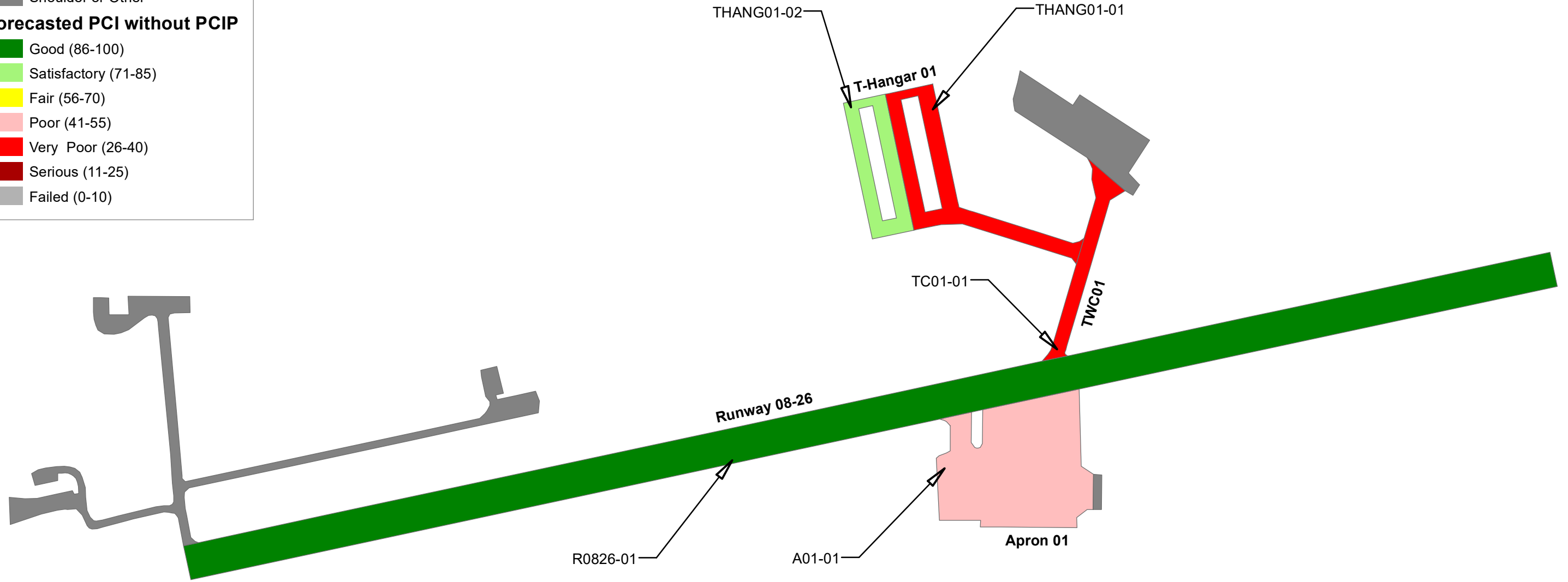
<p>All About Pavements, Inc. (API) <small>www.allaboutpavements.com Telephone: 217-586-2765 FAX: 217-586-1967</small></p>	ENGINEER	DATE	MAP NUMBER
	KP/MR	May 2021	Page 10
	REVISOR	SCALE	
	JMA	1 in = 300 ft	FINAL

Legend

- Section Boundary
- Shoulder or Other

Forecasted PCI without PCIP

- Good (86-100)
- Satisfactory (71-85)
- Fair (56-70)
- Poor (41-55)
- Very Poor (26-40)
- Serious (11-25)
- Failed (0-10)



**Alabama Statewide
Pavement Management Program Update
Chilton (02A) County Airport
Clanton, AL**

Figure B3A

2027 Forecasted PCI without PCIP

	All About Pavements, Inc. (API) <small>www.allaboutpavements.com Telephone: 217-586-2765 FAX: 217-586-1967</small>	ENGINEER KP/MR	DATE May 2021	MAP NUMBER Page 11
		REVISED JMA	SCALE 1 in = 300 ft	FINAL

All sections recommended for Rehabilitation or Reconstruction between 2021 and 2024 also receive Surface Treatment in the 3rd year of paving.

Legend

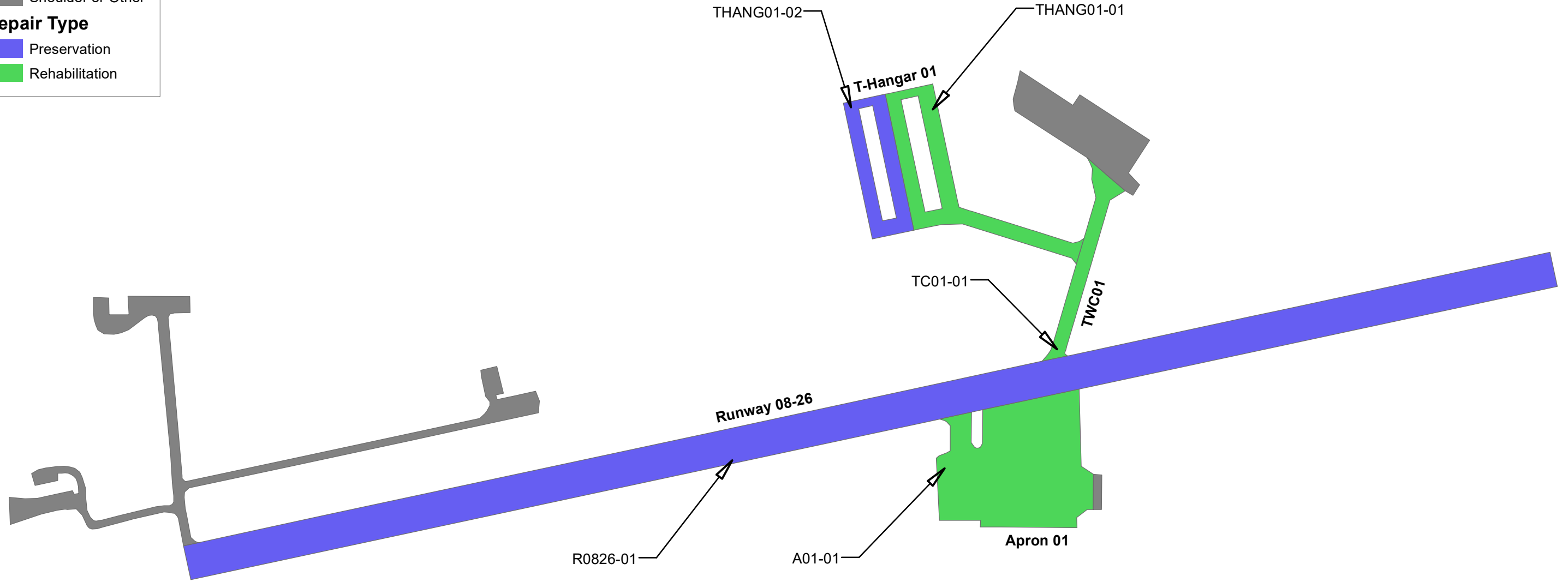
□ Section Boundary

■ Shoulder or Other

Repair Type

■ Preservation

■ Rehabilitation



Alabama Statewide
Pavement Management Program Update
Chilton (02A) County Airport
Clanton, AL

Figure B3B

Repair Type		
ENGINEER KP/MR	DATE May 2021	MAP NUMBER Page 12
REVISED JMA	SCALE 1 in = 300 ft	FINAL

All About
Pavements, Inc. (API)
www.allaboutpavements.com
Telephone: 217-586-2765 FAX: 217-586-1967

All sections recommended for Mill & AC Overlay or AC Reconstruction between 2021 and 2024 also receive Surface Treatment in the 3rd year of paving

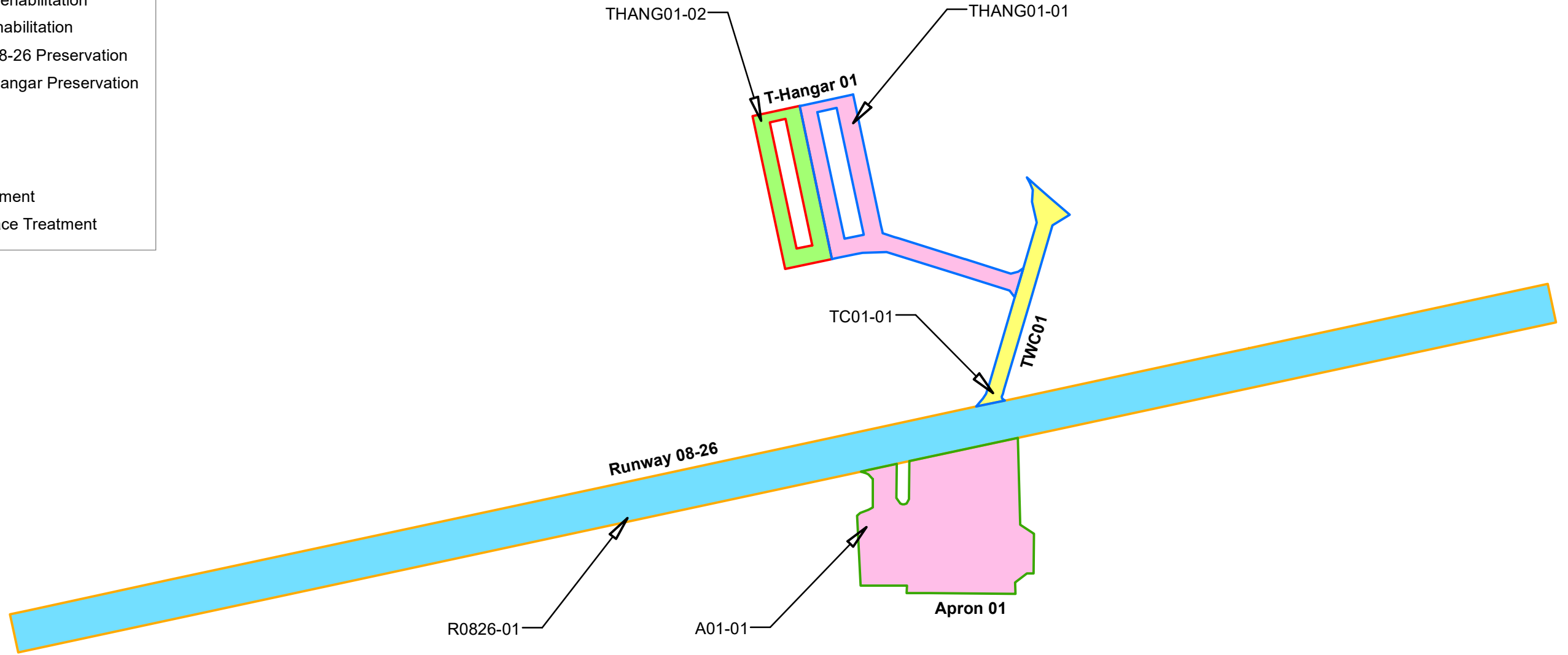
Legend

Project Name

- 02A_21-01_Taxiway Rehabilitation
- 02A_22-01_Apron Rehabilitation
- 02A_27-01_Runway 08-26 Preservation
- 02A_27-02_Taxiway Hangar Preservation

M&R Activity

- Mill 2" & 2" AC OL
- Mill 2" & 2" AC OLP
- Runway Surface Treatment
- Taxiway & Apron Surface Treatment



Alabama Statewide
Pavement Management Program Update
Chilton (02A) County Airport
Clanton, AL

Figure B3C

PCIP Recommendations

<p>All About Pavements, Inc. (API) <small>www.allaboutpavements.com Telephone: 217-586-2765 FAX: 217-586-1967</small></p>	ENGINEER	DATE	MAP NUMBER
	KP/MR	May 2021	Page 13
	REVISOR	SCALE	
	JMA	1 in = 300 ft	FINAL

APPENDIX C

OVERVIEW OF PAVEMENT DISTRESSES



% 5~|| Ucf7fUWb| f57L

5~|| UcfVWWh| lgUgfygcZfHfVbNWh| VWGwUgXVnZU|| iYZ|ifYcZhY
UgUHUWUfYg fZWk\YfYhgYgfygUxgU|b|g\|| \Ygi bWk\Y~cUg'HY
VWgdcd|UfYc hYg fZW|b||UnlgUgfygcZdfUYVWg'5ZfYfYUfX
HZZWcU|h hYVWgWbWZfa| |'aUngXWg UfU| 'Xc|WghUfY Ycd
UdUmbfng|V| |WVWbk|YcfhYg |bcZbU|| Ucf"HYd|WgUfY YghU&
ZYhd| 'dbhYcd| YgY' 5~|| UcfVWWh| 'cWfGcbn|bUfYghUfYg VVWk'
fYUfXUZZWcU| |zg WUgk\Y' dHgZbX|gWghXVXUa UcfGf VUfU Xgfyg'

Gj YfHng

- ◆ @k! aUWi dcZbz\Uf' | YVWgfi b| | 'dfUYlc XWchYk|h bby
cfcbnUzk |HfVbNWh| VWG'HYVWgUfYbdcgUYX'
- ◆ A Y|a !: ifhYXj Ycda YfZ|| \HU|| UcfVWWh| |bc UdUmbcf
b|kcf_ 'cZVWghUa UfY|| \hngUYXA Y|a!gj Y|U|| UcfVWWh| '
|gXVnUkY!XVdUmbcZfHfVbNWh| VWGk\YfU' dWg
UfYgUfYm YX|bdUW|ccXU| |f|Uf|hf cWVWkYb|Wg/
◆ <|| \! \Ugd|fygXg hUfYd|WgUfYkY XVbXUxgdUYXUfYX'Yg"
Gca YcZhYd|Wga UfWibWfUZZWbXa UfUg: CS'dbU'

FYUfcd|cbg

- ◆ @k! Bc Ufcbzg fZWgU'cfj YfUzf`ck gj YfHngfyg/
- ◆ A Y|a ! dffU'cfZ ~Xch' dUWzj YfUf fVWghf W
- ◆ <|| \! dffU'cfZ ~Xch' dUWzj YfUf fVWghf W



& 6 YXh| B57L

6 YXh| lgU4a cZVlia |bcigaUMjUdbhYdj Ya Vhg fZWhUMSUgUg |bn
['Ug'] YfZNM| g fZWhUi g UmVWA Ygi |Yg|Wth6 YXh| lgU gXVn
YWg| YUaci bgcZig| U|WwA YhcfRfg|bhYa | 'cf`ck!Ufj c|XWthb|cfVch"
-hcWAgk\ YUg|UH`ghYj c|XgZhYa | Xfh| \dkYhYUxhYbYdbXgci h
dle hYg fZWCzhYdj Ya YhQBWhYVYXh| dcWg|gbcifY YgVYXfh| WX
kYhYZig| UicfRfk|` UWai` UYcbhYg fZW'

**Gj YfNg BcX| fYgcZg| Y|nifYX|bX'6 YXh| 'gci` XWbdXk\ Y|hg
YfNg| Ybci [\ lc fXWg |XNg|UW'**

**FYUFD`Mg`Scbch| /g|XVdthYXg|NgXifUv|thh| \YUbx|c`g|X
|de hYUfNgUZNXk|h VYXh| zfa c| YhYVWga UMjU/dUW'**



3" 6cW7fUWb| 157L

6cWVWgUy|bWbNEXWVghUHy|XhYdjYaYHbcfWVHiUfgUdX
d|Wg"HYVcVgaUuU|YbgrZca%An?Zc|c%6Vn?6ZVf'6cWVWVh|'
lgWgXaUbnmg|fb_UYcZhYUg|UWbWVYUk|gbdicUk|gcV|WVX'HY
cWVfWcZVcWVWVh|i gUn|bWVghUHyUg|UuUg|UWbWg|bZVUhd'
6cWVWVh|bcfaUncWVg|YUu|Ydcdf|bcZhYdjYaYHfWVh|k|"
gaV|aYgcWVfcbn|bhYcb|WVWVg'

GjYf|ng

- ◆ @ck! X|bXVnWVghUHyUacg| | \hngUYZVh|gh|bcZf| |bcVWV
XaU|YECSEd|H|U" I hZ'XWVg\jY%|bWcf'YgaYbk|XhZbX
Z'XWVg\jYZ'Y|bg|gUWf|WV|cb/
- ◆ A Y|a! X|bXVnWVghUHyUacXUfngUYX|gaY: CS'dd|H|Uz
ihZ'XWVghUHyUacg| | \hngUYZVh|gh|YUaYbk|X|f|WVf
hU%|bWcfZ'XWVghUHyUacg| | \hngUYXVh|gh|YZ'Y|b'
ih|g|gUWf|WV|cb/
- ◆ <| | \! X|bXVnWVghUHyUg|YfngUYZVh|gh|UWV|H|Y: CS'
dd|H|U'

FYUFD'Wg

- ◆ @ck! BcU|cb/
- ◆ A Y|a! gUWVgZddn|YjYUcfZ'WVWg|fWVcf\Y|gU|ZbX
cjYUu
- ◆ <| | \! fWVWg|fWVcf\Y|gU|ZbXcjYUu



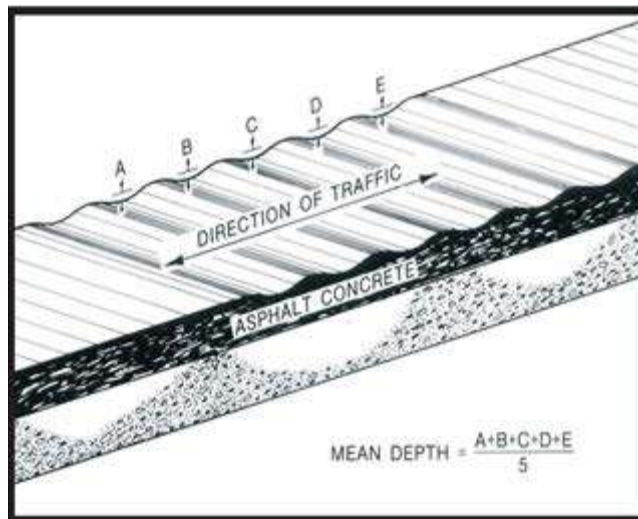
Corrugation

Description

Corrugation is a series of closely spaced ridges and valleys (ripples) occurring at fairly regular intervals, usually less than 5 feet (1.5 meters) along the pavement. The ridges are perpendicular to the traffic direction. Traffic action combined with an unstable pavement surface or base usually causes this type of distress.

Severity Levels

- @** Corrugation is a series of closely spaced ridges and valleys (ripples) occurring at fairly regular intervals, usually less than 5 feet (1.5 meters) along the pavement. The ridges are perpendicular to the traffic direction. Traffic action combined with an unstable pavement surface or base usually causes this type of distress.
- A** Corrugation is a series of closely spaced ridges and valleys (ripples) occurring at fairly regular intervals, usually less than 5 feet (1.5 meters) along the pavement. The ridges are perpendicular to the traffic direction. Traffic action combined with an unstable pavement surface or base usually causes this type of distress.
- <** Corrugation is a series of closely spaced ridges and valleys (ripples) occurring at fairly regular intervals, usually less than 5 feet (1.5 meters) along the pavement. The ridges are perpendicular to the traffic direction. Traffic action combined with an unstable pavement surface or base usually causes this type of distress.



)" SYFYgdcbf57L

SYFYgdcbfY'cW/nXdj Ya YHj fZWMfG'Uj H Yy Uhdgg|| \hmckYfhUb
hcgYcZhYgffci bNj 'dj Ya YH-ba Un]hgUBWg' || \hSYFYgdcbfYbdi
bc]MVYi b] UZFUUbzk\ YbcbNj kUF'WUng]VEXUHI UNg'VIhY
XfYgdcbWUgc Y'cWPK]hci hfU'VWU g'cZgUhgWUHXVndbNj 'cZ
kUF'SYFYgdcbWVWU g'XVng]Nia YHcZhYZi bU]dgc] 'cfWbVWU]h
Xfj] Wbg] Vdb'SYFYgdcbWU g'fci | \bYgUBzk\ YbZ' Yk]h kUF'cZ
gZ]VhXhZw' XWU g'\n'fcdUbj 'cZ]VZFI

GjYfng

- ◆ @k! SYFYgdcbWVcVg] Ycf'cWPKVng]UBXUfng]cbng|| \hm
UWUgdj Ya YHf]Nj 'ei U]m]UXa Un]g'\n'fcdUbj 'dcb]U'db'
fi bkUg'AU]aia Xh' % # l' % &]WZf fi bkUg' % & l' %]WZfU] kUg'
UbXUfcbg/
- ◆ A]ia ! HYXfYgdcbWVcVg] Y'acWUYNIZWUgdj Ya YHf]Nj '
ei U]m]UXU g'g'\n'fcdUbj 'dcb]U'db'fi bkUg'AU]aia Xh' % & l' %
]WZf fi bkUg' % & l' %]WZfU] kUg'UbXUfcbg/
- ◆ < || \ ! HYXfYgdcbWVfU]n'cVg] Y'g] Y'YnIZWUgdj Ya YHf]Nj '
ei U]m]UXU g'g'X]h]Y'\n'fcdUbj 'dcb]U'/SYh [fUf'hub' %]WZf
fi bkUg] fUf'hub' &]WZfU] kUg'UbXUfcbg'

FYUfDe'Vg

- ◆ @k! BcU]cb/
- ◆ A]ia ! GU'ckzdU]U'cfZ' ~ Xh' dUW'
- ◆ < || \ ! GU'ckzdU]U'cfZ' ~ Xh' dUW'



*" >Yi6Uj57L

SYGJdb

>YiUgMgcbWigXf_YbXifNgcbhYdjYaYhijfZMk\YbVhaJbci gVbXf
\UgVbVifbXcfWVchX~cUjXVi fbXifNg Uij UfjbXh i dle'
Uhd jaUYn%&|bWf%a|`jaYfg!

GjYfhi@jYg

BcXifYgZejYfhiYXfX-fggjZMfHcJbXUfhiYiUgMgcbYlg'



+">chFYZMcb7fUWb] f57L

8YgAd]cb

HlgYgYgcWAgdbnibbdj Ya Ylg\Uj]d UbUg\UicfRfg fAWcj YUD7'gU'
HlgWV]cfmKYgch]bWXYZMcbVWVh] Zca UnichYfhdYcZUgM]Yz
Va YhgW]hXZ]a YgW]hXZ]g WVVWgUY]gYX]g'ch]hX]bU'UXM]hg YgY
VWg'>chFYZMcbVWVh]]gV]gXa Ub`mna'cj Ya YhcZhYD7'gU'Vb]h'
hY57'g fAWWV]gYcZhYa U'UXac]g]fYWU] Yg]h]gch]cUXFYUX'<ckY Yz
hZ]WcU]h] 'aU'W]gUYfUXkbcZhY57b]fhYVWV]Yg]]h]]bgU]h] Ux
: CS'dh]U'=-ZhYdj Ya YhgZU]a YfXUdh] U'WVzhYVW]g]]X]e VY
gUYX'5'_bck Y]YcZgU]a Yg]dgVb]h hY57'g fAWk]``\Ydle]X]h]n
hYgVWg'

GjY]h]@jYg

@ 7UWg\Uj Ycb]m]]h]gU]h] f]h]Ycfbc: CS'dh]U'cfbc'gU]h] UbXUbVY
Z'YcfbcdZ'YX' =ZchZ'YzhYVWg\Uj YUa Ybk]h]cZ'f]bWf]'
a]]a Yf]cf'Yg':]'YXWVgUYcZUbk]h]Zi hYfZ'YfaU]U]g]b'
g]h]gVWf]m]b]h]cb'

A CbYcZhYZ`ck]h] Vb]h]dgY]gg f]h]WVgUYacX]UYngUYX]ga Y: CS'
dh]U'U'UbXUbVY]hYfZ'YcfbcdZ'YcZUbk]h]/h]Z'YXWVgUYfch]
gUYXcfUYcb]m]]h]gUYXV]hYfZ'Y]g]bi h]g]h]gVWf]m]b]h]cb]/f]h]
bcdZ'YXWVgUYfcd]gUYXcfUYcb]m]]h]gUYXV]hYa Ub VVW
k]h]]g] f]h]h]b]Y%]bWf]'a]]a Yf]cf]f]L]]]h]U]Xa VVW]h] Y]gg
b]fhYVWVcfU]hYVb]f'cZ]h]gV]h] VVWg'

< 7UWgUYg] YfngUYXV]h]h]: CS'dh]U'U'UbXUbVY]hYfZ'YcfbcdZ'
YcZUbk]h]"



, " @cb|JiXbUUbXHfUbgYfgY7fUWb| 157L

@cb|JiXbUUbXHfUbgYfgY7fUWb| HEMWgUfYdUUYlc hYdj Ya YHbVHF|bYcf
'UxkbXfWfcb' H Yna UhVYU gXVm %Udcbf mWbdf VxXdj |h "Uy'chz&
gfb UyZhy57'g fAWX Yc \UxXb| 'zhYUg UZ'cf' EufZMj YMW
WigXVmMWgVbU h hYg fAWXi fg' HUb| YgVWgY HbXUWghY
dj Ya YHbVHF|bYcf 'UxkbXfWfcbzUxa UhY
WigXVm|Yag&cf' EiggHfXUvj Y'HYgHndgcZMWgUfYbchi gUmçX
fYUX

GjYfng

- ◆ @k! \GjYfngYfa|bcfgU|h'cfbcgU|h"HYWUgVbVZ'Xcfih
Z'X'U bZ'XWUg\GjYUaYbk|X'cZ%#|bWcf'Yg': |'XWUgUfY
Ubk|X v|hYfZ'Y|g|b|g|g|UWfmWb|cb/
- ◆ A Wia ! dYcZHYZ`ck|h| Wb|hdgY|gg' %EMWgUfYacXUym
gdUYXUxUvVYhYfZ'XcfibZ'XczUbk|X/'&Z'XWUgUfYbchi
gdUYXcfdbm||\hngUYXZihhYfZ'Y|g|b|g|g|UWfmWb|cb' Eih
Z'XWUgUfYbchi gdUYXcfdbm||\hngUYXZihhYUWk|X YWUg
%#|bWcf(E||\HUXa WUW| Y|g|b|f|hYUWcfUhYWb|f'cZHY
HfGm|h WUg/
- ◆ <||\! gjYfngUYXk|h UXZ|H: C7dH|U"HYmUvVYhYfZ'X
cfibZ'X'

FYUFD:MG

- ◆ @k! BcUW|cb/
- ◆ A Wia ! gUWUg/
- ◆ <||\! gUWUgcf dZfa UZ'X'h'dUW'



9" C] G] UYB7L

C] g] UYghYXWjcfUjbcfgZbh' cZhYdjYa Yhg fZWWgXVnhY
g] h' cZjZAYzcfchYfg'j Ylg'

Gj YfNg Bc X] fYgZgj Y] mifYXWjbx' Hgg Z] Vhlc]bYUyhUic] g] UY
Ylgg'

FYUFD' MNg

- ◆ Scbch]h/'
- ◆ DffU'cfZ' Xh'dUW'



%8' DUWb'`

FYUfduWb Uxi f]mWidUWb]gWbg\NYXUNZUMN UXYgcZck kY`]h
dMzfa gcfk UgWbgi WXX

Gj YINg

- ◆ @ck!]b[ccXWbY]cbUx]gdMzfa]h]g]g]UWf]m
- ◆ A Y]i a !]gga Yk\ U]NY]cfU]XU]XU]ZUM]g]Y]h]ei U]m]c]ga Y]Y]N]h
- ◆ <][\!]gU]X]m]N]h]cfU]XU]XU]ZUM]g]Y]h]ei U]m]g]]h]ZUM]h]ncf\U]g]\[\`
: C8'dh]U'

FYUfcd]cbg

- ◆ @ck! BcU]cb/
- ◆ A Y]i a ! g]U]V]W]g]Y]U]f]h]Y]X]g]Y]g]g]]bh]Y]d]U]W]cf]m]U]W]h]Y]d]U]W
- ◆ <][\! f]m]U]W]h]Y]d]U]W'



:]ifY74. "5g]U]H]U]W]b"

%Dc'lg X5[[fY\te f57L

8YAd]db

5[[fY\UYdc'lg]h]lgWigXvifvNfXfUz]Wd]W]cbg'Dc'lg XU[[fY\UY]g
dYgHk\YbWgYUa]b]cbczUdjYaYhfyYUghUthYdb]cbczU[[fY\UY
YfN]h]UvjYhYUg]UhgYhYjYfinaU'cfhYfYfbc'fi[\cfU]i'U
U[[fY\UYd]f]Wg]c'dfj]X]ccXg]XfYg]UW'9]g]bWcZ]h]g]m]cZ]g]N]g]g]
Ug]b]X]W]X]k\Yb]h]Y]i]a]V]f]cb]U]g]X]f]g]U]W]f]U]h]f]g]i]g'ck'cf\U]X]cd]X
g]b]Z]U]h]n]z]ca'df]j]ci]g]U]h]g'

GjY]h]e]y]Yg

BcX]fY]g]c]Z]g]Y]h]m]f]Y]X]b]X<ck]y]Y]z]h]Y]X]f]Y]c]Z]c'lg]h]g]c]X]Y
g]b]Z]U]h]n]z]ca'df]j]ci]g]U]h]g]b]W]X]k]b]h]Y]W]b]h]cb]g]f]j]Y]h]X]f]U]X]g]U]X]W]U



%&FUYH 157L

8YbHdb

FUYH lghYXgcXlH'cZMUGYU[fUYdUfMgZca hYdJYa YHgfAW'

8YgYA|'GjYlmi@jYg'

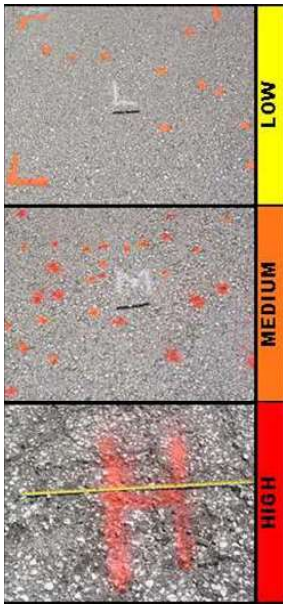
5gi gX\YlZMUGYU[fUYfVgk'cFXa lHHMUGYU[fUYgngcZHY
UgUha]"5[[fUYWgMgfVfck\YbacfYhU'cbYU'cbH WUGYU[fUY
dYWga]ggh"-ZbXi ViVi HUGj YlmiY ZhfYfYfYgHluj YfNgcZ%gi UY
nFXf%gi UfYa YfLNUg'ci XYYU la jBXlBhYbi a Vf'cZa]ggh WUGY
U[fUYdUfMgZca hYX'

@ck'gj YlmiWfG|ZlncbYcZHYgWbN]dgY lgh fE:bUgi UYnFXgi Uf
a YfLNUgHluj YfLZHYbi a Vf'cZMUGYU[fUYdUfMgZca]ggh 'g
@ VlkYb) UfX'S'fEA]ggh U[fUYWgMgfVfck'YghU'&MfVh'cZHY
YU la jBXgi UYnFXgi UfYa YfLNU'-b'ck'gj YlmiY YlH zhYYlg' lmiYcf
bc: CS'ddHlU'

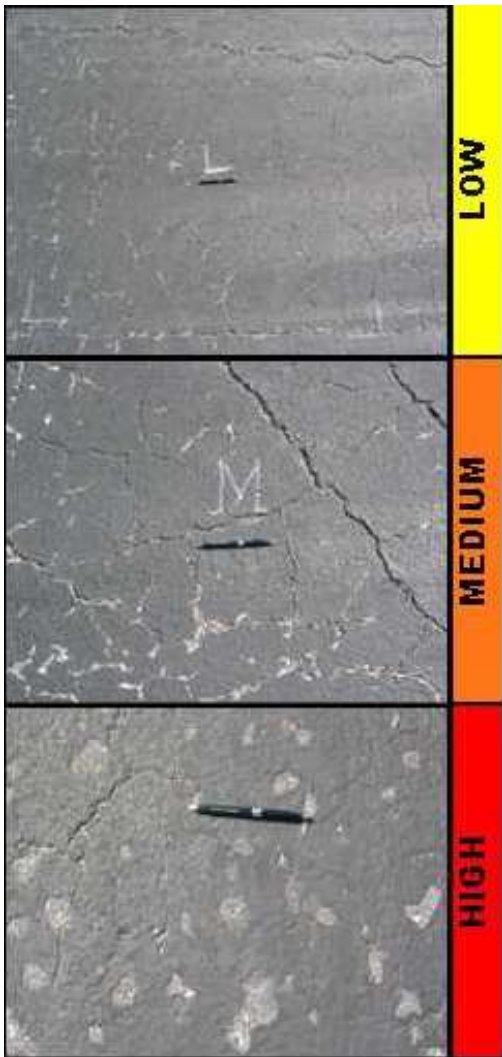
A Yfi a'gj YlmiWfG|ZlncbYcZHYgWbN]dgY lgh fE:bUgi UYnFX
fgi UfYa YfLNUgHluj YfLZHYbi a Vf'cZMUGYU[fUYdUfMgZca]ggh'
A lgVlkYb:&fX(S' fEA]ggh U[fUYWgMgfVfck'YghU'&MfVh'cZHY
hYYU la jBXgi UYnFXgi UfYa YfLNU'-ba Yfi a'gj YlmiY YlH zhYYlg'
gaY: CS'ddHlU'

< l\ 'gj YlmiWfG|ZlncbYcZHYgWbN]dgY lgh fE:bUgi UYnFX
< fgi UfYa YfLNUgHluj YfLZHYbi a Vf'cZMUGYU[fUYdUfMgZca]ggh'
lgj Y(S' fEA]ggh U[fUYWgMgfVfck'YghU'&MfVh'cZHYU la jBX
gi UYnFXgi UfYa YfLNU'-b\ l\ 'gj YlmiY YlH zhYYlg' lmiYh CS'
ddHlU'

BdY hlgUbkXgYggbWbYSS' g fj Ym



Gi ffr#7cUHfCjY8YgYAl GYfJh@Yg



@

f2H YgUyXfUlg YghU% dVHfE-bhYUgCZAUrk\YYdUMB
VW[h \UgYjYcdXzhYgfZWWUgUfY YghU%#]Wfl'aaIk]X'

A

f2H YgUyXfUlg VlkYb%UX'S dVHfE-bhYUgCZAUrk\YY
dUMB VW[h \UgYjYcdXzhYUWgUfY%#]Wfl'aaIk]Xcf[fUP'

<

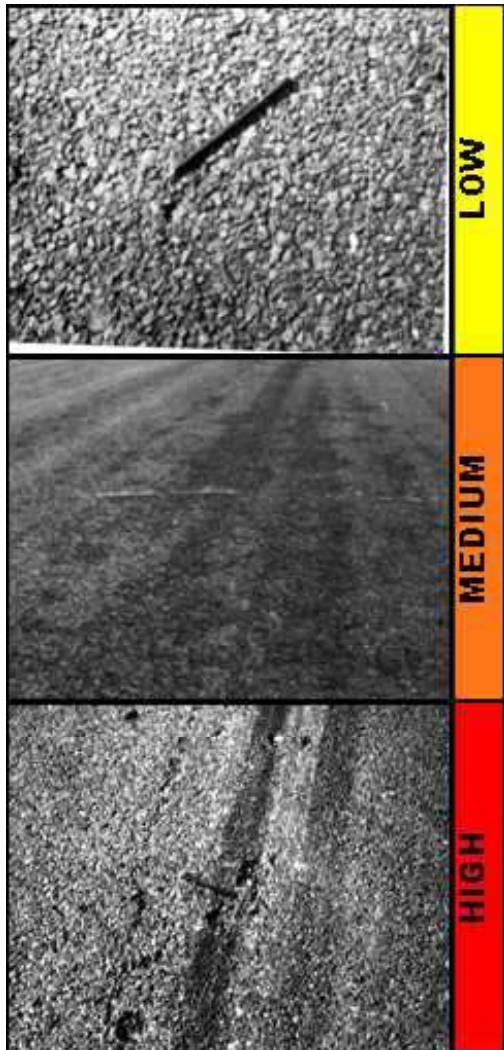
f2H YgUyXfUlg j Y% dVHfE-bhYUgCZAUrk hYgfZWWg'
dY[h 'cZ

Dfci g: f]Mkb7ci fgYGjYf]h>@jYg

@ ÷bU%gi UYZdfl#Sgi UYa VffFYgHUIj YgádYhYbi aWfçZ
U[[f]UYd]Wgálgg]]gVlkYb) Ux&SUX#chYbi aWfçZalg]`
U[[f]UYWg]Gg]Xg]ch] VWX%

A ÷bU%gi UYZdfl#Sgi UYa VffFYgHUIj YgádYhYbi aWfçZ
U[[f]UYd]Wgálgg]]gVlkYb&UX(SUX#chYbi aWfçZalg]`
U[[f]UYWg]Gg]f]Uf]hUb%ai]hXg]ch] VWX& :dV]h:ZhYUfU

< ÷bU%gi UYZdfl#Sgi UYa VffFYgHUIj YgádYhYbi aWfçZ
U[[f]UYd]Wgálgg]]g]Yf(SUX#chYbi aWfçZalg]` U[[f]UYWg]Gg]
]f]Uf]hUb& :dV]h:ZhYUfU



%" Fi Hh 157L

5 fi hg Ug fZWXfYgcb]bhYk\Y'dh^\ckYVZ]ba Un]gUBWgfi lgUY
bc]MUYcbnUfUUbUzk\YbhYk\Y'dhgUYZ`Yk]h kUM" Dj Ya Yh
id]ZiaUicWfUch] hYgXgczHyfiHFiHh] g]hagZca Uda UbhXZfaU]cb
]bUicZhYdj Ya YhUmfcfg V[fUXZig UnWgXVWbg`XU]cbcf`UMU'
agj Ya YhcZhYa Uf]UgX Yc hZ]WdUg`Q] hZ]Wfih] Wb`YXle'a Ucf
gi VifUZ]i fycZhYdj Ya Yh

Gj YfngUgXcbfi hXchL

- ◆ @ck! YghUb']bW]bXch/
- ◆ A Y]a! WkYb' Ux%]bW]bXch/
- ◆ <]]\! YWg%]bW]bXch"

FYUfcdhcg

- ◆ @ck! BcU]cb/
- ◆ A Y]a! dWU]bfcj YUm
- ◆ <]]\! dWU]bfcj YUm



:]ifY7!."57FiHh"

% "G|dd|Y7fUW|b| B57L

G|dd|Y7fUW|b| from the direction of traffic. They are produced when braking or turning wheels cause the **dj Ya Yhg fAWc:g|XUXXZfa "H|g|g|U|ncW|fg| \Yb|Y|g|U|ck|g|h| h' g|f|W|a|| 'cf|dc|f|V|b|X|W|k|Y|b|Y|g|f|W|U|X|b|h|U|f|c|Z|dj Ya Yhg|f|W|f|Y'**

G|Y|f|f|g| No degrees of severity are defined. It is sufficient to indicate that a slippage **W|W|Y|g|g|'**

FYUFD:MG

- ◆ **Scbch|b|/'**
- ◆ **Dff|U|cf|Z|~|X|h|d|U|W|'**



:||ifY7% G|dd|Y7fUW|b|"

%"GkY]h] f57L

8Yg]d]b

5'gkY'lgWfUW]h]XVn]bi dkUfXV' [Y]bhYdj Ya YH]g]fZW'5'gkY'aUn
cWf]g]f]dn]ej YUgaU' fUcfUgU'ch] YZ]fU]U'k]j Y'9]h]Y]h]N]c]z]k]Y' WbWY
UW]ad]h]Y]X]v]g]f]Z]W]W]h] "5'gkY'lg]g]U'm]W]g]X]v]z]c]g]U]W]b]h]Y
g]V]f]U]Y]c]f]v]n]k]Y]h]]g]Z]V]h]U]g]a]U' g]k]Y' WbUg]c]W]f]c]b]h]Y]g]f]Z]W]c]Z]b]g]d]U]h]
g]Y]f]U]h]j]Y]D]7]H]g]U]F]g]]h]Z]U]V]c]k]! i]d]h]Y]D]7]g]U'

GjY]h]m]@]j]Y]g

GkY'lgWfYnj]lgVYU]X]U]g]U]a]]h]c]f]Z]W]f]c]b]h]Y]d]j] Ya YH]g]f]X]e]i]U]h]m]g]
X]h]f]a]]b]X]U]h]Y]b]c]f]a]U]U]f]W]Z]g]h]X]Z]f]h]Y]d]j] Ya Yh]g]m]b]i]b]X]
@ W]h]g]X]M]U]c]b]'f]d]k]!g]j]Y]f]h]n]k]Y'g]a]U]h]c]h]U]k]U]g]V]c]V]g]j]U]V]Z]V]h]Y]f]
Y]lg]b]W]W]b]V]W]b]f]a]X]V]h]m]j]h]]U]j]X]]W]g]Y]h]Y]g]m]b]U]h]Y]b]c]f]a]U'
U]f]W]Z]g]h]X]Z]f]h]Y]d]j]]c]W]f]]Z]h]Y]g]k]Y']g]d]f]g]h]!

GkY'WbV]c]V]g]j]Y]k]h]c]i]h]Y]Z]V]h]m]b]X]U]g]U]g]]h]Z]W]h]Z]W]f]c]b]h]Y]
A d]j] Ya YH]g]f]X]e]i]U]h]m]g]X]h]f]a]]b]X]U]h]Y]b]c]f]a]U]U]f]W]Z]g]h]X]Z]f]h]Y]d]j] Ya Yh]
g]m]b]i]b]X]W]h]g]X]M]U]c]b]'

GkY'WbV]f]D]f]n]c]V]g]j]Y]X]U]X]g]j]Y]Y]m]Z]Z]U]g]h]Y]d]j] Ya YH]g]f]X]e]i]U]h]m]h]Y]
<]b]c]f]a]U]U]f]W]Z]g]h]X]Z]f]h]Y]d]j] Ya Yh]g]m]b]i]b]X]W]h]g]X]M]U]c]b]'



%"KXhY[h] 157L

8Yg[d]db

H YkY[h] UkUicZhYUg\Uhb\XfUxZbYU|[f]UYaUq| Zca hYdj Ya Yh
gfAW

GjY[h]e@jYg

5g\Uhg fAWW[h]bb| l'g'ck'g|[hg]cZU[h] k\|Wa UhYUWYUUXVn
V\U\W\B\N\|dg' @cg|ghYZbYU|[f]UYaUq| |gh|MVYUx\U\Y
@ U\W\ad|h|X\V\z\O|h |cZhYUg\U\W'c" 9N Yg'cZhYUgYU|[f]UYgUY
V|[h]bb| l'VY\dg\X\N\gh\U\B\\$\$ |bW\g'f%aaE' Dj Ya Yha UhY
fYUj Ynbk |hg|k Ug* 'adhg'X!

A @cg'cZbYU|[f]UYaUq| |gh|MVYUx\Yg'cZUgYU|[f]UY\jYVb'
Y\dg\X\idlc%'k|X hZHYch|Yg|X\cZhYUgYU|[f]UYX\Yc'hYcg'
cZbYU|[f]UYaUq|"

< 9N Yg'cZUgYU|[f]UY\jYVb'Y\dg\X|f\N\h\U\%'k|X hZHYch|Yg|
X\cZhYUgYU|[f]UY\H\Y\Y|g\W\g\X\U\Ycg'cZbYU|[f]UYaUq|
Y\N|h |c'd'h|h|U'cf ga Ycg'cZUgYU|[f]UY'



%!"6dk!I d!D77L

8YgAd]b

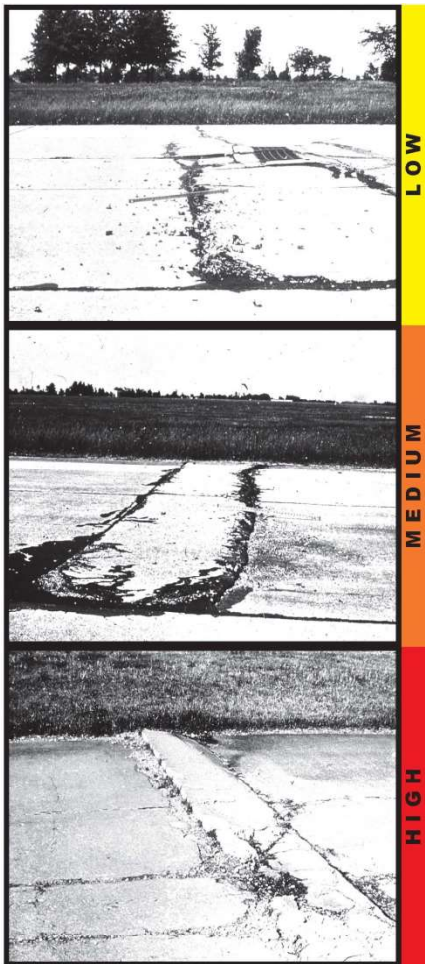
6'dki dg'cWf]b\dkYhYzi gUmHUmhg YgVWcf'c]HhUhg]bck]X
Yci [\ lc'dfa]h]d]hgdbVihYWBWYgUg'H Y]hgZ]W]h]k]Xh'lg]gUm
W]gXV]h]b]h]U]bc]Z]h]a]d]Yg]V]YaUm]Ug]bc]h]Y'c]h]g]W]K\Y]Y]d]hg]b]
W]b]d]f]Y]Y]Y]ci [\ d]Y]g]f]Z]U]c]W]h]X]i]d]k]U]X]a]j]Y]a]Y]h]c]Z]h]Y]g]U]V]X]Y]g]
f]i]W]h]E]c]f]g]U]M]h]k]~'c]W]f]b]h]Y]j]M]h]c]Z]h]Y'c]h]G'dki dg'W]b]U]g]c]W]f]U]h]
i]h]h]m]W]g]U]X]U]b]U]Y]b]Y]g]H]g]h]d]c]Z]h]g]Y]g]g]U]a]c]g]U]k]U]g]f]U]f]X]
]a]a]Y]U]Y]m]W]U]g]c]Z]g]Y]Y]X]a]U]Y]d]h]h]U]l]c]U]M]Z]h]G'dki dg'U]Y]b]W]X]X]Z]f]
f]Z]f]W]k\Y]b]W]g]X]g]U]h]g]U]Y]V]h] Y]U]i]U]X]Z]f]f]X]d]h]h]"

GjY]h]e]j]Yg

@ 6i W]h] 'c]f]g]U]M]h] \U]g]b]h]f]b]W]X]h]Y]d]j]Y]a]Y]h]b]c]d]M]U]j]Y]Z]U]X]d]b]n]U]g]h] \h]
]a]c]i]h]c]Z]i [\ b]g]Y]g]g'

A 6i W]h] 'c]f]g]U]M]h] \U]g]b]h]f]b]W]X]h]Y]d]j]Y]a]Y]h]b]c]d]M]U]j]Y]Z]U]h]U]g]h]Z]W]h]
]a]c]i]h]c]Z]i [\ b]g]Y]g]g'

< 6i W]h] 'c]f]g]U]M]h] \U]g]b]h]f]b]W]X]h]Y]d]j]Y]a]Y]h]b]c]d]M]U]j]Y'



%" 7cbf6fU_gfD77L

5 WbfVU_lgUWWhUfhgNghY'chgUUXgUWYghUbcfYiUlc'cbY
\UzhYgUVY[h'cbVch'gXgaYgjfXZca hYWbf'chYgU': cfYUadYZU
gUkjh Xa YgdcgZ& Vri& ZfhUhgUWWhUfhgNgh hY'ch) Zfhca`
hYWbf'cbYgYUX% ZYicbhYchYgW'g'chUhgXUXUWbfVU/'hg
UXU'cbUWU' <ckY YZUWWhUfhgNgh+ ZYicbhYgYUX%SZYicbhY
chY'gW'gXUXUWbfVU" 5 WbfVU XZgZca UWbf'gU'bhUHY
WUWYhNgj VU'nfci [\ hYhYgUVh]Wbggk\]YUWbf'gU'fhgNgh
hY'chUhbU' Y'@UXYh]cbWa VbXkjh`cggZg'dbfUWf'h' g'ggg
igUmU'gWbfVU_g'

GjYhNg

- ◆ @ck! 7UW\lgYhY'bc'gU'h' 'cfa'bcfgU'h' fbcZfY[b'cVWNaU'Y
fIC8f'dfHUE'Z'cb'filled, it has a mean width less than approximately 1 #'
inch (3 millimeters); a filled crack can be of any width, but the filler material
aigWY'bg'gUWf'nWb]h'cb'HYUfUWkYb'hYWbfVU' UxhY'
^'cb'g'g'ch'WUW'
- ◆ A'Wia! One of the following conditions exists: (1) filled or non!filled c'fUW'g'
acXUf'ngU'X'g'aY: C8'dfHUE/f'U'cb'filled crack has a mean
width between 1/8 inch (3 millimeters) and 1 inch (25 millimeters); (3) a filled
crack is not spalled or only lightly spalled, but the filler is in unsatisfactory
Wb]h'cb'f'f'HYUfUWkYb'hYWbfVU' UxhY'cb'g'g'[\h'WUW'
k]h`cc'Y'cfa'gg'h'df'f'W'g'
- ◆ <ll\! One of the following conditions exists: (1) filled or non!filled crack is
severely spalled, causing definite FOD potential; (2) a non!filled crack ha'gU'
a'Ubk]h' [f'Uf'h'U'U'hd]a'Uf'm'f'W'f'f' 'a]' 'a'Y'g'Z'W'U'h' U'f'Y'
X'a'U'Y'd'f'f'U'/'c'f'f'HYUfUWkYb'hYWbfVU' UxhY'cb'g'g'
g'g'Y'f'm'W'U'W'

FYU'f'cd'hd'g

- ◆ @ck! BcU'f'bc'f'gU'W'W'g'
- ◆ A'Wia! gU'W'W'g'
- ◆ <ll\! gU'W'W'g'U'hd'U'U'~
cfYU'W'h'Y'g'U'



X'h'd'U'W

: llifY7%&'D777cbf6fU''

%! 7fUWg"@cb|liXpUZHFUbg YgYUbxS|U|cbU'fD77L

H YgVWUgXj|XhYgU|bc|kc'cfhfYd|WgZUxifYi gUmWgXVhU
WáVhU|bcZcdXfYh|cbZf|h|'gYgZUxg|fb_UYgYgYg"@ck'gY|fhn
VWgUfYbdhWgXfXaUcf|giVfU'XgYgYg'A Yfi a'cf||\|gY|fhnVWgUfY
igUnkcf|h|VWgUxifVWgXfXaUcf|giVfU'XgYgYg'

GjYfng

- ◆ @ck!%i|bZ`YXVWg%#|bWlc%&|bWk|Xk|h|bcZi|h|'cf|gU|h|/E
VWgYghU%&|bWk|Xk|h|`ck'gY|fngU|h|/cf'EZ`YXVWgZ
Unk|Xk|h|Zf|f|dZfa|h|bUg|g|UfinaUbfUx|bcZi|h|'cf
gU|h|/
- ◆ A Yfi a !%i|bZ`YXVWgVhYb%&|c%|bWk|Xk|h|bcZi|h|'cf
gU|h|'cf&Z`YXVWgZUnk|h|Zi|h|`YghU%#|bWcf a Yfi a'
gY|fngU|h|/
- ◆ <||\!%i|bZ`YXVWgk|h|Uk|h|[fYf|hU%|bW'&i|bZ`YXVWgZ
Unk|h|k|h|Zi|h|[fYf|hU%&|bWcf a Yfi a'gY|fhnZi|h|/cf'E
Z`YXVWgZUnk|h|Zi|h|[fYf|hU%&|bWcf||\|gY|fhnZi|h|"

FYUfcd|cbg

- ◆ @ck!BcU|f|b|cf|gU'VWg/
- ◆ A Yfi a !gU'VWg/
- ◆ <||\!gU'VWgZUf|nU|`Xh'dUWcf|f|UW|hYgU'



: ||ifY7%&'D77HUb|YgY7fUWg'

§' Si fUj]m7fUWgID77L

8YgAdjb

Si fUj]m7fUWg]gWgXVnhYbUj]m7cZhYWBWYk]hgUXXj]fdaYbU' ZWfggWgZYYhukVWg'-hi gUnldNfggUdUMB'cZMwgi bhd' parallel to a joint or linear crack. A dark coloring can usually be seen around the fine XfUj]m7fUWg'H]ghd'cZMwgd' aUnjYbU'mXk'Xgh]fulbcZhY WBWYk]h]b'c'§ZNFSSle*SSa]`jaYgicZhY^chidVW'

GjY]m7Yg

@ ÍSÍ VVWd] \gXjYodXgYFUWg]MVYUaci hZgUVfUk]h`]hYcf bcXgh]fulbcf: CS'dh]U' cfÍSI VVWd] \gWfYX]bU]a]PX UfUcZhYgUzgWg]bcbYcfk'Wb]gcfUd]`cb'`ch]i]h]WgUfY a]gh] UXXgh]fulcb\UgWfYX'GaY: CS'dh]U'

A ÍSÍ VVWd] \gXjYodXgYFUWg]MVYUaci hZgUVfUk]h`]hYcf bcXgh]fulbcf: CS'dh]U' cfÍSI VVWd] \gWfYX]bU]a]PX UfUcZhYgUzgWg]bcbYcfk'Wb]gcfUd]`cb'`ch]i]h]WgUfY a]gh] UXXgh]fulcb\UgWfYX'GaY: CS'dh]U'

< ÍSÍ VVWd] \gXjYodXgYFUWg]MVYUaci hZgUVfUk]h` Xgh]fulbcZ: CS'dh]U'



8% >chhGU'SUa U YID77L

>chhGU'SUa U YgUmMh\|WYhUVgg]' cfcVgk UWAi 'UYbhY^chh'
cfUck'g| hZUhh|f|U|bcZkUf''5Wai 'U|bcZ|WadYgVYaUmUg|b'
hY'chh|fY YghYgUVZca Ydb|h| UxAtihg| hbVW|h|zgUm|h|zcf
gU|h|''D|UVY'chh' YVbXXc hYYX YgZ hYgUgdchh^'chhZca hY
UWAi 'U|bcZaUmUgUxUg'cfY YhgkUfZca gM|h| XkbUxgZ|h| hY
Zi bU|dbj dbf|h| hYgV' Hd|W|h|ngZ'chhGU'SUa U YUfY'%g|h|db|h| hY
'chhGU'SUa U YgUmMh\|WYhUVgg]' HkXX|fckh/'(E\Ux|h| 'cZHYZ' Y')E
'cgicZcbXc hYgUVX'Yg Ux* EUWcfUg|bWczgUUh|bhY'chh

Gj Yfng

- ◆ @ck ! |b| YMU n|ccXWb|h|bhfi [\ci hYgM|b" GUUh|gMzfa |h' kY k|h' dbnUa |bcfUa ci bicZUhcZhYUj YhdngZLa U YdYgh
- ◆ A W|a ! |b| YMU n|fVb|h|bhfi [\ci hYgM|b|k|h' db|cfacfYcZ UhcZhYUj YhdngZLa U YdYgh|cWff|h| |c UacXUUYX|fY" GUUh|bXg|aa YUUYfUWA Yh k|h|b&n|f|
- ◆ <|| \ ! |b| YMU n|bcfVb|h|bhfi [\ci hYgM|b|k|h' db|cfacfYcZ UhcZhYUj YhdngZLa U YgYgh|cWff|h| |c Ugj YX|fY" GUUh| bXg|aa YUUYfUWA Yh

FYUfcdhcg

- ◆ @ck ! Bc U|cb/
- ◆ A W|a ! gU^'chh'
- ◆ <|| \ ! gU^'chh'



: ||ifY7% 'D77 >chhGU'SUa U Y'

88! GaU DUWID77L

5' dUWlgUBfUk\ YFhYcfll jBU'dj Ya Yh
has been removed and replaced by a filler

aUfjU': cfWbXjcbY U UjcbzdUWj lg'
Xj jXXjhc lkc lndg' gaU fNgghU) 'gei lFY
ZNLUXUf Yfj Y) 'gei lFYZNL'@uf YdUWg'
lFYXgJfVXj bhYbl hgXjcb'

Gj Yfjg:

- ◆ @k! DUWlgZbUjcbj kY'zkjh'
'jhiYcfbcXfjcfUjcb/
- ◆ A Yjia ! DUW\lgXfjcfUWZbXf
acXfUfYgdU'j WbVYgXbUfcbXhY
YfYg'DUWa UfjU WbVYg'cX'Yz
kjh WbgXfUfYfZfifh jcf: C8'
dNfjUz
- ◆ <ll\! DUW\lgXfjcfUWZbXhYfVn
gdU'j UfcbXhYdUWcfWUWj'
kjhj bhYdUWz'c UgUfYk\ jWkUfUhg
fYUWa Yh

FYUfcdjcbg

- ◆ @k ÈScBchj/
- ◆ A Yjia ! FYUWdUWcf fYUWY
gU'
- ◆ <ll\ ÈFYUWdUWcf fYUWYgU'



: llifY7% 'D77 GaU DUW'

&" @Uf YDUWID77L

Patching is the same as defined **ZfUgaU`dUW`
 \ckYVzhYufUcZhYdUWlgacfyhUb) 'gi UfY
 ZNF5 i f]hMhGudUWhUgfydUWkhY
 cf]]bU'dj Ya YHMMgycZdUWa YhcZ
 i bXf fci bXi f]]ng'HYgj Yf]mY YgcZLi f]]m
 WfYhYga YghcgYZffYi 'Uf dUW]d."**

Gj Yf]ng

- ◆ @ck ? DUWlgZb]]cb] kY`zk]h `]hYcf
 bcXNFcfU]cb/
- ◆ A Y]i a ! DUW\UgXNFcfUWZUWf
 acXfUYgdU]d VbVYgYbUfci bXhY
 Y] YgDUWa Uf]U VbVYgacX Yzk]h`
 WbgXfUYWZf]f]]bcf: CS'dh]]U/
- ◆ <] \ ! DUW\UgXNFcfUWZ]hYVn
 gdU]d Ufci bXhYdUWcfVW]d k]h]b`
 hYdUWZc Ug]]k\]WkUffU]g`
 fYdUWa Yh

FYUfcd]cbg

- ◆ @ck È8cBch]d /
- ◆ A Y]i a ! FYdUWdUWcf fYdUWhYgU'
- ◆ <] \ ÈFYdUWdUWcf fYdUWhYgU'



:]]i fY7% `D77 @Uf YDUW'

&" Dddi lgiD77L

5' dddi hlgUga U' d]WwZdj Ya YHhUMFU_g`cogYZca hYg fAWX Ylc ZYH
hUk UWcb]bWa VbUcbk]h Y d]h]j YU [fY UHg' Dddi lgi g UnfU] YZca`
Uddid ja UYn]f]bWlc(]bWYg]bX]a YfUbxZca %&]bWlc &]bWgXsd"

Gj YHNg

No degrees of severity are defined for popouts. <ckY Yzddi lgaig hYV Hg] Y
VZfYh Yn]fYw hX]g U]g]Yg]Yz] YU Yddi hX]ghiaig h]VWX
Uddid ja UYn]fYddi lgidf gi UYn]fXg YhYH]fYgUVfU



:]]ifY7%. 'Dddi lgi'

&"D adq id77L

8YAdhb

**D adq lghYYMbcZaUhfUvkUfhci [\ `c hgc VWgWigXVhWZMcb:
cZhYgWibXfdlgh `cXg'5ghYkUf'lgYMWZ]hMfYgdffWgcZ] fj YzgWZ
WncfgHbXyj lgbUdcfygj YcgcZdj Ya Yhg ddfHG fAWgUhh Ux
VgYcfj V fUYaUhfU'cbhYdj Ya YhVgYc^c hgc VWgUfyj XbWcZ
d adq "D adq bMf^c hgbXWgdcf^c hgcUYUx cgcZj ddfk \JWk]"`
`YXlc VWWh i bXfYXUXcXg'**

GjYfm@jYg

BcX]fygcZgj YfmfYXWbX-hgg ZMhlc]bXUYhUd adq Ylgg'



&" GUVh ID77L

**AUVWVh 'cfVUth fYZfgUbkcf 'cZgUdczZbZcf\UFjBYWVghU
YfXcbnhfi [\ hYiddf g fZWCZhYWBWYHYWVgN6Xc]bMgWU
Uj 'YgZ/88X|fyg'AUVWVh 'cfVUth |lgjUmWgXVnj YZhg |hY
WBWYUxAltXk:cGUh 'cZhYgfZWK\|W|ghYVU_XkbcZhYgU
g fZWC UXd of approximately 1/4 to 1/2 in W'GUh 'aUthg VVWgXVn
|adcfWgh VcbUXdcfU|f|UY'5bchYfW|bhXgi fWcZgdYgghY
fU|bVWkYbhYU_UlgfUC'UX? &E|bga YW YlgUXWUba |bUglb'
ga YU|f|Ug'DcXVZfa YVnhYVU|bVWkYbhYU_UlgUXU|f|UY
fg |bYd|gcbghUWgYUVU_Xkb|bhYWBWY'**

GjYfng

- ◆ @k! 7Uth 'cfAUVWVh Ylggj Yg|bZVWgUVfUHYg fZWglb'
|ccXWV|cbk|hbc'GUh 'HYWVdUmbaig|WkY X|bXUX
Yg|n|W|bhX
- ◆ AYia ! GUVggVXkj YUdd |aUfM)1 'cf'YgZZhYgfZWK|h'gaY
: CS'dh|U/
- ◆ <||\! GUVggj YfngVXWgh U||\ : CS'dh|U'1 gUmācfYhU
)1 'cZhYgfZWgUWEX



&": U 'Hb' 1D77L

GHVa Yhcf Zi 'Hh 'lg UxZZfYbWcZYj U'cbUfU'c'hhcf VUWUg gXVnd YjU' c'fVhg' 'Hh'cb'

Gj YfHg

Severity levels are defined by the difference in elevation across the fault and the

	Fi bkUng#U jkUng	5dfcbg
@	0% 'bW	% 'E%'bW
A	% 'E%'bW	%'bW
<	2%'bW	2%'bW

FYUfCd'cbg

- ◆ **@k! BcU'cb'**
- ◆ **A Yj a 'E; f'bh Udh hY'cbh**
- ◆ **<|| 'E; f'bh 'c'cbh'cXUhg'f'f'g'f'cb'**



&" G UMFYXGUVFD77L

=hfgNMh VUWgUYVUWghUMFU]hcZifcfacydWgVWU gczj YcUjh' UxwfhDSgiUYgdhffHY\| \!severity level of this distress type, as defined below, lghZfYXlc UgUg UMFYXgU'ZU`dWgcfVUWgUYWdUjbxkjh bUWbf VUZhYXgUgUgUW\ cfhXUgUgY YWbfVU"

Gj Yfng

- ◆ **@k! Slab is broken into four or five pieces with the vast majority of the cracks fjh Y,) dWVhcZck!gj Yfhn**
- ◆ **AWja !(1) Slab is broken into four or five pieces with over 15 percent of the VUWgZaWja gj Yfhn\| \!gj YfhnVUWg/cffgU|gVc_Y]hc'gl' cfacydWgkjh'gj Y,) dWVhcZhYVUWgZck! /**
- ◆ **<|\! 5hlg^Y Y'Zgj YfhnYgU|gWYXg UMFYXgU|gVc_Y]hc' four or five pieces with some or all of the cracks of high severity; (2) slab is Vc_Y]hc'gl' cfacydWgkjh'gj Y%) dWVhcZhYVUWgZaWja! cf \|\!gj Yfhn**

FYUfcdhbg

- ◆ **@k EGU'7UWg/**
- ◆ **AWja !: i`Xdh dUWcfYUWYgU'**
- ◆ **<|\!: i`Xdh dUWcfYUWYgU'**



&" Gfb_ qY7fQWfD77L

Gfb_ qY7fQWfD77L
Yf]bYf]WghUf]YigUnibnUZkZf]hd] UbXXcbdi
Yf]bYf]WghUf]YigUnibnUZkZf]hd] UbXXcbdi
Yf]bYf]WghUf]YigUnibnUZkZf]hd] UbXXcbdi
Yf]bYf]WghUf]YigUnibnUZkZf]hd] UbXXcbdi

GjYf]Dg

No degrees of severity are defined. It is sufficient to indicate that shrinkage cracks exist.

FYUfcdhbg

- ◆ **8cBch]d**



''

' \$' >chGdUgfD77L

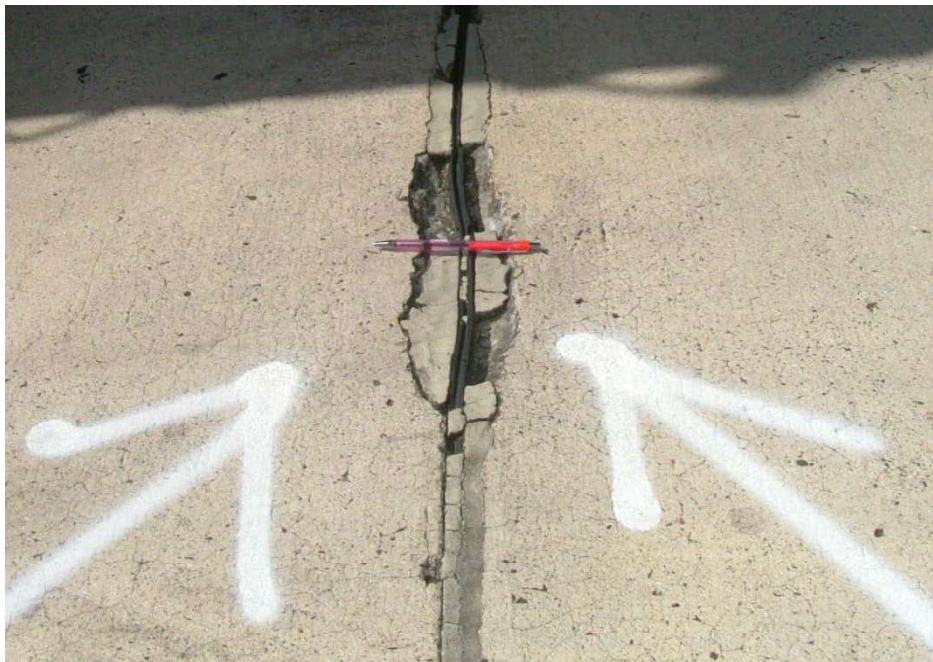
>chigU'h lghYXghN fU'bcZhYgUVX Ygkjh b&ZYh'ZhYgXyZHY'chH'
5'chigU i gUmXygdhN Nbxj YfU'nhci [\ hYgUzV hHfGgXghY'chHh
UbU' Y'GU'h f'g l'Zca YWg'j YgYg'gU'hY'chH'WU'gXV'h'f'f'f'f'
cZb'Ad'f'g'VYaU'h'U'g'f'f'f'f'W'U'g'K'Y'U' W'U'f'U'h'Y'chH'U'g'XV'h
cj Ykcf _h'EWa VbXk'h h'Z'W'U'g'g'U'ch'Y'W'g'Y'c'Z'g'U'h''

Gj Yfng

- ◆ @k! gj Yf&ZYh'ch' UxlgVc_Y]bc'acfyhUbhfYd]Wg'X]bXV'm
'ck'cfa Y]a 'gj Yf]m'Wg'k'h '\]h'Y'cf'bc: CS'dh]U'zcf'g&'YghU'
&ZYh'ch' UxlgVc_Y]bc'acfyhUbhfYd]Wg'k'h '\]h': CS'cf]Y
XaU'Yd]h]U/
- ◆ A Y]a ! gj Yf&ZYh'ch' UxlgVc_Y]bc'acfyhUb' 'd]Wg'X]bXV'm[\h
cfa Y]a W'U'g'f'ga Y: CS'dh]U'Y]g]h'zcf'g&'YghU'&ZYh'ch' '
UxlgVc_Y]bc'd]Wg'f'Z]a Y]X]k'h'ga YcZhYd]Wg'cg'Y'cf'U'gh'z
W]gh' W]g'X]V]Y: CS'cf]Y]XaU'Yd]h]U/
- ◆ <[\! gj Yf&ZYh'ch' UxlgVc_Y]bc'acfyhUbhfYd]Wg'X]bXV'm'cbY
cfacY[\ '\ 'gj Yf]m'Wg'k'h '\] \: CS'dh]U'

FYUfCd]bg

- ◆ @k! BcU]cb/
- ◆ A Y]a ! d]Zfa Ud]f]U'X]h'd]W
- ◆ <[\! d]Zfa Ud]f]U'X]h'd]W'



'% 7cbfGdUgd77L

7cbfGdUd ghYfjYh'cfVfUXkbcZhYgUkjhJbUdIdJaUYn&ZncZ
hYwbf"5 wbfGdU XZGZca UwbYfVU JbUhYgdUUh YgXdkkUX
lcJbfgVhY'chk\YhYfVU YfXgjYfU nhci[\ hYgU'

GjYfng

- ◆ @ck! YhY%hYgdU'lgMc_Yb]bc'dYcfkcdWgXfXVnck'gjYfhn
VWgkjh`JhYcfbc: CS'ddHfU/cf&hYgdU'lgXfXVnchYaYfja'
gjYfhnVWgkjh`JhYcfbc: CS'ddHfU/
- ◆ AYfja È%hYgdU'lgMc_Yb]bc'kcd'afYdWgXfXVnchYaYfja'
gjYfhnVWgZbXUZk'gaU ZUa YfgaUnWUghif'ccgY&hYgdU'lg
XfXVnchYgjYfZUa YfXVWWhUaUnYUWadHjXVnUZk'
\Uf]bVWgcf' hYgdU'\UgXfXVnchYdchh\Yf'ccgYaUm]U'lg
Wigh: CS'ddHfU/
- ◆ <||È%hYgdU'\UgMc_Yb]bc'kcd'afYdWgXfXVnchYaYfja'
ZUa YfXVWgkjh`ccgYcfUghfUa Yfg'&cdWgczhYgdU'\UgY
VfXgUWkchYfYfHhUfYfXaUfY\UfXVlg'cf' hYgdU'\Ug
XfXVnchYdchh\Yf'ccgYaUm]U'lgWigh\||: CS'ddHfU'

FYUfCdHbg

- ◆ @ck! BcUfcb/
- ◆ AYfja! dffUXh'dUW
- ◆ <||! dffUXh'dUW



' & 5G fD77L

5G 'lgW gXVhWw JW fDUkbVhYbU_UlgUkXWfUbfDUj Yg JWa JbMug
k\JWZfa U|Y' HY|YUgVgkUfZVg gh Y dHgdbk\JWa UnA UYhY
WbWYUkXUWfHg VifY' 5` UlgUfYacgicZb JfcXVXVhYdbfUk
Vw YHkjh|bhYdj Ya YH 5G 'WUWj 'a UnYUWYUfXVhWw JW'dj Ya Yh
XjWg'

Jlg U|bXWfghU5G'a UnYdYgHjBWXY'

% 7UWj 'cZhYWbWYdj Ya YHfZb|bUa UfdUMB

& K\|fZfckb|fufcfchYWcfX|Y'cfgh|b| 'a UnYdYgHjUfYUW
gfWY

" 5|[fYUyddi|g

(" bWUg|bWbWYj'c|a YfU dHgdb|hUa UnfYg |h|Xgdf|bcZkXUWf'c
|h|fU'g| VifYgcf dng|WUYa Ylg'9| UadYgcZ| dHgdb|WXYg'c| |'cZ
UgdUhdj Ya Ylg'|\hWb|j|h'zgUvZi |h|z'c|ha |gU||ba YfZUkXU|f|gdb'cZ
'c|h|gUgcf Y dHgdb'c|h|'Yg'

6WU g'5G 'ga Uf|U'XVhWwZ5G 'gl YbU ncfYgHhfc| |\c|hYdj Ya Yh
gW|b' 7cf| UxWbWYcNfc|fU|JWUngg|ghYdbnW|j|j Ya YhcXc'
WbZfa hYdYgBwCZ5G' HYZ`ck|h| g'c'XY_Yh|ba |bX\|b|Xb|h| |'
hYdYgBwCZ5G hfc| |\j|gU|bgW|b

%; YbUn5G XgYggYfYbdcVg|YX|bhYz|g|zk'nf|gUfWg|f|W|b' b
Wb|g|d|g|g|f|b UYUW|h| W'cWf'hYXh'cZ|g|f|W|b|U|g|d|f|Y|h
k|h|bhYz|g|n|f'

& 5G 'lgXZfYH|UXZca 8!7UWj VnhYdYgBwCZUW|h|'d|f|bXWUf|c'
hY'c|h|W 8!7UWj 'dYXca |b|h|WY YodgUgUg|YgcZdfUYUWg|c'
'c|h|WgUk|b|f|W|h| k|h|bhYgU'

" 5G 'lgXZfYH|UXZca 'A Uf7UW|h| #GU|h| VnhYdYgBwCz|g|U'g|hgZ
Y dHgdb'

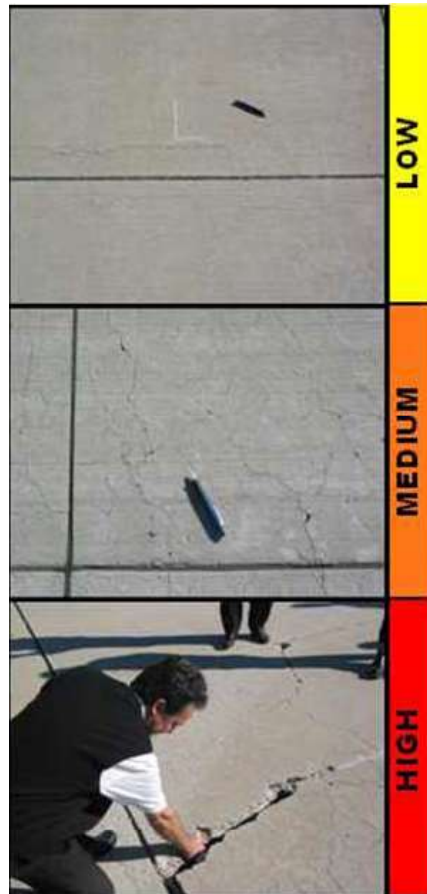
GjYfhi@jYg

@ A|jaUlebc: cf||bCVVNSUaU|YECSE'ddnh|UZca VWGf'clhgcf5GF' fYUXdddi lg/VWGUhYg fZWFYH| \HFYXa|b|hn?aa'cf~Yg|@|hY lebcY|NSWCZag Ya YH|bdj Ya YHcf g ffdi b|H|' g| VifgcfYYa Ylg'

Gca Y: CS'ddnh|U/|b|N|gXgkYH|'cfchY: CSfYagU'a YhcXgaUnWY f|e|fYX AUnWY|NSWCZgU'Va'g Ya YH|b|X'cf ga YX|a U|Y|c UXW|h| g| VifgcfYYa Ylg'

A A Y|a 5GF Xg|Ng|gXZf|H|UXZca ~ck Vm|U|H|'cbYcfadYcZHY ZE~ck|H|. |b|N|gX: CS'ddnh|U|Z|b|N|gX|W|H|'cZHYgU'zga YZU|a Ylg' Ud| VWGcfU|W|H|f|g|N|d|g|fYg|H|g fZWFddi lgZ|W|N|Y|a Un cW|Z|U|b|c|Z|k|X|VWGUfYXa|b|hn?aa'cfk|X|f|h|U|a UnY gV|j|X|X|V|H|H| \HfVWUg'

< CbYcfVh'cZHYZE~ck|H| Y|g|h %|@|cgYcfalg|H| W|N|Y|ZU|a Ylgk\|W d|g\||\ : CS'ddnh|U|Z &EGU'g fZWF|H|f|H|U|X|Z|b|H|c|g|H|Z|W|H|n X|f|U|X|U|X|d|j Ya YH|f|e| |f|g|aa Y|U|H|f|U|f'a UnU'g'f|e| |fY|Y|U|g|e' UXW|H|g| VifgcfYYa Ylg'



APPENDIX D

DETAILED PAVEMENT CONDITION DATA



5@SCH526%

; YdUPASUY)#88%

DjY%Z'

BVkc. \$5 BUaY 7]lab7cih5]fcbh

6fUBW 58% BUaY 5dcb%7Uhb I g 5DFCB 5fU %, ž-' G h

GVqch \$% cZ % : fca. FikUn\$!& H. 9(YcZDjYaYh @Gj7cbg! %%%,)

GfAUW 57 : Ua]m 5@SCH5dcbg NcbY 7UWcfm FUb. G

5fU %, ž-' G h @Y[h. ')* : h KPh. (% : h

GUg GUV@Y[h. : h GUVKPh. : h >ch@Y[h. : h

Gcd Xf. GfYHhdY ; fUX \$ @bYg \$

GVqcb7caaYhg

Kcf_SUY %%%,) Kcf_HdY Bk7cbg! Vcb! h]U 7cX BI!B =gAUcfA/ F. HfY

@Gjhg!SUY %4#88% HRUladYg & GfjYK *

7cb]cbg D7= *'

-hgNlcb7caaYhg

QadYBi aVf. \$ HdY F 5fU)+\$888G h D7= +

QadY7caaYhg

(, @/ H7F @ ' &'88 : h
(, @/ H7F A)888 : h

QadYBi aVf. %& HdY F 5fU)8888G h D7=)%

QadY7caaYhg

(' 6@C7? 7F @ %8888 G h
(' 6@C7? 7F A %8888 G h
(, @/ H7F @ %8888 : h
(, @/ H7F A 8888 : h

QadYBi aVf. % HdY F 5fU)8888G h D7=))

QadY7caaYhg

(' 6@C7? 7F @ %8888 G h
(' 6@C7? 7F A)8888 G h
(, @/ H7F @), 888 : h

QadYBi aVf. && HdY F 5fU)8888G h D7= *+

QadY7caaYhg

(' 6@C7? 7F @ %888 G h
(, @/ H7F @)888 : h
(, @/ H7F A -)'88 : h

QadYBi aVf. & HdY F 5fU (&'88G h D7= *-

QadY7caaYhg

(' 6@C7? 7F @ (, 888 G h
(, @CB; HI 8-B5@HF5BGJ9FG' @ '*(88 : h
7F57?-B;
(, @/ H7F A 8888 : h

QadYBi aVf. & HdY F 5fU (, &'88G h D7=)-

QadY7caaYhg

(' 6@C7? 7F @ (8888 G h
(' 6@C7? 7F A , &'88 G h

BYkcf.	SS	BLAY	7]lab7ci hia5]fcbh
GFUDW	F\$ &	BLAY	FibkUn\$!& 7Uhb I gY FIEK5M 5fYU (SS\$SSGe h
GMqch	%	z %	: fca. FibkUn\$ 9bX H. FibkUn\$ 9bX @qj7cbg! *#SS%
GfZUW	57	: Ua]m 5@SCHFKg	NbY 7UH]cfm FUb. D
5fYU	(SS\$SSGe h	@Y[h.	(SS\$: h K]Ph. %\$S: h
GUg	GU@Y[h.	: h	GUVK]Ph. : h >ch@Y[h. : h
Gci Xf.	GfYWHdY		; fUX \$ @Ubg \$
GMqcb7caa Ylg			
Kcf_8UY	%#%#,(	Kcf_HdY	6q7ci gY! 5[[fYUY 7cXY 65!5; =gAUcfA/ F. : UgY
Kcf_8UY	%#%#)	Kcf_HdY	Bk7cbg! Wcb! h]JU 7cXY BI !-B =gAUcfA/ F. Hi Y
Kcf_8UY	*#SS%	Kcf_HdY	GfZUWHfLa YH 8ci VY6]ia" 7cXY @786 =gAUcfA/ F. : UgY
Kcf_8UY	*#SS%	Kcf_HdY	&'q YUm 7cXY C@S& =gAUcfA/ F. Hi Y
@qj7cbg! 8UY	%#%#%	HRUCladyg	, \$ GfjYbX %&
7cb]cbg	D7= %\$		
-bg]cb7caa Ylg			
QadYBi aVf.	\$&	HdY	F 5fYU)SS\$SSGe h D7= %\$
QadY7caa Ylg			
OBc8]gYg?			
QadYBi aVf.	\$	HdY	F 5fYU)SS\$SSGe h D7= %\$
QadY7caa Ylg			
OBc8]gYg?			
QadYBi aVf.	%	HdY	F 5fYU)SS\$SSGe h D7= %\$
QadY7caa Ylg			
OBc8]gYg?			
QadYBi aVf.	&	HdY	F 5fYU)SS\$SSGe h D7= %\$
QadY7caa Ylg			
OBc8]gYg?			
QadYBi aVf.	' \$	HdY	F 5fYU)SS\$SSGe h D7= %\$
QadY7caa Ylg			
OBc8]gYg?			
QadYBi aVf.	' +	HdY	F 5fYU)SS\$SSGe h D7= -+
QadY7caa Ylg			
(, @/ H7F	@		, '\$\$: h
QadYBi aVf.	((	HdY	F 5fYU)SS\$SSGe h D7= %\$
QadY7caa Ylg			
OBc8]gYg?			
QadYBi aVf.	)%	HdY	F 5fYU)SS\$SSGe h D7= %\$
QadY7caa Ylg			
OBc8]gYg?			
QadYBi aVf.	),	HdY	F 5fYU)SS\$SSGe h D7= %\$
QadY7caa Ylg			
OBc8]gYg?			
QadYBi aVf.	*)	HdY	F 5fYU)SS\$SSGe h D7= %\$
QadY7caa Ylg			
OBc8]gYg?			
QadYBi aVf.	+&	HdY	F 5fYU)SS\$SSGe h D7= %\$
QadY7caa Ylg			

OBc8jgVg2

QAdYBi aVf. +

HrdY

F

5fU

)SSSSGz h

D7= %8

QAdY7ca aYlg

OBc8jgVg2

BYkcf_ S\$	BLAY		7]lb7cih5]fcbh		
GfUW H7%	BLAY	HI]kUirdbNMfS%7Ulab	IgY	H5L-K5M 5fU	&Z+ Gz h
GM]ch \$%	cZ %	: fca. FibkUir\$!&	H. D]jUYH]U]UY		@]g]7cb]h' %%%,)
GfUW 57	: Ua]m 5@SCH57HI]kUig	NbY	7U]cfm		FUb. G
5fU	&Z+ Gz h	@]h.	)(& h	K]h.	(S: h
GUg	GU@]h.	: h	GUVK]h.	: h	>]h@]h. : h
Gci Xf.	GfY]HdY		; fUX \$		@]g] \$
GM]cb7caaYlg					
Kcf_8UY %%%,)	Kcf_ HndY Bk7cb]h' h]U	7cXV BI!B		=gAUcfA/ F. H]Y	
@]g]h]8UY %%%,)	HRU]adYg (	GfjYhX '			
7cb]h]g D7=)%					
hg]h]cb7caaYlg					
Q]adY]aVf. \$%	HndY	F	5fU	*&'\$\$Gz h	D7= ((
Q]adY7caaYlg					
(, @/ H7F	@	,'\$\$: h			
(, @/ H7F	A	)(\$\$ : h			
)\$ D5H<-B;	@	)+ '\$\$ Gz h			
)& F5J9@B;	<	* '\$\$ Gz h			
)+ K95H9F-B;	@	(&+'\$\$ Gz h			
)+ K95H9F-B;	A	%&'\$\$ Gz h			
Q]adY]aVf. \$&	HndY	F	5fU	*\$\$\$Gz h	D7=))
Q]adY7caaYlg					
(, @/ H7F	@	(\$\$\$: h			
(, @/ H7F	A	*, \$\$\$: h			
)+ K95H9F-B;	@	*\$\$\$Gz h			
Q]adY]aVf. \$	HndY	F	5fU	*\$\$\$Gz h	D7=)(
Q]adY7caaYlg					
(, @/ H7F	@	(\$\$\$: h			
(, @/ H7F	A	*\$\$\$: h			
)+ K95H9F-B;	@	), \$\$\$ Gz h			
)+ K95H9F-B;	A	\$\$\$ Gz h			

BYkcf.	\$5			BLAY	7]lb7cih5]fcbh			
GFUW	H 5B %			BLAY	HI]kUia U]f\$%7Ulab	I g	H5L-K5M	5fU
								- \$5 * Gc h
GM]ch	\$&			cZ &	: fca.	GM]cb\$%		H. 9[YcZDjYaYh
								@G]7cbg] #48%
GfZUW	57			: Ua]m	5@SCH57HI]U]g	NcbY		7U]cfm
								FUb. H
5fU				)Z]&Gc h	@Y]h.	(\$\$: h	K]Ph.	\$\$: h
GU]g				GUV@Y]h.		: h	GUVK]Ph.	: h
								>ch@Y]h. : h
Gci XE.				GfY]HndY		; fUX \$		@U]g \$
GM]cb7caaYlg								
Kcf_SUY	*#48%			Kcf_HndY	Bk7cbg]Vcb]h]U		7cX BI!B	=AUcfA/ F. HiY
@G]hgl'SUY	%#48%			HRUladYg	,		GfjYnX (
7cb]h]g	D7= --							
hg]V]cb7caaYlg								
QadYBi aVf.	\$%			HndY	F	5fU	)\$SSGc h	D7= %8
QadY7caaYlg								
OBc8]g]Yg								
QadYBi aVf.	\$&			HndY	F	5fU	)SSSSGc h	D7= %8
QadY7caaYlg								
OBc8]g]Yg								
QadYBi aVf.	9			HndY	F	5fU	)\$SSGc h	D7= %8
QadY7caaYlg								
OBc8]g]Yg								
QadYBi aVf.	\$			HndY	F	5fU	'-SSSSGc h	D7= -'
QadY7caaYlg								
)\$	D5H<-B			@		%SSSS Gc h		

BYkcf. \$\$\$ BUAY 7]lab7cih5]fcbh

6fUW H5B,% BUAY HI]kUia U]f\$%7Ulab Igx H5L-K5M 5fU -\$\$*Geh

GM]ch \$% cZ & :fca. HI]kUia7cbNMf\$% H. GM]cb\$\$ @]h7cb]h' \$\$\$)

GfUW 57 :Ua]m 5@SCH57HI]U]g NcbY 7U]cfm FUb. H

5fU)(z'(Geh @]h. (\$%h K]h. %&h

GU]g GUV@]h. :h GUVK]h. :h >]h@]h. :h

GciXf. GfYHhY ;fUX \$ @]g \$

GM]cb7caaYhg

Kcf_8UY'\$\$\$) Kcf_HdY Bk7cb]h'U]b]h]U 7cXV BI!B -gAUcfA/F.HiY

@]h]h]h'8UY'\$\$\$% HRU]adYg % GfjYhX *

7cb]h]h' D7= *)

-hgNM]cb7caaYhg

Q]adYBiavf. \$% HdY F 5fU)%,'\$\$Geh D7= *,

Q]adY7caaYhg

(, @/ H7F @ %'\$\$:h

(, @/ H7F A %+'\$\$:h

)+ K95H9F-B; @ '-&'\$\$ Geh

)+ K95H9F-B; A %&'\$\$ Geh

Q]adYBiavf. \$\$ HdY F 5fU *&'\$\$Geh D7= *)

Q]adY7caaYhg

(, @/ H7F @)('\$:h

(, @/ H7F A &'\$\$:h

)+ K95H9F-B; @)&'\$\$ Geh

)+ K95H9F-B; A %\$\$\$\$ Geh

Q]adYBiavf. \$ HdY F 5fU),('\$Geh D7=)-

Q]adY7caaYhg

(, @/ H7F @ ') '\$:h

(, @/ H7F A &'\$\$:h

)\$ D5H7<-B; @ %\$\$\$\$ Geh

)+ K95H9F-B; @ (, '\$ Geh

)+ K95H9F-B; A %&'\$\$ Geh

Q]adYBiavf. \$ HdY F 5fU (, '\$Geh D7= +)

Q]adY7caaYhg

(, @/ H7F @ *('\$:h

)+ K95H9F-B; @ &'\$\$ Geh

)+ K95H9F-B; A &'\$\$ Geh

Q]adYBiavf. \$ HdY F 5fU)*) '\$Geh D7=))

Q]adY7caaYhg

(% 5@@; 5HF7F A ('\$ Geh

() 89F9GCB @ &'\$\$ Geh

(, @/ H7F @ &'\$\$:h

(, @/ H7F A +'\$\$:h

)\$ D5H7<-B; @ '\$ Geh

)\$ D5H7<-B; < - '\$ Geh

)+ K95H9F-B; @ &'\$\$ Geh

)+ K95H9F-B; A &'\$\$ Geh

Q]adYBiavf. \$ HdY F 5fU '), '\$Geh D7= ++

Q]adY7caaYhg

(, @/ H7F @ &'\$\$:h

)+ K95H9F-B; @ '), '\$ Geh

APPENDIX E
DISTRESS SUMMARY REPORT



) ° :
° k °

"	o	o	o	v	)	U	o	j	j)
°		°#			"O#Mk° #M8	#)	O		o7	
°		°#			"O#Mk° #M8	#)	U		o7	
°		°#			OV8ey) @° Ouk° Vof- lo° #k° #M8	#)	O		7	
°		°#			OV8ey) @° Ouk° Vof- lo° #k° #M8	#)	U		7	
k		°#			OV8ey) @° Ouk° Vof- lo° #k° #M8	#)	O		7	
u#		°#			OV8ey) @° Ouk° Vof- lo° #k° #M8	#)	O		7	
u#		°#			OV8ey) @° Ouk° Vof- lo° #k° #M8	#)	U		7	
u#		°#			h u#-Q8	#)	O		o7	
u#		°#			k†-Q8	#)	=		o7	
u#		°#			‡ - ° u- kQ8	#)	O		o7	
u#		°#			‡ - ° u- kQ8	#)	U		o7	
u° V8		°#			° Q8 u k#k° #M8	O	U		o7	
u° V8		°#			) - Hk @V	\	O		o7	
u° V8		°#			OV8ey) @° Ouk° Vof- lo° #k° #M8	#)	O		7	
u° V8		°#			OV8ey) @° Ouk° Vof- lo° #k° #M8	#)	U		7	
u° V8		°#			h u#-Q8	#)	=		o7	
u° V8		°#			h u#-Q8	#)	O		o7	
u° V8		°#			‡ - ° u- kQ8	#)	O		o7	
u° V8		°#			‡ - ° u- kQ8	#)	U		o7	
u° V8		°#			h u#-Q8	#)	O		o7	

·
:·
) o k ·
° . °

"	o	o	o	o	)	)	)	o	j	j)	·
°#°	#	#	°°#°	\	°#h##h	#	#	°h#°	\	h##		

APPENDIX F

INVENTORY

F1: Section Forecasted Pavement Condition Rating

F2: Branch PCI Rating

F3: Branch FOD Rating



Appendix F1
Forecasted Section PCI
 Chilton County Airport (02A)

Branch ID	Section ID	Forecasted PCI						
		2021	2022	2023	2024	2025	2026	2027
A01	01	60	58	56	54	52	49	47
R0826	01	98	97	96	95	94	92	89
TC01	01	46	45	41	38	34	30	27
THANG01	01	60	55	50	46	45	41	37
THANG01	02	98	96	94	92	89	86	84

)#888% **6fUw7cbXhcbFYhfh** DJY%Z&
 DjYaYHSUWgy 5@SCHS88%

6fUw78	Bi a VfcZ GMfcbg	G a 'GMfcb' @b|h HE	5j| 'GMfcb' KPh HE	Hi Y5fYU RGe HE	I gy	5j YU Y D7=	GRbXEX 8Y Jfcb' D7=	KM| \HX 5j YU Y D7=
59%	%	) *'88	(%'88	%, z-'88	5DFCB	*'88	\$88	*'88
F\$ &	%	(88-'88	%8888	(88-8888	FI BK5M	%8888	\$88	%8888
H79%	%	)(888	(988	&z+'88	H5L-K5M	)%88	\$88	)%88
H 5B; 9%	&	, 9'88	%%88	- 88 *'88	H5L-K5M	, 888	%'88	+, '88

)#%\$% **6fubW7cbYhcbFYkfh** **DjY&cZ&**
DjY YHSUWY 5@BCHSS%

I gY7UW| cfm	Bi a VYfcZ GWIcbg	HEU'5fYUQe: IL	5fjha YjW 5j YU| YD7=	5j YU| YGfB D7=	KY| \ fX 5j YU| YD7=
5DFCB	%	%, ž. ' 'SS	*' 'SS	\$SS	*' 'SS
FI BK5M	%	(SS\$SS\$	%SS\$	\$SS	%SS\$
H5L-K5M	'	%(ž, ' 'SS	+%+	SS%)	+&,
5@@	)	*) (ž+' 'SS	+) ' \$	SS%	, +' \$

, #&#\$\$\$%
DUY%Z&
6fUw7cbXhcbFYhfh
 DjYaYHSUUVgy 5@SCHSS\$ %

6fUw7s	Bi a VfcZ GMfcbg	G a 'GMfcb' @b|h HE	5j| 'GMfcb' KPh HE	Hi Y5fYU RGe HE	I gy	5j YU Y : CS' DcHhJU : CS	GRbXEX 8Y Jhcb' DcHh : CS	KY| \HX 5j YU Y : CS
5\$%	%	) *'\$\$	(%'\$\$	%, z-' '\$\$	5DFCB)%\$\$	\$\$\$)%\$\$
F\$ &	%	(z\$-'\$\$	%\$'\$	(\$z-\$'\$)	FI BK5M	\$\$\$	\$\$\$	\$'\$
H7\$%	%	)( &\$\$	(\$'\$	&z-+' '\$\$	H5L-K5M	*('\$\$	\$\$\$	*('\$\$
H 5B; \$%	&	, \$'\$	%%'\$\$	- \$z *' '\$\$	H5L-K5M	&'\$\$	%'\$\$	1110%

, #&#SS%
6fubW7cbYhcbFYkfh
DjY&cZ&
DjY YHSUWUY 5@BCHSS\$ %

I gY7UW| cfm	B| a VYfcZ GWM|cbg	HEU'5FYUQz: IL	5fha YJW 5j YU Y: CS	5j YU YGB' : CS DcHbJU	KY| \ BX 5j YU Y: CS D
5DFCB	%	%, ž. ' 'SS	)%SS	\$SS	)%SS
FI BK5M	%	(\$SS-\$SS	\$SS	\$SS	\$SS
H5L-K5M	'	%(\$, ' 'SS	(\$*+	SS')	' - ''
5@@	)	*)(ž+' 'SS	' ('* \$	&'! *	%''%

APPENDIX G

SAFETY AND PREVENTIVE MAINTENANCE POLICIES



Appendix G1
Localized Safety (Stopgap) Repair Policy

Distress	Distress Severity	Description	Code	Work Type	Work Unit
41	High	ALLIGATOR CR	PA-FD	Patching - AC Full-Depth	SqFt
43	High	BLOCK CR	CS-AC	Crack Sealing - AC	Ft
45	High	DEPRESSION	PA-FD	Patching - AC Full-Depth	SqFt
47	High	JT REF. CR	CS-AC	Crack Sealing - AC	Ft
48	High	L & T CR	CS-AC	Crack Sealing - AC	Ft
50	High	PATCHING	PA-FD	Patching - AC Full-Depth	SqFt
53	High	RUTTING	PA-FD	Patching - AC Full-Depth	SqFt
54	High	SHOVING	PA-PD	Patching - AC Partial-Depth	SqFt
55	NA	SLIPPAGE CR	PA-PD	Patching - AC Partial-Depth	SqFt
56	High	SWELLING	PA-FD	Patching - AC Full-Depth	SqFt
61	High	BLOW-UP	SL-PC	Slab Replacement - PCC	SqFt
61	Medium	BLOW-UP	PA-PF	Patching - PCC Full Depth	SqFt
62	High	CORNER BREAK	PA-PF	Patching - PCC Full Depth	SqFt
63	High	LINEAR CR	PA-PF	Patching - PCC Full Depth	SqFt
63	Medium	LINEAR CR	CS-PC	Crack Sealing - PCC	Ft
64	High	DURABIL. CR	SL-PC	Slab Replacement - PCC	SqFt
64	Medium	DURABIL. CR	PA-PF	Patching - PCC Full Depth	SqFt
66	High	SMALL PATCH	PA-PP	Patching - PCC Partial Depth	SqFt
67	High	LARGE PATCH	PA-PF	Patching - PCC Full Depth	SqFt
70	High	SCALING	SL-PC	Slab Replacement - PCC	SqFt
71	High	FAULTING	GR-PP	Grinding (Localized)	Ft
72	High	SHAT. SLAB	SL-PC	Slab Replacement - PCC	SqFt
74	High	JOINT SPALL	PA-PP	Patching - PCC Partial Depth	SqFt
75	High	CORNER SPALL	PA-PP	Patching - PCC Partial Depth	SqFt
76	High	ASR	SL-PC	Slab Replacement - PCC	SqFt

°
O h k h

Distress	Distress Severity	Description	Code	Work Type	Work Unit
41	Medium	ALLIGATOR CR	PA-AD	Patching - AC Full-Depth	SqFt
41	High	ALLIGATOR CR	PA-AD	Patching - AC Full-Depth	SqFt
42	N/A	BLEEDING	PA-AS	Patching - AC Partial-Depth	SqFt
43	High	BLOCK CR	PA-AD	Patching - AC Full-Depth	SqFt
43	Medium	BLOCK CR	CS-AC	Crack Sealing - AC	Ft
44	Low	CORRUGATION	PA-AS	Patching - AC Partial-Depth	SqFt
44	High	CORRUGATION	PA-AS	Patching - AC Partial-Depth	SqFt
44	Medium	CORRUGATION	PA-AS	Patching - AC Partial-Depth	SqFt
45	Medium	DEPRESSION	PA-AD	Patching - AC Full-Depth	SqFt
45	Low	DEPRESSION	PA-AD	Patching - AC Full-Depth	SqFt
45	High	DEPRESSION	PA-AD	Patching - AC Full-Depth	SqFt
47	High	JT REF. CR	CS-AC	Crack Sealing - AC	Ft
47	Medium	JT REF. CR	CS-AC	Crack Sealing - AC	Ft
48	High	L & T CR	CS-AC	Crack Sealing - AC	Ft
48	Medium	L & T CR	CS-AC	Crack Sealing - AC	Ft
49	N/A	OIL SPILLAGE	PA-AD	Patching - AC Full-Depth	SqFt
50	High	PATCHING	PA-AD	Patching - AC Full-Depth	SqFt
50	Medium	PATCHING	PA-AD	Patching - AC Full-Depth	SqFt
52	High	RAVELING	PA-AS	Patching - AC Partial-Depth	SqFt
53	High	RUTTING	PA-AD	Patching - AC Full-Depth	SqFt
53	Low	RUTTING	PA-AD	Patching - AC Full-Depth	SqFt
53	Medium	RUTTING	PA-AD	Patching - AC Full-Depth	SqFt
55	N/A	SLIPPAGE CR	PA-AD	Patching - AC Full-Depth	SqFt
56	Low	SWELLING	PA-AD	Patching - AC Full-Depth	SqFt
56	Medium	SWELLING	PA-AD	Patching - AC Full-Depth	SqFt
61	Low	BLOW-UP	PA-PF	Patching - PCC Full Depth	SqFt
61	Medium	BLOW-UP	PA-PF	Patching - PCC Full Depth	SqFt
61	High	BLOW-UP	PA-PF	Patching - PCC Full Depth	SqFt
62	Medium	CORNER BREAK	PA-PF	Patching - PCC Full Depth	SqFt
62	High	CORNER BREAK	PA-PF	Patching - PCC Full Depth	SqFt
62	Low	CORNER BREAK	CS-PC	Crack Sealing - PCC	Ft
63	Medium	LINEAR CR	CS-PC	Crack Sealing - PCC	Ft
63	High	LINEAR CR	PA-PP	Patching - PCC Partial Depth	SqFt
64	Medium	DURABIL. CR	PA-PF	Patching - PCC Full Depth	SqFt
64	High	DURABIL. CR	SL-PC	Slab Replacement - PCC	SqFt
65	High	JT SEAL DMG	JS-LC	Joint Seal (Localized)	Ft
65	Medium	JT SEAL DMG	JS-LC	Joint Seal (Localized)	Ft
66	High	SMALL PATCH	PA-PP	Patching - PCC Partial Depth	SqFt
66	Medium	SMALL PATCH	PA-PP	Patching - PCC Partial Depth	SqFt
67	Medium	LARGE PATCH	PA-PF	Patching - PCC Full Depth	SqFt

°
O h k h

Distress	Distress Severity	Description	Code	Work Type	Work Unit
67	High	LARGE PATCH	PA-PF	Patching - PCC Full Depth	SqFt
69	N/A	PUMPING	JS-LC	Joint Seal (Localized)	Ft
70	Medium	SCALING	PA-PP	Patching - PCC Partial Depth	SqFt
70	High	SCALING	SL-PC	Slab Replacement - PCC	SqFt
71	High	FAULTING	GR-PP	Grinding (Localized)	Ft
71	Medium	FAULTING	GR-PP	Grinding (Localized)	Ft
72	Medium	SHAT. SLAB	SL-PC	Slab Replacement - PCC	SqFt
72	High	SHAT. SLAB	SL-PC	Slab Replacement - PCC	SqFt
74	High	JOINT SPALL	PA-PP	Patching - PCC Partial Depth	SqFt
74	Medium	JOINT SPALL	PA-PP	Patching - PCC Partial Depth	SqFt
75	Medium	CORNER SPALL	PA-PP	Patching - PCC Partial Depth	SqFt
75	High	CORNER SPALL	PA-PP	Patching - PCC Partial Depth	SqFt
76	Medium	ASR	SL-PC	Slab Replacement - PCC	SqFt
76	High	ASR	SL-PC	Slab Replacement - PCC	SqFt

APPENDIX H

M&R UNIT COSTS

H1: M&R Unit Costs

H2: Component Costs for Repair

H3: Airport Category

Maintenance and Repair (M&R) Unit Costs

The M&R costs developed for the ALDOT PMP include costs for maintenance, preservation, and repair activities and are described below.

Unit Costs Source Data

The source for the M&R costs data is RSMMeans, which has data for 14 locations throughout Alabama, as identified by the yellow highlighted boxes in Figure 1. The cost data is presented in terms of individual line items like asphalt wearing course, aggregate base etc., which were consolidated to develop the activity costs described below.

The cost data show a distinct difference in costs between locations north and south of Birmingham, especially for the higher value items like the asphalt layers. Therefore, the unit costs were developed accordingly for the airports north and south of Birmingham, as identified in Figure 1. Appendix H2 presents the component costs used in developing the M&R costs.

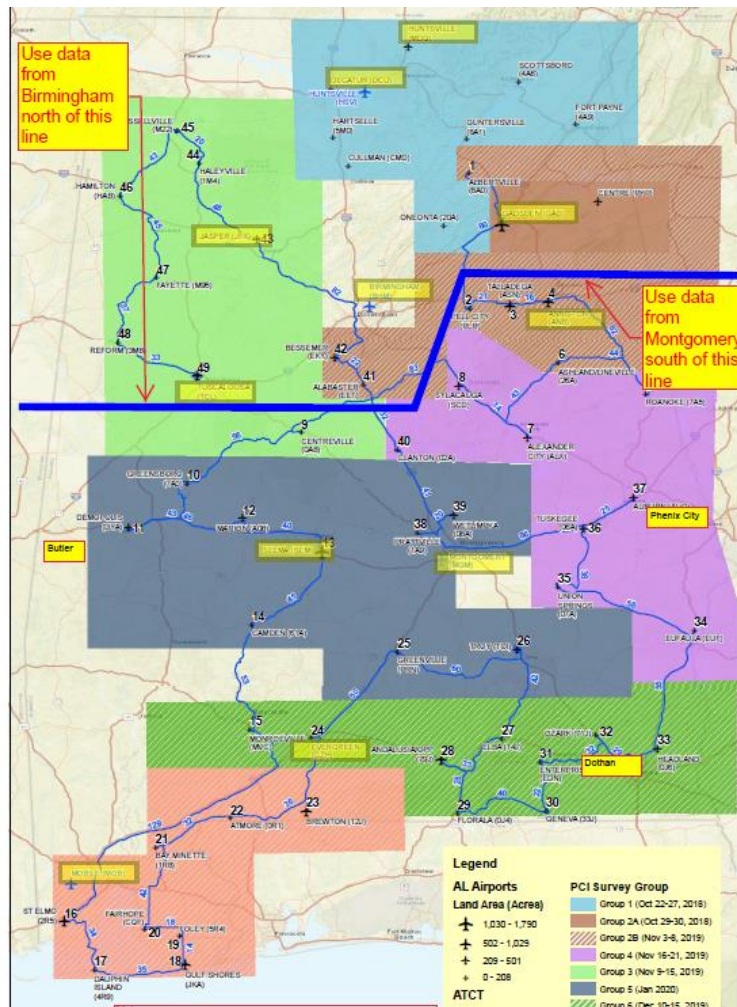


Figure 1: RSMMeans Unit Costs Locations.

Maintenance & Repair (M&R) Activities

Maintenance activities are localized activities which are typically assigned in the first year of the M&R plan based on the observed distresses.

Repair activities are further subdivided into preservation, rehabilitation, and reconstruction. Repair activities are conducted for larger areas, typically at the section level and are assigned based on the Critical Pavement Condition Index, denoted as CP in Table 1. The CP is based on the section’s rank or importance within the overall network and typically ranges from 55 to 70. The CP was set at 70 for the ALDOT runway pavements and 65 for the other pavements.

Table 1: Repair Activities.

Activity Type	PCI	Activity
Preservation	> CP	Runway Surface Treatment
		Taxiway and Apron Surface Treatment
Rehabilitation	> CP	2" AC OL ¹
	55 - CP	Mill 2" & 2" AC OL
	45 - 55	Mill 2" & 2" AC OLP (With Pre-Overlay Repairs)
Reconstruction	0 - 45	Reconstruct with AC

¹For Sections with Structural Distress and PCI greater than Critical PCI

The depths for the milling and overlay (AC OL) in Table 1 were established by creating a balance between removal of surficial distress and providing additional pavement structural capacity. All overlay options include full-depth patching to repair localized distresses.

From the FAA 5010 records, the Alabama airport network includes a wide range of allowable aircraft loads. The airports were divided into three categories of allowable aircraft loads based on requirements for minimum pavement thickness and the use of a P-401 surface layer. The categories are based on the aircraft maximum gross takeoff weight (MGTOW) and include: less than 12,500 lbs, 12,500 to 30,000 lbs, and 30,000 to 100,000 lbs. Appendix H3 presents the category for each airport.

For any sections requiring reconstruction, the pavement sections were established primarily in accordance with the requirements in Table 3 of the FAA’s Advisory Circular 150/5320-6F. The pavement sections used for developing the cost estimates are:

- ≤ 12,500 lbs 4" P-403 (State HMA Mix) + 6" P-209 Base
- 12,500 – 30,000 lbs 4" P-403 (State HMA Mix) + 8" P-209 Base
- 30,000 – 100,000 lbs 5" P-401 + 10" P-209 Base

It is important to note that while the FAA requires a stabilized base for those pavements that support aircraft operations with MGTOWs that are greater than 100,000 lbs, the number of such operations is minimal for those airports shown in Appendix H3. As a result, the cost of a stabilized base is excluded in the development of the unit costs for ALDOT’s PMP update. However, based on the Engineer’s future design and aircraft fleet mix development, project-level construction work could include the use of a stabilized base at that time.

M&R Unit Costs

Paving projects typically include additional project costs like mobilization, design, construction administration and inspections, and drainage improvements. A summary of non-direct pavement construction line items has been included in the unit costs in Tables 5 and 6 as described below. These non-direct items are expressed as a percentage of the total component costs for each activity.

These non-direct pavement construction items were developed from API’s extensive experience with APMP project cost estimation. These percentages may vary for Alabama airport construction projects; however, since the direct pavement scope of work is estimated in a network-level evaluation, these conservative estimates serve as a good starting point for the development of realistic total project costs and annual APMP budgets for ALDOT. For repair activities such as Mill & Overlay, which typically do not include significant drainage work, the corresponding multiplier was reduced by 50 percent. The non-direct cost factors are presented in Table 2.

Table 2: Cost Factors.

Factor	Function of	Estimate		
		Preservation	Rehabilitation	Reconstruction
Mobilization	All costs, less design	10%	10%	10%
Drainage Improvements	Paving costs	-	4%	8%
Contingency	All costs, less mobilization and design	10%	20%	20%
Design & CM	All costs, less mobilization and design	15%	20%	20%

The M&R unit costs for maintenance, preservation, and repair activities were developed from the RSMMeans cost data and are presented in the following section.

Maintenance

The maintenance activities include crack seal, and full and partial-depth patching. The unit costs are presented in Table 3.

Table 3: Unit Costs for Maintenance.

Activity	Unit Cost	Unit
Seal Cracks - AC	\$3.95	lf
AC Full-Depth Patching	\$25.05	sf
AC Partial-Dept Patching	\$16.28	sf
Seal Cracks – PCC	\$8.35	lf
PCC Full-Depth Patching	\$48.70	sf
PCC Partial-Depth Patching	\$243.51	sf
Jt. Seal	\$11.13	lf
Slab Replacement	\$27.83	sf
Grinding	\$6.96	lf

Preservation

The unit costs for the surface treatments are presented in Table 4. They include sealing of cracks and application of pavement markings.

Table 4: Unit Costs for Preservation Activities.

Activity	Unit Cost	Unit
Runway Surface Treatment	\$0.57	sf
Taxiway and Apron Surface Treatment	\$0.88	sf

Rehabilitation and Reconstruction

As discussed previously, repair activities are also divided into rehabilitation and reconstruction. The unit costs for airport repair for the Northern Region (Birmingham Area) and Southern Region (Montgomery Area) are shown in Tables 5 and 6, respectively.

Table 5: Unit Costs for Repair Activities, Northern Region.

Activity Type	Activity	MGTOW, thousand lbs		
		≤ 12.5	12.5-30	30-100
Rehabilitation	2" AC OL	\$3.78		\$4.19
	Mill 2" & 2" AC OL	\$4.15		\$4.56
	Mill 2" & 2" AC OLP	\$5.18		\$5.79
Reconstruction	AC Reconstruction	\$8.40	\$9.10	\$10.91

Table 6: Unit Costs for Repair Activities, Southern Region.

Activity Type	Activity	MGTOW, thousand lbs		
		≤ 12.5	12.5-30	30-100
Rehabilitation	2" AC OL	\$3.54		\$3.91
	Mill 2" & 2" AC OL	\$3.90		\$4.27
	Mill 2" & 2" AC OLP	\$4.82		\$5.37
Reconstruction	AC Reconstruction	\$7.63	\$8.25	\$9.87

Appendix H2
Component Costs for Repair

Activity Type	Unit	Birmingham (Northern)	Montgomery (Southern)	Comments
Milling 1" to 3"	SY	\$2.08	\$2.01	
Pavement Demolition	SY	\$6.34	\$6.12	
Haulage - For Demolition & AC	CY	\$6.08	\$5.87	
Haulage for 12" Thick Demolition	SY	\$2.03	\$1.96	
Haulage for 2" Thick AC Paving	SY	\$0.34	\$0.33	
Haulage for 3" Thick AC Paving	SY	\$0.51	\$0.49	
Haulage for 4" Thick AC Paving	SY	\$0.68	\$0.65	
AC Wearing Course	Ton	\$97.42	\$86.90	
AC Binder Course	Ton	\$87.80	\$78.17	
P401 - For airports with >60 kip aircraft	Ton	\$116.90	\$104.28	Assumed P401 cost to be 20% greater than AC Wearing Course
6" Aggregate Base (P208)	SY	\$10.17	\$9.12	
8" Aggregate Base (P208)	SY	\$13.29	\$11.89	
6" P209 Aggregate Base	SY	\$12.20	\$10.94	Assumed P209 cost to be 20% greater than P208
8" P209 Aggregate Base	SY	\$15.95	\$14.27	Assumed P209 cost to be 20% greater than P208
10" P209 Aggregate Base	SY	\$19.94	\$17.84	Direct multiplier for 10" from 8"
4" P154 Aggregate Base	SY	\$5.42	\$4.86	Assumed P154 cost to be 20% lower than P208
6" P154 Aggregate Base	SY	\$8.14	\$7.30	Assumed P154 cost to be 20% lower than P208
Pavement Markings	sf	\$1.48	\$1.39	

**Appendix H3
Airport Category**

Region	City	FAA ID	Max Gross Weight (Thousand lbs)			Max GW	Category
			S	D	2D		
Birmingham	Reform	3M8	12.5	-	-	12.5	<= 12,500
	Fayette	M95	15.0	-	-	15.0	12,500-30,000
	Hamilton	HAB	15.0	-	-	15.0	12,500-30,000
	Scottsboro	4A6	15.0	-	-	15.0	12,500-30,000
	Alabaster	EET	16.0	-	-	16.0	12,500-30,000
	Centre-Piedmont	PYP	16.0	-	-	16.0	12,500-30,000
	Fort Payne	4A9	16.0	-	-	16.0	12,500-30,000
	Haleyville	1M4	20.0	-	-	20.0	12,500-30,000
	Hartselle	5M0	20.0	-	-	20.0	12,500-30,000
	Guntersville	8A1	24.0	-	-	24.0	12,500-30,000
	Cullman	CMD	30.0	-	-	30.0	12,500-30,000
	Russellville	M22	30.0	-	-	30.0	12,500-30,000
	Jasper	JFX	50.0	-	-	50.0	> 30,000
	Oneonta	20A	20.0	35.0	55.0	55.0	> 30,000
	Bessemer	EKY	60.0	60.0	-	60.0	> 30,000
	Albertville	8A0	60.0	90.0	130.0	130.0	> 30,000
	Madison	MDQ	60.0	75.0	140.0	140.0	> 30,000
	Decatur	DCU	75.0	125.0	150.0	150.0	> 30,000
	Tuscaloosa	TCL	61.0	87.0	168.0	168.0	> 30,000
	Gadsden	GAD	90.0	115.0	195.0	195.0	> 30,000
Montgomery	Florala	0J4	-	-	-	-	<= 12,500
	Elba	14J	4.0	-	-	4.0	<= 12,500
	Headland	0J6	12.0	-	-	12.0	<= 12,500
	Roanoke	7A5	12.0	-	-	12.0	<= 12,500
	Greenville	PRN	15.0	-	-	15.0	12,500-30,000
	Union Springs	07A	15.0	-	-	15.0	12,500-30,000
	Wetumpka	08A	15.0	-	-	15.0	12,500-30,000
	Atmore	0R1	16.0	-	-	16.0	12,500-30,000
	Clanton	02A	16.0	-	-	16.0	12,500-30,000
	Eufaula	EUF	16.0	-	-	16.0	12,500-30,000
	Geneva	33J	16.0	-	-	16.0	12,500-30,000
	Greensboro	7A0	16.0	-	-	16.0	12,500-30,000
	Centreville	0A8	18.0	-	-	18.0	12,500-30,000
	Ashland-Lineville	26A	20.0	-	-	20.0	12,500-30,000
	Sylacauga	SCD	20.0	-	-	20.0	12,500-30,000
	St. Elmo	2R5	23.0	-	-	23.0	12,500-30,000
	Ozark	71J	-	25.0	-	25.0	12,500-30,000
	Camden	61A	27.0	-	-	27.0	12,500-30,000
	Bay Minette	1R8	28.0	-	-	28.0	12,500-30,000
	Foley	5R4	28.0	-	-	28.0	12,500-30,000
Tuskegee	06A	28.5	-	-	28.5	12,500-30,000	

**Appendix H3
Airport Category**

Region	City	FAA ID	Max Gross Weight (Thousand lbs)			Max GW	Category
			S	D	2D		
Montgomery	Alexander City	ALX	30.0	-	-	30.0	12,500-30,000
	Dauphin Island	4R9	30.0	-	-	30.0	12,500-30,000
	Pell City	PLR	30.0	-	-	30.0	12,500-30,000
	Prattville	1A9	30.0	-	-	30.0	12,500-30,000
	Enterprise	EDN	-	-	-	-	> 30,000
	Evergreen	GZH	30.0	50.0	-	50.0	> 30,000
	Marion	A08	30.0	50.0	-	50.0	> 30,000
	Selma	SEM	33.0	54.0	-	54.0	> 30,000
	Fairhope	CQF	36.0	58.0	-	58.0	> 30,000
	Brewton	12J	40.0	60.0	-	60.0	> 30,000
	Demopolis	DYA	30.0	38.0	60.0	60.0	> 30,000
	Monroeville	MVC	70.0	-	-	70.0	> 30,000
	Auburn-Opelika	AUO	45.0	75.0	-	75.0	> 30,000
	Talladega	ASN	30.0	65.0	95.0	95.0	> 30,000
	Gulf Shores	JKA	80.0	100.0	-	100.0	> 30,000
	Troy	TOI	24.0	80.0	140.0	140.0	> 30,000
	Anniston	ANB	28.0	43.5	260.0	260.0	> 30,000
Andalusia-OPP	79J	98.0	160.0	275.0	275.0	> 30,000	

APPENDIX I

PAVEMENT CAPITAL IMPROVEMENT PROGRAM

I1: PCIP Summary

I2: Year 1 Maintenance Plan



Appendix I1
PCIP Summary
Chilton County Airport (02A)

Branch & Section	2021	2022	2023	2024	2025	2026	2027
A01-01	StopGap \$2883.95 Before:59.65 After:59.65	Required Project Major Below Critical \$575017.02 Before:57.44 After:100	Preventive \$332.65 Before:97.79 After:97.79	Preventive + Required Project Global MR \$89578.16 Before:95.57 After:100	Preventive \$352.91 Before:97.79 After:97.79	Preventive \$727 Before:95.58 After:95.58	Preventive \$1123.21 Before:93.37 After:93.37
R0826-01	Preventive \$804.09 Before:98.04 After:98.04	Preventive \$1295.99 Before:96.93 After:96.93	Preventive \$1757.45 Before:95.95 After:95.95	Preventive \$2310.52 Before:94.84 After:94.84	Preventive \$3087.92 Before:93.3 After:93.3	Preventive \$4224.92 Before:91.1 After:91.1	Preventive + Required Project Global MR \$286277.4 Before:88.16 After:93.3
TC01-01	Required Project Major Below Critical \$122993.12 Before:45.6 After:100	Preventive \$26.58 Before:98.98 After:98.98	Preventive \$57.92 Before:97.85 After:97.85	Preventive + Required Project Global MR \$15971.77 Before:96.33 After:98.98	Preventive \$61.45 Before:97.85 After:97.85	Preventive \$107.89 Before:96.33 After:96.33	Preventive \$170.55 Before:94.36 After:94.36
THANG01-01	Required Project Major Below Critical \$220834.68 Before:58.21 After:100	Preventive \$58.87 Before:98.98 After:98.98	Preventive \$128.32 Before:97.85 After:97.85	Preventive \$225.3 Before:96.33 After:96.33	Preventive \$357.28 Before:94.35 After:94.35	Preventive \$521.23 Before:91.99 After:91.99	Preventive \$711.16 Before:89.39 After:89.39

Appendix I1
PCIIP Summary
Chilton County Airport (02A)

Branch & Section	2021	2022	2023	2024	2025	2026	2027
THANG01-02	Preventive \$101.89 Before:97.16 After:97.16	Preventive \$169.53 Before:95.42 After:95.42	Preventive \$257.77 Before:93.24 After:93.24	Preventive \$363.99 Before:90.73 After:90.73	Preventive \$481.5 Before:88.09 After:88.09	Preventive \$604.98 Before:85.47 After:85.47	Preventive + Required Project Global MR \$37638.8 Before:83 After:90.74

Appendix I2
Localized Maintenance Plan
Chilton County Airport (02A)

Branch ID	Section ID	Policy	Distress Code	Description	Severity	Distress Qty	Distress Unit	Percent Distress	Work Description	Work Qty	Work Unit	Unit Cost	Work Cost
A01	01	Safety	48	L & T CR	Medium	864	Ft	0.62	No Localized M & R	0		\$0.00	\$0
A01	01	Safety	48	L & T CR	Low	8,719	Ft	6.28	No Localized M & R	0		\$0.00	\$0
A01	01	Safety	43	BLOCK CR	Low	35,633	SqFt	25.65	No Localized M & R	0		\$0.00	\$0
A01	01	Safety	43	BLOCK CR	Medium	13,207	SqFt	9.51	No Localized M & R	0		\$0.00	\$0
THANG01	02	Preventive	50	PATCHING	Low	205	SqFt	0.58	No Localized M & R	0		\$0.00	\$0
THANG01	01	Safety	48	L & T CR	Low	924	Ft	1.95	No Localized M & R	0		\$0.00	\$0
THANG01	01	Safety	57	WEATHERING	Medium	13,322	SqFt	28.05	No Localized M & R	0		\$0.00	\$0
THANG01	01	Safety	48	L & T CR	Medium	1,139	Ft	2.4	No Localized M & R	0		\$0.00	\$0
THANG01	01	Safety	57	WEATHERING	Low	34,106	SqFt	71.81	No Localized M & R	0		\$0.00	\$0
THANG01	01	Safety	50	PATCHING	Low	202	SqFt	0.42	No Localized M & R	0		\$0.00	\$0
THANG01	01	Safety	41	ALLIGATOR CR	Medium	6	SqFt	0.01	No Localized M & R	0		\$0.00	\$0
THANG01	01	Safety	45	DEPRESSION	Low	40	SqFt	0.08	No Localized M & R	0		\$0.00	\$0
THANG01	01	Safety	50	PATCHING	High	14	SqFt	0.03	Patching - AC Full-Depth	32	SqFt	\$25.05	\$818
TC01	01	Safety	52	RAVELING	High	8	SqFt	0.03	No Localized M & R	0		\$0.00	\$0
TC01	01	Safety	50	PATCHING	Low	780	SqFt	3.14	No Localized M & R	0		\$0.00	\$0
TC01	01	Safety	48	L & T CR	Medium	2,495	Ft	10.06	No Localized M & R	0		\$0.00	\$0
TC01	01	Safety	57	WEATHERING	Medium	2,204	SqFt	8.89	No Localized M & R	0		\$0.00	\$0
TC01	01	Safety	57	WEATHERING	Low	21,804	SqFt	87.93	No Localized M & R	0		\$0.00	\$0
TC01	01	Safety	48	L & T CR	Low	224	Ft	0.9	No Localized M & R	0		\$0.00	\$0
R0826	01	Preventive	48	L & T CR	Low	53	Ft	0.01	No Localized M & R	0		\$0.00	\$0