Alabama Statewide Airport Pavement Management Program Update

Troy Municipal Airport at N Kenneth Campbell Field (TOI)

Final Report

February 2022

Submitted to

Alabama Aeronautics Bureau

Submitted by

JVIATION

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Pavement Management – Evaluation – Testing - Design

ALABAMA STATEWIDE AIRPORT PAVEMENT MANAGEMENT PROGRAM UPDATE

Troy Municipal Airport at N Kenneth Campbell Field, Troy (TOI)

FINAL REPORT

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Executive Summary

The Jviation Inc. team, which included All About Pavements, Inc., (API) was awarded a contract by the !fl·ōl·Y·l· 5ŜLJl·ℕűYŜyű 2₮ ¢ℕl·yãLJ2ℕűl·úλ2yℚă !Ŝℕ2yl·dzűλŎă .dzℕŜl·dz ó![5h¢ú in 2018 to update the existing Alabama Statewide Airport Pavement Management Program (APMP). The scope of this project includes the airside pavement network at Troy Municipal Airport (TOI).

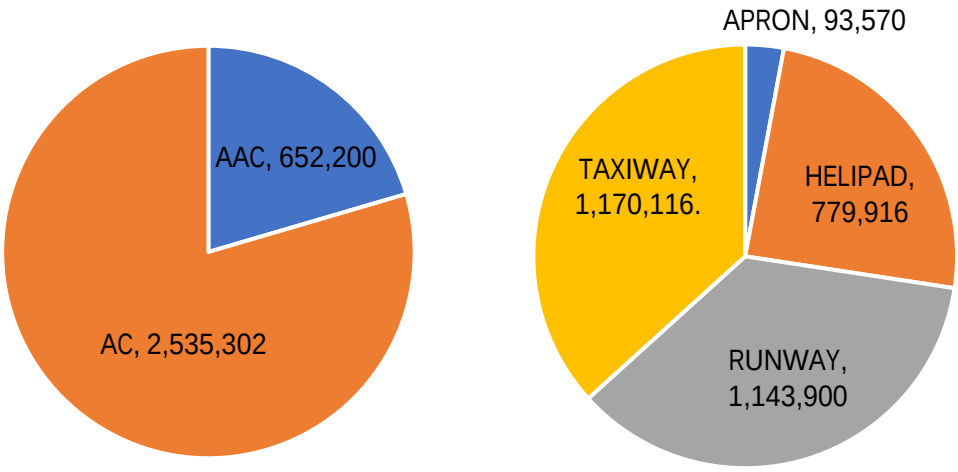
The following APMP tasks were completed to achieve the project objectives at TOI:

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

ES.1 Pavement Inventory

There are 15 branches and 25 sections within TOIℚă LJl·ØŜY·Ŝyű ySűø2ℕ℩ øλűK l· ű2űl·t ădzℕ₮l·ŎŜ l·ℕŜl· 2₮ approximately 3.2 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 ăŎl·fŜ ₮ℕ2Y л ű2 млл űKl·ú LJℕ2ØλŘŜă l· YŜl·ădzℕŜ 2₮ úKŜ LJl·ØŜY·Ŝyűℚă ŧunctional surface condition. The overall area-weighted network PCI (AW PCI) for the TOI pavement network is 62Σ ℕŜLJℕŜăŜyűλyƎ l· áFairɛ

condition. The network area-weighted pavement age (AW Age) is greater than 20 years. ALDOT wanted the condition of the helipad to be not included in the overall PCI computations, and it and Runway 14-32 were not considered for the PCIP.

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

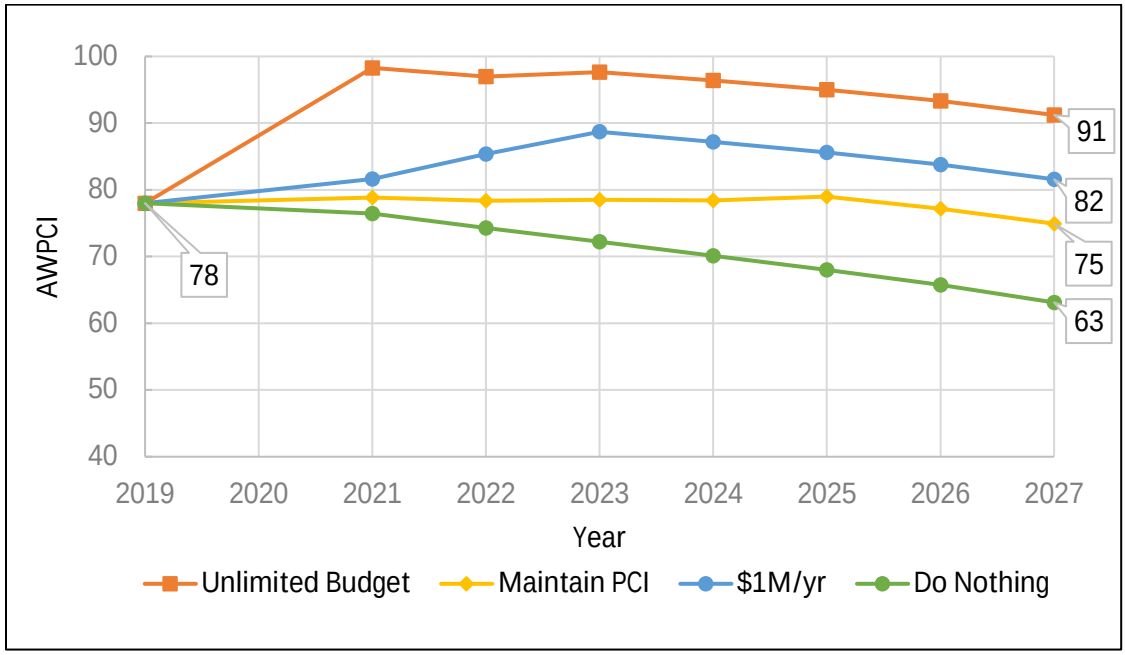
Table ES-1: TOI Section PCI Values and Ratings.

Branch ID	Name	Section ID	Surface	Area, sf	PCI	PCI Category
A01	Apron 01	01	AC	63,985	53	Poor
A02	Apron 02	01	AC	29,585	39	Very Poor
R0725	Runway 07-25	01	AC	151,200	100	Good
R0725	Runway 07-25	02	AC	468,500	100	Good
R0725	Runway 07-25	03	AC	32,500	100	Good
R1432	Runway 14-32	01	AC	143,000	39	Very Poor
R1432	Runway 14-32	02	AC	348,700	37	Very Poor
TA1	Taxiway A1	01	AC	11,705	70	Fair
TA2	Taxiway A2	01	AC	13,825	51	Poor
TA3	Taxiway A3	01	AC	15,912	44	Poor
TC01	Taxiway Connector 01	01	AC	20,968	39	Very Poor
TC02	Taxiway Connector 02	01	AC	26,871	42	Poor
THANG01	Taxiway Hangar 01	01	AC	41,800	55	Poor
TP01	Taxiway Parallel 01	01	AC	78,188	77	Satisfactory
TP01	Taxiway Parallel 01	02	AC	165,974	44	Poor
TP01	Taxiway Parallel 01	03	AC	37,379	40	Very Poor
TP01	Taxiway Parallel 01	04	AC	63,260	42	Poor
TP02	Taxiway Parallel 02	01	AC	90,858	38	Very Poor
TP02	Taxiway Parallel 02	02	AC	13,469	39	Very Poor
TP02	Taxiway Parallel 02	03	AC	147,866	42	Poor

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 TOI 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 $5.2 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
2022	TOI_22-01_Apron 01 Rehabilitation	$602,254	105,785	46	100
2023	TOI_23-01_Taxiway Parallel 01 Rehabilitation	$3,838,675	413,114	38	100
2024	TOI_24-01_Runway 07-25 Surface Treatment	$415,081	652,200	96	98
2025	TOI_25-01_Apron 01 Surface Treatment	$41,944	63,985	93	98
2026	TOI_26-01_Taxiway Parallel 01 Surface Treatment	$278,930	413,114	96	99
	Total	$5,176,884			

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 $4,028 as summarized in Table ES-3.

Table ES-3: Summary of Localized Maintenance Plan.

Policy	Work Description	Work Quantity	Work Unit	Work Cost
Preventive	Crack Sealing - AC	1,020	Ft	$4,028
			Total	$4,028

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1 Introduction

1.1. Overview

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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 Troy Municipal Airport (TOI), 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:

- ü Conduct a visual pavement inspection of the asphalt surfaced pavements for 59 of the 72 public use airports in Alabama.
- ü Based on the visual inspection analysis results, develop a 7-year PCIP for each airport.

The scope of work is as shown below:

- ü Conduct a Records Review
- ü Update Pavement Network Definition
- ü Conduct Pavement Condition Surveys
- ü Update and customize existing APMP PAVER database
- ü Develop PCIP and associated project cost estimates
- ü Prepare Draft and Final Reports
- ü 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 rl·ûλyƎ 2₮ άD22ŘéΣ άCl·λℕéΣ 2ℕ άt22ℕé ølă l·ăăλƎyŜŘ ōl·ăŜŘ 2yˆúKŜ 2ØŜℕl·ff LJl·ØŜYˆŜyű Õ2yŘλúλ2y℗

The deliverable products include a PAVER 7.0 database, individual airport evaluation reports, a statewide summary report, and the web viewer. The TOI report will be one of the 59 individual airport reports that will be l·ØI·ƛfI·ōfŜ 2y˝ ! [5h¢⍰ă ǿŜōăƛűŜ℗

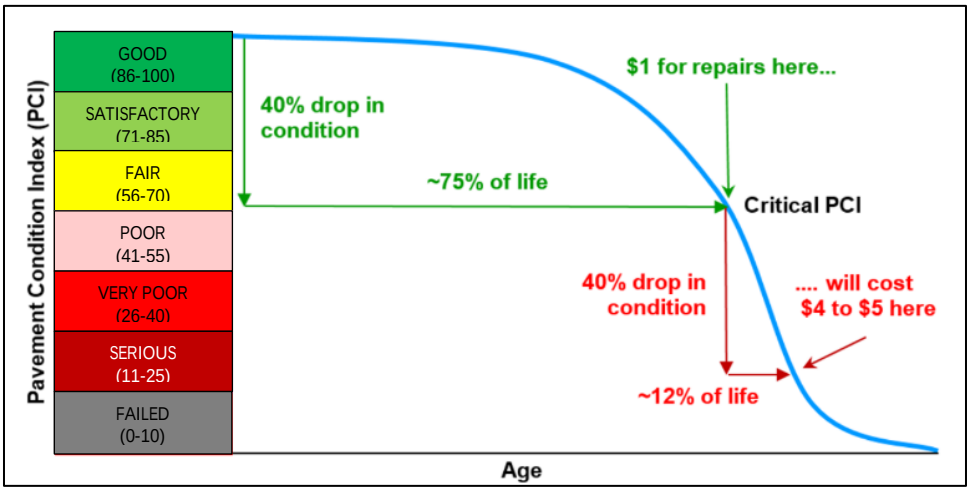
1.3. Pavement Management Concept

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-èŜI·ℕ LJI·ØŜY˝ŜyűΣ I· áD22Řέ ű2 áCI·ƛℕέ Ŏ2yŘƛűƛ2y˝ℕI·ûƛyƎ Y˝I·è fI·ăű 2yťè p ű2 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 ûKŜ LJI·ØŜY˝Ŝyű ădzℕ₮I·ŎŜ ŘŜŎfƛyŜă ű2 I· á₮I·ƛℕέ Ŏ2yŘƛűƛ2y℗ ¢KŜ LJ2ƛyű I·û ǿKλŎK rehabilitation can be done ōŜ₮2ℕŜ ûKŜ ăűŜŜLJ ŘŜŎfƛyŜ 2ŎŎdzℕă ƛă ŎI·ffŜŘ ûKŜ áŎℕƛűƛŎI·f t / Lέ Σ I·yŘ ƛă ƎŜyŜℕI·ffè Ŏ2yãƛŘŜℕŜŘ ű2 2ŎŎdzℕ ǿKŜy˝ûKŜ 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

TOI is a General Aviation (GA) airport located approximately 4 miles north west of Troy. The airport was activated in December 1944 and is owned and operated by the City of Troy. Figure 2.1 shows an aerial image of the airport.

Figure 2.1: Troy Municipal Airport.

(Source: Google Earth)

2.2. Pavement Inventory

TOI consists of two runways, parallel taxiways, multiple connector taxiways, a helipad, and an apron. The total pavement area is approximately 3.2 million square feet. All pavements at TOI are Asphalt Concrete (AC) surfaced. A complete listing of the pavement sections is included in Appendix A. Runway 07-25 is 6,197 ft. long and 100 ft. wide. Runway 14-32 is 5,024 ft. long and 100 ft. wide.

A records search was undertaken to identify any preservation or rehabilitation work that has occurred at Troy Municipal Airport since the last APMP update in 2009. The records for the Runway 07-25 extension in 2012 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 TOI. As the table shows, the pavements at TOI are not exposed to any freeze-thaw cycles. The mean air temperature for January ranges from an average low of 36 degrees °F to an average high of 57 degrees °F. The average annual rainfall at TOI is near 54 inches.

Table 2.1: Average Annual Temperatures and Rainfall for TOI.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High Temp (°F)	57	62	69	76	83	88	90	90	86	77	68	60
Low Temp (°F)	36	39	45	51	60	67	71	70	66	54	45	39
Precip. (in)	5.1	4.8	6.6	4.2	3.7	4.8	5.8	3.6	3.5	2.8	4.4	4.4

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 ŘλØλŘλyΞ l·y˝l·ΞŜyŎèℚă LJl·ØŜY˝Ŝyűă λyű2 l· KλŜℕl·ℕŎKλŎl·f 2ℕŘŜℕ úKl·ű ₹l·ŎλfλűJ·ûŜă λyãLJŜŎúλ2y˝l·yŘ a ɔw LJfl·yŷλyΞ¢ The TOI 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 TOI.

Once branches have been defined, pavement evaluation and analysis techniques require the airfield LJl·ØŜY˝Ŝyű ăëăúŜY˝ ű2 ōŜ ōℕ2ℓŜy˝ ɗzLJ λyű2 ŘλăŎℕŜűŜ ăŜŎúλ2yã¢ ! LJl·ØŜY˝Ŝyű ćăŜŎúλ2y€ λă úKŜ ăY˝l·ftŜăű 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 (± 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 ƨℕ IjdzI·yűλúè ƨŦ I· ŘλăúℕŜăă ăŜŜy˝ŜfăŜǿKŜℕŜΣ ǿŜℕŜ ŘŜăλƎyl·űŜŘ I·ă άI·ŘŘλûλƨyl·fε ăI·Y˝LJfŜ dzyλûă I·ă ŘŜăŎℕλōŜŘ λy˝ 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 TOI.

Table 2.2: PCI Sampling Rate for AC Surfaces.

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

2.5. Inventory Summary

There are 15 branches (facilities) at TOI that include 25 pavement sections and a total area of approximately 3.2 million square feet of paved surfaces, as shown in Table 2.3.

Table 2.3: TOI Pavement Branches.

Branch ID	Branch Name	Branch Use	Area, sf	Number of Sections
A01	Apron 01	APRON	63,985	1
A02	Apron 02	APRON	29,585	1
AHELO01	Helipad 01	HELIPAD	779,916	2
R0725	Runway 07-25	RUNWAY	652,200	3
R1432	Runway 14-32	RUNWAY	491,700	2
TA1	Taxiway A1	TAXIWAY	11,705	1
TA2	Taxiway A2	TAXIWAY	13,825	1
TA3	Taxiway A3	TAXIWAY	15,912	1
TC01	Taxiway Connector 01	TAXIWAY	20,968	1
TC02	Taxiway Connector 02	TAXIWAY	26,871	1
TC04	Taxiway Connector 04	TAXIWAY	9,597	1
THANG01	Taxiway Hangar 01	TAXIWAY	41,800	1
TP01	Taxiway Parallel 01	TAXIWAY	344,801	4
TP02	Taxiway Parallel 02	TAXIWAY	252,193	3
TP03	Taxiway Parallel 03	TAXIWAY	432,444	2
		Total	3,187,502	25

Table 2.4 shows the distribution of airfield pavement by age with the area-weighted age being greater than 20 years for all airside pavements at TOI.

Table 2.4: TOI Pavement Age.

Age (Years)	Number of Sections	Percent of Area	Area, sf
0 ς 5	3	20	652,200
6 ς 10	2	3	89,893
11 ς 15	0	0	0
16 ς 20	0	0	0
> 20	20	77	2,445,409

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: TOI Pavement Area by Surface Type.

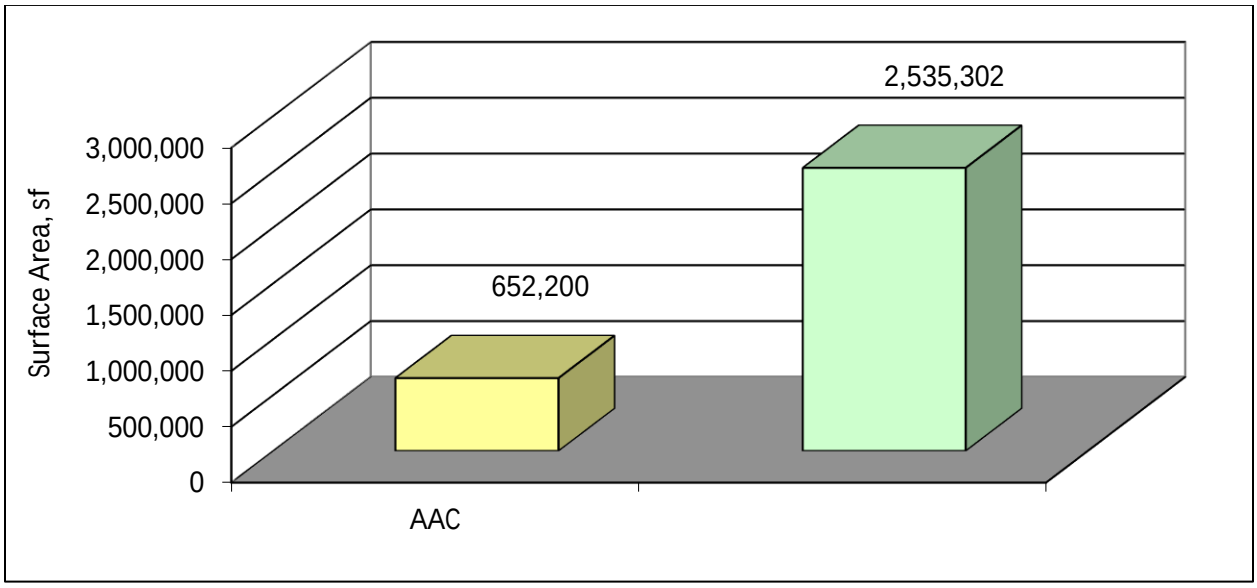
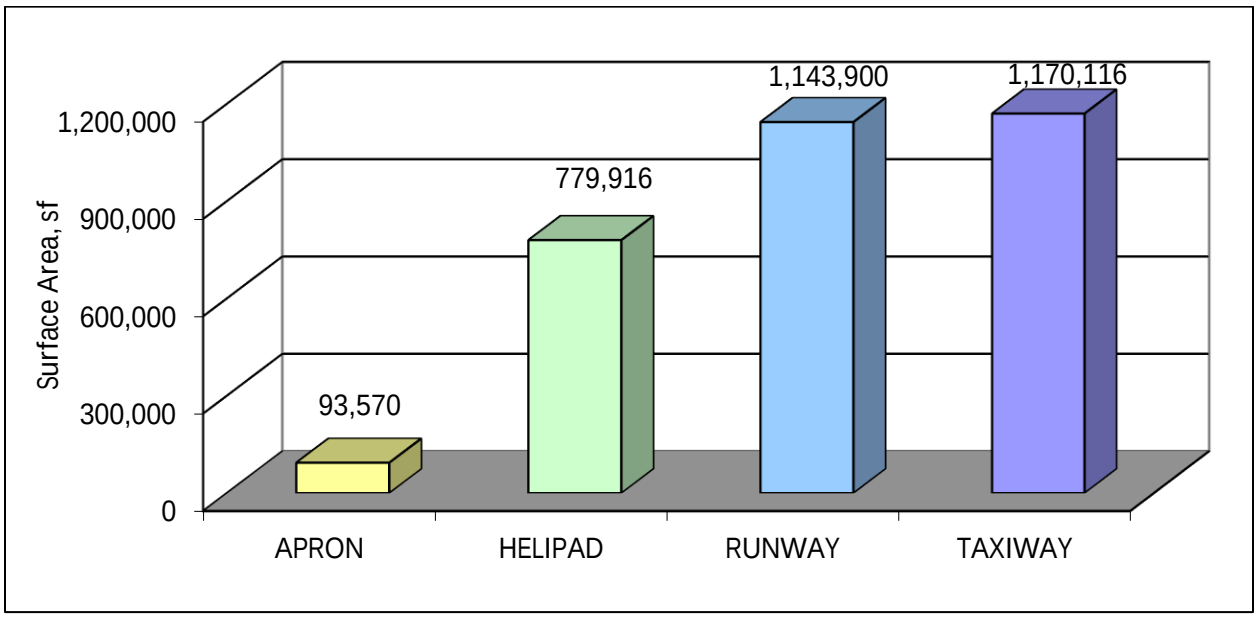


Figure 2.3: TOI Pavement Area by Branch Use.



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

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3 Pavement Condition

3.1. Introduction

A visual PCI survey of the airside pavements at TOI 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;

- ü 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.
- ü 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 mel·ădzℕŜ 2₮ űĸŜ LJI·ØŜY^ŜyűΩă ₮dzyŎúλ2yl·t ădzℕ₮I·ŎŜ Ŏ2yŘλúλ2y₱ Lú LJℕ2ØλŘŜă ʎyãλ∃Kű ʎyű2 űĸŜ ŎI·dzăŜă 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	GOOD: Pavement has minor or no distresses and should require only routine maintenance.
			71-85	SATISFACTORY: Pavement has scattered low-severity distresses that should require only routine maintenance.
FAIR			56-70	FAIR: Pavement has a combination of generally low- and medium-severity distresses. Near-term maintenance and repair needs may range from routine to major.
POOR			41-55	POOR: 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	VERY POOR: Pavement has predominantly medium- and high-severity distresses that cause considerable maintenance & operational problems. Near-term M&R needs will be major.
			11-25	SERIOUS: Pavement has mainly high-severity distresses that cause operational restrictions; immediate repairs are needed.
			0-10	FAILED: Pavement deterioration has progressed to the point that safe aircraft operations are no longer possible; complete reconstruction is required.

3.3. Distress Types

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

- ü 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.
- ü 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, ά5έ ÖℕI·Ö℩ƛyƎΣ f₴yƎƛΰűdzŘƛy1·f ÖℕI·Ö℩ƛyƎΣ LJ₴LJ-outs, pumping, scaling, shrinkage cracks, and joint and corner spalling.
- ü Moisture & Drainage related: AC distresses include alligator cracking, depressions, potholes and swelling; PCC distresses include corner breaks, divided slabs and pumping.
- ü 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.

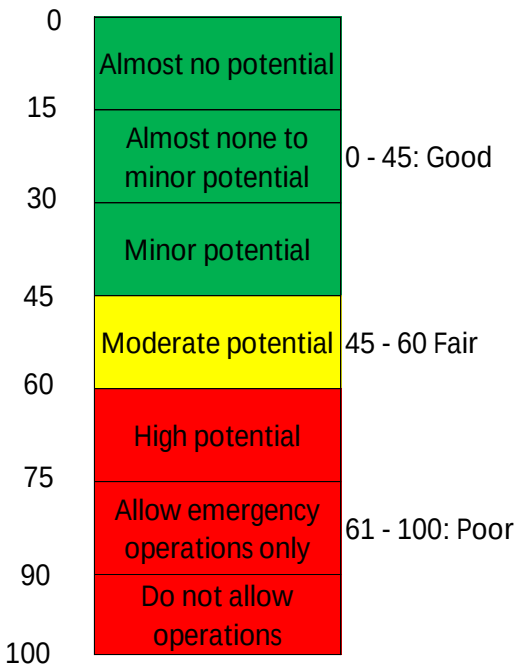
5ǎúŴŜăă ŘŜăŎŴǺLJúǺ2yã LJŴ2ØǺŘŜŘ ǺY ! LJLJŜyŘǺÈ / ØŜŴŜ úI·ʅŜY ŦŴ2Y úKŜ ά t /L CǺŜfŘ a I·yʊzI·ʊ£é ŘŜØŜf2LJŜŘ õè úKe U.S. Army Construction Engineering Research Lab (CERL), latest edition. Appendix C provides a detailed explanation of each type of AC and PCC surface distress.

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

ALDOT wanted the condition of the helipad to be not included in the overall PCI computations, and it and Runway 14-32 were not considered for the PCIP. The airside pavements at TOI include 20 sections with 391 sample units. The sample number of sample units that were surveyed in the field is 95, 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.

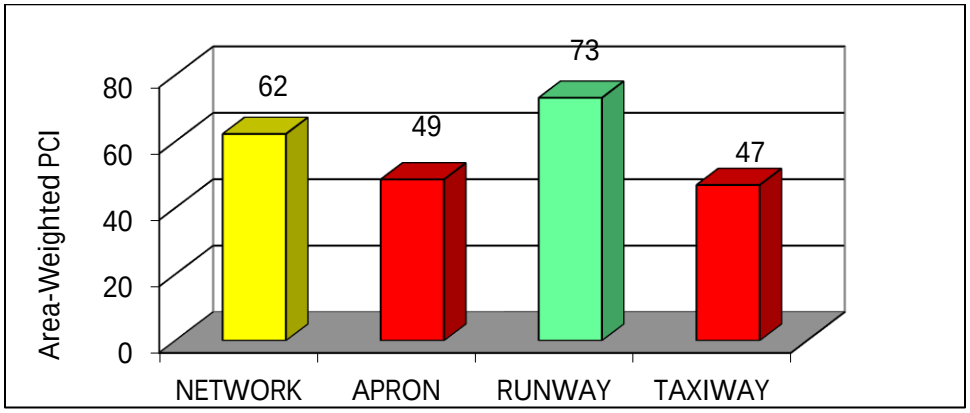


Figure 3.3 shows the distribution of the TOI pavement network by condition. Approximately 62 percent 2Ŧ úKŜ ySűø2ℕ] ƛă ƛy´át22ℕé 2ℕ ø2ℕăŜ Ô2yŘƛúƛ2y◊

Figure 3.3: Pavement Condition by Percent of Area.

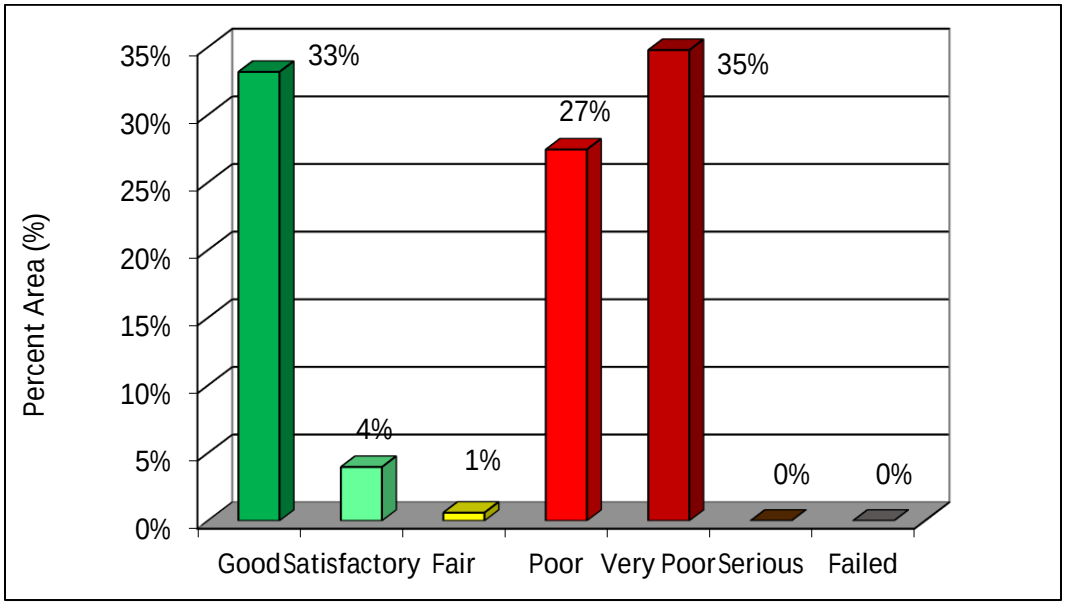


Table 3.2 is a listing of the section PCI.

Table 3.2: Section PCI.

Branch ID	Name	Section ID	Surface	Area, sf	PCI	PCI Category	FOD
A01	Apron 01	01	AC	63,985	53	Poor	60
A02	Apron 02	01	AC	29,585	39	Very Poor	71
R0725	Runway 07-25	01	AC	151,200	100	Good	0
R0725	Runway 07-25	02	AC	468,500	100	Good	0
R0725	Runway 07-25	03	AC	32,500	100	Good	0
R1432	Runway 14-32	01	AC	143,000	39	Very Poor	75
R1432	Runway 14-32	02	AC	348,700	37	Very Poor	77
TA1	Taxiway A1	01	AC	11,705	70	Fair	43
TA2	Taxiway A2	01	AC	13,825	51	Poor	60
TA3	Taxiway A3	01	AC	15,912	44	Poor	70
TC01	Taxiway Connector 01	01	AC	20,968	39	Very Poor	73
TC02	Taxiway Connector 02	01	AC	26,871	42	Poor	72
THANG01	Taxiway Hangar 01	01	AC	41,800	55	Poor	57
TP01	Taxiway Parallel 01	01	AC	78,188	77	Satisfactory	35
TP01	Taxiway Parallel 01	02	AC	165,974	44	Poor	70
TP01	Taxiway Parallel 01	03	AC	37,379	40	Very Poor	74
TP01	Taxiway Parallel 01	04	AC	63,260	42	Poor	72
TP02	Taxiway Parallel 02	01	AC	90,858	38	Very Poor	75
TP02	Taxiway Parallel 02	02	AC	13,469	39	Very Poor	75
TP02	Taxiway Parallel 02	03	AC	147,866	42	Poor	72

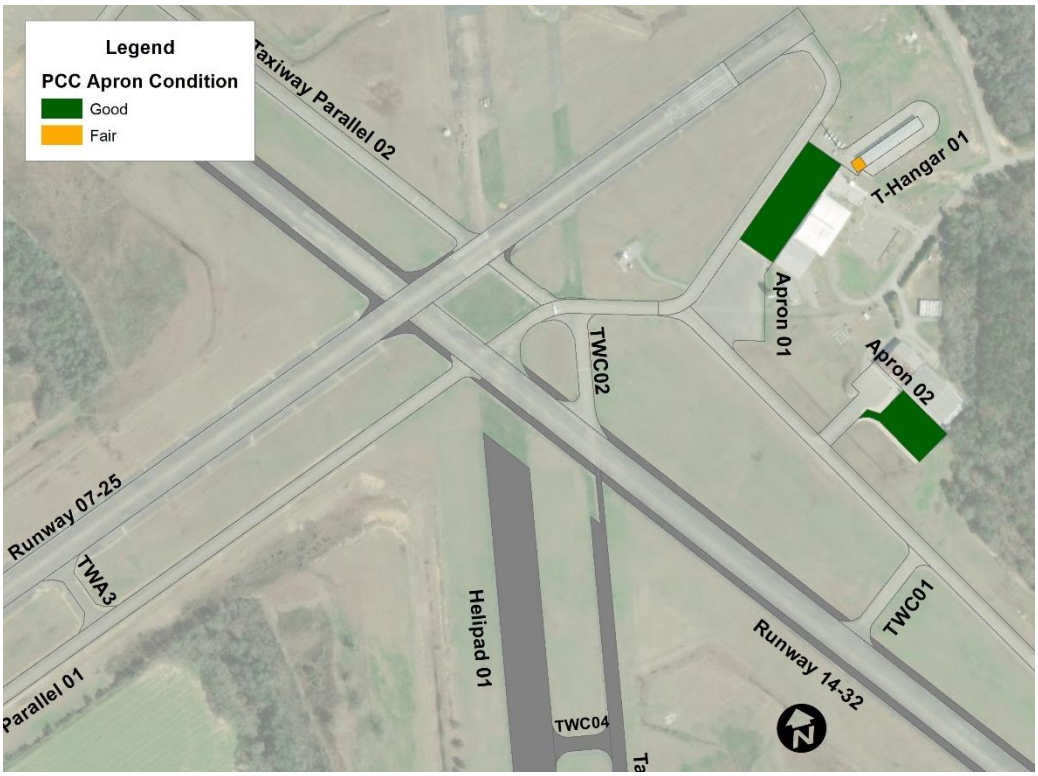
Figure B2A and B2B in Appendix B are maps of the section PCI in 7- and 3-scale categories, respectively. Figures B2C is a map of the FOD rating. Appendix D contains a detailed report of the PCI values and distress type, quantity, and severity data for each sample unit that was surveyed in a section. 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 t2ℕúfl·yŘ /ŜYŜyú /2yÖℕŜúŜ ót//ú l·LJℕ2yãΦ C2ℕ úKŜăŜ LJl·ØŜYŜyúăΣ l· ℕl·úΛyΞ 2Ŧ áD22ŘéΣ áCl·ΛℕéΣ 2ℕ át22ℕé ǿl·ă assigned based on the overall pavement condition. Figure 3.4 shows the condition of the PCC aprons at TOI.

Figure 3.4: PCC Apron Condition Rating.



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 ŘI·úI·◊ t !±9w◊ă tℕŜŘλŎúλ2y′ a2ŘŜfλyƎ Y′2ŘdzfŜ ø I·ă dzăŜŘ ű2 Řevelop pavement performance models that I·ℕŜ Ŏ2Y′Y′2yfè ℕŜŦŜℕℕŜŘ ú2 I·ă ΨCI·Y′λfè /dzℕØŜă◊◊

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.

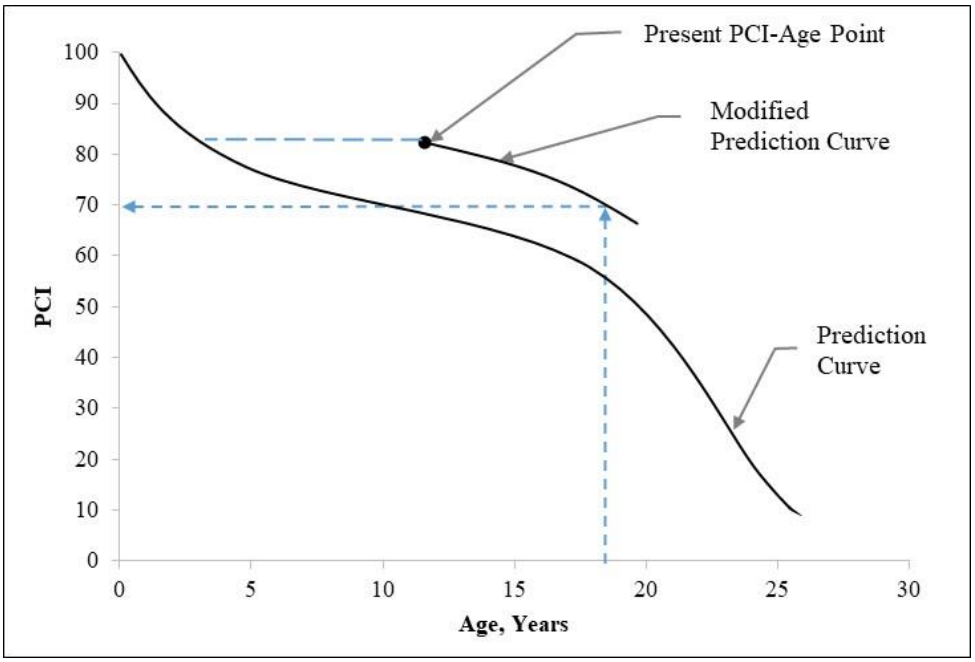
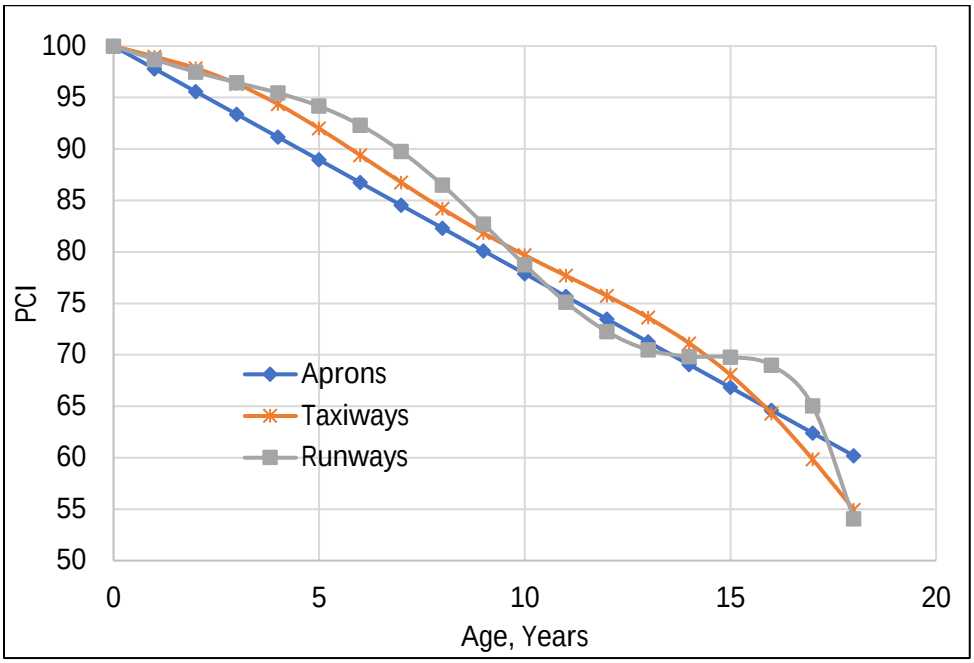


Figure 4.2: Family Curves.



4.3. Critical PCI Values

¢KŜ /₦ƛύλŎI٠f t /L ØI٠fdzŜ ƛă ŘŜŦλyŜŘ I٠ă ά*the PCI value at which the rate of PCI loss increases with time, or the cost of applying localized preventive maintenance increases significantly*φέ ¢Kλă ŘŜŦλyλύλ2yˇλă λyŎ2₦LJ2₦I٠ύŜŘ 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.

Lyˇ I٠ŎŎ2₦ŘI٠yŐŜ ǿλύK ![5h¢Ωă ŦŽŐdză 2yˇLJ₦ŠăŜ₦ØI٠ύλ2yΣ 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 ς 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]	$3.91
	55 - CP	Mill 2" & 2" AC OL	$4.27
	45 - 55	Mill 2" & 2" AC OLP (With Pre-Overlay Repairs)	$5.37
Reconstruction	0 - 45	AC Reconstruction	$9.87

[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 TOI 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 78.
- Constrained Funding: This scenario constrains the funding to $1 million each year (total of $7 million). The PCI increases to 82 in 2027.
- Do Nothing: Performing no M&R would reduce the network PCI from 78 to 63 by 2027.

Figure 4.3: Budget Analysis Process.

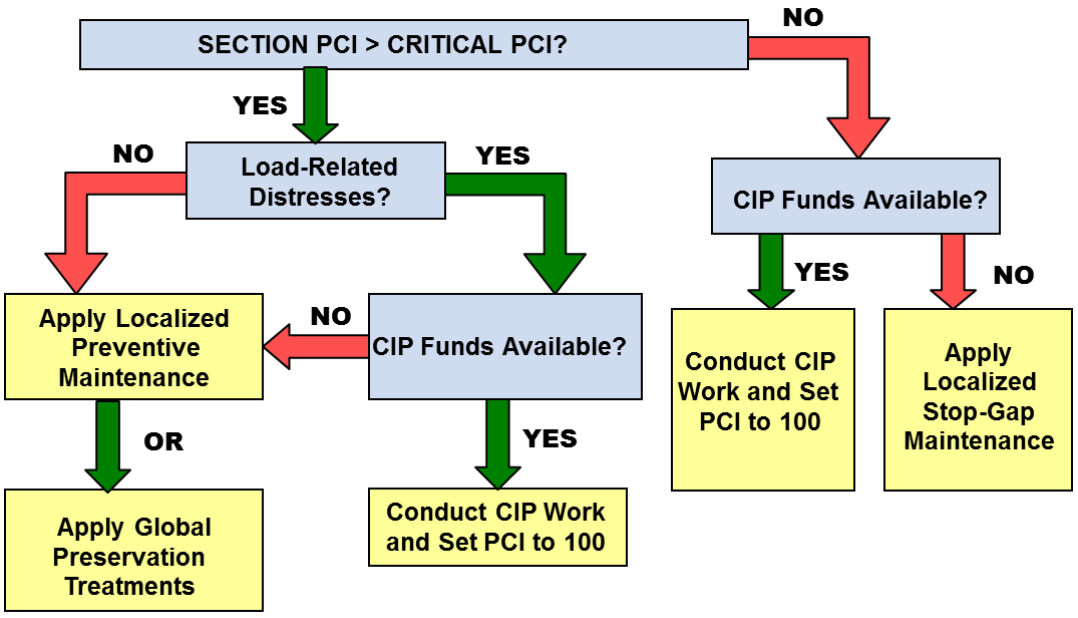


Figure 4.4: M&R Funding Levels.

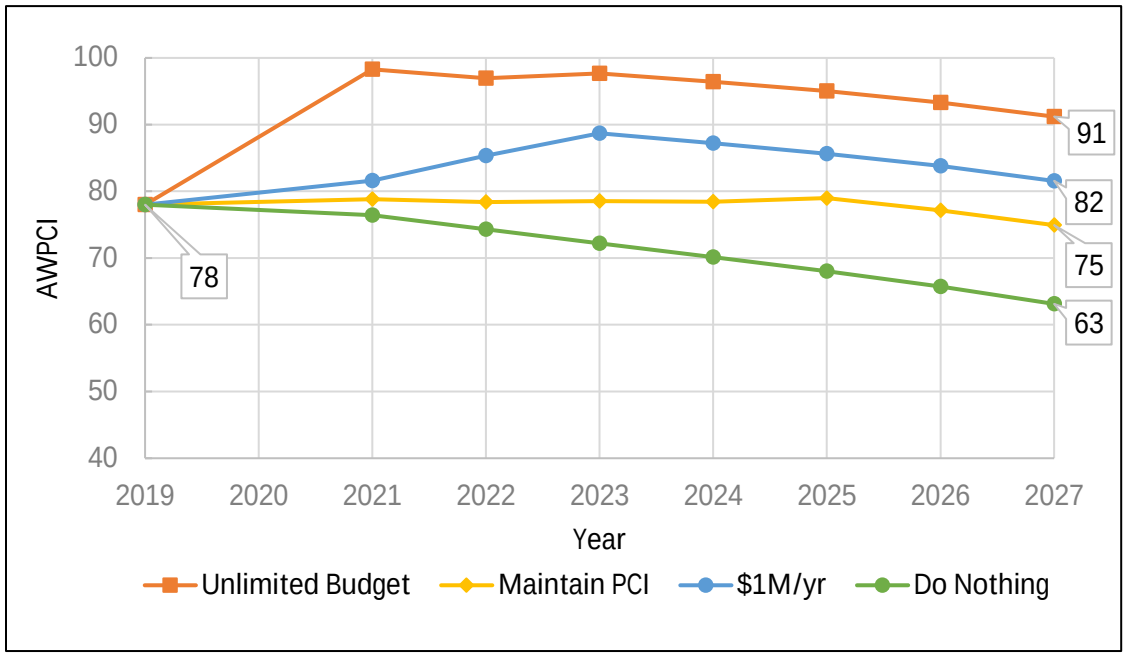


Table 4.2 summarizes the annual funding required for the above analyses. For the unlimited analysis, all pavement needs are funded in the year they are required. Therefore, the unfunded costs are zero. The total funded amount over the 7-year period is approximately $4.2 million. For the annual funding 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

ŦƵℕ ΰĸŜăŜ Ⅰ·ŎΰΩØΩΰΩŠă Ⅰ·ℕŜ ℕŜLJℕŠăŜyΰŜŘ Ⅰ·ă ΩdzyŦdzyŘŜŘέ₡ The ΩdzyŦdzyŘŜŘέ ℕŜLJⅠ·ΩℕăΩy′2027 for this funding level is approximately $2 million.

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

Year	Unlimited	Maintain PCI	Constrained $1M/year	Do Nothing
2021	$3,795,000	$442,000	$951,000	$0
2022	$4,000	$316,000	$994,000	$0
2023	$357,000	$410,000	$884,000	$0
2024	$5,000	$352,000	$43,000	$0
2025	$7,000	$531,000	$48,000	$0
2026	$9,000	$76,000	$54,000	$0
2027	$13,000	$99,000	$68,000	$0
Total	$4,189,000	$2,225,000	$3,041,000	$0
2027 Backlog	-	$3,456,000	$1,956,000	$5,815,000

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 ΩyŎΩdzŘŜŘ ΰƨ2 LJℕ2ØΩŘŜ Ⅰ· ƒ2ƎΩŎⅠ·ƒ LJƒⅠ·y′ØKΩŎK Ø2ΩdzƒŘ Ⅰ·Ø2ΩŘ ŎℕŜⅠ·ΰΩyƎ ΩΩăƒⅠ·yŘăέ 2Ŧ ySØŜℕ 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 $5.2 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 TOI.

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
2022	TOI_22-01_Apron 01 Rehabilitation	$602,254	105,785	46	100
2023	TOI_23-01_Taxiway Parallel 01 Rehabilitation	$3,838,675	413,114	38	100
2024	TOI_24-01_Runway 07-25 Surface Treatment	$415,081	652,200	96	98
2025	TOI_25-01_Apron 01 Surface Treatment	$41,944	63,985	93	98
2026	TOI_26-01_Taxiway Parallel 01 Surface Treatment	$278,930	413,114	96	99
	Total	$5,176,884			

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

Branch	Section	Area, sf	PCI Before Rehab	Activity	Activity Type	Cost
TOI_22-01_Apron 01 Rehabilitation						$602,254
A01	01	63,985	48	Mill 2" & 2" AC OLP	Rehabilitation	$364,279
THANG01	01	41,800	46	Mill 2" & 2" AC OLP	Rehabilitation	$237,975
TOI_23-01_Taxiway Parallel 01 Rehabilitation						$3,838,675
TA1	01	11,705	57	Mill 2" & 2" AC OL	Rehabilitation	$54,597
TA2	01	13,825	41	Mill 2" & 2" AC OLP	Rehabilitation	$81,070
TA3	01	15,912	33	AC Reconstruction	Reconstruction	$171,687
TC02	01	26,871	31	AC Reconstruction	Reconstruction	$289,931
TP01	01	78,188	70	Mill 2" & 2" AC OL	Rehabilitation	$364,702
TP01	02	165,974	33	AC Reconstruction	Reconstruction	$1,790,818
TP01	03	37,379	29	AC Reconstruction	Reconstruction	$403,310
TP01	04	63,260	31	AC Reconstruction	Reconstruction	$682,560
TOI_24-01_Runway 07-25 Surface Treatment						$415,081
R0725	01	151,200	-	Surface Treatment	Preservation	$96,228
R0725	02	468,500	-	Surface Treatment	Preservation	$298,168
R0725	03	32,500	-	Surface Treatment	Preservation	$20,684
TOI_25-01_Apron 01 Surface Treatment						$41,944
A01	01	63,985	-	Surface Treatment	Preservation	$41,944
TOI_26-01_Taxiway Parallel 01 Surface Treatment						$278,930
TA1	01	11,705	-	Surface Treatment	Preservation	$7,903
TA2	01	13,825	-	Surface Treatment	Preservation	$9,335
TA3	01	15,912	-	Surface Treatment	Preservation	$10,744
TC02	01	26,871	-	Surface Treatment	Preservation	$18,143
TP01	01	78,188	-	Surface Treatment	Preservation	$52,792
TP01	02	165,974	-	Surface Treatment	Preservation	$112,064
TP01	03	37,379	-	Surface Treatment	Preservation	$25,238
TP01	04	63,260	-	Surface Treatment	Preservation	$42,713
					Total	$5,176,884

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 $5.2 million for TOI:

- ü FAA (90%): $4.6 million
- ü ALDOT (5%): $0.3 million
- ü Airport Sponsor (5%): $0.3 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 $4,028. 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 TOI pavements.

Table 4.5: Summary of Year-1 Maintenance Plan.

Policy	Work Description	Work Quantity	Work Unit	Work Cost
Preventive	Crack Sealing - AC	1,020	Ft	$4,028
			Total	$4,028

APPENDIX A

INVENTORY

Appendix A

Pavement Inventory Report

Troy Municipal Airport At N Kenneth Campbell Field (TOI)

Branch ID	Name	Branch Use	Section ID	Rank[1]	Length (ft)	Width (ft)	Area (sf)	LCD[2]	Surface[3]
A01	Apron 01 Troy	APRON	01	S	315	150	63,985	1/1/1944	AC
A02	Apron 02 Troy	APRON	01	S	140	140	29,585	1/1/1944	AC
AHELO01	Helipad 01 Troy	HELIPAD	01	S	2,670	150	389,958	1/1/1944	AC
AHELO01	Helipad 01 Troy	HELIPAD	02	S	2,670	150	389,958	1/1/1944	AC
R0725	Runway 07-25 Troy	RUNWAY	01	P	1,512	100	151,200	3/1/2021	AAC
R0725	Runway 07-25 Troy	RUNWAY	02	P	4,685	100	468,500	3/1/2021	AAC
R0725	Runway 07-25 Troy	RUNWAY	03	P	325	100	32,500	3/1/2021	AAC
R1432	Runway 14-32 Troy	RUNWAY	01	P	1,430	100	143,000	1/1/1944	AC
R1432	Runway 14-32 Troy	RUNWAY	02	P	3,487	100	348,700	1/1/1944	AC
TA1	Taxiway A1 Troy	TAXIWAY	01	S	200	50	11,705	1/1/2012	AC
TA2	Taxiway A2 Troy	TAXIWAY	01	S	225	50	13,825	1/1/1944	AC
TA3	Taxiway A3 Troy	TAXIWAY	01	S	225	50	15,912	1/1/1944	AC
TC01	Taxiway Connector 01 Troy	TAXIWAY	01	S	360	50	20,968	1/1/1944	AC
TC02	Taxiway Connector 02 Troy	TAXIWAY	01	S	393	50	26,871	1/1/1944	AC
TC04	Taxiway Connector 04 Troy	TAXIWAY	01	S	200	35	9,597	1/1/1944	AC
THANG01	Taxiway Hangar 01 Troy	TAXIWAY	01	T	780	50	41,800	1/1/1944	AC
TP01	Taxiway Parallel 01 Troy	TAXIWAY	01	P	1,527	50	78,188	1/1/2012	AC
TP01	Taxiway Parallel 01 Troy	TAXIWAY	02	P	3,289	50	165,974	1/1/1944	AC
TP01	Taxiway Parallel 01 Troy	TAXIWAY	03	P	635	50	37,379	1/1/1944	AC
TP01	Taxiway Parallel 01 Troy	TAXIWAY	04	P	1,223	50	63,260	1/1/1944	AC
TP02	Taxiway Parallel 02 Troy	TAXIWAY	01	P	1,715	50	90,858	1/1/1944	AC
TP02	Taxiway Parallel 02 Troy	TAXIWAY	02	P	250	50	13,469	4/14/1997	AC
TP02	Taxiway Parallel 02 Troy	TAXIWAY	03	P	2,895	50	147,866	1/1/1944	AC
TP03	Taxiway Parallel 03 Troy	TAXIWAY	01	P	4,420	50	216,222	1/1/1944	AC
TP03	Taxiway Parallel 03 Troy	TAXIWAY	02	P	4,420	50	216,222	1/1/1944	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 = Aphalt 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

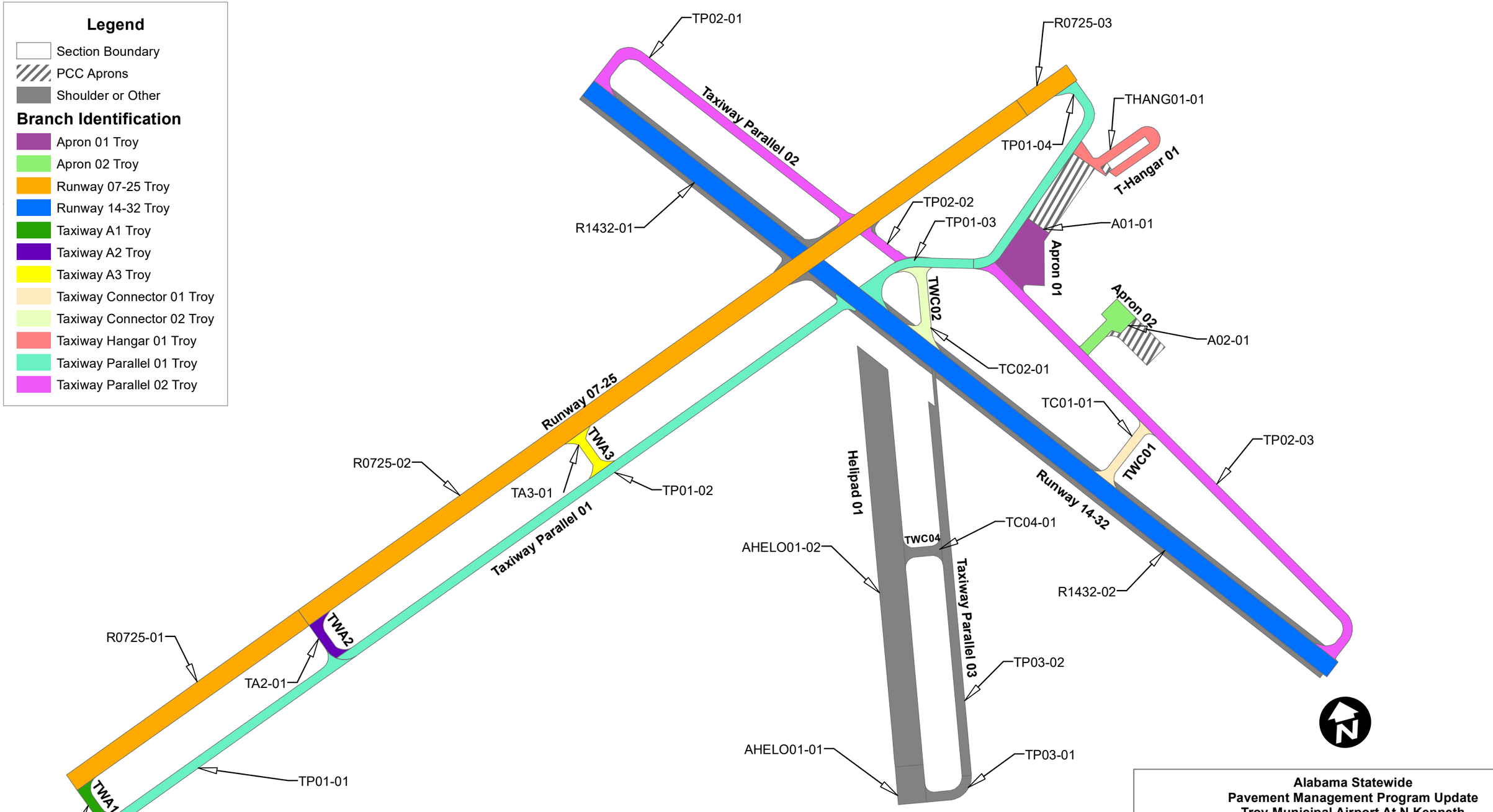
B3: Pavement Capital Improvement Plan (PCIP) Maps
- B3A: 2027 Forecasted PCI without PCIP
- B3B: M&R Needs
- B3C: PCIP Recommendations

Legend

- Section Boundary
- PCC Aprons
- Shoulder or Other

Branch Identification

- Apron 01 Troy
- Apron 02 Troy
- Runway 07-25 Troy
- Runway 14-32 Troy
- Taxiway A1 Troy
- Taxiway A2 Troy
- Taxiway A3 Troy
- Taxiway Connector 01 Troy
- Taxiway Connector 02 Troy
- Taxiway Hangar 01 Troy
- Taxiway Parallel 01 Troy
- Taxiway Parallel 02 Troy



Alabama Statewide
Pavement Management Program Update
Troy Municipal Airport At N Kenneth
Campbell Field (TOI) Troy, AL

Figure B1A

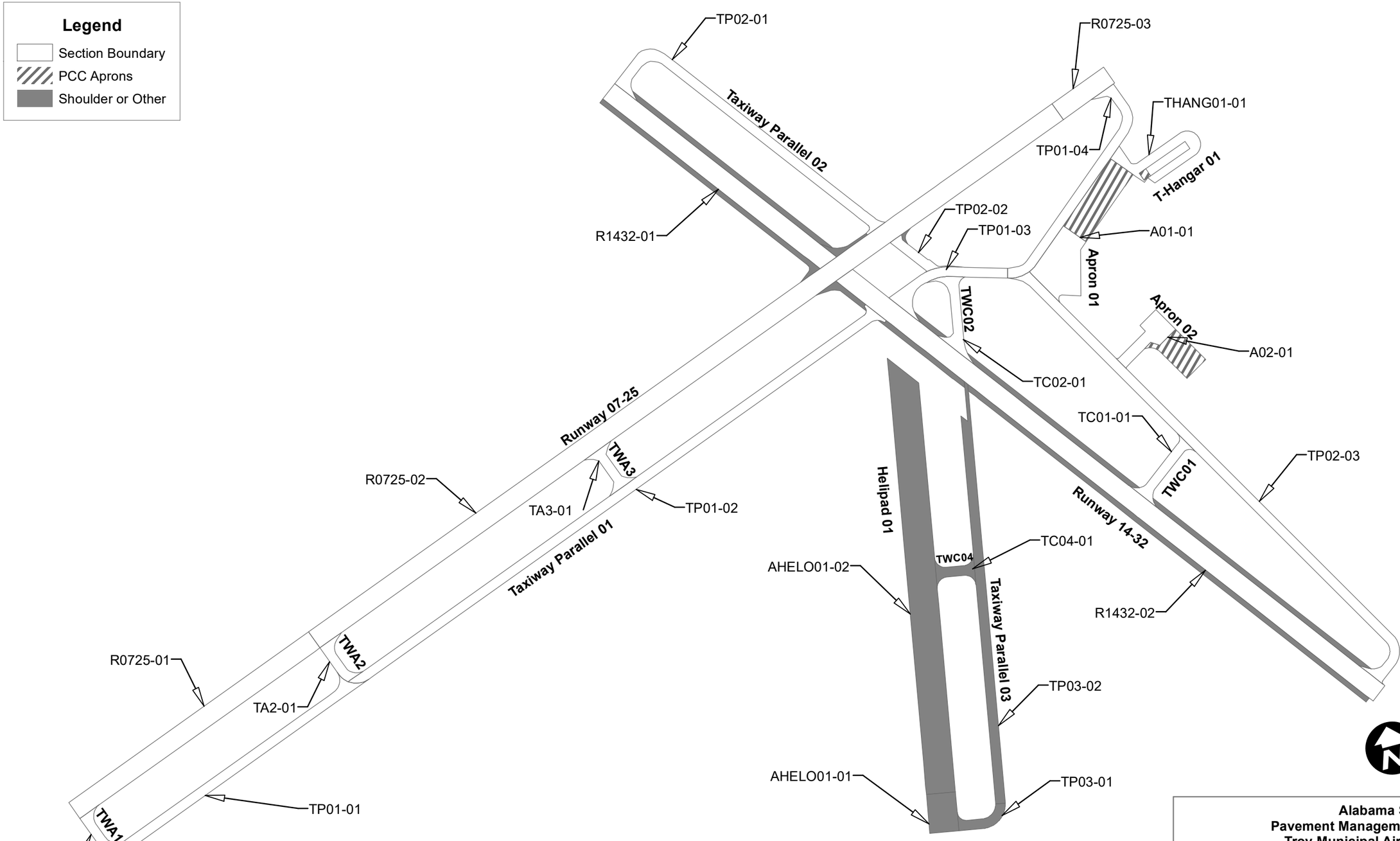
Branch Identification

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

ENGINEER	DATE	MAP NUMBER
KP/MR	May 2021	Page 1
REVISED	SCALE	
JMA	1 in = 500 ft	FINAL

Legend

- Section Boundary
- PCC Aprons
- Shoulder or Other



Alabama Statewide
Pavement Management Program Update
Troy Municipal Airport At N Kenneth
Campbell Field (TOI) Troy, AL

Figure B1B

Section Identification

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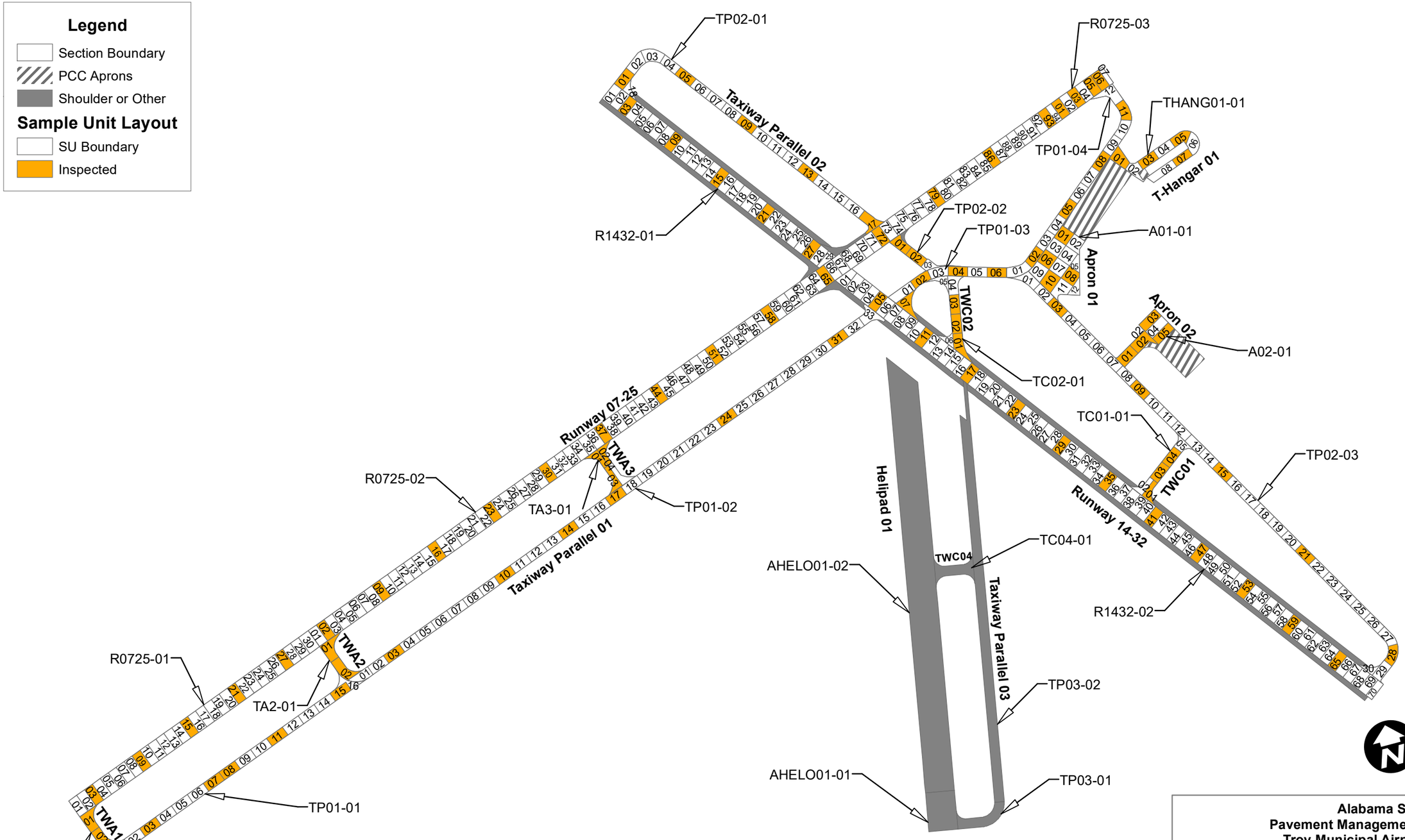
ENGINEER	DATE	MAP NUMBER
KP/MR	May 2021	Page 2
REVISED	SCALE	
JMA	1 in = 500 ft	**FINAL**

Legend

- Section Boundary
- PCC Aprons
- Shoulder or Other

Sample Unit Layout

- SU Boundary
- Inspected



Alabama Statewide
Pavement Management Program Update
Troy Municipal Airport At N Kenneth
Campbell Field (TOI) Troy, AL

Figure B1C

Sample Unit Layout

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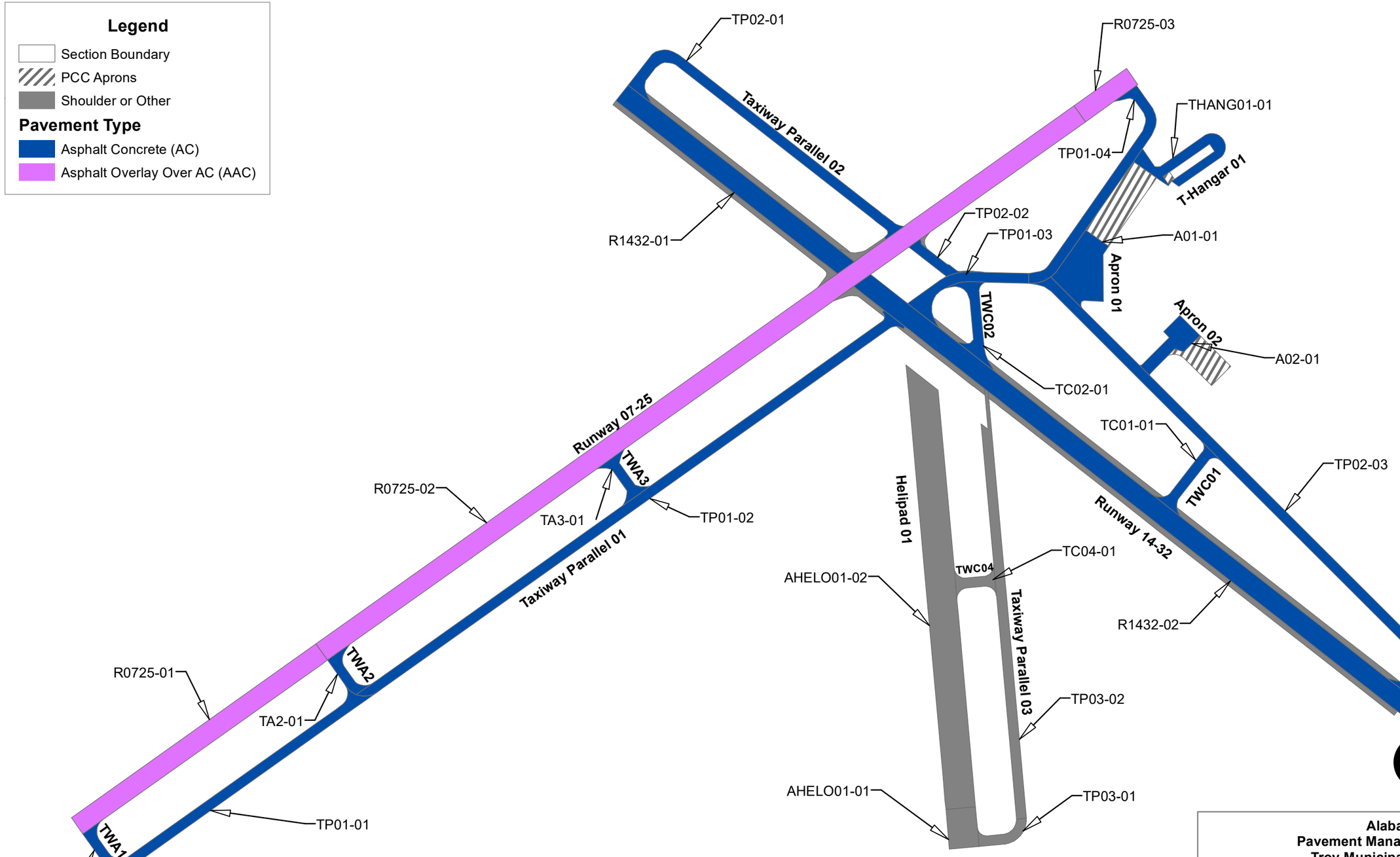
ENGINEER	DATE	MAP NUMBER
KP/MR	May 2021	Page 3
REVISED	SCALE	
JMA	1 in = 500 ft	**FINAL**



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Pavement Management Program Update
Troy Municipal Airport At N Kenneth
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Figure B1D

Pavement Type

All About
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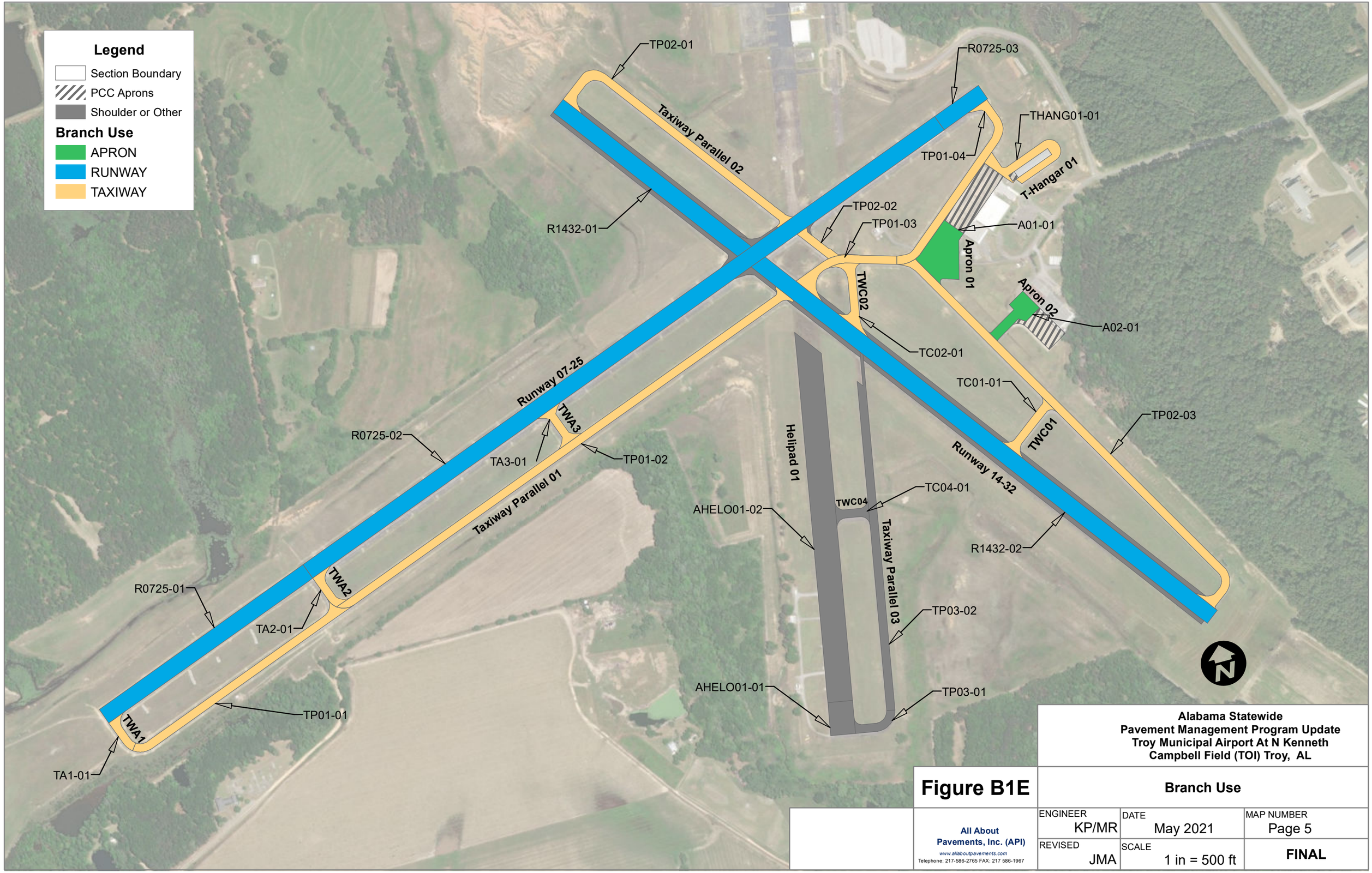
ENGINEER	DATE	MAP NUMBER
KP/MR	February 2022	Page 4
REVISED	SCALE	
JMA	1 in = 500 ft	**FINAL**



Alabama Statewide
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Troy Municipal Airport At N Kenneth
Campbell Field (TOI) Troy, AL

Figure B1E

Branch Use

All About
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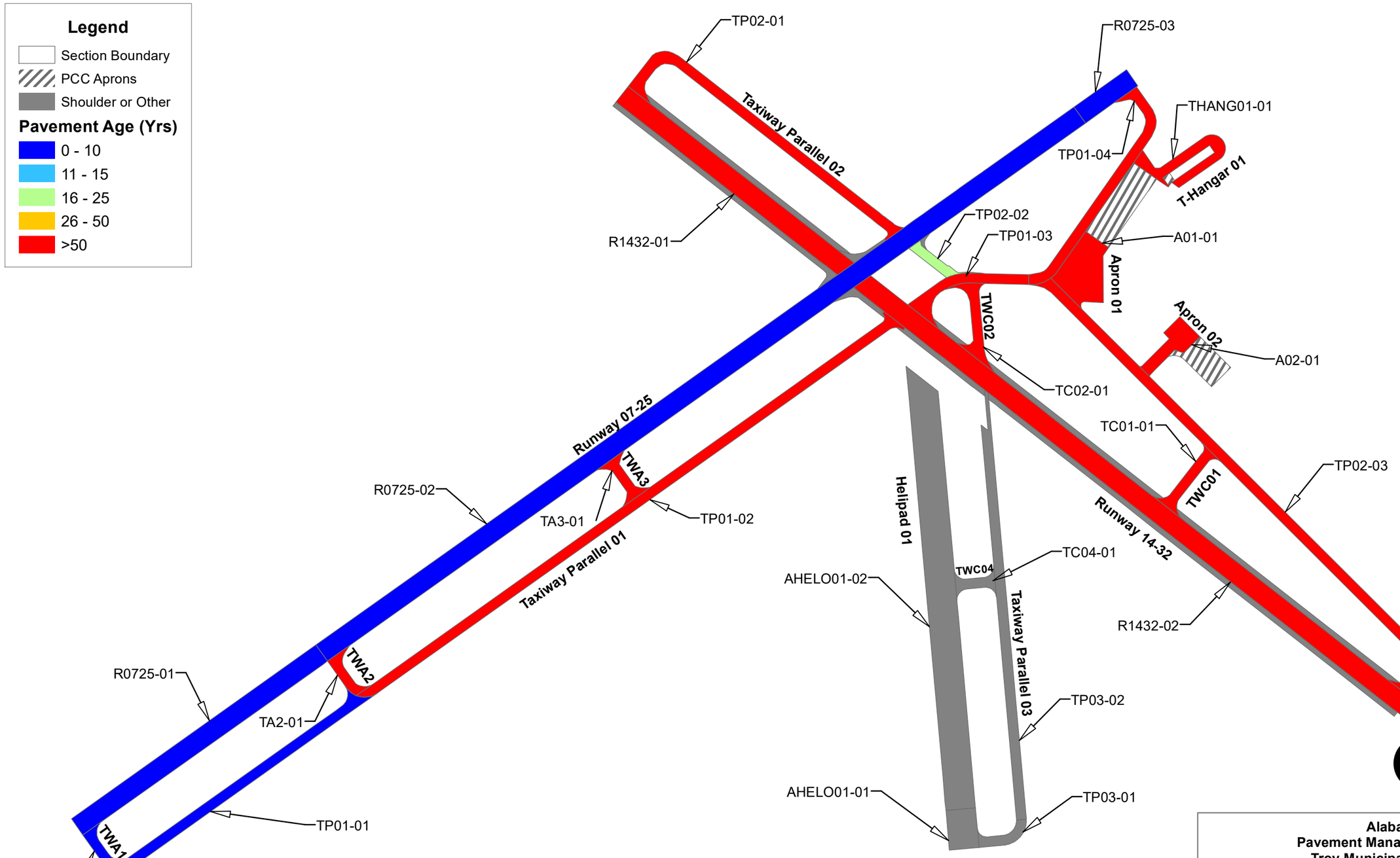
ENGINEER	DATE	MAP NUMBER
KP/MR	May 2021	Page 5
REVISED	SCALE	
JMA	1 in = 500 ft	**FINAL**



Alabama Statewide
Pavement Management Program Update
Troy Municipal Airport At N Kenneth
Campbell Field (TOI) Troy, AL

Figure B1F

Pavement Age

All About
Pavements, Inc. (API)
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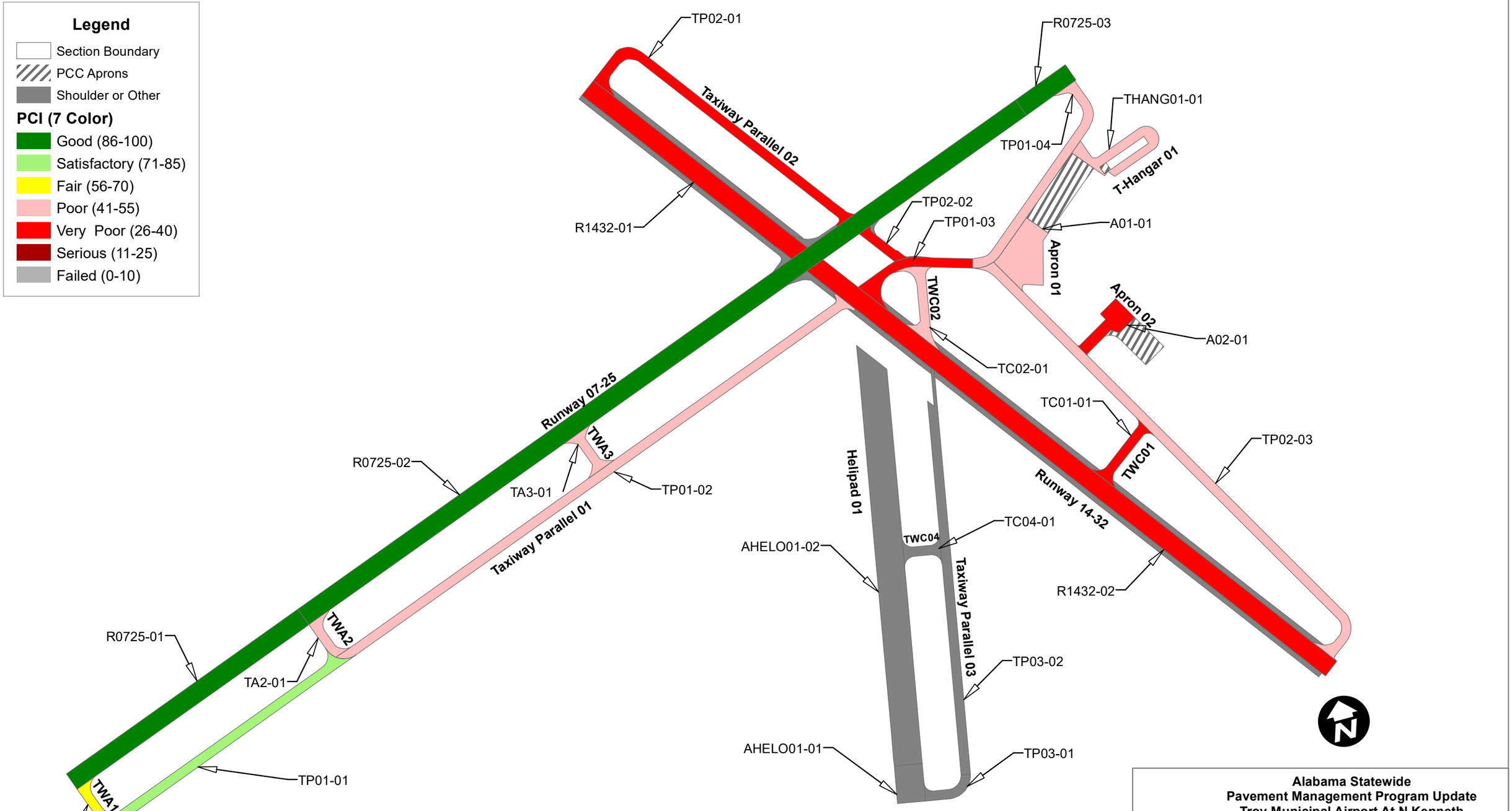
ENGINEER	DATE	MAP NUMBER
KP/MR	February 2022	Page 6
REVISED	SCALE	
JMA	1 in = 500 ft	**FINAL**

Legend

- Section Boundary
- PCC Aprons
- 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
Troy Municipal Airport At N Kenneth
Campbell Field (TOI) Troy, AL

Figure B2A

7-Color PCI

All About
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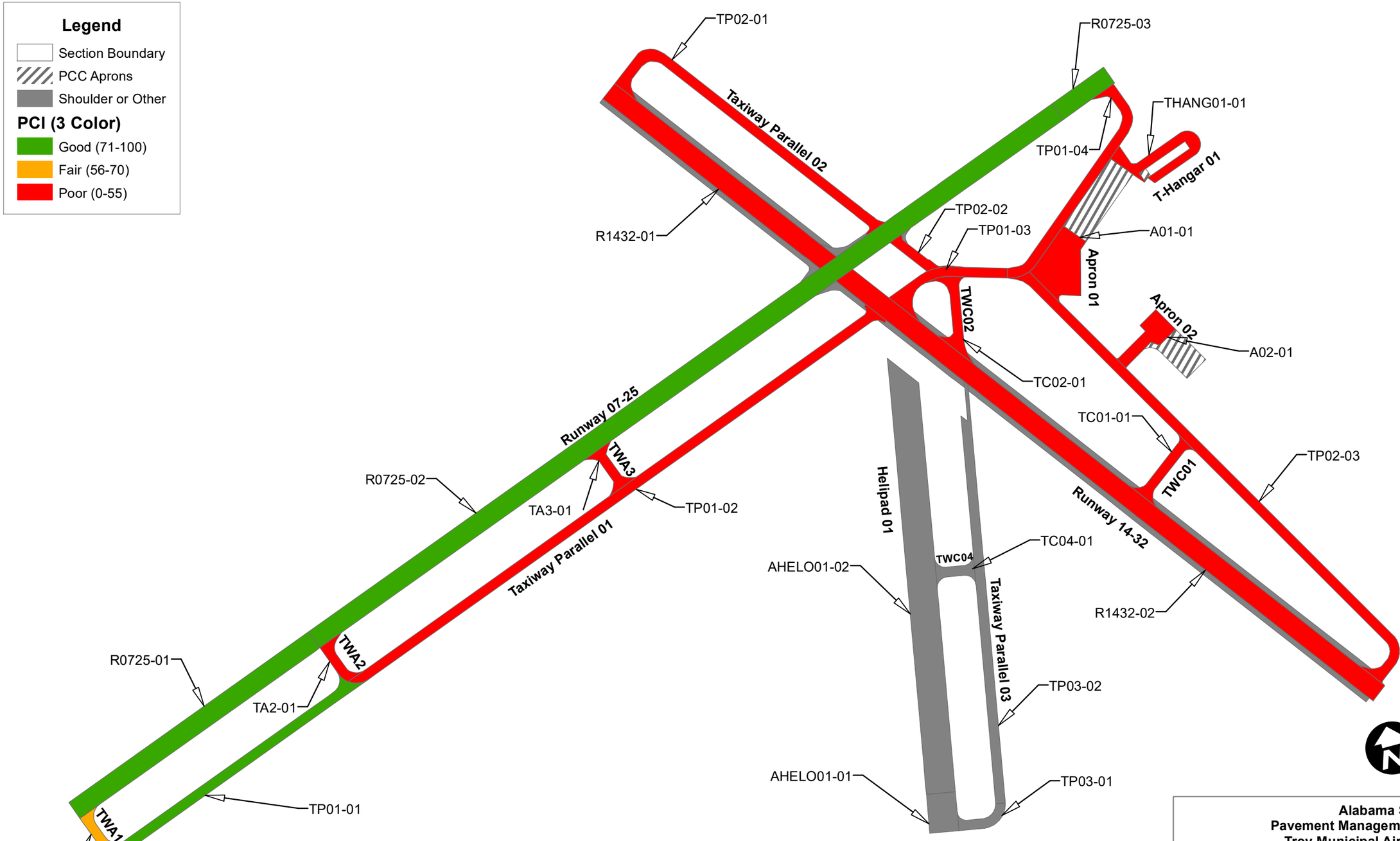
ENGINEER	DATE	MAP NUMBER
KP/MR	February 2022	Page 7
REVISED	SCALE	
JMA	1 in = 500 ft	**FINAL**

Legend

- Section Boundary
- PCC Aprons
- Shoulder or Other

PCI (3 Color)

- Good (71-100)
- Fair (56-70)
- Poor (0-55)



Alabama Statewide
Pavement Management Program Update
Troy Municipal Airport At N Kenneth
Campbell Field (TOI) Troy, AL

Figure B2B

3-Color PCI

All About
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ENGINEER	DATE	MAP NUMBER
KP/MR	February 2022	Page 8
REVISED	SCALE	
JMA	1 in = 500 ft	**FINAL**

Legend

- Section Boundary
- PCC Aprons
- Shoulder or Other

FOD Rating

- Good (0 - 45)
- Fair (46 - 60)
- Poor (61 - 100)

TP02-01
R0725-03
THANG01-01
TP01-04
Taxiway Parallel 02
T-Hangar 01
TP02-02
TP01-03
A01-01
R1432-01
Apron 01
TWC02
Apron 02
A02-01
TC02-01
TC01-01
TP02-03
Runway 07-25
TWA3
TWC01
R0725-02
TA3-01
TP01-02
Helipad 01
Runway 14-32
TC04-01
TWC04
AHELO01-02
Taxiway Parallel 01
Taxiway Parallel 03
R1432-02
TP03-02
R0725-01
TWA2
TA2-01
AHELO01-01
TP03-01
TP01-01
TWA1
TA1-01

Alabama Statewide
Pavement Management Program Update
Troy Municipal Airport At N Kenneth
Campbell Field (TOI) Troy, AL

Figure B2C

FOD Rating

JVIATION ENGINEERING & PLANNING

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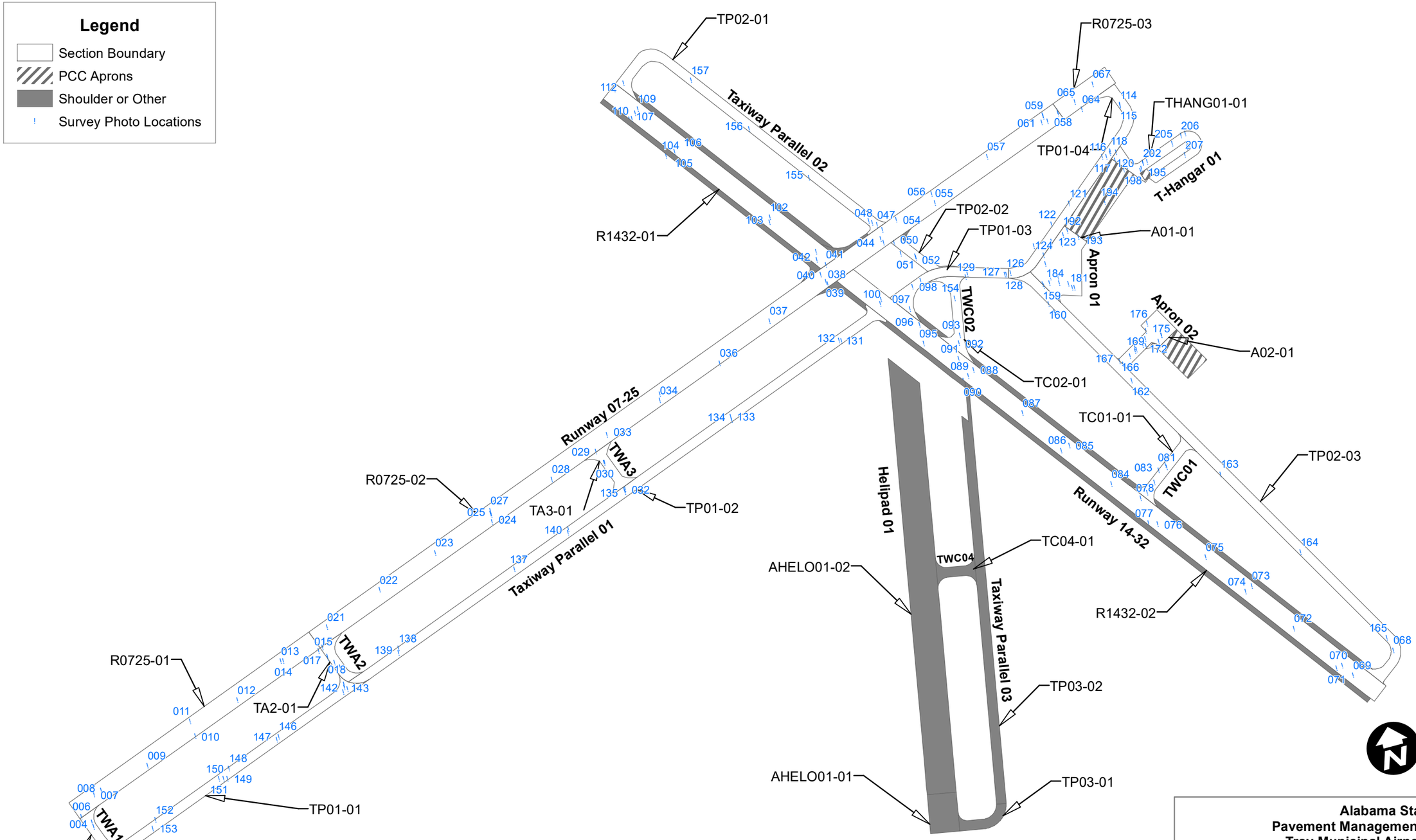
ENGINEER	DATE	MAP NUMBER
KP/MR	February 2022	Page 9
REVISED	SCALE	
JMA	1 in = 500 ft	FINAL

Legend

- Section Boundary
- PCC Aprons
- Shoulder or Other
- Survey Photo Locations



Alabama Statewide
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Troy Municipal Airport At N Kenneth
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Figure B2D

Survey Photo Locations

All About
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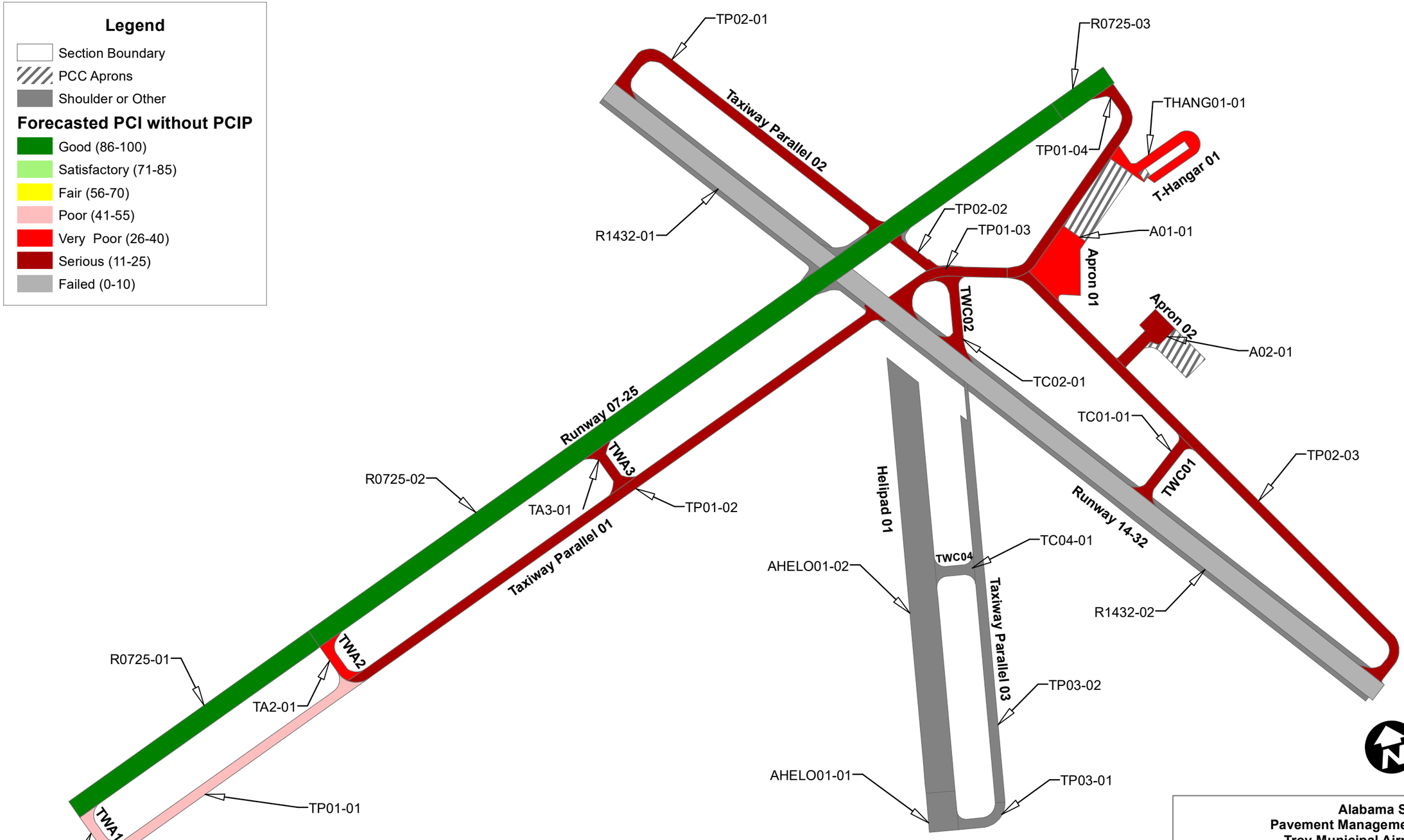
ENGINEER	DATE	MAP NUMBER
KP/MR	May 2021	Page 10
REVISED	SCALE	
JMA	1 in = 500 ft	**FINAL**

Legend

- Section Boundary
- PCC Aprons
- 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
Troy Municipal Airport At N Kenneth
Campbell Field (TOI) Troy, AL

Figure B3A

2027 Forecasted PCI without PCIP

All About
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ENGINEER	DATE	MAP NUMBER
KP/MR	February 2022	Page 11
REVISED	SCALE	
JMA	1 in = 500 ft	**FINAL**

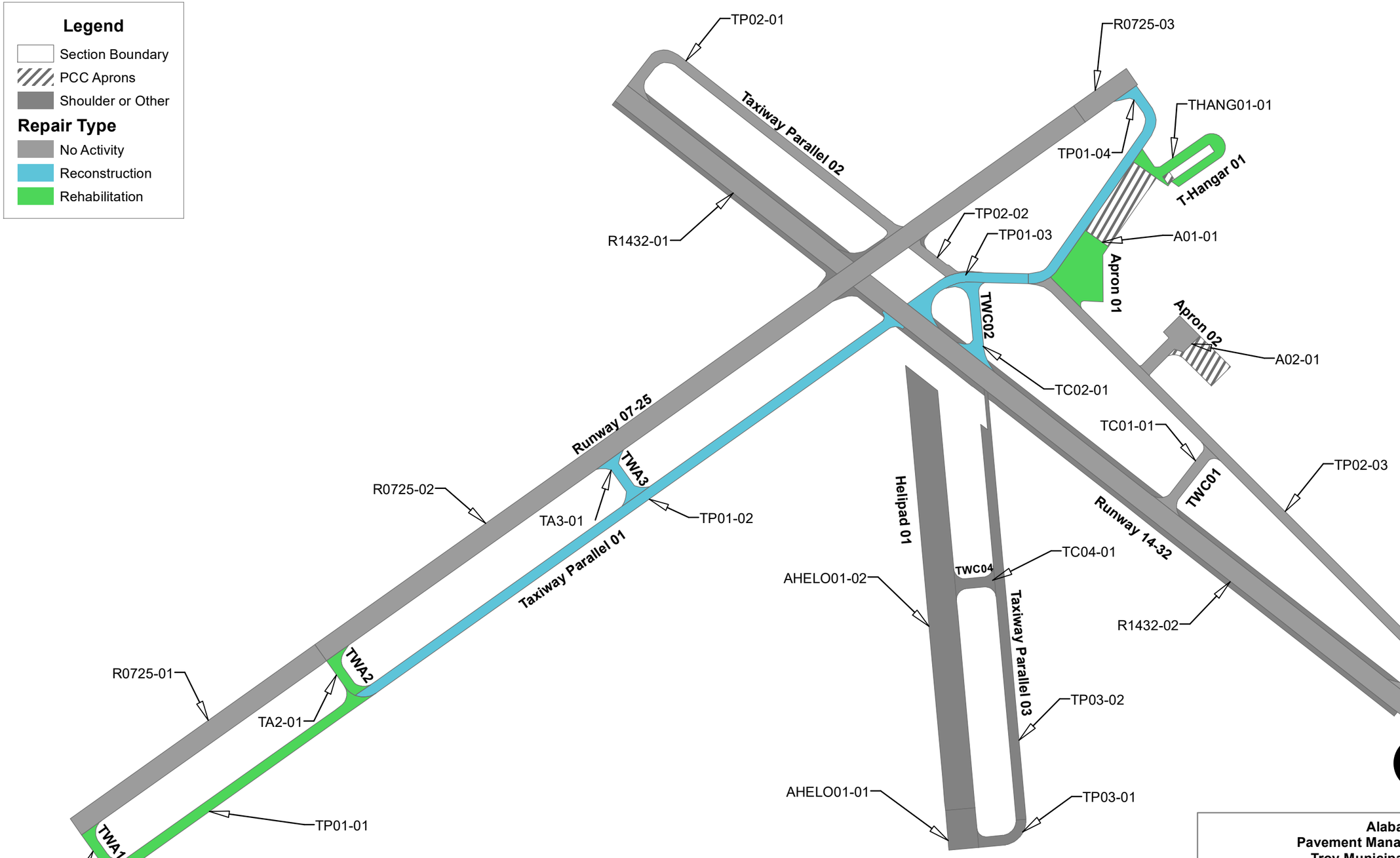
All sections recommended for Rehabilitation or Reconstruction between 2021 and 2024 also receive Surface Treatment in the 3rd year of paving.

Legend

- Section Boundary
- PCC Aprons
- Shoulder or Other

Repair Type

- No Activity
- Reconstruction
- Rehabilitation



Alabama Statewide
Pavement Management Program Update
Troy Municipal Airport At N Kenneth
Campbell Field (TOI) Troy, AL

Figure B3B

Repair Type

All About
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Telephone: 217-586-2765 FAX: 217 586-1967

ENGINEER	DATE	MAP NUMBER
KP/MR	February 2022	Page 12
REVISED	SCALE	
JMA	1 in = 500 ft	**FINAL**

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

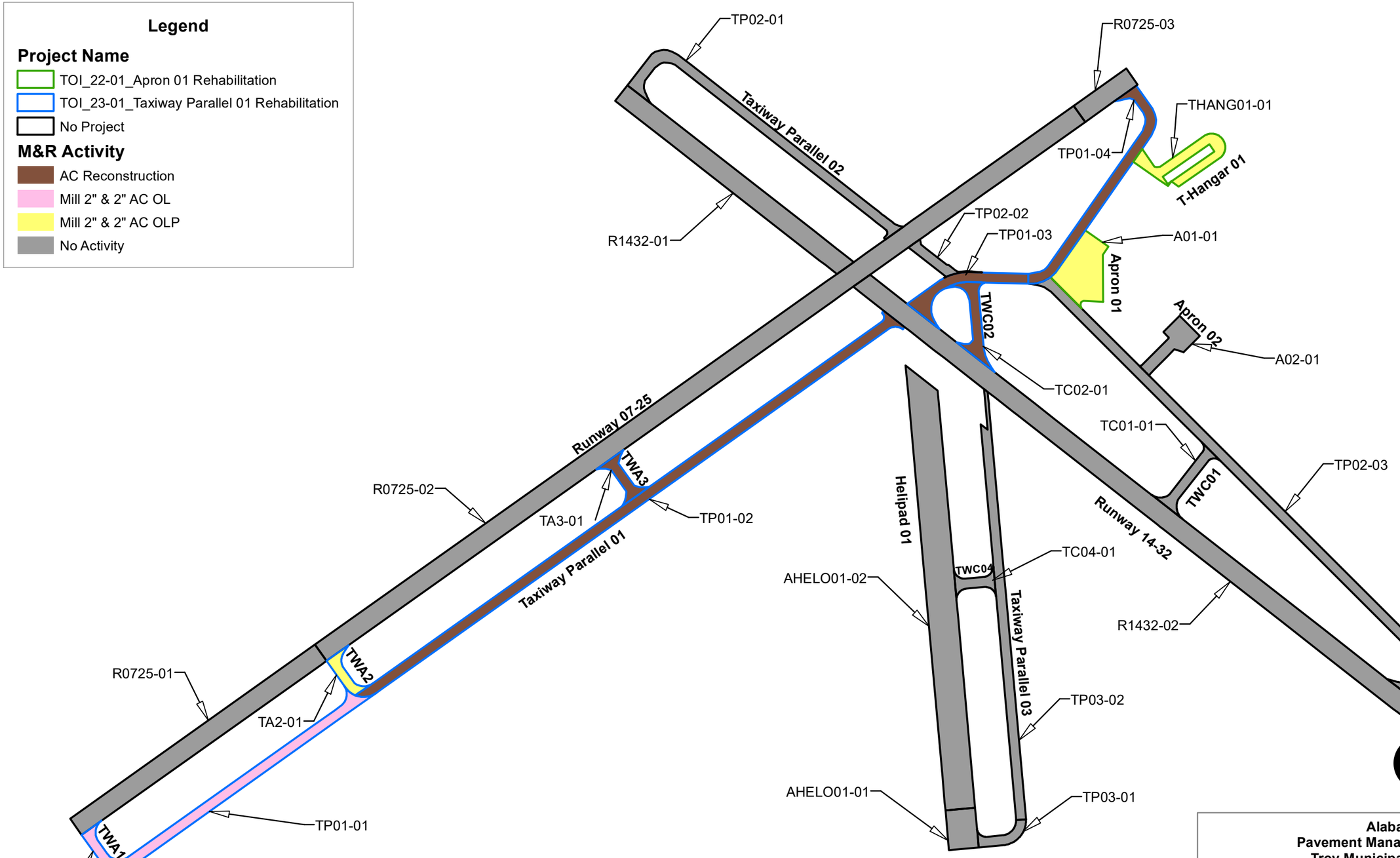
Legend

Project Name

- TOI_22-01_Apron 01 Rehabilitation
- TOI_23-01_Taxiway Parallel 01 Rehabilitation
- No Project

M&R Activity

- AC Reconstruction
- Mill 2" & 2" AC OL
- Mill 2" & 2" AC OLP
- No Activity



Alabama Statewide
Pavement Management Program Update
Troy Municipal Airport At N Kenneth
Campbell Field (TOI) Troy, AL

Figure B3C

PCIP Recommendations

All About
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ENGINEER	DATE	MAP NUMBER
KP/MR	February 2022	Page 13
REVISED	SCALE	
JMA	1 in = 500 ft	**FINAL**

APPENDIX C

OVERVIEW OF PAVEMENT DISTRESSES

1. Alligator Cracking (AC)

2. Bleeding (AC)

3. Block Cracking (AC)

-
-
-

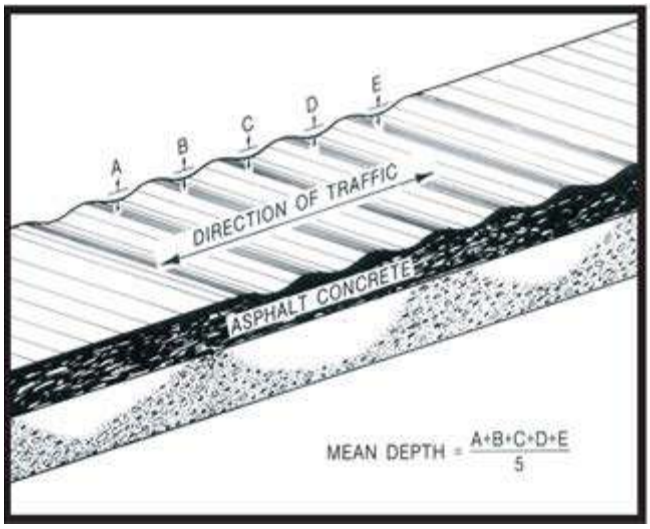
-
-
-

4. Corrugation (AC)

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



_____

-
-
-

_____

-
-
-


CAP

7. Joint Reflection Cracking (AC)

_____

-
-

-

_____

-
-
-


48 M

9. Oil Spillage (AC)

_____

_____

-
-

10. Patching

_____

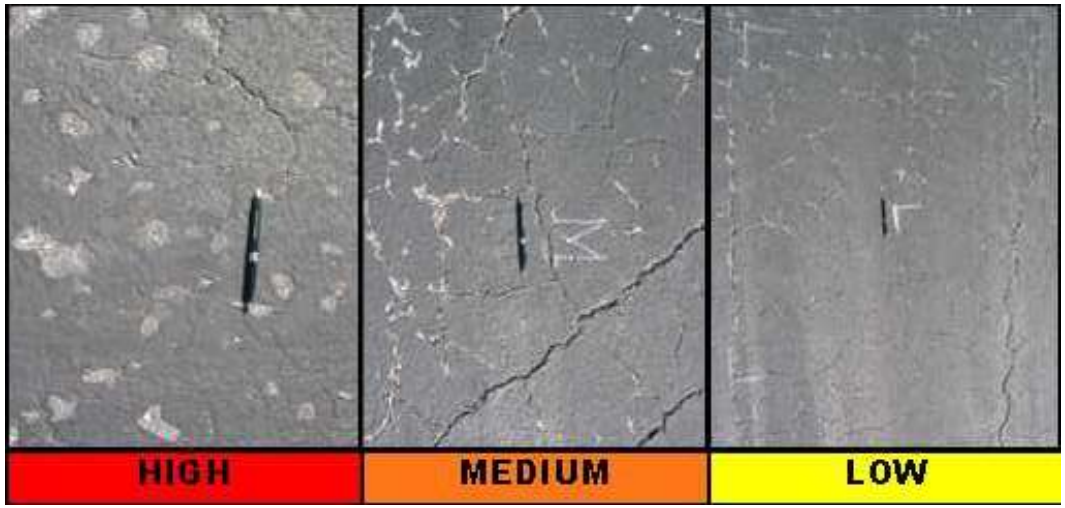
-
-
-

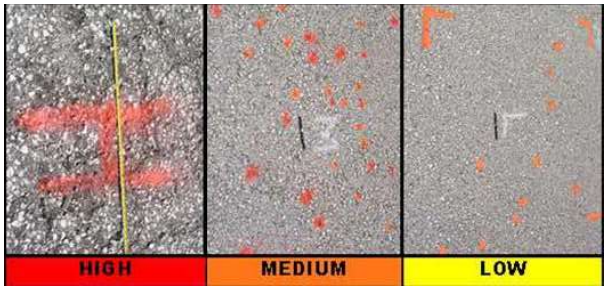
_____

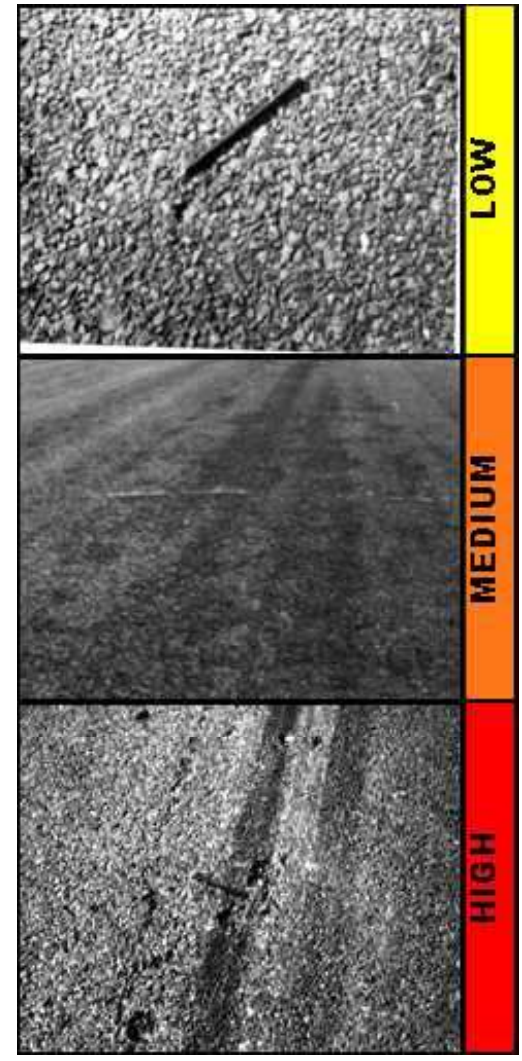
-
-
-

11. Polished Aggregate (AC)

12. Raveling (AC)


HIGH
MEDIUM
LOW


HIGH
MEDIUM
LOW


LOW
MEDIUM
HIGH

13. Rutting (AC)

from the direction of traffic. They are produced when braking or turning wheels cause the

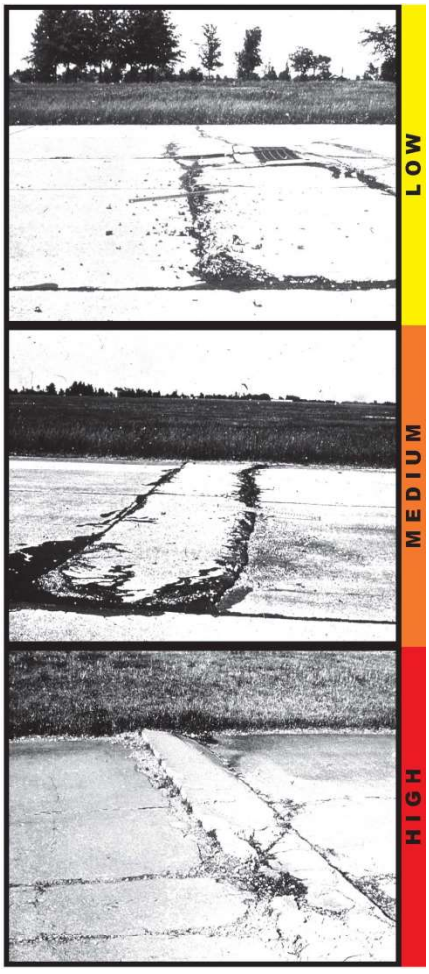
_____ No degrees of severity are defined. It is sufficient to indicate that a slippage

_____

- ♦
- ♦

15. Swelling (AC)

16. Weathering (AC)

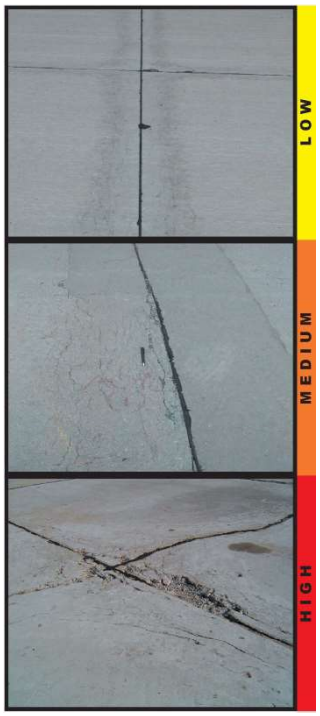

LOW
MEDIUM
HIGH

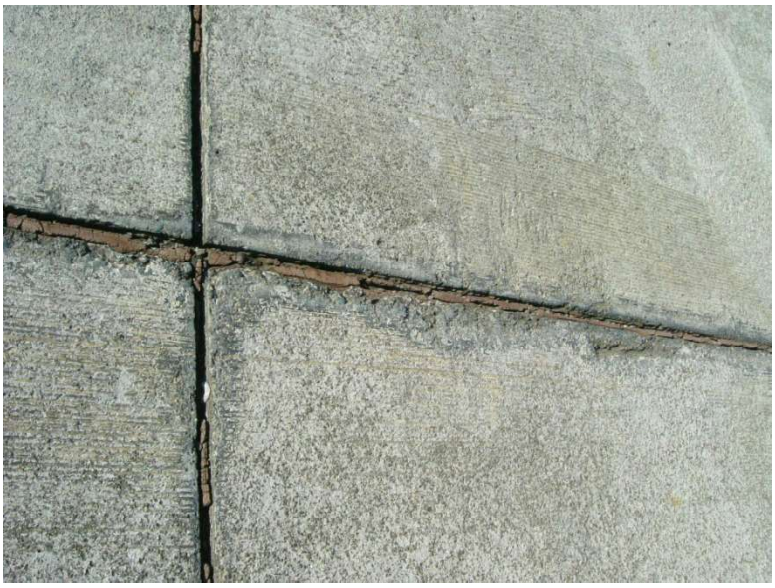
- filled, it has a mean width less than approximately 1 inch (3 millimeters); a filled crack can be of any width, but the filler material

- One of the following conditions exists: (1) filled or non filled c 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

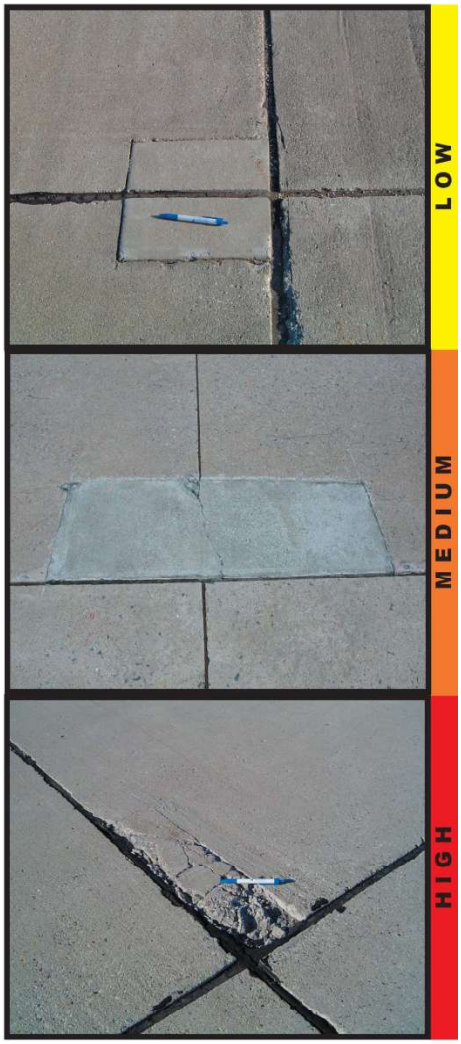
- One of the following conditions exists: (1) filled or non filled crack is severely spalled, causing definite FOD potential; (2) a non filled crack ha

parallel to a joint or linear crack. A dark coloring can usually be seen around the fine





has been removed and replaced by a filler



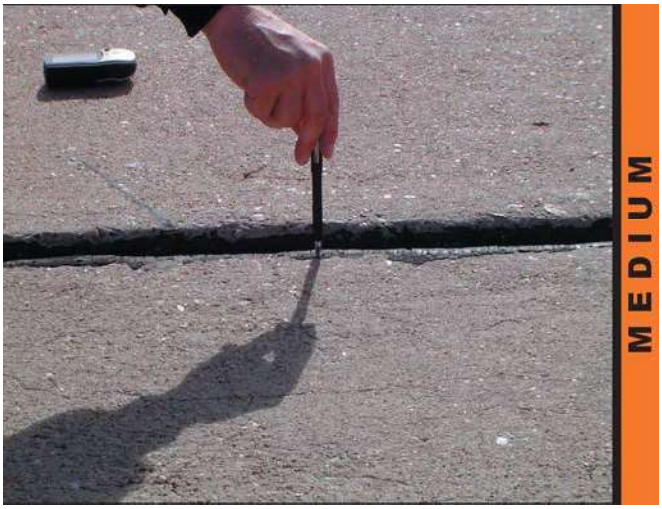
Patching is the same as defined

No degrees of severity are defined for popouts.

of approximately 1⁄4 to 1⁄2 in

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

-
-
-



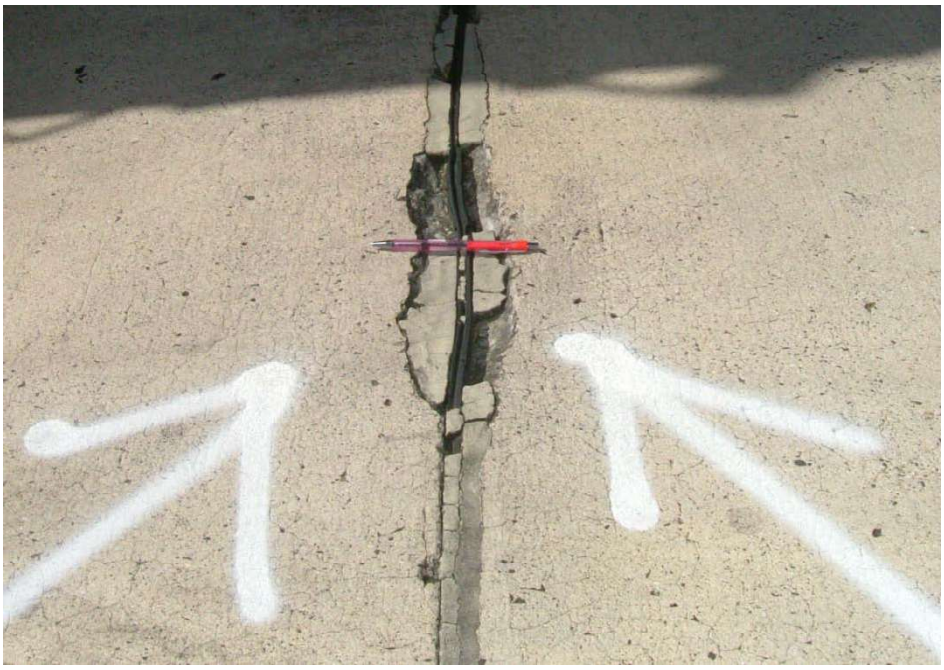
severity level of this distress type, as defined below,

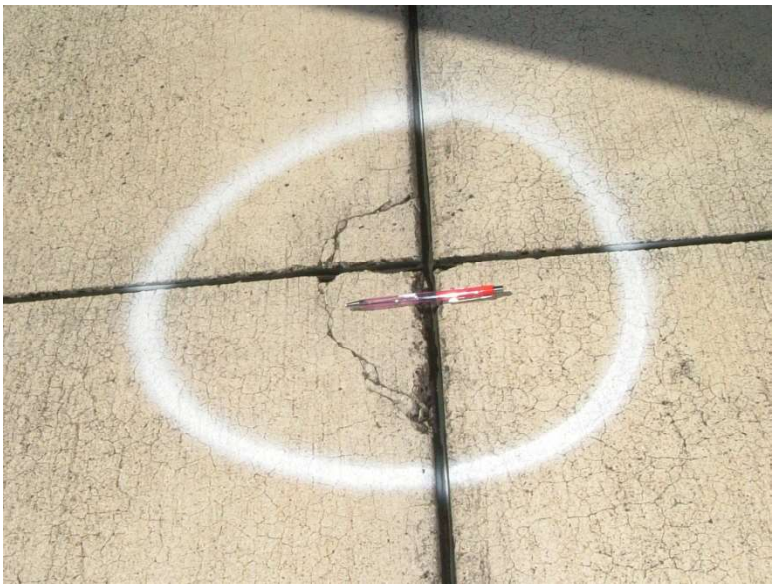
- Slab is broken into four or five pieces with the vast majority of the cracks
- (1) Slab is broken into four or five pieces with over 15 percent of the
- four or five pieces with some or all of the cracks of high severity; (2) slab is

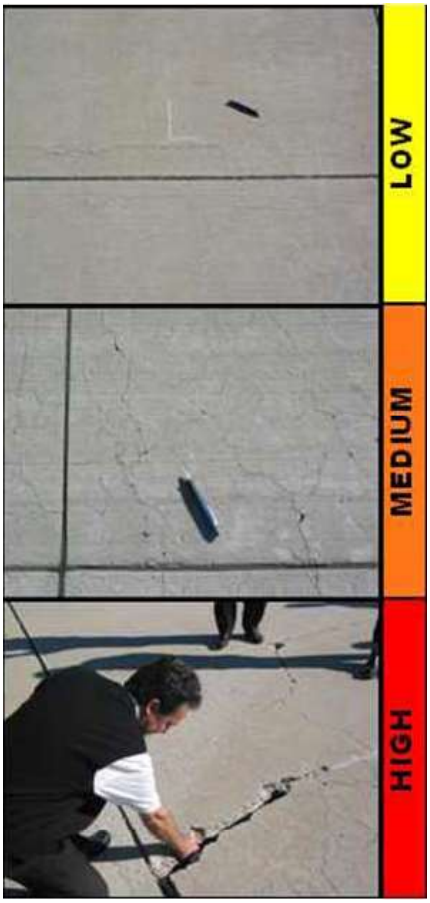
---

-
-
-

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






LOW
MEDIUM
HIGH

APPENDIX D

DETAILED PAVEMENT CONDITION DATA

APPENDIX E

DISTRESS SUMMARY REPORT

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Troy Municipal Airport At N Kenneth Campbell Field (TOI)

Branch ID	Section ID	Surface	Area (sf)	Distress Number	Description	Distress Mechanism	Severity	Quantity	Quantity Units	Distress Density
A01	01	AC	63,985	43	BLOCK CRACKING	Climate/Durability	Low	3,478	SqFt	5.4%
A01	01	AC	63,985	45	DEPRESSION	Other	Medium	24	SqFt	0.0%
A01	01	AC	63,985	48	LONGITUDINAL/TRANSVERSE	Climate/Durability	Low	2,467	Ft	3.9%
A01	01	AC	63,985	48	LONGITUDINAL/TRANSVERSE	Climate/Durability	Medium	3,592	Ft	5.6%
A01	01	AC	63,985	52	RAVELING	Climate/Durability	Medium	98	SqFt	0.2%
A01	01	AC	63,985	57	WEATHERING	Climate/Durability	Low	31,908	SqFt	49.9%
A01	01	AC	63,985	57	WEATHERING	Climate/Durability	Medium	31,976	SqFt	50.0%
A02	01	AC	29,585	41	ALLIGATOR CRACKING	Load	Medium	231	SqFt	0.8%
A02	01	AC	29,585	43	BLOCK CRACKING	Climate/Durability	Low	3,110	SqFt	10.5%
A02	01	AC	29,585	43	BLOCK CRACKING	Climate/Durability	Medium	12,314	SqFt	41.6%
A02	01	AC	29,585	48	LONGITUDINAL/TRANSVERSE	Climate/Durability	Low	124	Ft	0.4%
A02	01	AC	29,585	48	LONGITUDINAL/TRANSVERSE	Climate/Durability	Medium	1,536	Ft	5.2%
A02	01	AC	29,585	57	WEATHERING	Climate/Durability	Medium	29,585	SqFt	100.0%
R0725	01	AC	151,200		NO DISTRESS					
R0725	02	AC	468,500		NO DISTRESS					
R0725	03	AC	32,500		NO DISTRESS					
R1432	01	AC	143,000	43	BLOCK CRACKING	Climate/Durability	Low	25,740	SqFt	18.0%
R1432	01	AC	143,000	43	BLOCK CRACKING	Climate/Durability	Medium	102,960	SqFt	72.0%
R1432	01	AC	143,000	48	LONGITUDINAL/TRANSVERSE CRACKING	Climate/Durability	Medium	1,144	Ft	0.8%
R1432	01	AC	143,000	57	WEATHERING	Climate/Durability	Low	57,200	SqFt	40.0%
R1432	01	AC	143,000	57	WEATHERING	Climate/Durability	Medium	71,500	SqFt	50.0%
R1432	02	AC	348,700	43	BLOCK CRACKING	Climate/Durability	Medium	332,850	SqFt	95.5%
R1432	02	AC	348,700	48	LONGITUDINAL/TRANSVERSE CRACKING	Climate/Durability	Medium	2,124	Ft	0.6%
R1432	02	AC	348,700	57	WEATHERING	Climate/Durability	Low	174,350	SqFt	50.0%
R1432	02	AC	348,700	57	WEATHERING	Climate/Durability	Medium	174,350	SqFt	50.0%
TA1	01	AC	11,705	48	LONGITUDINAL/TRANSVERSE CRACKING	Climate/Durability	Low	270	Ft	2.3%
TA1	01	AC	11,705	48	LONGITUDINAL/TRANSVERSE CRACKING	Climate/Durability	Medium	220	Ft	1.9%
TA1	01	AC	11,705	57	WEATHERING	Climate/Durability	Low	8,905	SqFt	76.1%
TA1	01	AC	11,705	57	WEATHERING	Climate/Durability	Medium	2,800	SqFt	23.9%

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Troy Municipal Airport At N Kenneth Campbell Field (TOI)

Branch ID	Section ID	Surface	Area (sf)	Distress Number	Description	Distress Mechanism	Severity	Quantity	Quantity Units	Distress Density
TA2	01	AC	13,825	43	BLOCK CRACKING	Climate/Durability	Low	1,620	SqFt	11.7%
TA2	01	AC	13,825	43	BLOCK CRACKING	Climate/Durability	Medium	1,600	SqFt	11.6%
TA2	01	AC	13,825	45	DEPRESSION	Other	Low	45	SqFt	0.3%
TA2	01	AC	13,825	45	DEPRESSION	Other	Medium	15	SqFt	0.1%
TA2	01	AC	13,825	48	LONGITUDINAL/TRANSVERSE CRACKING	Climate/Durability	Medium	711	Ft	5.1%
TA2	01	AC	13,825	57	WEATHERING	Climate/Durability	Medium	13,825	SqFt	100.0%
TA3	01	AC	15,912	43	BLOCK CRACKING	Climate/Durability	Low	962	SqFt	6.0%
TA3	01	AC	15,912	43	BLOCK CRACKING	Climate/Durability	Medium	6,227	SqFt	39.1%
TA3	01	AC	15,912	48	LONGITUDINAL/TRANSVERSE CRACKING	Climate/Durability	Medium	1,113	Ft	7.0%
TA3	01	AC	15,912	57	WEATHERING	Climate/Durability	Medium	15,912	SqFt	100.0%
TC01	01	AC	20,968	43	BLOCK CRACKING	Climate/Durability	Medium	20,968	SqFt	100.0%
TC01	01	AC	20,968	45	DEPRESSION	Other	Medium	304	SqFt	1.4%
TC01	01	AC	20,968	57	WEATHERING	Climate/Durability	Low	2,891	SqFt	13.8%
TC01	01	AC	20,968	57	WEATHERING	Climate/Durability	Medium	18,077	SqFt	86.2%
TC02	01	AC	26,871	43	BLOCK CRACKING	Climate/Durability	Medium	26,871	SqFt	100.0%
TC02	01	AC	26,871	57	WEATHERING	Climate/Durability	Medium	26,871	SqFt	100.0%
THANG01	01	AC	41,800	45	DEPRESSION	Other	Medium	86	SqFt	0.2%
THANG01	01	AC	41,800	48	LONGITUDINAL/TRANSVERSE CRACKING	Climate/Durability	Low	1,160	Ft	2.8%
THANG01	01	AC	41,800	48	LONGITUDINAL/TRANSVERSE CRACKING	Climate/Durability	Medium	2,191	Ft	5.2%
THANG01	01	AC	41,800	52	RAVELING	Climate/Durability	Low	1,230	SqFt	2.9%
THANG01	01	AC	41,800	52	RAVELING	Climate/Durability	Medium	98	SqFt	0.2%
THANG01	01	AC	41,800	54	SHOVING	Other	Medium	308	SqFt	0.7%
THANG01	01	AC	41,800	57	WEATHERING	Climate/Durability	Low	34,352	SqFt	82.2%
THANG01	01	AC	41,800	57	WEATHERING	Climate/Durability	Medium	6,119	SqFt	14.6%
TP01	01	AC	78,188	48	LONGITUDINAL/TRANSVERSE CRACKING	Climate/Durability	Low	1,624	Ft	2.1%
TP01	01	AC	78,188	48	LONGITUDINAL/TRANSVERSE CRACKING	Climate/Durability	Medium	1,020	Ft	1.3%

APPENDIX F

PAVEMENT CONDITION REPORTS

F1: Section Forecasted Pavement Condition Rating
F2: Branch PCI Rating
F3: Branch FOD Rating

Appendix F1

Forecasted Section PCI

Troy Municipal Airport At N Kenneth Campbell Field (TOI)

Branch ID	Section ID	Forecasted PCI						
		2021	2022	2023	2024	2025	2026	2027
A01	01	50	48	46	44	42	39	37
A02	01	36	34	32	30	28	25	23
R0725	01	100	99	98	97	96	94	93
R0725	02	100	99	98	97	96	94	93
R0725	03	100	99	98	97	96	94	93
R1432	01	34	30	26	21	17	13	8
R1432	02	32	28	24	19	15	11	6
TA1	01	66	62	57	52	48	45	43
TA2	01	46	45	41	38	34	30	27
TA3	01	40	36	33	29	26	22	19
TC01	01	35	31	28	24	21	17	14
TC02	01	38	34	31	27	24	20	17
THANG01	01	49	46	44	40	37	33	30
TP01	01	75	72	70	66	62	57	52
TP01	02	40	36	33	29	26	22	19
TP01	03	36	32	29	25	22	18	15
TP01	04	38	34	31	27	24	20	17
TP02	01	34	30	27	23	20	16	13
TP02	02	35	31	28	24	21	17	14
TP02	03	38	34	31	27	24	20	17

Branch Condition Report

Pavement Database: ALDOT_220316

Branch ID	Number of Sections	Sum Section Length (Ft)	Avg Section Width (Ft)	True Area (SqFt)	Use	Average PCI	Standard Deviation PCI	Weighted Average PCI
A01	1	315.00	150.00	63,985.00	APRON	53.00	0.00	53.00
A02	1	140.00	140.00	29,585.00	APRON	39.00	0.00	39.00
R0725	3	6,522.00	100.00	652,200.00	RUNWAY	100.00	0.00	100.00
R1432	2	4,917.00	100.00	491,700.00	RUNWAY	38.00	1.00	37.58
TA1	1	200.00	50.00	11,705.00	TAXIWAY	70.00	0.00	70.00
TA2	1	225.00	50.00	13,825.00	TAXIWAY	51.00	0.00	51.00
TA3	1	225.00	50.00	15,912.00	TAXIWAY	44.00	0.00	44.00
TC01	1	360.00	50.00	20,968.00	TAXIWAY	39.00	0.00	39.00
TC02	1	393.00	50.00	26,871.00	TAXIWAY	42.00	0.00	42.00
THANG01	1	780.00	50.00	41,800.00	TAXIWAY	55.00	0.00	55.00
TP01	4	6,674.00	50.00	344,801.00	TAXIWAY	50.75	15.22	50.68
TP02	3	4,860.00	50.00	252,193.00	TAXIWAY	39.67	1.70	40.40

Pavement Database: ALDOT_220316

Use Category	Number of Sections	Total Area (SqFt)	Arithmetic Average PCI	Average STD PCI	Weighted Average PCI
APRON	2	93,570.00	46.00	7.00	48.57
RUNWAY	5	1,143,900.00	75.20	30.38	73.17
TAXIWAY	13	728,075.00	47.92	11.93	46.88
ALL	20	1,965,545.00	54.55	21.69	62.26

Branch Condition Report

Pavement Database: ALDOT_220316

Branch ID	Number of Sections	Sum Section Length (Ft)	Avg Section Width (Ft)	True Area (SqFt)	Use	Average FOD Potential	Standard Deviation FOD Pote	Weighted Average FOD Poten
A01	1	315.00	150.00	63,985.00	APRON	60.00	0.00	60.00
A02	1	140.00	140.00	29,585.00	APRON	71.00	0.00	71.00
R0725	3	6,522.00	100.00	652,200.00	RUNWAY	0.00	0.00	0.00
R1432	2	4,917.00	100.00	491,700.00	RUNWAY	76.00	1.00	76.42
TA1	1	200.00	50.00	11,705.00	TAXIWAY	43.00	0.00	43.00
TA2	1	225.00	50.00	13,825.00	TAXIWAY	60.00	0.00	60.00
TA3	1	225.00	50.00	15,912.00	TAXIWAY	70.00	0.00	70.00
TC01	1	360.00	50.00	20,968.00	TAXIWAY	73.00	0.00	73.00
TC02	1	393.00	50.00	26,871.00	TAXIWAY	72.00	0.00	72.00
THANG01	1	780.00	50.00	41,800.00	TAXIWAY	57.00	0.00	57.00
TP01	4	6,674.00	50.00	344,801.00	TAXIWAY	62.75	16.08	62.86
TP02	3	4,860.00	50.00	252,193.00	TAXIWAY	74.00	1.41	73.24

Pavement Database: ALDOT_220316

Use Category	Number of Sections	Total Area (SqFt)	Arithmetic Average FOD	Average STD FOD Potential	Weighted Average FOD P
APRON	2	93,570.00	65.50	5.50	63.48
RUNWAY	5	1,143,900.00	30.40	37.24	32.85
TAXIWAY	13	728,075.00	65.23	12.45	66.53
ALL	20	1,965,545.00	56.55	26.05	46.78

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

Appendix G2
Localized Preventive Repair Policy

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

Appendix G2
Localized Preventive Repair Policy

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 RSMeans, 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.

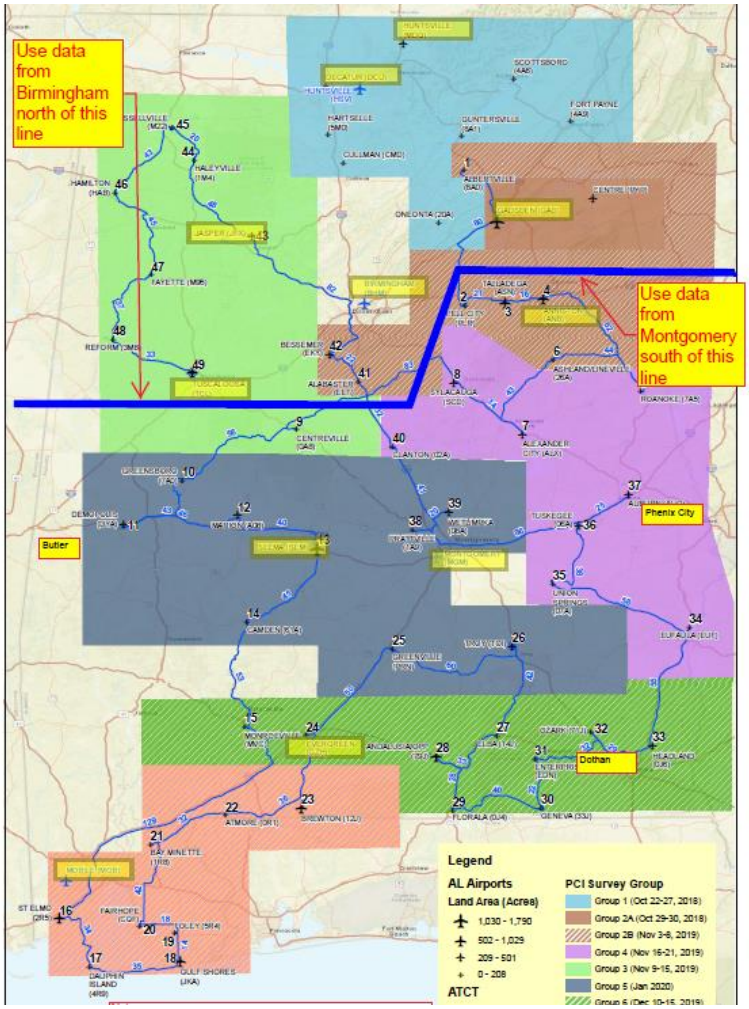

Figure 1: RSMeans Unit Costs Locations.

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

[1]For 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 RSMeans 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

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	