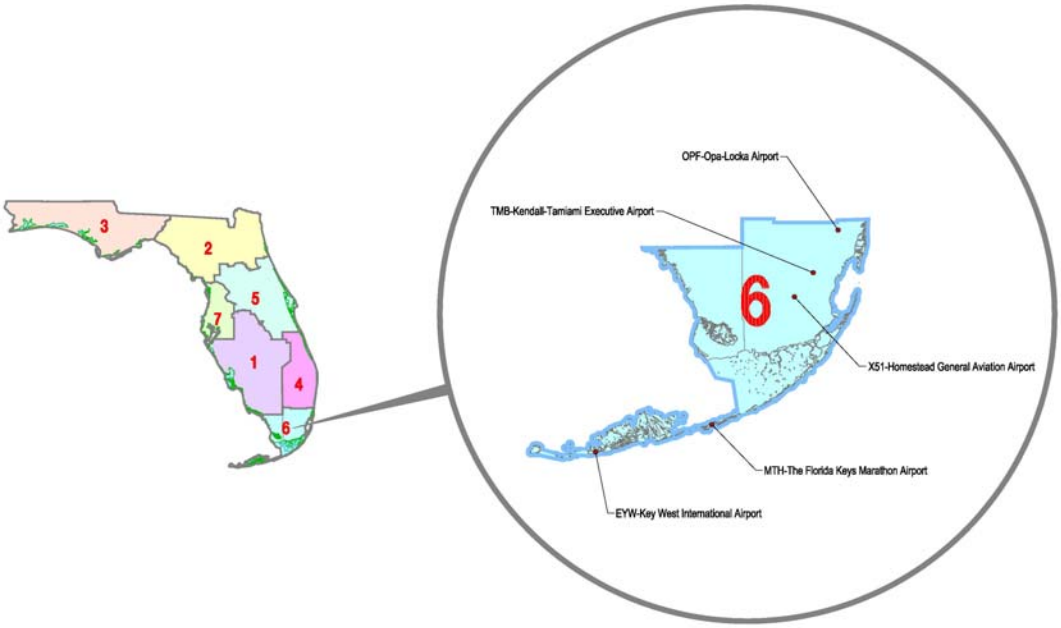
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
AVIATION OFFICE

Statewide Airfield Pavement Management Program

District 6 Report

May 22, 2008



Prepared for:
Florida Department of Transportation
Aviation Office

by:

URS Corporation Inc. / MACTEC Engineering & Consulting, Inc. / Planning Technology, Inc. / ASC Geosciences, Inc.

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EXECUTIVE SUMMARY

URS Corporation, Inc. with team members MACTEC Engineering and Consulting, Inc. (MACTEC), Planning Technology, Inc. (PTI), and ASC Geosciences, Inc. (ASCG) was awarded a contract to provide services in support of the Florida Department of Transportation (FDOT) Aviation Office for Phase II of the Statewide Aviation Pavement Management Program. As part of this contract, MACTEC conducted pavement condition surveys for airside pavements for airports located in District 6, evaluated the conditions and developed a maintenance and rehabilitation program to improve conditions to prescribed minimum levels. District 6 has 1 Primary (PR), 3 Regional Reliever (RL), and 2 General Aviation (GA) airports participating in the Statewide Pavement Management Program.

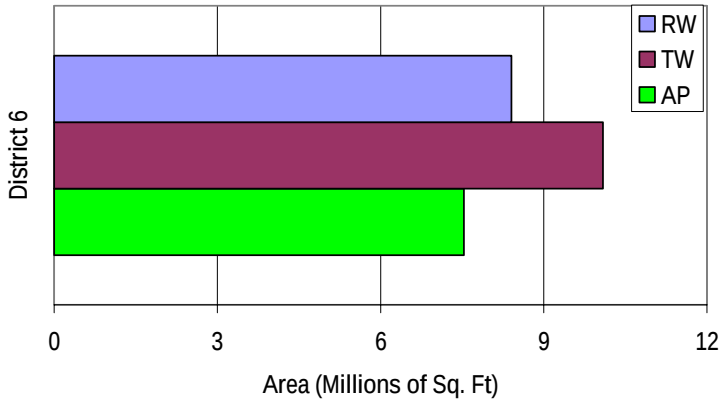
Pavement Area and Use

The total pavement area in 2006/2007 for airports located in District 6 is approximately 26,026,476 square feet. The breakdown of pavement area for each pavement use is provided as follows:

Table E-1: Pavement Area by Pavement Use – District 6

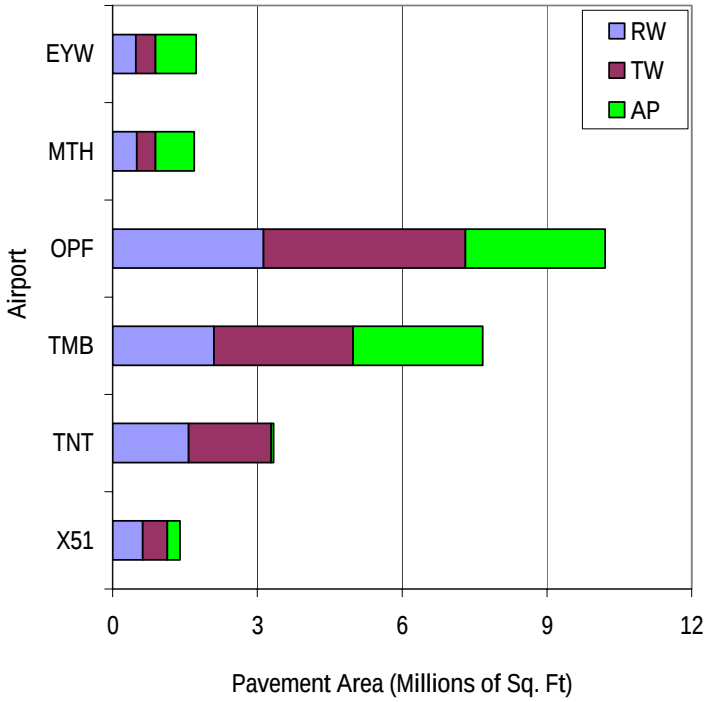
Use	Area, SqFt
Runway	8,406,388
Taxiway	10,088,123
Apron	7,531,965
Total	**26,026,476**

Figure E-1: Pavement Area by Use – District 6



Tables, Figures Prepared by VVD, Checked by BX

Figure E-2: Pavement Area by Use by Airport – District 6



Pavement Condition Index (PCI)

The overall area-weighted Pavement Condition Index (PCI) of the airports in District 6 in 2006/2007 is 77, representing a Satisfactory overall network condition.

Table E-2 provide list of participating airports within District 6 with weighted-PCI and pavement area.

Table E-3 and Figure E-3 provide the weighted-average PCI by pavement use for airports participating in the program from District 6. Figure E-4 provides the distribution PCI by pavement use by airport. Figure E-5 provides the area-weighted PCI by surface type.

The condition summary by pavement use table illustrates the area-weighted PCI computed individually for each use. On average, the runways, taxiways, and aprons are in Satisfactory condition.

Table E-2: Participating Airports Summary– District 6

Airport	Area-Weighted PCI	Pavement Area, SqFt
EYW	76	1,730,400
MTH	73	1,689,111
OPF	71	10,206,526
TMB	88	7,671,143
TNT	72	3,333,595
X51	79	1,395,701
District 6	**77**	**26,026,476**

Figure E-3: PCI by Pavement Use – District 6

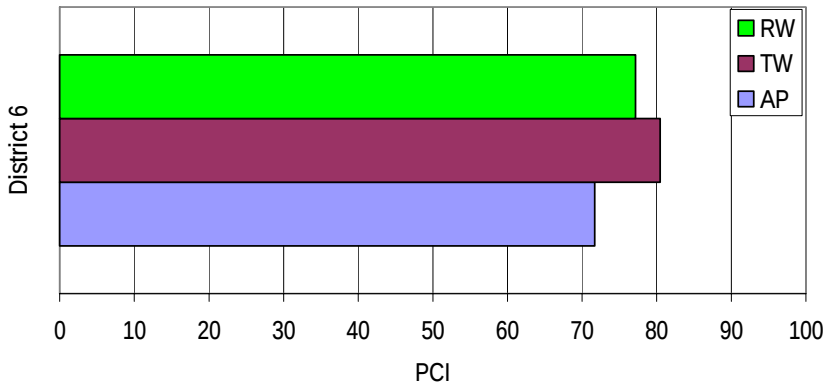


Table E-3: Condition Summary by Pavement Use – District 6

Use	Area-Weighted PCI
Runway	77
Taxiway	80
Apron	72
All	**77**

Figure E-4: PCI by Use by Airport – District 6

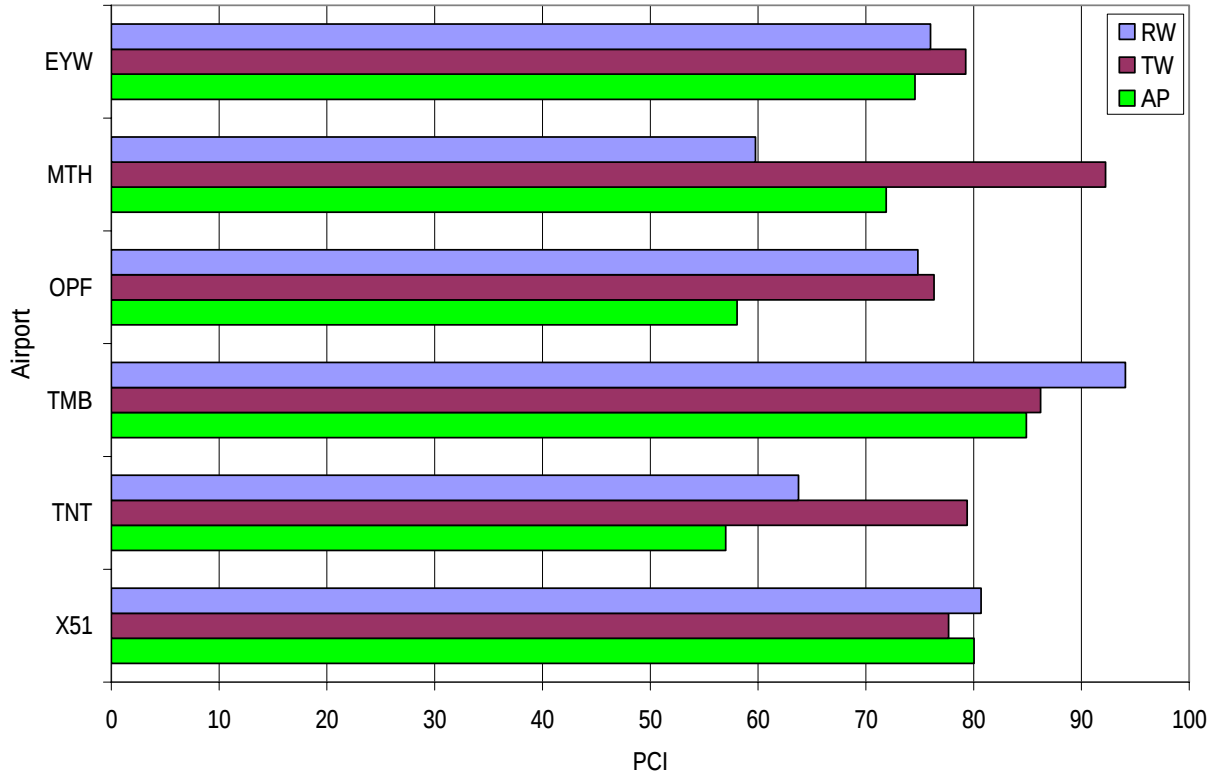
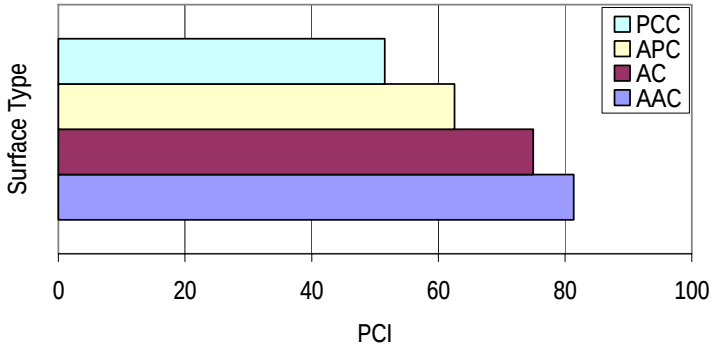


Figure E-5: PCI by Surface Type – District 6



Maintenance and Rehabilitation Costs

Airports in District 6 with immediate M&R needs (2008 needs) include EYW (Key West International Airport), MTH (The Florida Keys Marathon Airport), OPF (Opa Locka Airport), TMB (Kendall-Tamiami Executive Airport), TNT (Dade-Collier Training and Transition Airport), and X51 (Homestead General Aviation Airport). Some of these needs may not be the highest priority for funding but would need to be programmed over several years. These immediate needs based on FDOT criteria are summarized in the following table.

Table E-4: Immediate Major M&R Cost – District 6

Airport	Avg PCI - Before M&R	Immediate M&R Total **	Avg PCI -1st Year After M&R
EYW	76	$70,000	76
MTH	73	$4,255,000	90
OPF	71	$22,339,000	85
TMB	88	$2,381,000	88
TNT	72	$4,996,000	90
X51	79	$199,000	80
District 6	**77**	**$34,242,000**	**86**

* This table shows the area-weighted PCI before and after Major M&R and routine maintenance work for the first year of the 10-year plan. It includes all airports participating in the program from District 6.
** Cost figures are rounded to nearest $1000. Sum may be different. Costs are adjusted for inflation.

A forecast of Major M&R cost for a 10-year period was developed using an unlimited budget. The analysis identified ongoing maintenance needs and major M&R during that interval. This is summarized in Table E-4 and Figures E-5 and E-6.

Table E-5: 10 Year M&R Costs under Unlimited Funding Scenario - District 6

Year	Preventive	Major M&R >= Critical	Major M&R < Critical	Total
2008	$786,000	$7,000	$34,235,000	$35,028,000
2009	$1,846,000	$0	$2,852,000	$4,699,000
2010	$2,161,000	$0	$509,000	$2,670,000
2011	$2,567,000	$0	$113,000	$2,680,000
2012	$2,755,000	$0	$2,675,000	$5,430,000
2013	$2,764,000	$0	$4,841,000	$7,605,000
2014	$3,024,000	$0	$3,336,000	$6,360,000
2015	$3,403,000	$0	$1,418,000	$4,820,000
2016	$3,603,000	$0	$3,644,000	$7,247,000
2017	$3,757,000	$0	$4,075,000	$7,832,000
Total	**$26,668,000**	**$7,000**	**$57,697,000**	**$84,371,000**

Note: Cost figures are rounded to nearest $1000. Sum may be different. Costs are adjusted to inflation

The 10 year analysis suggests an annual budget on the order of $8.5 million would be expected to provide an improvement in the overall condition, where the area-weighted PCI would increase from 77 in 2006/2007 to 80 in 2017. However, as stated above, a number of large projects exist that would need to be programmed over multiple years.

It is important to note that although preventative and some major M&R activities would have to be conducted over several years, the area-weighted PCI value for all airport pavements in

District 6 in 2017 may remain near 80. What is most important is that the pavement repair work (preventative and major M&R) that has been identified for airports in District 6 is conducted at some point in the 10-year plan.

Figure E-6: Immediate M&R Costs by Airport - District 6

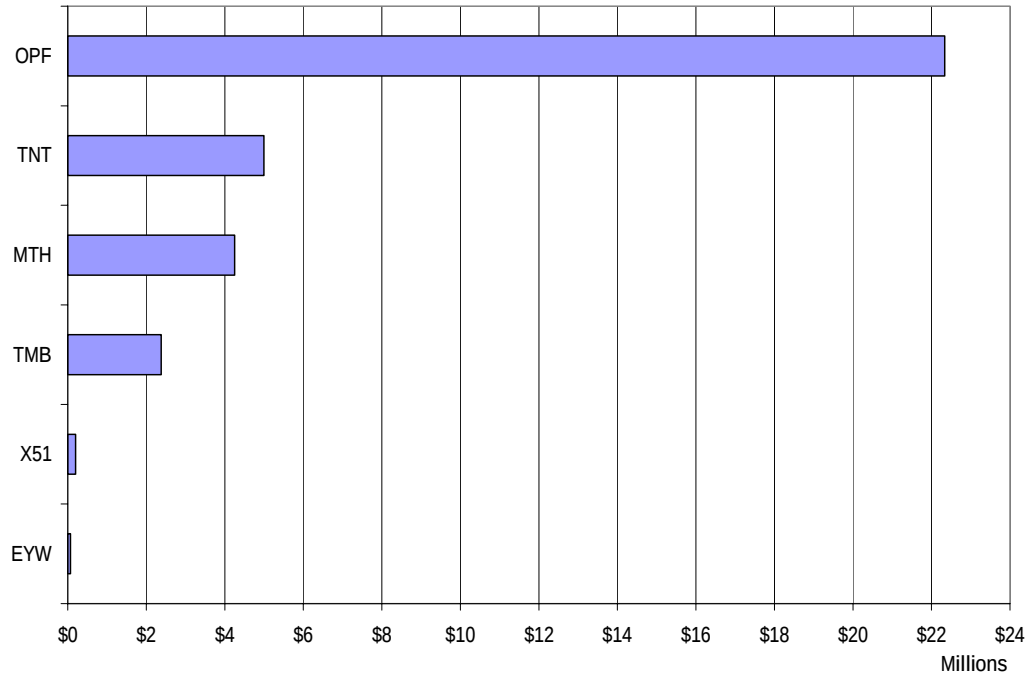
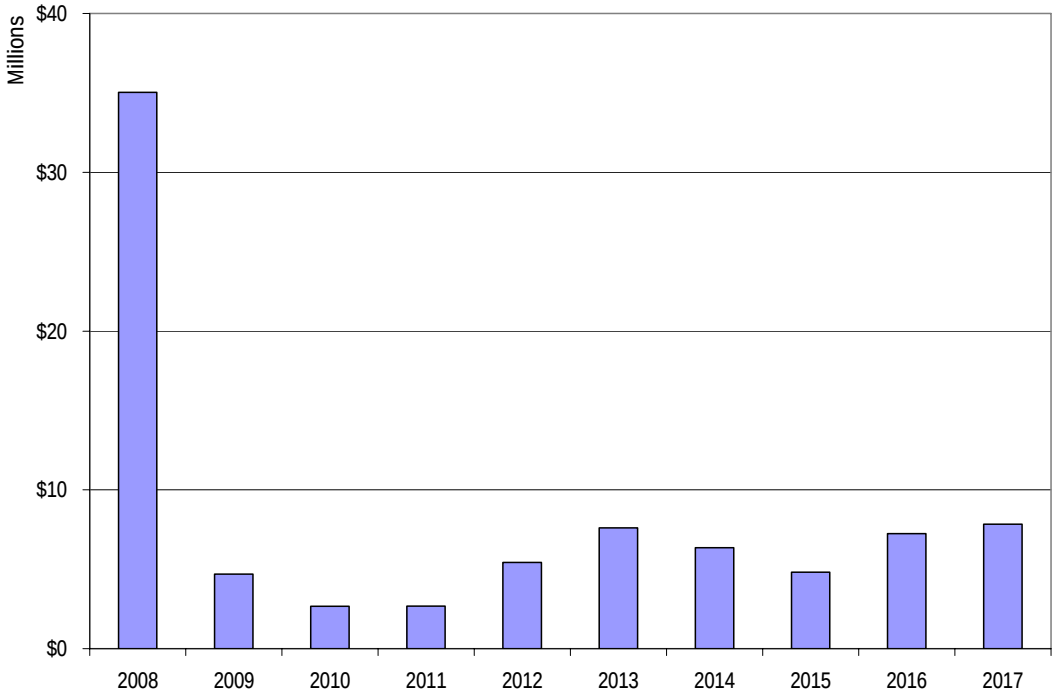


Figure E-7: Estimated Annual Costs (2008-2017) - District 6



1. INTRODUCTION

The State of Florida has more than 100 public airports that are vital to the Florida economy as well as the economy of the United States. These public airports range from small general aviation airports to large international hub airports. These airports serve business travelers, tourism, and cargo operations crucial to the daily life of the people of Florida.

There are millions of square yards of pavement for the runways, taxiways, aprons and other ¬areas that support aircraft operations. The timely and proper maintenance and rehabilitation (M&R) of these pavements allows the airports to operate efficiently, economically and without excessive down time. In order to support the planning, scheduling, and design of the M&R activities, FDOT has implemented pavement management system technology.

This report describes the procedures used to develop the appropriate engineering and scientific standards of care, quality, budget, and schedule requirements implemented at airports in District 6 as a result of their participation in the Statewide Aviation Pavement Management Program.

1.1 Purpose

This Florida Airport Pavement Evaluation Report is intended to:

- Describe, briefly, the Florida Department of Transportation (FDOT) Aviation Office Statewide Pavement Management Program and the roles and responsibilities of the program's participants
- Provide background information on pavement management principles, objectives, and benefits to the participating airports
- Outline the procedures used to collect, evaluate and report pavement inspection results at the airports
- Present the findings from the inspection and analysis of the needs for maintenance and rehabilitation activities for the airports in District 6 in this report.

1.2 FDOT Aviation PMS Program

In 1992, FDOT implemented a Pavement Management System (PMS) program to improve the knowledge of pavement conditions at public airports in the State system, identify maintenance needs at individual airports, automate information management, and establish standards to address future needs.

The FDOT Aviation Office participated in the development of a proprietary software pavement management system and developed and populated a pavement management database that provided valuable information for establishing M&R policies, estimating M&R costs, and developing recommendations for performing routine pavement maintenance. This system was implemented and condition surveys performed in 1992 and 1993 and again updated in 1998 and 1999. The proprietary system, AIRPAV, is no longer supported.

In 2004, the FDOT Aviation Office undertook a project to update the PMS Program software utilized for the PMS program. The Aviation Office selected a consultant team consisting of URS Corporation, Inc., MACTEC Engineering and Consulting, Inc. (MACTEC), Planning Technology, Inc. (PTI), and ASC Geosciences, Inc. (ASCG) to aid with the implementation of the program update. This project involved a review of the AIRPAV software and other available

PMS software. As a result of this review, MicroPAVER was selected as the software for the update project. Condition data from the 1998/1999 surveys were converted to the MicroPAVER system.

The inventory of the pavement systems and drawings of the pavements were updated to reflect maintenance, rehabilitation, and construction activities since 1998/1999 to the extent that information was available. Detailed, specific procedures for the inspection and collection of pavement data were developed for this project. A web-site (www.floridaairportpavement.com) was developed for the input of data under secure procedures. The site also has a public section for dissemination of information to the general public.

1.3 Organization

The FDOT Aviation Office manages the day-to-day details of the Statewide PMS and the updates. The Aviation Office Airport Engineering Manager serves as the Program Manager (PM) monitoring the work of the Consultant. The Aviation Office has review and approval authority for each program task.

1.3.1 Consultant Role

The Consultant (MACTEC Engineering and Consulting/URS Corporation/Planning Technology/ASC Geosciences) developed the PMS based upon procedures outlined in FAA Advisory Circular 150/5380-6B Guidelines and Procedures for Maintenance of Airport Pavements (FAA/AC) and ASTM D 5340 Standard Test Method for Airport Pavement Condition Index Surveys (2004).

The Consultant provided technical and administrative assistance to the Aviation Office PM, during the execution of this program, which involves the continuing evaluation of airport pavements and updating of the PMS. A website is available to view and update airport information, including construction activities and pavement condition data. In addition, pavement evaluation reports will be available for viewing and download from the site (www.floridaairportpavement.com).

1.3.2 Airport Role

The airports are the ultimate client for each of the field inspections and reports. Individual airports were provided final deliverables prepared by the Consultant that have been reviewed and approved by the FDOT Aviation Office. The airport should review system inventory drawings in their folder in the pavement management website and add maintenance and rehabilitation activities conducted on airside pavements on the website system inventory form.

1.4 Pavement Types and Pavement Management

1.4.1 Pavement basics

A pavement is a prepared surface designed to provide a continuous smooth ride at a certain speed and to support an estimated amount of traffic for a certain number of years. Pavements are constructed of a combination of subgrade soils, subbases, bases and surfacing. There are mainly two types of pavements;

- Flexible pavement, composed of asphalt concrete (AC) surface, and
- Rigid pavement composed of Portland cement concrete (PCC) surface.

Both pavement types use a combination of layered materials and thicknesses in order to support the traffic loads and protect the underlying subgrade soil. Flexible pavements (AC) dissipate the load from layer to layer until the load magnitude is small enough to be supported by the subgrade soil. In rigid pavements (PCC), the Portland cement concrete supports most of the load, the base or subbase layer is mainly constructed to provide a smooth and continuous platform for the concrete.

Due to the different nature of both pavement types and their materials, flexible and rigid pavements have different distresses and failure mechanisms. Understanding the mechanics and failure modes of both pavement types will assist engineers in making adequate and long lasting repairs or rehabilitation to the pavement structures.

1.4.2 Pavement Management System Concept

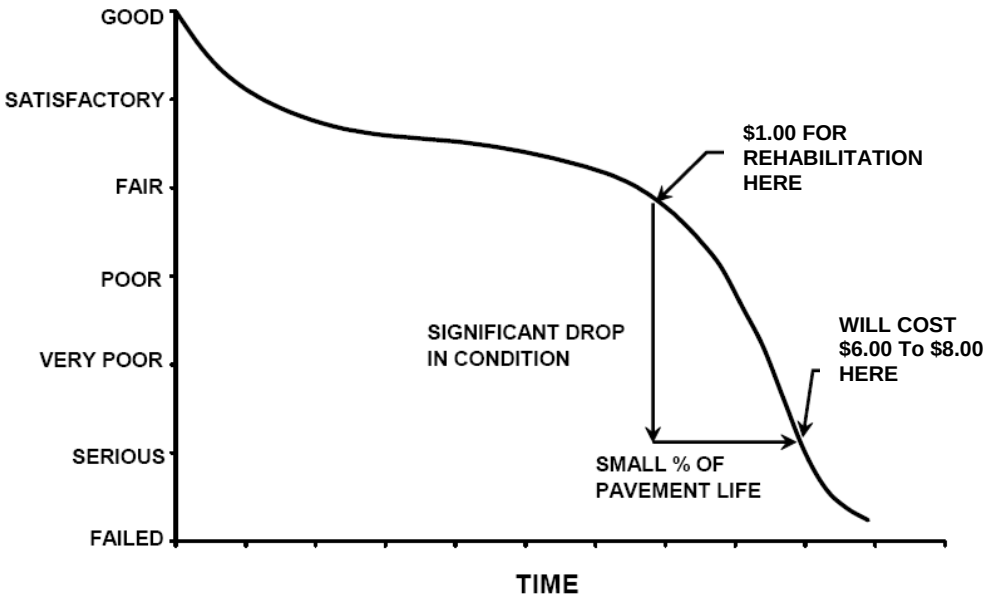
A pavement management system (PMS) is a tool to assist engineers, planners and managing agencies in making decisions when planning pavement M&R. The management of pavements involves scheduling pavement maintenance and rehabilitation before pavements deteriorate to a condition where reconstruction (the most expensive alternative) is the only solution. Figure 1-1, taken from FAA/AC 5380-7A Pavement Management System, illustrates how a pavement generally deteriorates and the relative cost of rehabilitation at various times throughout its life. Note that during the first 75 percent of a pavement's life, it performs relatively well. After that, however, it begins to deteriorate rapidly.

The number of years a pavement stays in "Satisfactory" condition depends on how well it is maintained. The illustration demonstrates the cost of maintaining the pavement above a critical condition before rapid deterioration occurs is much less compared to maintaining pavements after substantial deterioration has occurred.

Pavements deteriorate at an accelerated rate with increasing traffic and limited M&R resources. Planned maintenance and rehabilitation, essentially preventing pavements from reaching deteriorated conditions, helps managers/owners/ agencies stretch and maximize the use of their budgets and prolong the life of the pavements. A PMS provides a tool to schedule and plan maintenance and rehabilitation based on engineering information and existing and predicted conditions of pavements.

There are several components or elements that are essential to a PMS. The first steps in the implementation of a PMS are to know and clearly identify what needs to be managed, the limits of the managing agency's responsibilities and the condition of the existing pavements. Once the cause and the extent of pavement problems are known, the appropriate maintenance and/or rehabilitation can be planned. By using local unit costs and expected yearly budgets, a multi year M&R plan can be developed.

Figure 1-1: Pavement Life Cycle



Pavements deteriorate even if they do not carry any traffic. Pavement distresses may be attributed to climate, environment, materials, construction or traffic. Knowing the cause, extent and predominance of pavement distresses helps determine the most appropriate maintenance or rehabilitation work needed. Planning and applying preventive maintenance prolongs pavement life and minimizes future pavement repair costs. By projecting the rate of deterioration, a life cycle cost analysis can be performed for various alternatives, and the optimal time of application of appropriate feasible alternatives can be determined. Such a decision is critical in order to avoid higher M&R costs at a later date.

A PMS enables the managing agency to identify and maintain the pavement conditions, keeping them at the upper end of the service life-condition curve. At this point, the total annual costs between maintaining a good pavement above a critical condition is much less than rehabilitating a poor pavement that has rapidly deteriorated beyond a critical condition level.

A PMS is a long-term planning tool that will result in an overall improvement of the pavement network condition and will also result in savings by applying the appropriate maintenance and rehabilitation activity at the appropriate time. Accurate estimates and timely M&R decisions and budgeting are of great importance when managing approximately 300 million square feet of Florida airside pavements.

1.4.3 Pavement Inspection Methodology for PMS

Pavement condition assessment is one of the primary decision variables in any airport pavement management system. Pavement condition assessments generally include visual surveys in accordance with ASTM D 5340, *Standard Test Method for Airport Pavement Condition Index Surveys* and structural evaluation. Pavement condition surveys assess the functional condition of the pavement surface. Typically, most problems within a pavement structure will eventually reflect to the pavement surface. The structural condition and relative support of the pavement layers can be assessed utilizing non-destructive deflection testing (NDT) as well as other in-depth engineering evaluation or sampling and testing methods.

Pavement sections are broken down into sample units as established in FAA AC 150/5380-6B and ASTM D 5340. Sample unit sizes are approximately 5000 ± 2000 square feet (3000 to 7000 square feet) for AC-surfaced pavements and 20 ± 8 slabs (12 to 28 slabs) for PCC-surfaced pavements. Before the field inspections, the sampling plan was developed based on previous sampling and modified based on the available knowledge of branches, sections, use patterns, construction types and history. The sampling rate used for FDOT Statewide Pavement Management Program is provided in Table 1-1 below.

Table 1-1: Sampling Rate for FDOT Condition Surveys

AC Pavements			PCC Pavements		
N	n		N	n	
	Runway	Others		Runway	Others
1-4	1	1	1-3	1	1
5-10	2	1	4-6	2	1
11-15	3	2	7-10	3	2
16-30	5	3	11-15	4	2
31-40	7	4	16-20	5	3
41-50	8	5	21-30	7	3
≥51	20% but ≤20	10% but ≤10	31-40	8	4
			41-50	10	5
			≥51	20% but ≤20	10% but ≤10

Where *N = total number of sample units in section*
n = number of sample units to inspect

The sample units to inspect are determined by a systematic random sampling technique. This means that the locations are determined such that they are distributed evenly throughout the section. In the case when nonrepresentive distresses are observed in the field, additional sample units were added.

The distress quantities and severity levels from the sample units are used to compute the PCI value for each section. PCI values range from 0 to 100. MicroPAVER provides a rating scale that relates PCI to pavement condition, with a PCI between 0 and 10 considered 'Failed'

pavement and a PCI between 86 and 100 considered 'Good' pavement, with five other conditions for PCI values between 11 and 85. Figure 1-2 shows the PCI scale.

Figure 1-2: PCI Rating Scale

1.5 Definitions

Aviation Office - The Aviation Office is charged with responsibility for promoting the safe development· of aviation to serve the people of the State of Florida. The Aviation Office worked closely with FDOT District Aviation Specialists, during development of this project. District Aviation Specialists will consult with airport owners in implementation of project recommendations.

Base Course - Base Course is a layer of manufactured material, usually crushed rock (aggregate) or stabilized material (asphalt or concrete or Florida Limerock), immediately beneath the surface course of a pavement, which provides support to the surface course.

Branch – (Facility in prior system) - A runway, taxiway or apron is called a Branch. This is an easy reference to a recognizable component of airport pavement. In this report, Branch ID maintains the original AirPAV identification where 100 series through 3000 series facilities are taxiways, 4000 and 5000 series facilities are aprons (the 5000 series represent runup aprons and turnarounds), and 6000 series facilities are runways. It also includes the common designation for the item e.g. RW 18-36.

Category - The Category classifies the airport according to the type and volume of aircraft traffic, as follows:

- GA – for general aviation or community airports
- RL – for regional relievers or small hubs
- PR – for primary

Critical PCI – The PCI value considered to be the threshold for M&R decisions. PCI above the Critical generate economical activities expected to preserve and prolong acceptable condition. M&R for PCI values less than Critical make sense only for reasons of safety or to maintain a pavement in operable condition. A pavement section is expected to deteriorate very quickly once it reaches the Critical PCI and the unit cost of repair increases significantly.

Distress Type - A distress type is a defined visible defect in pavement evidenced by cracking, vertical displacement or deterioration of material. In PCI technology, 16 distinct distress types for asphalt surfaced and 15 for Portland cement concrete surfaced pavements have been described and rated according to the impact their presence has on pavement condition.

Florida DOT (FDOT) - Florida Department of Transportation was represented in this project by the Office of Aviation.

Localized M&R (Maintenance and Repair) – Localized M&R is a temporizing activity performed on existing pavement to extend its serviceability and/or to improve rideability. Localized M&R can be applied either as a safety (stop-gap) measure or preventive measure. Common localized maintenance methods include crack sealing, joint sealing, and patching.

Global M&R- Global M&R is defined as activities applied to entire pavement sections with the primary objective of slowing the rate of deterioration. These activities are primary for asphalt surfaced pavements, e.g. surface treatments.

MicroPAVER – A commercially available software subsidized by FAA and agencies in the US Department of Defense developed to support engineered management of pavement assets using a condition based approach. This software has the functionality such that if properly implemented, maintained and operated it meets the pavement management system requirements described by FAA in Advisory Circular 150/5380-7A.

Minimum Condition Level - A threshold PCI value established by FDOT to represent the targeted minimum pavement condition that is desirable in the Florida Airport System. These values were established with consideration of pavement function and airport type. For instance, runways have higher minimum condition levels than aprons, and Primary airports have higher minimum condition levels than General Aviation airports.

Major M&R (e.g. Rehabilitation) – Activities performed over the entire area of a pavement section that are intended to restore and/or maintain serviceability. This includes asphalt overlays, milling and replacing asphalt pavement, reconstruction with asphalt, reconstruction with Portland Cement Concrete (PCC) pavements, and PCC overlays.

Network Definition – (Airport Sketch in prior system) – A Network Definition is a CAD drawing which shows the airport pavement outline with Branch and Section boundaries. This sketch is intended to assist the user of the report to quickly associate information from the text to a location on the airport. This drawing also includes the PCI sample units and is used to identify

those sample units to be surveyed, i.e. the sampling plan. The Network Definition for the airport in this report is in Appendix A along with a table of inventory data.

Pavement Condition Index (PCI) – The Pavement Condition Index is a number which represents the condition of a pavement segment at an instant in time. It is based on visual identification and measurement of specific distress types commonly found in pavement which has been in service for a period of time. The definitions and procedures for determining the PCI are found in ASTM D 5340-04, "Standard Test Method for Airport Pavement Condition Index Surveys," published by ASTM International.

Pavement Evaluation – A systematic approach undertaken by trained and experienced personnel intended for determination of the condition, serviceability, and best corrective action for pavement. Techniques to standardize pavement evaluation include the Pavement Condition Index procedures.

Pavement Management – Pavement management is a broad function that uses pavement evaluation and pavement performance trends as a basis for planning, programming, financing, and maintaining a pavement system.

Rank – Pavement rank in MicroPAVER determines the priority to be assigned to a pavement section when developing an M&R plan. Pavement sections are ranked as follows according to their use:

- P – for Primary pavements, such as primary runways, primary taxiways, and primary aprons
- S – or Secondary pavements, such as secondary runways, secondary taxiways, and secondary aprons
- T – for Tertiary pavements such as "T' hangars and slightly used aprons

Reconstruction – Reconstruction includes removal of existing pavement, preparation of subgrade, and construction of new pavement with new, or recycled materials. Reconstruction is indicated when distress types evident at the surface indicate failure in the pavement structure or subgrade of a type, and to an extent, not correctable by less extensive construction.

Rehabilitation – Rehabilitation represents construction using existing pavement for a foundation. Rehabilitation most commonly consists of an overlay of existing pavement with a new asphalt or concrete surface. Recently, technology has expanded the options to include recycling of existing pavement, and incorporating engineering fabrics or thin layers of elasticized materials to retard reflection of distress types through the new surface.

Sample Unit – Uniformly sized portions of a Section as defined in ASTM D 5340. Sample units are a means to reduce the total amount of pavement actually surveyed using statistics to select and survey enough area to provide a representative measure of Section PCI. Sample Unit sizes are 5,000 ± 2,000 square feet for AC-surfaced pavements and 20 ± 8 slabs for PCC-surfaced pavements.

Section – (Feature in prior system) - Sections subdivide Branches into portions of similar pavement. Sections are prescribed by pavement structure, age, condition and use. Sections are identified on the airport Network Definition. They are the smallest unit used for determining M&R requirements based on condition.

Section ID – A short form identification for the pavement Section that maintains the original AirPAV identification where 100 series through 3000 series sections are taxiways, 4000 and 5000 series sections are aprons (the 5000 series represent run-up aprons and turnarounds), and 6000 series sections are runways.

Use – In MicroPAVER use is the term for the function of the pavement area. This is either Runway, Taxiway, or Apron for purposes of the FDOT Statewide Aviation Pavement Management System.

2. NETWORK DEFINITION

The airports inspected in District 6 include:

- Key West International Airport (EYW)
- The Florida Keys Marathon Airport (MTH)
- Opa Locka Airport (OPF)
- Kendall-Tamiami Executive Airport (TMB)
- Dade-Collier Training and Transition Airport (TNT)
- Homestead General Aviation Airport (X51)

These airports are categorized as1 Primary (PR), 3 Regional Reliever, and 2 General Aviation (GA) airports.

The pavements within each airport network are defined in MicroPAVER in terms of manageable units that help to organize the data into similar groups. An organizational hierarchy is used to establish these units. The airport pavement network is subdivided into separate branches (runways, taxiways, or aprons) that have distinctly different uses. Branches are then divided into sections with similar pavement construction and performance that may share other common attributes. Sections are manageable units used to organize the data collection and are treated individually during the rehabilitation planning stage.

The network definition was used to identify changes in the network since the most recent update in 1998/1999 and also to plan the field inspection activities for 2006/2007 surveys. Prior to the field inspection process, the network definition drawing was updated. The purpose of this update is to compare the previous airport configuration and history with the current airport configuration and history and update the existing drawing showing network branch, section and sample unit designations to match the current configuration. This drawing serves not only as a primary guide for the airfield inspectors but also as an important history record.

The updated network definition fields and network definition drawings for airports participating from District 6 are included in Appendix A of each individual airport report.

3. PAVEMENT INVENTORY

The detailed pavement inventory was updated to reflect the network definition update and field inspection results.

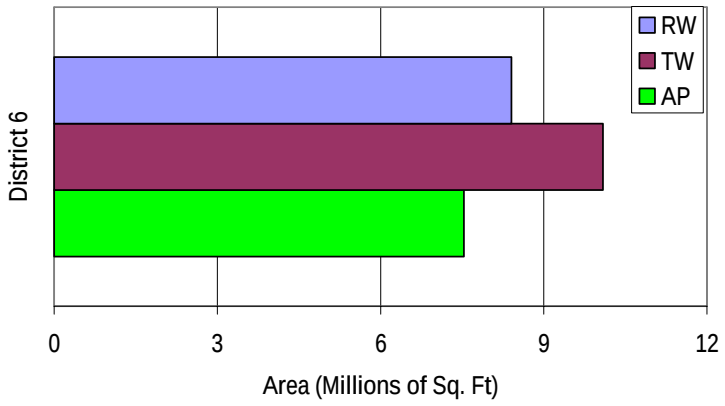
The total pavement area in 2006/2007 for airports participating in the program from District 6 is approximately 26,026,476 square feet. The breakdown of pavement area for each pavement use is provided in Table 3-1.

Table 3-1: Pavement Area by Pavement Use - District 6

Use	Area, SqFt
Runway	8,406,388
Taxiway	10,088,123
Apron	7,531,965
Total	**26,026,476**

Figure 3-1 presents the breakdown of the pavement area for airports in District 6 by pavement use.

Figure 3-1: Pavement Area by Use - District 6



Details of pavement section information including section dimensions, rank, surface type, last construction date and last inspection date are given in Appendix A of each individual airport report.

Tables, Figures Prepared by VVD, Checked by BX

4. PAVEMENT CONDITION

Pavement conditions were inspected in accordance with the methods outlined in FAA AC 150/5380-6B and ASTM D 5340 "Standard Practice for Airport Pavement Condition Index Surveys." These procedures define distress type, severity and quantity for sampling areas within each section to determine the Pavement Condition Index (PCI).

Pavement condition inspections for airports in District 6 were performed in 2006/2007. Data were recorded in the field using hand-held PDA (personal digital assistant) technology. The identifying information for each sample unit was pre-loaded into the PDA, and the survey results were entered directly, at the time of inspection. This simplified data handling and management.

During the inspections Global Positioning System (GPS) coordinates were recorded at the centroid of each sample unit. The centroid is usually the geometric center of the area but in cases where sample units are irregular in shape this is the center of mass. These data are presented in tables on updated Network Definition drawings available from the website.

After the completion of data collection, the data were imported into MicroPAVER and PCI values were calculated for the pavement sections.

According to the 2006/2007 survey, the overall the average area-weighted PCI for airports in District 6 is 77, representing a Satisfactory overall network condition.

Table 4-1 and Figure 4 1 provide the PCI distribution by rating and surface type for District 6.

Table 4-1: Airport Pavement PCI by Use and Rating Category - District 6

Airport	RW	TW	AP	AVG PCI	PCI Category
EYW	76	79	75	76	Satisfactory
MTH	60	92	72	73	Satisfactory
OPF	75	76	58	71	Satisfactory
TMB	94	86	85	88	Good
TNT	64	79	57	72	Satisfactory
X51	81	78	80	79	Satisfactory
District 6	**Satisfactory**	**Satisfatory**	**Satisfactory**	**77**	**Satisfactory**

Tables, Figures Prepared by VVD, Checked by BX

Figure 4-1: PCI by Surface Type - District 6

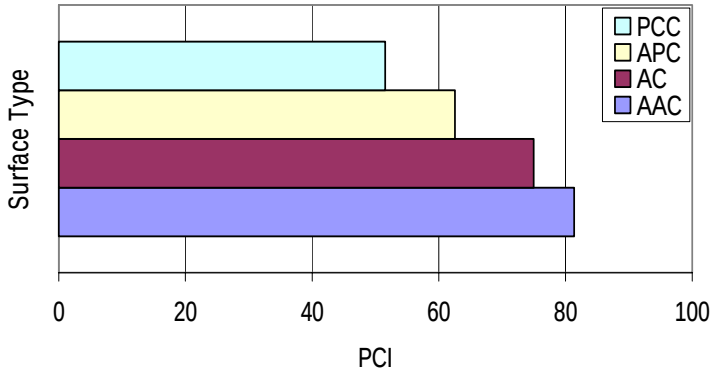


Table 4-2 illustrates the area-weighted PCI computed individually for each pavement use.

Table 4-2: Condition by Pavement Use - District 6

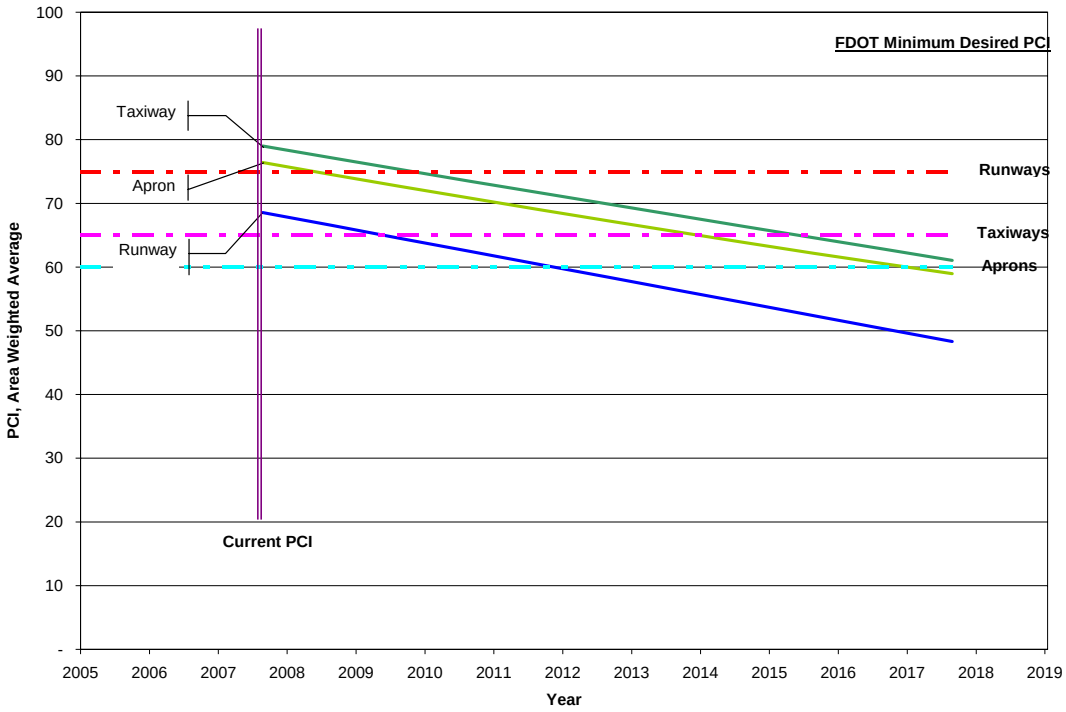
Use	Area-Weighted PCI
Runway	77
Taxiway	80
Apron	72
All	**77**

On average, the runways, taxiways, and aprons are in Satisfactory condition.

5. PAVEMENT CONDITION PREDICTION

Performance prediction models or deterioration curves for PCI were used to develop a condition forecast. The performance models were developed for combinations of variables such as pavement use (runway, taxiway or apron), surface type (AC or PCC) and airport category (GA, RL, or PR). Figures 5-1 to 5-3 illustrate the predicted performance of pavements at airports participating in the program from District 6 based on current condition, age since last construction and the deterioration model appropriate for the type of pavement. The figure presents the forecast for each pavement use and displays the FDOT minimum condition criteria for District 6 airports.

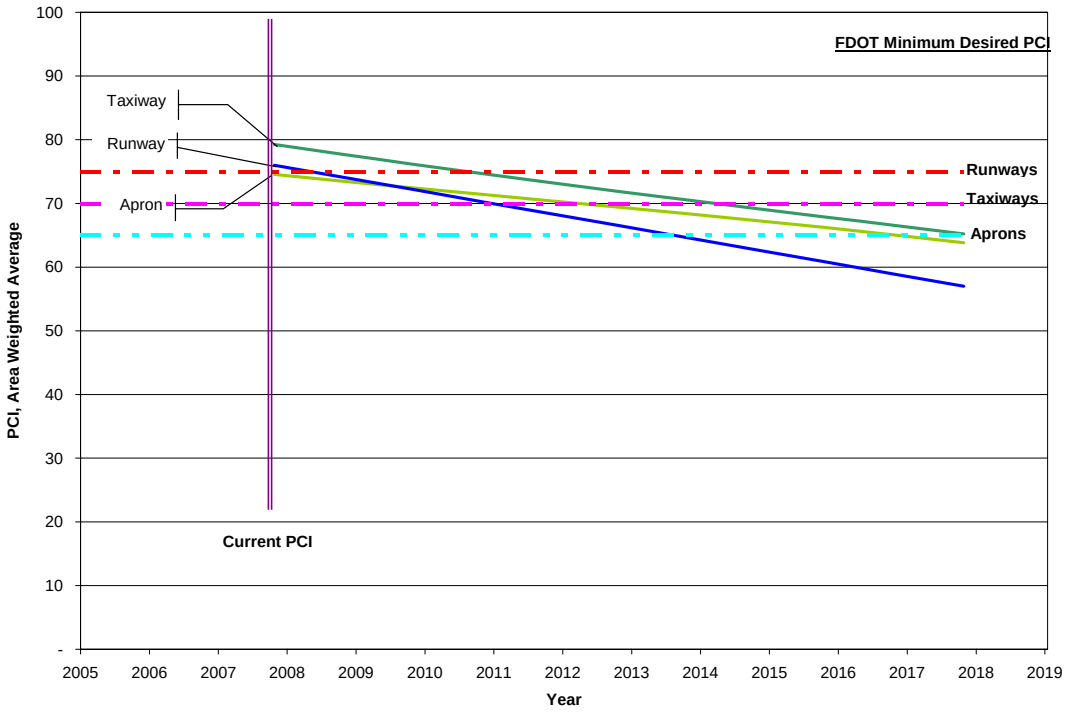
Figure 5-1: Predicted PCI for GA Airports by Pavement Use – District 6



Tables, Figures Prepared by VVD, Checked by BX

Figure 5-2: Predicted PCI for RL Airports by Pavement Use – District 6

Figure 5-3: Predicted PCI for PR Airports by Pavement Use – District 6



6. MAINTENANCE POLICIES AND COSTS

6.1 Policies

Maintenance and rehabilitation (M&R) policies are sets of rules used to develop repair recommendations for distresses encountered during the visual inspections.

Maintenance refers to repair-type activities that are applied to specific distress types on the pavement. These activities are preventative and/or corrective in nature, and are recommended to help achieve the performance goal.

Table 6-1 provides the list of the maintenance activities used in MicroPAVER to treat specific distress types. These repairs are used in an analysis only if there is an inspection within one year prior to the first year of the analysis period. MicroPAVER applies repairs to these distresses and adjusts the PCI based on specific rules.

Table 6-1: Routine Maintenance Activities for Airfield Pavements

Surface	Distress	Severity*	Work Type	Code	Work Unit
AC	Alligator Crack	M, H	Patching - AC Deep	PA-AD	SqFt
	Bleeding	N/A	No Localized M&R	NONE	SqFt
	Block Crack	M, H	Crack Sealing – AC	CS-AC	SqFt
	Corrugation	L, M, H	Patching - AC Deep	PA-AD	SqFt
	Depression	M, H	Patching - AC Deep	PA-AD	SqFt
	Jet Blast	N/A	Patching - AC Deep	PA-AD	SqFt
	Joint Ref. Crack	M, H	Crack Sealing – AC	CS-AC	Ft
	L & T Crack	M, H	Crack Sealing – AC	CS-AC	Ft
	Oil Spillage	N/A	Patching - AC Shallow	PA-AS	SqFt
	Patching	M, H	Patching - AC Deep	PA-AD	SqFt
	Polished Agg.	N/A	No Localized M&R	NONE	SqFt
	Raveling	L	Surface Sealing - Rejuvenating	SS-RE	SqFt
		M	Surface Seal - Coal Tar	SS-CT	SqFt
		H	Microsurfacing	MI-AC	SqFt
	Rutting	M, H	Patching - AC Deep	PA-AD	SqFt
	Shoving	M, H	Grinding (Localized	GR-LL	SqFt
	Slippage Crack	N/A	Patching - AC Shallow	PA-AS	SqFt
	Swelling	M, H	Patching - AC Deep	PA-AD	SqFt
PCC	Blow-Up	L, M, H	Patching - PCC Full Depth	PA-PF	SqFt
	Corner Break	M, H	Patching - PCC Full Depth	PA-PF	SqFt
	Linear Crack	M, H	Crack Sealing – PCC	CS-PC	Ft
	Durability Crack	H	Slab Replacement – PCC	SL-PC	SqFt
		M	Patching - PCC Full Depth	PA-PF	SqFt
	Jt. Seal Damage	M, H	Joint Seal (Localized)	JS-LC	Ft
	Small Patch	M, H	Patching - PCC Partial Depth	PA-PP	SqFt
	Large Patch	M, H	Patching - PCC Full Depth	PA-PF	SqFt
	Popouts	N/A	No Localized M&R	NONE	SqFt
	Pumping	N/A	No Localized M&R	NONE	SqFt
	Scaling	H	Slab Replacement – PCC	SL-PC	SqFt
	Faulting	M, H	Grinding (Localized)	GR-PP	Ft
	Shattered Slab	M, H	Slab Replacement – PCC	SL-PC	SqFt
	Shrinkage Crack	N/A	No Localized M&R	NONE	Ft
	Joint Spall	M, H	Patching - PCC Partial Depth	PA-PP	SqFt
	Corner Spall	M, H	Patching - PCC Partial Depth	PA-PP	SqFt

*L = Low, M = Medium, H = High

Tables, Figures Prepared by VVD, Checked by BX

Rehabilitation is warranted when the pavement condition decreases below a critical point such that the deterioration is extensive or rate of deterioration is so great that routine maintenance is no longer cost-efficient. This critical point is called "Critical PCI." The Critical PCI levels for different pavement and branch types established in Phase I of Statewide Pavement Management Program were reviewed and updated for development of the M&R plan for the airport. Sections above critical PCI levels receive routine maintenances while pavements predicted to deteriorate below their respective critical PCI level during the analysis period will be identified for Major M&R. Based on the existing condition, the Critical PCI levels for all pavements are set at 65.

It should be noted that critical PCI is not the same as Minimum PCI or Minimum Condition. The Minimum PCI is a value set by the user so pavement sections are rehabilitated before they fall below the set minimum. Table 6-2 gives the targeted, or desired, Minimum PCI values for runways, taxiways, and aprons of the three categories of airports.

Table 6-2: Desired Minimum PCI for Airports By Pavement Use

Use	Minimum PCI		
	GA	RL	PR
Runway	75	75	75
Taxiway	65	65	70
Apron	60	65	65

Typical Major M&R activities range from overlays to reconstruction. Based on the critical PCI values in Table 6-2 and our experience with pavement management systems, the PCI trigger range when the likely activity would be a mill and resurface was 31 to 55 and reconstruction at a PCI of 30 or lower. One important concept of pavement management systems is that it is cost effective to maintain pavements that are already in good condition rather than wait for them to get worse and require more expensive rehabilitation. With this objective, microsurfacing has been recommended to maintain pavements that have a PCI from 56 and 79. Microsurfacing is a surface treatment suggested for pavements in Fair to Satisfactory condition to extend the pavement life by five to seven years.

Crack sealing and full-depth patching are the M&R activities recommended to repair pavements with PCI values between 80 and 90. MicroPAVER considers these as preventative M&R with their primary objective being to slow the rate of pavement deterioration. While the trigger PCI for mill and overlay has been set to 55, MicroPAVER also assigns mill and overlay to sections with a PCI greater than 55 if they exhibit some structural distress. Table 6-3 summarizes the M&R activities for the three categories of airports based on PCI value.

Table 6-3: M&R Activities for Airports

	Activity	PCI Range
Maintenance	Crack Sealing and Full-Depth Patching	80 and 90
Rehabilitation	Microsurfacing (AC) or Concrete Pavement Restoration (PCC)	56 to 79
	Mill and Overlay (AC) or Concrete Pavement Restoration (PCC)	31 to 55
	Reconstruction	30 and less

6.2 Unit Costs

FDOT cost databases for airports and highway pavement maintenance and rehabilitation were reviewed in Phase I of Statewide Pavement Mangement Program in order to determine meaningful costs for the program. Table 6-4 presents the unit costs summary.

Table 6-4: Maintenance Unit Costs for FDOT

Code	Name	Cost	Unit
PA-AL	Patching – AC Leveling	$2.00	SqFt
PA-AS	Patching – AC Shallow	$4.00	SqFt
PA-PF	Patching – PCC Full Depth	$50.00	SqFt
PA-PP	Patching – Partial Depth	$35.00	SqFt
SL-PC	Slab Replacement	$15.00	SqFt
CS-PC	Crack Sealing – PCC	$2.00	Ft
UN-PC	Undersealing – PCC	$3.00	Ft
CS-AC	Crack Sealing – AC	$2.00	Ft
GR-PP	Grinding (Localized for PCC)	$20.00	Ft
GR-LL	Grinding (Localized for AC)	$6.00	SqFt
JS-LC	Joint Seal (Localized)	$1.75	Ft
JS-SI	Joint Seal – Silicon	$2.50	Ft
PA-AD	Patching – AC Deep	$7.00	SqFt
OL-AT	Overlay – AC Thin	$1.50	SqFt
SS-CT	Surface Seal – Coal Tar	$0.20	SqFt
SS-RE	Surface Seal – Rejuvenating	$0.15	SqFt
ST-SS	Surface Treatment – Slurry Seal	$0.25	SqFt
ST-ST	Surface Treatment – Sand Tar	$0.25	SqFt
MI-AC	Microsurfacing	$0.90	SqFt

The improvement in condition due to maintenance actions applied to specific distresses is only performed when an inspection is recent and only in the first year of the M&R analysis. In subsequent years MicroPAVER calculates M&R costs based on expected unit costs for pavements in a range of PCI. That is, for low PCI it is expected that the repair would be significant (e.g. reconstruction) and therefore very costly. Using available unit cost data the Major M&R Cost By Condition table was set up as shown in Table 6-5. The cost assigned to each range of PCI is based on a Transportation Cost Report provided by Office of Planning Policy of FDOT where the unit costs of reconstruction and resurfacing of airfield pavements were included. These costs were then assigned to the appropriate PCI range to arrive at a cost per square foot necessary to restore pavements at that PCI level to new condition, i.e. a PCI of 100.

A 3% inflation rate per year was applied to the unit costs during the M&R analysis.

Table 6-5: M&R Activities and Unit Costs by Condition for Airports

	Activity	PCI Trigger	Cost/SqFt		
			GA	RL	PR
Maintenance	Crack Sealing and Full-Depth Patching	90	$0.06	$0.10	$0.20
		80	$0.24	$0.40	$0.80
Rehabilitation	Microsurfacing (AC) or Concrete Pavement Restoration (PCC)	70	$0.69	$0.90	$1.40
		60	$3.42	$3.68	$4.23
	Mill and Overlay (AC) or Concrete Pavement Restoration (PCC)	50	$6.29	$7.61	$8.55
		40	$6.29	$7.61	$8.55
	Reconstruction	30	$13.62	$18.57	$20.88
		20	$13.62	$18.57	$20.88

7. PAVEMENT REHABILITATION NEEDS ANALYSIS

Maintenance and Rehabilitation (M&R) analyses were performed after the condition data were calculated and MicroPAVER was customized with the maintenance policies and cost settings described in the previous section.

The objective of the M&R analysis is to observe the effect of different fiscal scenarios on the network condition, over a period of ten years. The analysis was conducted using an unlimited budget. An unlimited budget allows all M&R needs to be identified along with the associated cost regardless of priority.

Table 7-1 presents the M&R needs list of immediate needs for Major M&R, i.e. Year 1 of the forecast. The importance of this listing is that it points out the major activities triggered by the current condition of the pavements.

The 10 year forecast results are shown in Figure 7-1, illustrating the effect on pavement condition (PCI) of doing no maintenance versus having unlimited funds and performing all M&R actions based on the policies.

The following network level observations can be made from the figure above:

- The average PCI for airports in District 6 will deteriorate from 77 to 61 in ten years if no M&R activities are performed.
- The PCI will remain at or above 80 through the 10-year analysis period under the unlimited budget scenario.

A 2017 PCI of 80 with this scenario is 19 PCI points higher than a "No M&R" scenario. The total cost for Major M&R over this 10-year period is about $58 million.

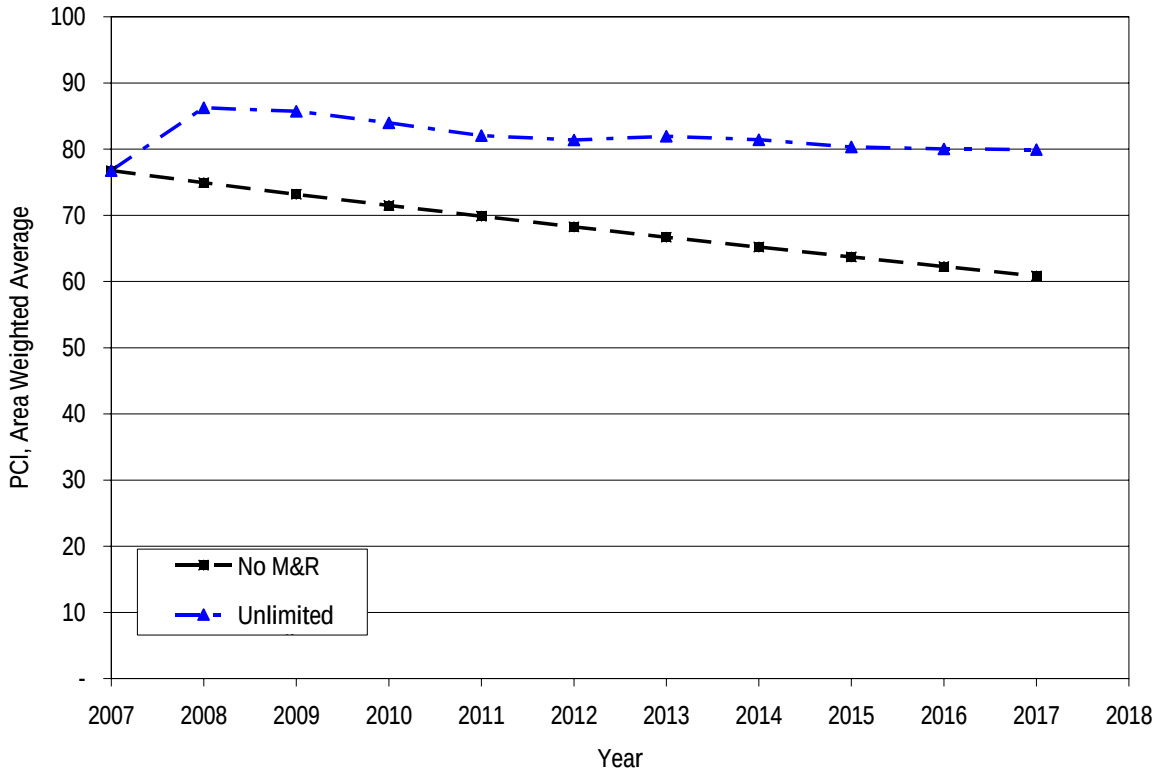
Table 7-1: Summary of Immediate Major M&R Needs - District 6

Airport	Avg PCI - Before M&R	Immediate M&R Total **	Avg PCI -1st Year After M&R
EYW	76	$70,000	76
MTH	73	$4,255,000	90
OPF	71	$22,339,000	85
TMB	88	$2,381,000	88
TNT	72	$4,996,000	90
X51	79	$199,000	80
District 6	**77**	**$34,242,000**	**86**

* This table shows the area-weighted PCI before and after Major M&R and routine maintenance work for the first year of the 10-year plan. It includes all airports participating in the program from District 6.
** Cost figures are rounded to nearest $1000. Sum may be different. Costs are adjusted for inflation.

Tables, Figures Prepared by VVD, Checked by BX

Figure 7-1: Budget Scenario Analysis - District 6



8. MAINTENANCE AND REHABILITATION PLAN

The M&R analysis results include activities that likely exceed a typical annual budget level. These activities would need to be evaluated for feasibility and desirability based on the district's future plans. In an effort to identify appropriate budget levels the 10 year M&R analysis was evaluated to determine levels needed to address several specific areas: preventive maintenance, major activities for pavements in poor condition (Major M&R for PCI less than Critical), and activities that would be desirable to preserve good pavement conditions where they exist (Major M&R for PCI greater than or equal to Critical).

Table 8-1 provides the summary results under the critical PCI scenario.

Approximately 59% of the total Major M&R cost is required in the first year (2008). This is a consequence of several large areas of pavement at EYW (Key West International Airport), MTH (The Florida Keys Marathon Airport), OPF (Opa Locka Airport), TMB (Kendall-Tamiami Executive Airport), TNT (Dade-Collier Training and Transition Airport), and X51 (Homestead General Aviation Airport) airports being below Critical PCI.

TMB (Kendall-Tamiami Executive Airport) is currently in overall Good condition with an average PCI value of 88, while EYW (Key West International Airport), MTH (The Florida Keys Marathon Airport), OPF (Opa Locka Airport), TNT (Dade-Collier Training and Transition Airport), and X51 (Homestead General Aviation Airport) airports are currently in Satisfactory condition with an average PCI value of 76, 73, 71, 72 and 79, respectively. The majority of the repair needs in 2008 are identified from the following airports: OPF (Opa Locka Airport), TNT (Dade-Collier Training and Transition Airport), and MTH (The Florida Keys Marathon Airport) will have need for major repair in 2008. The unlimited budget scenario provides the basis for estimating the total repair cost. In reality, it is neither operationally nor fiscally prudent.

Appendix B provides details of M&R plan by year under the unlimited funding scenario. It is important to understand that a PMS is a network level tool and the M&R costs provided in this report are only for planning purposes.

Table 8-1: M&R Costs under Unlimited Funding Scenario - District 6

Year	Preventive	Major M&R >= Critical	Major M&R < Critical	Total
2008	$786,000	$7,000	$34,235,000	$35,028,000
2009	$1,846,000	$0	$2,852,000	$4,699,000
2010	$2,161,000	$0	$509,000	$2,670,000
2011	$2,567,000	$0	$113,000	$2,680,000
2012	$2,755,000	$0	$2,675,000	$5,430,000
2013	$2,764,000	$0	$4,841,000	$7,605,000
2014	$3,024,000	$0	$3,336,000	$6,360,000
2015	$3,403,000	$0	$1,418,000	$4,820,000
2016	$3,603,000	$0	$3,644,000	$7,247,000
2017	$3,757,000	$0	$4,075,000	$7,832,000
Total	**$26,668,000**	**$7,000**	**$57,697,000**	**$84,371,000**

Note: Cost figures are rounded to nearest $1000. Sum may be different. Costs are adjusted to inflation

Tables, Figures Prepared by VVD, Checked by BX

9. VISUAL AIDS

9.1 GIS Linked Shape File

The pavement inventory data and pavement condition were linked to the airport's shape file to graphically show the inventory and condition of the airport via color coding shown on the shape file. The coding provides a visual representation that illustrates the PCIs for each pavement section.

During the inspections Global Positioning System (GPS) coordinates were recorded at the centroid of each sample unit. The centroid is usually the geometric center of the area but in cases where sample units are irregular in shape this is the center of mass. These data are presented in tables on updated Network Definition drawings of each individual airport report.

Selected digital photographs taken during the pavement inspection were provided in Appendix G of each individual airport report. These photographs may provide visual support to special pavement conditions or distress observed during the inspection of the facility. As requested by the Aviation Office, these photographs are not linked to the airport's database.

10. RECOMMENDATIONS

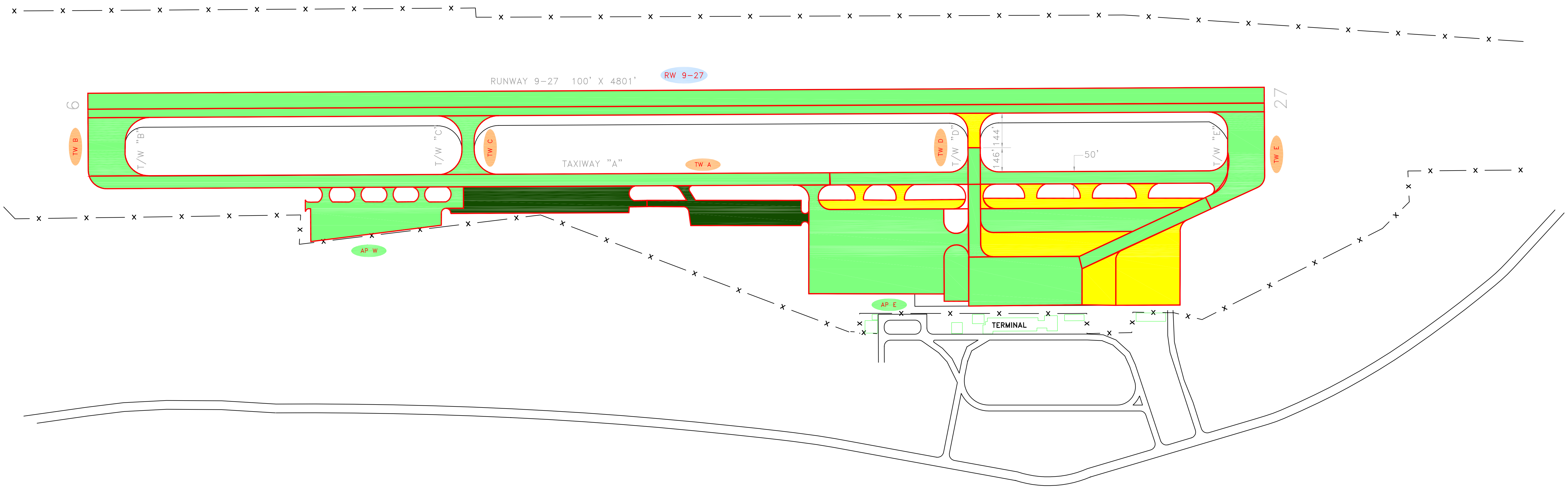
Pavement condition inspections were performed at airports participating in the program from District 6 and a 10-year M&R plan was developed based on the unlimited funding scenario.

Based on 2006/2007 condition inspections and M&R analysis results, some key M&R repair projects identified for each airport for the next 3 years are:

- EYW - Key West International Airport: East Apron
- MTH - The Florida Keys Marathon Airport: Jet Center Apron, Runway 7-25
- OPF - Opa Locka Airport: Runway 18L-36R, Center Apron, and Northeast Apron
- TMB - Kendall-Tamiami Executive Airport: South Apron
- TNT - Dade-Collier Training and Transition Airport: Runway 9-27
- X51 - Homestead General Aviation Airport: Taxiway N

APPENDIX A

2006/2007 CONDITION MAPS



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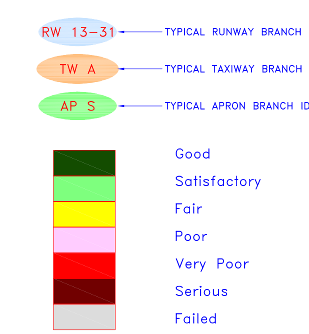

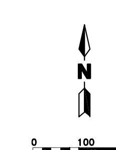

RUNWAY LENGTHS DEPICTED IN THIS DRAWING ARE FOR PAVEMENT MANAGEMENT PURPOSES ONLY AND MAY NOT MATCH PUBLISHED RUNWAY LENGTHS.

NUMBER	DATE	REVISIONS					
1	**Feb-19**	**Draft Report**					
0	*Feb-06*	*Initial Submittal*					
DESIGNED:	FL	DRAWN:	GB	CHECKED:		DATE:	2-21-2006

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URS

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Engineering and Consulting, Inc.
Tallahassee, Florida
850-656-1293

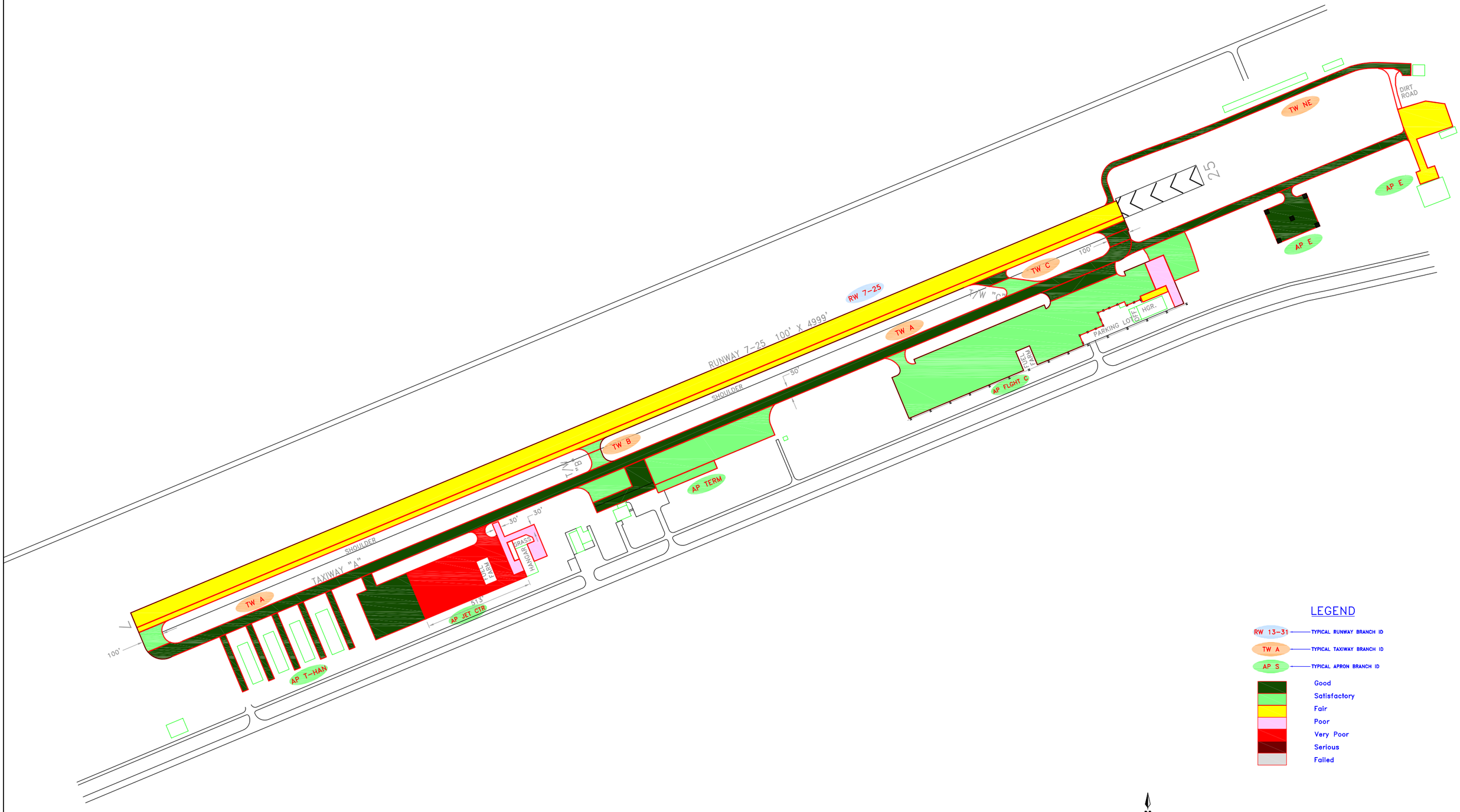
2007 Condition Map

KEY WEST INTERNATIONAL AIRPORT MONROE COUNTY, FLORIDA

FLORIDA DEPARTMENT OF TRANSPORTATION - AVIATION OFFICE 40

IDENTIFIER **EYW**

FDOT DISTRICT 6



LEGEND

RW 13-31 — TYPICAL RUNWAY BRANCH ID

TW A — TYPICAL TAXIWAY BRANCH ID

AP S — TYPICAL APRON BRANCH ID

- Good
- Satisfactory
- Fair
- Poor
- Very Poor
- Serious
- Failed

N

0 100 200

RUNWAY LENGTHS DEPICTED IN THIS DRAWING ARE FOR PAVEMENT MANAGEMENT PURPOSES ONLY AND MAY NOT MATCH PUBLISHED RUNWAY LENGTHS.

NUMBER	DATE	REVISIONS
2	Apr-07	Draft Report
1	May-06	Revised per FDOT comments
0	Feb-06	Initial Submittal

DESIGNED: FL | DRAWN: GB | CHECKED: | DATE: 9-06-2007

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MACTEC
Engineering and Consulting, Inc.
Tallahassee, Florida
850-656-1293

2006 Condition Map

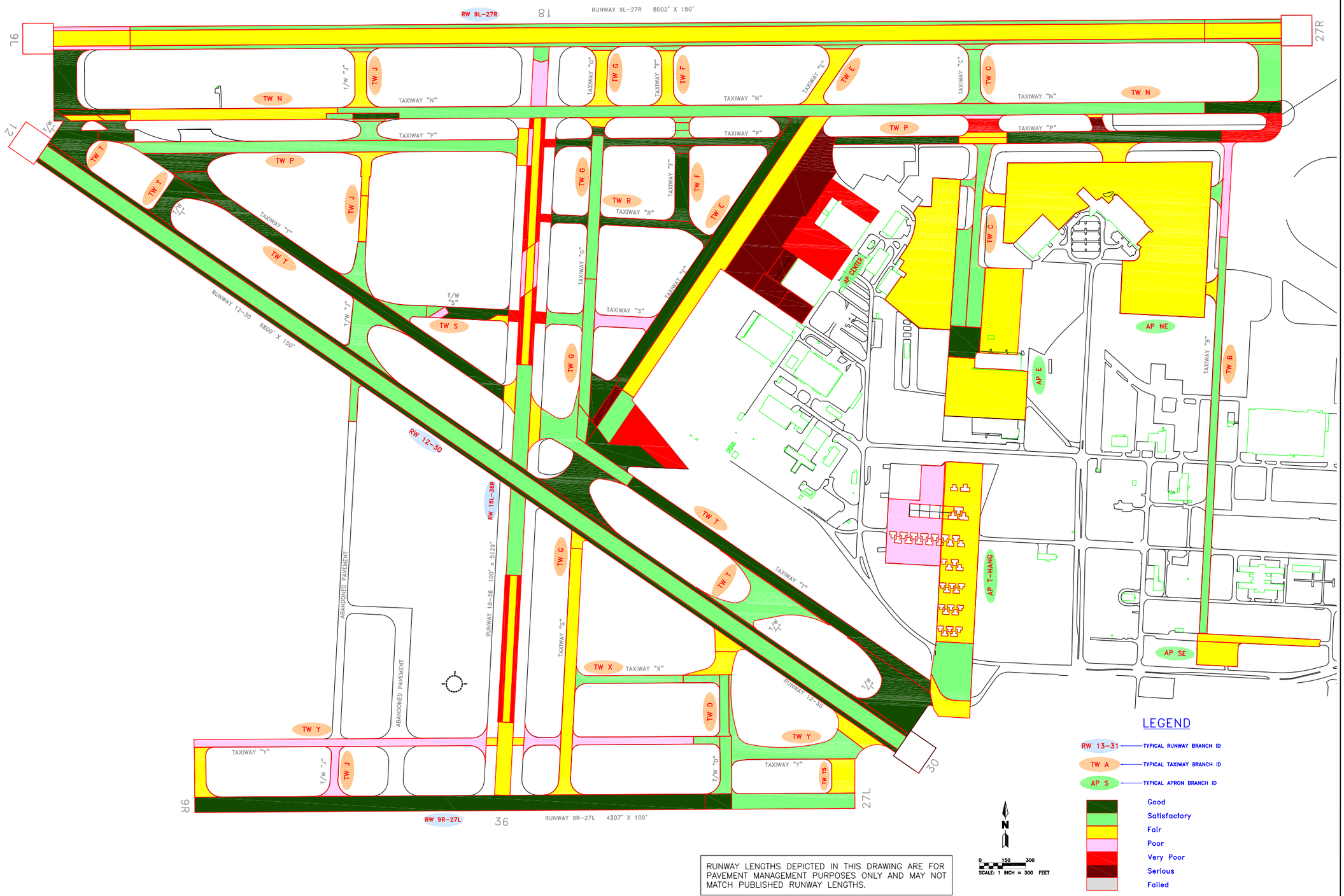
THE FLORIDA KEYS MARATHON AIRPORT
MONROE COUNTY, FLORIDA

FLORIDA DEPARTMENT OF TRANSPORTATION - AVIATION OFFICE

85

IDENTIFIER MTH

FDOT DISTRICT 6



LEGEND

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- TW A — TYPICAL TAXIWAY BRANCH ID
- AP S — TYPICAL APRON BRANCH ID

- Good
- Satisfactory
- Fair
- Poor
- Very Poor
- Serious
- Failed

N

0 150 300
SCALE: 1 INCH = 300 FEET

RUNWAY LENGTHS DEPICTED IN THIS DRAWING ARE FOR PAVEMENT MANAGEMENT PURPOSES ONLY AND MAY NOT MATCH PUBLISHED RUNWAY LENGTHS.

NUMBER	DATE	REVISIONS
1	Mar-06	Draft Report
0	Feb-06	Initial Submittal

DESIGNED: JP | DRAWN: | JCB | CHECKED: | DATE: 3-2-2006

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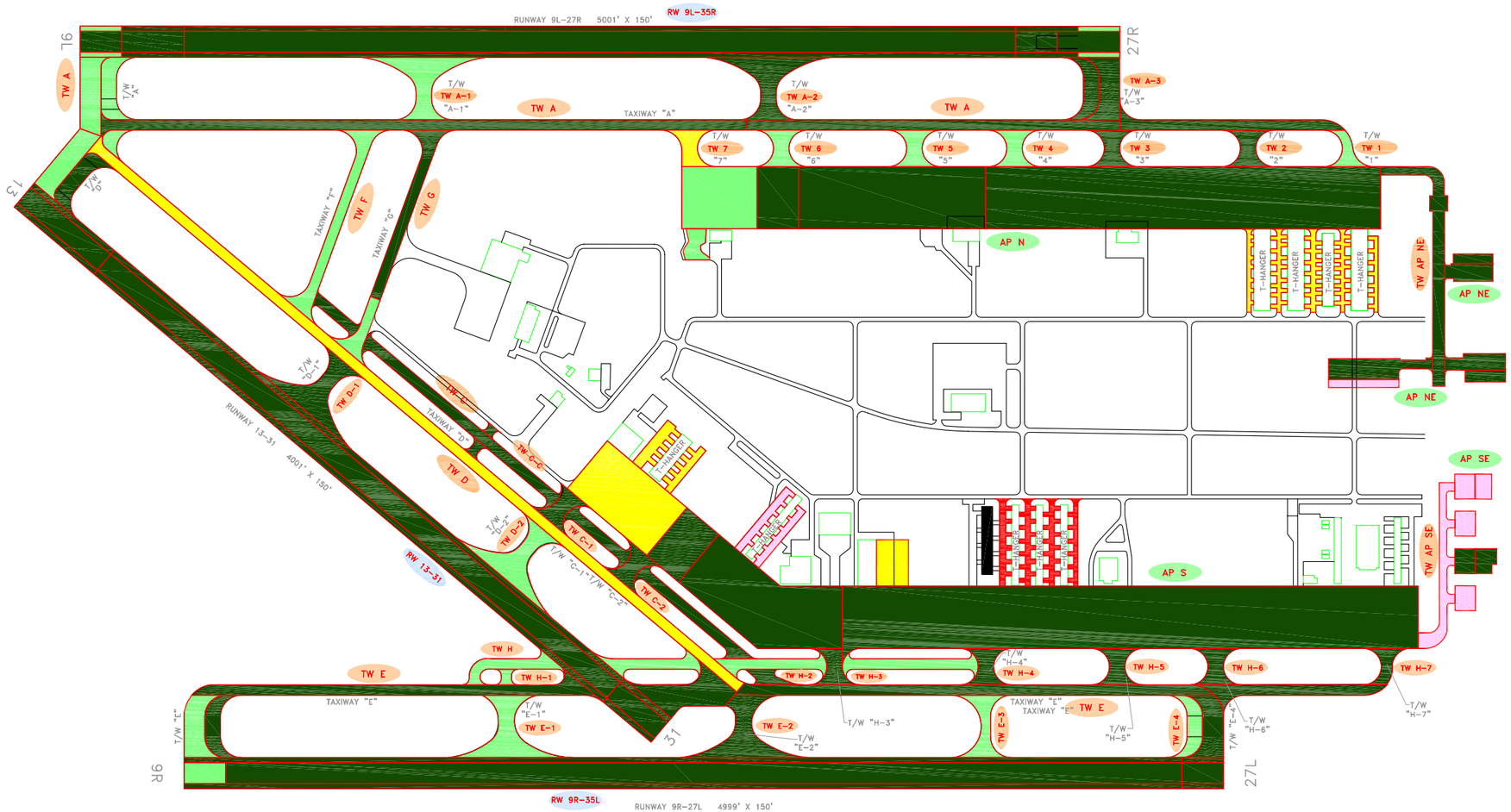
850-656-1293

2007 Condition Map

OPA LOCKA AIRPORT
MIAMI, MIAMI-DADE, FLORIDA

FLORIDA DEPARTMENT OF TRANSPORTATION - AVIATION OFFICE

IDENTIFIER: OPF
FDOT DISTRICT: 6



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- TW A — TYPICAL TAXIWAY BRANCH ID
- AP S — TYPICAL APRON BRANCH ID

- Good
- Satisfactory
- Fair
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- Very Poor
- Serious
- Failed

N

0 150 300

RUNWAY LENGTHS DEPICTED IN THIS DRAWING ARE FOR PAVEMENT MANAGEMENT PURPOSES ONLY AND MAY NOT MATCH PUBLISHED RUNWAY LENGTHS.

NUMBER	DATE	REVISIONS
2	Feb-19	Draft Report
1	May-06	Revised per FDOT comments
0	Feb-06	Initial Submittal

DESIGNED: FL | DRAWN: BB | CHECKED: | DATE: 2-20-2006

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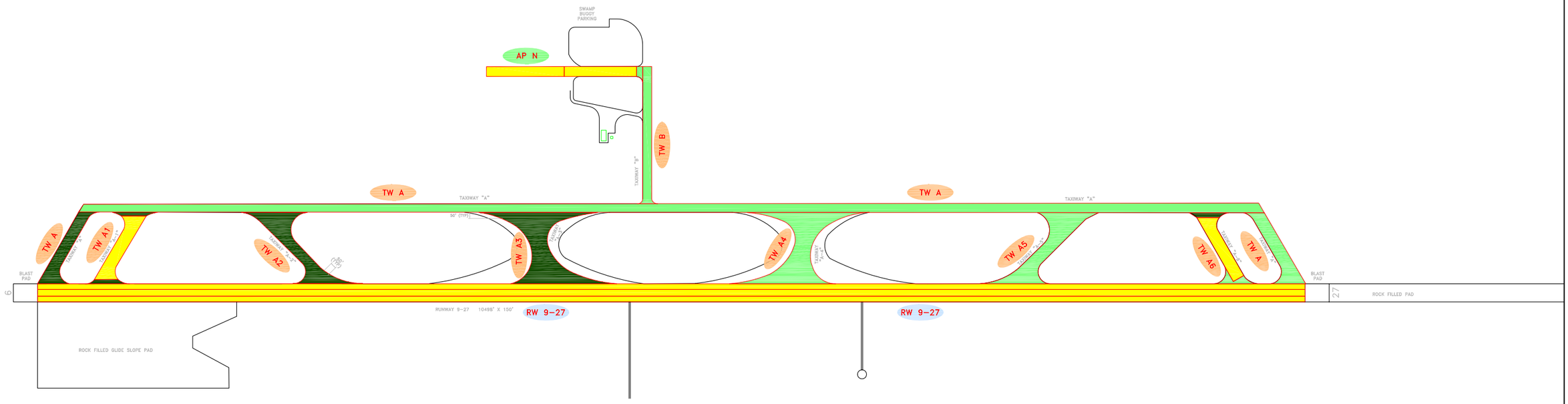
2007 Condition Map

KENDALL-TAMIAMI EXECUTIVE AIRPORT
DADE COUNTY, FLORIDA

FLORIDA DEPARTMENT OF TRANSPORTATION - AVIATION OFFICE 39

IDENTIFIER: TMB
FDOT DISTRICT: 6



LEGEND

RW 13-31 — TYPICAL RUNWAY BRANCH ID

TW A — TYPICAL TAXIWAY BRANCH ID

AP S — TYPICAL APRON BRANCH ID

- Good
- Satisfactory
- Fair
- Poor
- Very Poor
- Serious
- Failed

RUNWAY LENGTHS DEPICTED IN THIS DRAWING ARE FOR PAVEMENT MANAGEMENT PURPOSES ONLY AND MAY NOT MATCH PUBLISHED RUNWAY LENGTHS.

N

NUMBER	DATE	REVISIONS
1	Feb-22	Draft Report
0	Feb-06	Initial Submittal

DESIGNED: FL | DRAWN: BB | CHECKED: | DATE: 2-16-2006

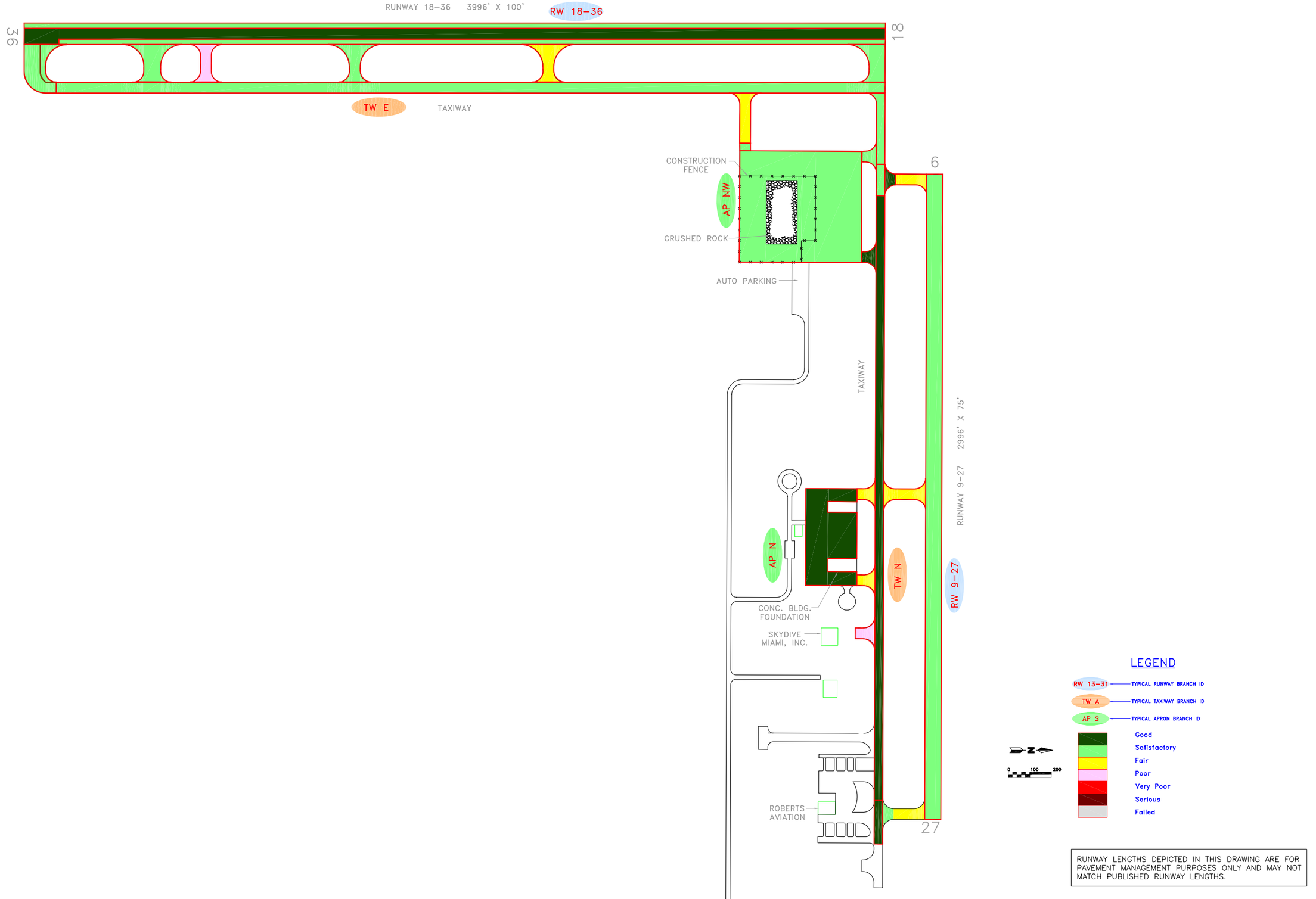
MACTEC
Engineering and Consulting, Inc.
Tallahassee, Florida
850-656-1293

2007 Condition Map

DADE-COLLIER TRAINING & TRANSITION AIRPORT
DADE COUNTY, FLORIDA

FLORIDA DEPARTMENT OF TRANSPORTATION - AVIATION OFFICE 18

IDENTIFIER: TNT
FDOT DISTRICT: 6



RUNWAY LENGTHS DEPICTED IN THIS DRAWING ARE FOR PAVEMENT MANAGEMENT PURPOSES ONLY AND MAY NOT MATCH PUBLISHED RUNWAY LENGTHS.

NUMBER	DATE	REVISIONS
1	Feb-06-08	Draft Report
0	Feb-06	Initial Submittal

DESIGNED: JCB DRAWN: RWF CHECKED: DATE: 2-20-2006

MACTEC
Engineering and Consulting, Inc.
Tallahassee, Florida
850-656-1293

2007 PCI Map

HOMESTEAD G.A. AIRPORT
HOMESTEAD, MIAMI-DADE, FLORIDA

FLORIDA DEPARTMENT OF TRANSPORTATION - AVIATION OFFICE 34

IDENTIFIER **X51**

FDOT DISTRICT **6**

APPENDIX B

MAJOR M&R PLAN

Table B-1: EYW Major M&R Plan by Year

Network	Branch Use	Branch ID	Section ID	Surface	Area, SqFt	Year	PCI Before Maint.	Activities	PCI After Maint.	Cost
EYW	TAXIWAY	TW D	505	AAC	9,600	2008	57	Microsurfacing	100	$53,050
EYW	TAXIWAY	TW D	520	AAC	5,150	2008	63	Microsurfacing	100	$17,412
EYW	APRON	AP E	4105	AC	72,800	2009	64	Microsurfacing	100	$232,300
EYW	APRON	AP E	4150	AC	72,800	2012	64	Microsurfacing	100	$253,841
EYW	APRON	AP E	4115	AC	52,000	2013	64	Microsurfacing	100	$186,754
EYW	APRON	AP E	4110	AC	27,000	2014	64	Microsurfacing	100	$99,878
EYW	RUNWAY	RW 9-27	6105	AAC	312,000	2014	64	Microsurfacing	100	$1,154,142
EYW	RUNWAY	RW 9-27	6110	AAC	168,000	2014	64	Microsurfacing	100	$621,461
EYW	APRON	AP E	4125	AC	90,000	2016	64	Microsurfacing	100	$353,201
EYW	APRON	AP E	4130	AC	31,300	2016	64	Microsurfacing	100	$122,835
EYW	TAXIWAY	TW B	205	AAC	40,750	2017	63	Microsurfacing	100	$179,766
EYW	TAXIWAY	TW C	305	AAC	20,100	2017	63	Microsurfacing	100	$88,670

Table B-2: MTH Major M&R Plan by Year

Network	Branch Use	Branch ID	Section ID	Surface	Area, SqFt	Year	PCI Before Maint.	Activities	PCI After Maint.	Cost
MTH	APRON	AP E	4510	AC	45,907	2008	56	Microsurfacing	100	$241,104
MTH	APRON	AP FLGHT C	4110	PCC	3,900	2008	55	PCC Restoration	100	$22,016
MTH	APRON	AP FLGHT C	4115	AC	12,500	2008	51	Mill & Overlay	100	$90,213
MTH	APRON	AP JET CTR	4305	AC	105,000	2008	33	Mill & Overlay	100	$1,604,610
MTH	APRON	AP JET CTR	4310	PCC	17,532	2008	53	PCC Restoration	100	$112,748
MTH	RUNWAY	RW 7-25	6105	AAC	375,000	2008	57	Microsurfacing	100	$1,822,126
MTH	RUNWAY	RW 7-25	6110	AAC	125,000	2008	63	Microsurfacing	100	$355,750
MTH	TAXIWAY	TW NE	405	AC	50,000	2008	89	Microsurfacing	100	$6,500
MTH	APRON	AP FLGHT C	4105	AC	286,500	2013	63	Microsurfacing	100	$945,248
MTH	APRON	AP TERM	4220	PCC	85,000	2017	64	PCC Restoration	100	$284,806

Table B-3: OPF Major M&R Plan by Year

Network	Branch Use	Branch ID	Section ID	Surface	Area, SqFt	Year	PCI Before Maint.	Activities	PCI After Maint.	Cost
OPF	APRON	AP CENTER	4105	AC	198,000	2008	56	Microsurfacing	100	$1,039,896
OPF	APRON	AP CENTER	4110	PCC	235,500	2008	22	Reconstruction	100	$4,373,235
OPF	APRON	AP CENTER	4115	PCC	40,000	2008	27	Reconstruction	100	$742,800
OPF	APRON	AP CENTER	4120	PCC	8,400	2008	25	Reconstruction	100	$155,988
OPF	APRON	AP CENTER	4125	PCC	93,600	2008	32	PCC Restoration	100	$1,532,981
OPF	APRON	AP CENTER	4130	PCC	21,000	2008	23	Reconstruction	100	$389,970
OPF	APRON	AP CENTER	4135	PCC	50,700	2008	24	Reconstruction	100	$941,499
OPF	APRON	AP CENTER	4140	AC	75,000	2008	28	Reconstruction	100	$1,392,750
OPF	APRON	AP E	4225	AC	177,861	2008	59	Microsurfacing	100	$724,428
OPF	APRON	AP NE	4305	AC	784,400	2008	63	Microsurfacing	100	$2,232,402
OPF	APRON	AP SE	4405	AC	31,500	2008	58	Microsurfacing	100	$140,679
OPF	APRON	AP T-HANG	4505	AC	153,664	2008	53	Mill & Overlay	100	$988,214
OPF	APRON	AP T-HANG	4507	AC	245,311	2008	61	Microsurfacing	100	$834,548
OPF	APRON	AP T-HANG	4515	AAC	28,000	2008	57	Microsurfacing	100	$136,052
OPF	RUNWAY	RW 18L-36R	6305	AC	47,000	2008	58	Microsurfacing	100	$209,902
OPF	RUNWAY	RW 18L-36R	6320	AC	118,450	2008	40	Mill & Overlay	100	$901,405
OPF	RUNWAY	RW 18L-36R	6322	AAC	7,500	2008	44	Mill & Overlay	100	$57,075
OPF	RUNWAY	RW 18L-36R	6340	AC	16,500	2008	53	Mill & Overlay	100	$106,112
OPF	RUNWAY	RW 18L-36R	6345	AC	31,000	2008	51	Mill & Overlay	100	$223,727
OPF	RUNWAY	RW 9L-27R	6105	APC	50,000	2008	61	Microsurfacing	100	$170,100
OPF	RUNWAY	RW 9L-27R	6110	APC	25,000	2008	55	Mill & Overlay	100	$141,125
OPF	RUNWAY	RW 9L-27R	6125	AAC	50,000	2008	61	Microsurfacing	100	$170,100
OPF	TAXIWAY	TW B	202	AC	31,500	2008	51	Mill & Overlay	100	$227,336
OPF	TAXIWAY	TW B	215	AC	5,848	2008	61	Microsurfacing	100	$19,895
OPF	TAXIWAY	TW C	312	AAC	2,625	2008	53	Mill & Overlay	100	$16,881
OPF	TAXIWAY	TW C	315	AC	23,000	2008	37	Mill & Overlay	100	$250,654
OPF	TAXIWAY	TW D	415	AC	27,450	2008	63	Microsurfacing	100	$78,123
OPF	TAXIWAY	TW E	510	AC	42,000	2008	64	Microsurfacing	100	$107,856
OPF	TAXIWAY	TW E	518	AC	14,500	2008	21	Reconstruction	100	$269,265

Table B-3: OPF Major M&R Plan by Year

Network	Branch Use	Branch ID	Section ID	Surface	Area, SqFt	Year	PCI Before Maint.	Activities	PCI After Maint.	Cost
OPF	TAXIWAY	TW F	610	AC	31,000	2008	59	Microsurfacing	100	$126,263
OPF	TAXIWAY	TW J	1010	AC	30,500	2008	64	Microsurfacing	100	$78,324
OPF	TAXIWAY	TW J	1025	AC	17,200	2008	63	Microsurfacing	100	$48,951
OPF	TAXIWAY	TW J	1050	AC	19,750	2008	43	Mill & Overlay	100	$150,298
OPF	TAXIWAY	TW N	1412	APC	7,500	2008	62	Microsurfacing	100	$23,430
OPF	TAXIWAY	TW N	1415	AC	7,500	2008	63	Microsurfacing	100	$21,345
OPF	TAXIWAY	TW N	1420	AC	284,750	2008	63	Microsurfacing	100	$810,398
OPF	TAXIWAY	TW N	1437	APC	2,688	2008	64	Microsurfacing	100	$6,902
OPF	TAXIWAY	TW P	1622	AC	3,600	2008	27	Reconstruction	100	$66,852
OPF	TAXIWAY	TW P	1635	AC	9,730	2008	56	Microsurfacing	100	$51,102
OPF	TAXIWAY	TW P	1640	AC	15,000	2008	62	Microsurfacing	100	$46,860
OPF	TAXIWAY	TW P	1650	AC	7,750	2008	23	Reconstruction	100	$143,917
OPF	TAXIWAY	TW P	1652	AAC	3,750	2008	58	Microsurfacing	100	$16,748
OPF	TAXIWAY	TW P	1655	AC	24,000	2008	64	Microsurfacing	100	$61,632
OPF	TAXIWAY	TW P	1660	AC	37,824	2008	36	Mill & Overlay	100	$453,661
OPF	TAXIWAY	TW R	1804	AC	3,500	2008	37	Mill & Overlay	100	$38,143
OPF	TAXIWAY	TW S	1915	AC	3,750	2008	52	Mill & Overlay	100	$25,590
OPF	TAXIWAY	TW S	1919	AC	9,800	2008	38	Mill & Overlay	100	$96,060
OPF	TAXIWAY	TW S	1925	AAC	3,600	2008	63	Microsurfacing	100	$10,246
OPF	TAXIWAY	TW S	1935	AC	29,000	2008	47	Mill & Overlay	100	$220,690
OPF	TAXIWAY	TW Y	2605	AC	27,000	2008	56	Microsurfacing	100	$141,804
OPF	TAXIWAY	TW Y	2609	AC	8,300	2008	59	Microsurfacing	100	$33,806
OPF	TAXIWAY	TW Y	2610	AC	152,000	2008	53	Mill & Overlay	100	$977,512
OPF	TAXIWAY	TW Y5	2630	AC	33,500	2008	61	Microsurfacing	100	$113,967
OPF	APRON	AP E	4215	AC	137,500	2009	64	Microsurfacing	100	$363,693
OPF	RUNWAY	RW 18L-36R	6335	AAC	15,000	2009	64	Microsurfacing	100	$39,676
OPF	RUNWAY	RW 9L-27R	6115	AAC	700,000	2009	64	Microsurfacing	100	$1,851,528
OPF	TAXIWAY	TW G	735	AC	123,000	2009	64	Microsurfacing	100	$325,340
OPF	TAXIWAY	TW J	1030	AC	15,000	2009	64	Microsurfacing	100	$39,676

Table B-3: OPF Major M&R Plan by Year

Network	Branch Use	Branch ID	Section ID	Surface	Area, SqFt	Year	PCI Before Maint.	Activities	PCI After Maint.	Cost
OPF	RUNWAY	RW 18L-36R	6315	AAC	114,500	2010	63	Microsurfacing	100	$345,712
OPF	TAXIWAY	TW G	715	AC	9,400	2010	64	Microsurfacing	100	$25,609
OPF	TAXIWAY	TW G	710	AC	29,000	2011	64	Microsurfacing	100	$81,378
OPF	TAXIWAY	TW T	2007	AC	11,275	2011	64	Microsurfacing	100	$31,639
OPF	RUNWAY	RW 18L-36R	6325	AC	119,000	2012	63	Microsurfacing	100	$381,181
OPF	TAXIWAY	TW B	220	AC	37,600	2012	64	Microsurfacing	100	$108,676
OPF	TAXIWAY	TW C	330	AC	12,000	2012	64	Microsurfacing	100	$34,684
OPF	TAXIWAY	TW D	420	AC	21,225	2012	64	Microsurfacing	100	$61,347
OPF	TAXIWAY	TW G	740	AC	7,500	2012	64	Microsurfacing	100	$21,677
OPF	TAXIWAY	TW P	1621	AC	16,800	2012	64	Microsurfacing	100	$48,557
OPF	TAXIWAY	TW Y	2625	AC	24,225	2012	64	Microsurfacing	100	$70,018
OPF	APRON	AP E	4205	AC	292,300	2013	64	Microsurfacing	100	$870,182
OPF	TAXIWAY	TW C	320	AC	90,000	2013	64	Microsurfacing	100	$267,931
OPF	RUNWAY	RW 9L-27R	6120	AAC	350,000	2014	64	Microsurfacing	100	$1,073,214
OPF	APRON	AP E	4210	AC	110,000	2015	64	Microsurfacing	100	$347,415
OPF	TAXIWAY	TW N	1425	AC	6,000	2015	64	Microsurfacing	100	$18,950
OPF	TAXIWAY	TW T	2008	AC	103,600	2015	64	Microsurfacing	100	$327,202
OPF	TAXIWAY	TW X	2505	AC	35,500	2015	64	Microsurfacing	100	$112,120
OPF	APRON	AP T-HANG	4510	AC	80,000	2016	64	Microsurfacing	100	$260,245
OPF	RUNWAY	RW 9R-27L	6415	AC	80,000	2016	64	Microsurfacing	100	$260,245
OPF	TAXIWAY	TW C	310	AC	30,650	2016	64	Microsurfacing	100	$99,706
OPF	TAXIWAY	TW J	1035	AC	28,000	2016	64	Microsurfacing	100	$91,086
OPF	TAXIWAY	TW J	1045	AC	16,000	2016	64	Microsurfacing	100	$52,049
OPF	TAXIWAY	TW N	1422	AC	281,250	2016	64	Microsurfacing	100	$914,925
OPF	TAXIWAY	TW S	1930	AC	19,000	2016	64	Microsurfacing	100	$61,808
OPF	RUNWAY	RW 12-30	6205	AC	680,000	2017	63	Microsurfacing	100	$2,525,101
OPF	RUNWAY	RW 18L-36R	6355	AAC	9,000	2017	64	Microsurfacing	100	$30,156
OPF	RUNWAY	RW 9L-27R	6130	APC	25,000	2017	64	Microsurfacing	100	$83,766
OPF	TAXIWAY	TW B	205	AC	129,650	2017	64	Microsurfacing	100	$434,413

Table B-3: OPF Major M&R Plan by Year

Network	Branch Use	Branch ID	Section ID	Surface	Area, SqFt	Year	PCI Before Maint.	Activities	PCI After Maint.	Cost
OPF	TAXIWAY	TW B	210	AC	5,044	2017	64	Microsurfacing	100	$16,901
OPF	TAXIWAY	TW Y	2620	AC	97,775	2017	64	Microsurfacing	100	$327,611

Table B-4: TMB Major M&R Plan by Year

Network	Branch Use	Branch ID	Section ID	Surface	Area, SqFt	Year	PCI Before Maint.	Activities	PCI After Maint.	Cost
TMB	APRON	AP N	4225	AC	64,400	2008	59	Microsurfacing	100	$262,301
TMB	APRON	AP NE	4330	APC	14,625	2008	42	Mill & Overlay	100	$111,296
TMB	APRON	AP S	4125	AC	34,875	2008	55	Mill & Overlay	100	$196,869
TMB	APRON	AP S	4130	AC	19,200	2008	56	Microsurfacing	100	$100,838
TMB	APRON	AP S	4135	AC	31,368	2008	42	Mill & Overlay	100	$238,711
TMB	APRON	AP S	4140	AC	72,000	2008	35	Mill & Overlay	100	$942,480
TMB	APRON	AP SE	4410	AC	40,000	2008	45	Mill & Overlay	100	$304,400
TMB	TAXIWAY	TW AP SE	1105	AC	29,500	2008	48	Mill & Overlay	100	$224,495
TMB	APRON	AP S	4105	AC	150,000	2012	64	Microsurfacing	100	$433,546
TMB	TAXIWAY	TW D	405	AC	203,000	2012	64	Microsurfacing	100	$586,732
TMB	TAXIWAY	TW A	110	AC	36,000	2013	64	Microsurfacing	100	$107,173
TMB	TAXIWAY	TW A	111	AC	22,500	2014	64	Microsurfacing	100	$68,992
TMB	TAXIWAY	TW E3	527	AC	28,000	2014	64	Microsurfacing	100	$85,857
TMB	RUNWAY	RW 9L-27R	6109	AC	10,000	2015	64	Microsurfacing	100	$31,583
TMB	TAXIWAY	TW 7	210	AAC	19,700	2015	64	Microsurfacing	100	$62,219
TMB	TAXIWAY	TW D	410	AC	37,000	2015	64	Microsurfacing	100	$116,858
TMB	APRON	AP N	4220	AAC	105,000	2016	64	Microsurfacing	100	$341,572
TMB	RUNWAY	RW 9R-27L	6304	AC	17,500	2016	64	Microsurfacing	100	$56,929
TMB	TAXIWAY	TW D	412	AC	8,400	2016	64	Microsurfacing	100	$27,326
TMB	TAXIWAY	TW H1	805	AC	4,000	2016	64	Microsurfacing	100	$13,012
TMB	RUNWAY	RW 9L-27R	6126	AC	10,000	2017	64	Microsurfacing	100	$33,507
TMB	RUNWAY	RW 9L-27R	6126	AC	10,000	2017	64	Microsurfacing	100	$33,507

Table E-5: TNT Major M&R Plan by Year

Network	Branch Use	Branch ID	Section ID	Surface	Area, SqFt	Year	PCI Before Maint.	Activities	PCI After Maint.	Cost
TNT	APRON	AP N	4105	AAC	48,750	2008	56	Microsurfacing	100	$222,690
TNT	RUNWAY	RW 9-27	6105	AC	587,888	2008	64	Microsurfacing	100	$1,368,604
TNT	RUNWAY	RW 9-27	6110	AAC	986,812	2008	61	Microsurfacing	100	$3,105,500
TNT	TAXIWAY	TW A1	120	AC	63,900	2008	64	Microsurfacing	100	$148,759
TNT	TAXIWAY	TW A6	170	AC	57,800	2008	63	Microsurfacing	100	$150,338
TNT	TAXIWAY	TW B	215	AAC	43,500	2010	64	Microsurfacing	100	$107,435
TNT	TAXIWAY	TW A	105	AAC	740,000	2013	64	Microsurfacing	100	$1,997,106
TNT	TAXIWAY	TW A6	176	AAC	8,870	2013	63	Microsurfacing	100	$26,745
TNT	TAXIWAY	TW B	205	AAC	83,500	2014	64	Microsurfacing	100	$232,110
TNT	TAXIWAY	TW A5	160	AAC	90,500	2015	63	Microsurfacing	100	$289,501
TNT	TAXIWAY	TW A	180	AAC	73,500	2016	64	Microsurfacing	100	$216,755
TNT	TAXIWAY	TW B	210	AAC	3,750	2017	64	Microsurfacing	100	$11,391

Table E-6: X51 Major M&R Plan by Year

Network	Branch Use	Branch ID	Section ID	Surface	Area, SqFt	Year	PCI Before Maint.	Activities	PCI After Maint.	Cost
X51	TAXIWAY	TW E	130	AC	12,025	2008	53	Mill & Overlay	100	$65,284
X51	TAXIWAY	TW N	230	AC	7,390	2008	61	Microsurfacing	100	$23,256
X51	TAXIWAY	TW N	240	AC	12,000	2008	56	Microsurfacing	100	$54,816
X51	TAXIWAY	TW N	290	AC	5,600	2008	59	Microsurfacing	100	$20,759
X51	TAXIWAY	TW N	295	AC	5,600	2008	45	Mill & Overlay	100	$35,224
X51	TAXIWAY	TW E	180	AC	12,200	2010	64	Microsurfacing	100	$30,131
X51	RUNWAY	RW 18-36	6105	AAC	204,025	2012	63	Microsurfacing	100	$597,273
X51	TAXIWAY	TW E	150	AC	13,950	2012	63	Microsurfacing	100	$40,838
X51	TAXIWAY	TW N	250	AC	7,390	2012	63	Microsurfacing	100	$21,634
X51	TAXIWAY	TW N	280	AC	5,600	2012	64	Microsurfacing	100	$14,673
X51	APRON	AP NW	4105	AC	163,000	2013	64	Microsurfacing	100	$439,903
X51	TAXIWAY	TW E	110	AAC	25,600	2015	64	Microsurfacing	100	$73,297
X51	TAXIWAY	TW E	140	AC	13,425	2015	64	Microsurfacing	100	$38,438
X51	RUNWAY	RW 9-27	6205	AC	224,700	2016	63	Microsurfacing	100	$740,358
X51	TAXIWAY	TW N	210	AAC	5,600	2016	63	Microsurfacing	100	$18,451
X51	TAXIWAY	TW N	260	AC	4,468	2016	64	Microsurfacing	100	$13,176
X51	TAXIWAY	TW E	160	AC	15,875	2017	64	Microsurfacing	100	$48,221
X51	TAXIWAY	TW N	255	AAC	3,600	2017	64	Microsurfacing	100	$10,935

URS Corporation Inc. / MACTEC Engineering & Consulting, Inc. /
Planning Technology, Inc. / ASC Geosciences, Inc.