2011 AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE (APMS)

TRACY MUNICIPAL AIRPORT
SAN JOAQUIN COUNTY, CALIFORNIA

California Department of Transportation
Division of Aeronautics
Contract No. 63A0061

February 2012

HILL INTERNATIONAL, INC.
11440 West Bernardo Court, Suite #375
San Diego, California 92127

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#

1.0 - EXECUTIVE SUMMARY

This report was prepared for the California Department of Transportation as part of a state-wide update of the existing Airport Pavement Management System (APMS). In general, this update consisted of obtaining information on maintenance, rehabilitation, and new construction activities at Tracy Municipal Airport since the last on-site survey was conducted in 2003; performing a visual pavement condition survey and updating the existing database with the information obtained for the pavements at the airport site.

The general purpose of this APMS update is the following:

1. To provide an individual airport owner/manager with current and projected needs for repairing, maintaining or preserving site pavements, including cost estimates.
2. To provide the State and FAA with a state-wide list of current and projected pavement repair and preservation needs for all airports within the system.

The report presents a branch-by-branch current pavement condition index, recommendations for preserving the airport pavement system, and the estimated costs for current repair needs at Tracy Municipal Airport. Also presented are projected pavement conditions, needs, and costs for the year 2016 and 2021. The five-year and ten-year projected costs assume no actions are taken with regard to current needs and pavement deterioration continues unabated. In order to make more cost effective decisions about pavement maintenance and rehabilitation, please refer to the FAA Advisory Circular 150/5380-7A.

Conclusions and Recommendations

In summary, the overall condition of the pavement inventory at Tracy Municipal Airport is a pavement condition index (PCI) of 71, which is in the "medium green" or "satisfactory" condition range. The current budget requirement to maintain the pavement network at an acceptable condition (PCI > 80) at Tracy Municipal Airport is approximately $1,172,650. The specific pavement rehabilitation recommendations for each pavement feature are shown in Table 3 on page 17 of this report. The majority of this cost is related to the rehabilitation of Runways 8-26 and 12-30 and Aprons A1A and A2. If pavement rehabilitation is totally deferred until the year 2016, the total estimated cost for rehabilitation is increased to $3,752,932 in 2011 dollars. In addition, if pavement rehabilitation is totally deferred until the year 2021, the total estimated cost for rehabilitation rises to nearly $6,038,572 in 2011 dollars.

2.0 - INTRODUCTION AND SCOPE

During 2011, the State of California Department of Transportation (Caltrans), with funding from the Federal Aviation Administration (FAA), updated the existing Airport Pavement Management System for 85 general aviation airports throughout the state. In general, this project included:

- Obtaining historical design, construction, and maintenance records at each airport for each pavement branch (runway, taxiway, apron, etc.).
- Conducting a visual pavement condition survey at each airport using standardized guidelines established by the FAA (Advisory Circular 150/5380-6B).
- Entering the data (physical records and condition survey) into a computer program developed for pavement management systems (MicroPAVER™).
- Developing a series of reports by MicroPAVER™. These included a pavement inventory report, a pavement inspection report, and others. Copies of the computer-generated reports are included in the final report for each airport site. Copies of these reports were also provided to the individual airport sponsor.
- Updating existing airport layout drawings to reflect recent construction documents and actual conditions encountered during the field condition surveys.

This report presents the results of the Airport Pavement Management System (APMS) Update. The following is a list of definitions to help the reviewer more fully understand the terms used in APMS and this report.

Pavement Branch: An individual airport pavement facility. Examples of branches are “Runway 1-19”, “Taxiway B”, and “Apron 2”.

Pavement Section: All or portion of a branch having a consistent age, structural thickness and material composition. Examples of sections are: 1) “Runway 2-20 originally constructed to 5,000 feet in 1980, with three inches of asphalt concrete on six inches of aggregate base”; 2) “a 1,000-foot extension to Runway 2-20 constructed in 1990, with the same pavement section as the original”; 3) “a 5,000 square foot run-up apron constructed at the same time as the Runway 2-20 extension, but with three inches of asphalt concrete on four inches of aggregate base.”

Pavement Feature: A generic term not used in the APMS computer database, but commonly used interchangeably with “pavement branch”.

Sample Unit: All or a designated portion of a pavement section (generally 5,000 square feet) deemed to be representative in condition to the entire pavement section. A sample unit or group of sample units represent at least 10% of the pavement section’s total area and are visually surveyed to establish the overall condition of the pavement section.

PCI: Pavement Condition Index (PCI) is an average numerical value ranging from 0 (totally failed pavement) to 100 (new pavement) for a pavement sample unit, section or branch. PCI is calculated

based on assumed initial values of 100 less deduct values. Deduct values are pre-established based on pavement distress type and severity. For more information on the survey methodology and process, see FAA AC 150/5380-7A "Airport Pavement Management Program", FAA AC 150/5380-6B "Guidelines and Procedures for Maintenance of Airport Pavements," and ASTM D5340-11 for "Standard Test Method for Airport Pavement Condition Index Surveys".

The purpose of this study, in addition to updates of the maintenance, construction, and PCI since 2003, was to develop a list of current maintenance procedures necessary to increase the PCI levels to what is considered to be "acceptable" for current and future use. An additional purpose was to estimate the current costs associated with the steps necessary to implement the anticipated maintenance/rehabilitation procedures. These costs were developed using statewide cost information for various types of pavement maintenance and construction practices. These costs are intended to be used for system planning purposes. The actual cost will be dependent on site-specific information not considered in the current scope of services. In order to make more cost effective decisions about pavement maintenance and rehabilitation, please refer to the FAA Advisory Circular 150/5380-7A.

Our scope of services was divided into a number of tasks. In summary, the initial tasks consisted of updating the pavement histories at the airport site since the 2003 survey was conducted. Updates included changes due to new construction, major maintenance or pavement rehabilitation activities, and modifications to branch sample unit designation. After the updating tasks were completed, the airport owner/manager was notified for coordination of the field inspection. Field pavement evaluations and data processing were then completed. A re-inspection report showing the field distress data collected will be included with the electronic data files provided to the airport.

Airport layout drawings were also developed showing pavement branch and condition survey sample unit locations as well as PCI ratings for each airport.

This report summarizes the work completed for Tracy Municipal Airport based on the June 2011 field survey. The airport contact person is:

NAME: Mr. Rod Buchanan – City of Tracy Airport & Transit Management

ADDRESS: 400 East Tenth Street, Tracy, California 95376

PHONE: 209-831-6262

3.0 - AIRPORT SITE DESCRIPTION AND FIELD STUDY

Tracy Municipal Airport is located in Tracy (San Joaquin County), California. Prior to conducting the field survey, all available information regarding design/construction/maintenance changes since the 2003 study/last update was obtained. Based on the information obtained, the airport drawing was updated, where necessary, and the survey sample areas were established. The updated layout for Tracy Municipal Airport showing the branch and sample designation areas is shown on the following plate. The following branch designations were used:

- **A - Aprons**
- **R – Runways**
- **T – Taxiways**

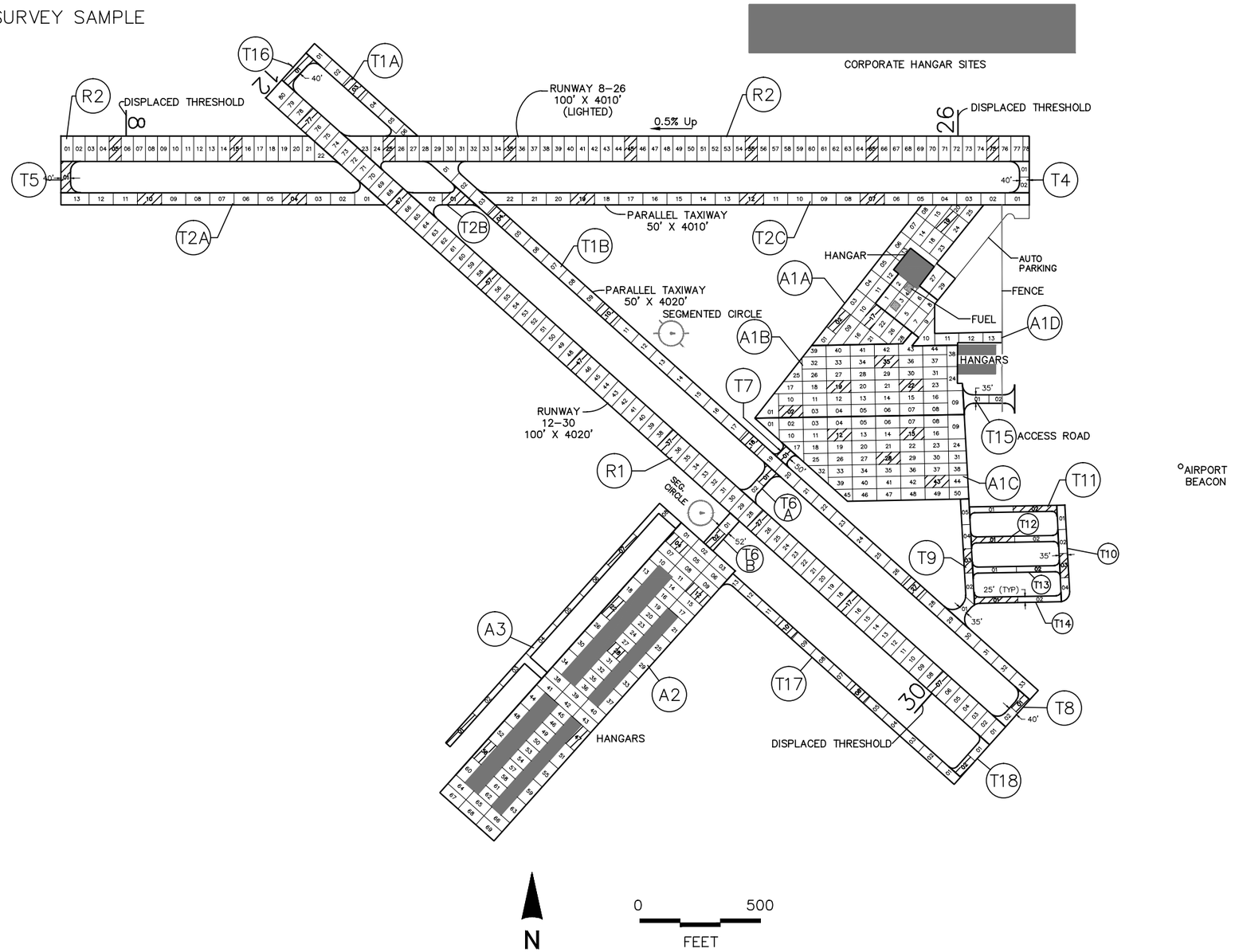
Presented in Appendix A is an Inventory Report of all grant-funded, paved areas at the airport site. Adjoining non-public features, such as private hangar taxilanes, were not surveyed. Included in this report is a listing of each branch, the general location of the branch at the airport site, the pavement ranking by use (primary, secondary or tertiary), the pavement type (Asphalt Concrete, Portland Cement Concrete), and the total area of the branch in square feet.

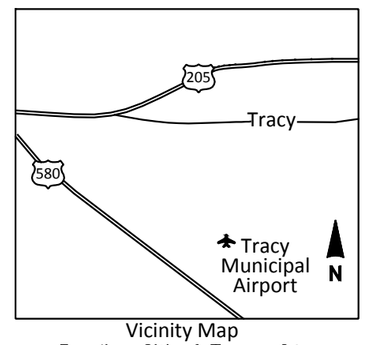
Field surveys consisted of visual observation of pavement distress at each branch. As noted on the Branch and Sample Designation Drawing on the following page, some of the survey was conducted on a random basis at predetermined locations. Some other survey areas were chosen to represent the average condition for a branch. In all cases, greater than 10% of the total branch area was surveyed in accordance with FAA survey procedures. The two deviations from this general rule are for small-sized branches. In these cases, either 100% of the area was surveyed if the branch was very small or a minimum of 5,000 square feet of pavement was surveyed.

CALTRANS Airport Pavement Management System, 2011

LEGEND

RANDOM SURVEY SAMPLE





Vicinity Map
3 miles SW of Tracy, CA

Notes:

1. Map intended for schematic representation of pavement condition. Do not scale.
2. Private taxilanes and aprons as well as other non–publicly funded improvements are not shown.

NO.	REVISION	DATE

TRACY MUNICIPAL AIRPORT

FAA Site Number 02359.*A

SAN JOAQUIN COUNTY, CALIFORNIA

Site Code TCY

BRANCH AND SAMPLE DESIGNATION

California Division of Aeronautics Project No. 63A0061

Hill International

Mead & Hunt

DATE: 10/31/11

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4.0 - PCI CALCULATIONS

Observations of pavement distress type, extent, and severity as previously discussed were entered into the MicroPAVER™ program for calculation of Pavement Condition Index (PCI) for each pavement branch. In general, the PCI calculation is simply a value of 100, less deduct points. Deduct points are standard values based on the type, extent, and severity of the distress observed. All of the MicroPAVER™ (Version 6.5) PCI calculations for Tracy Municipal Airport are presented in Appendix B. The condition of a pavement based on PCI is presented on Table 1.

TABLE 1

PAVEMENT CONDITION BASED ON PCI

PCI	Pavement Condition
86 – 100	Good
71 – 85	Satisfactory
56 – 70	Fair
41 – 55	Poor
26 – 40	Very Poor
11 – 25	Serious
0 – 10	Failed

We wish to point out that Table 1 has been modified since the 2003 update. The pavement condition terminology has been adjusted to match the current standards. The following plate shows the PCI conditions at Tracy Municipal Airport for each pavement section. A PCI Frequency Report is also presented in Appendix B.

The weighted average overall PCI for all pavements at the Tracy Municipal Airport is 71, or Satisfactory condition*. The weighted average PCI for Runway R1 (Runway 12-30) is 70, or Fair condition*. The weighted average PCI for Runway R2 (Runway 8-26) is 73, or Satisfactory condition*. The weighted average PCI for both runways is 71, or Satisfactory condition*.

*The PCI is calculated based on a weighted average. A sample equation for determining the weighted average of two areas is:

(PCI 1) X (Area 1/Area (total) + (PCI 2) X (Area 2/Area (total) = PCI (overall).

5.0 - CURRENT PAVEMENT CONDITIONS

The current (2011) pavement conditions at Tracy Municipal Airport are shown on the PCI Rating Plate (located on the following page). Presented in Table 2 are the changed conditions observed relative to the 2003 Survey.

In 2011, the method for conducting the pavement condition survey and condition calculation (ASTM D5340-11 for "Standard Test Method for Airport Pavement Condition Index Surveys") was changed significantly. In the previous method, the asphalt pavement distress "weathering and raveling" was combined; in the new method, this combined distress type was broken down into two separate distresses with modified deduct curves. In addition, the deduct curves for the concrete pavement distress "scaling" have been modified in the 2011 method. Also, a new concrete pavement distress, "alkali silica reaction (ASR)" has been added in the new method to address the presence of the ASR material failure mechanism that may be found in concrete pavements.

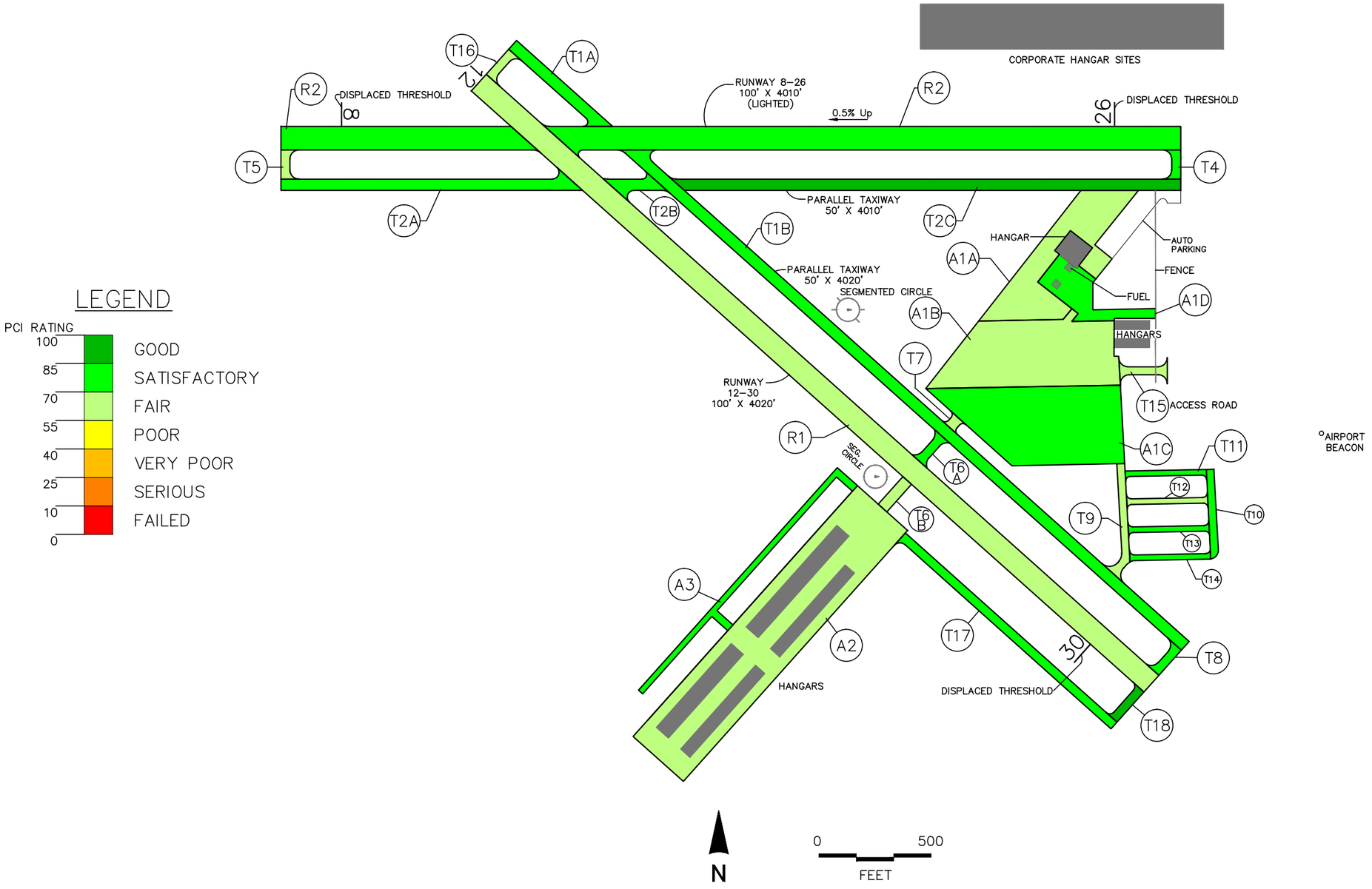
The impact of the recent changes to ASTM D5340-11 is that the condition deterioration (changes in PCI) from the 2003 survey to the 2011 survey may appear to be more significant than would be anticipated. This correction, while potentially significant now, will show a normal rate of deterioration (3-8 points per year) in future surveys. Since 2003, Apron A3 was constructed.

TABLE 2

CHANGE IN PAVEMENT CONDITION

BRANCH NAME	BRANCH ID	SECTION ID	2003 PCI	2011 PCI	COMMENTS
APRON 1	A1	A	48	57	Surface treatment since 2006
APRON 1	A1	B	93	70	No known maintenance since 2003
APRON 1	A1	C	92	74	No known maintenance since 2003
APRON 1	A1	D	100	84	No known maintenance since 2003
APRON 2	A2	A	51	67	Surface treatment since 2006
APRON 3	A3	A	--	82	New construction since 2003
RUNWAY 12/30	R1	A	86	70	No known maintenance since 2003
RUNWAY 8/26	R2	A	91	73	No known maintenance since 2003
TAXIWAY C	T1	A	86	74	No known maintenance since 2003
TAXIWAY C	T1	B	90	72	No known maintenance since 2003
TAXIWAY A	T2	A	93	79	No known maintenance since 2003
TAXIWAY A	T2	B	89	79	No known maintenance since 2003
TAXIWAY A	T2	C	96	88	No known maintenance since 2003
TAXIWAY E	T4	A	86	79	No known maintenance since 2003

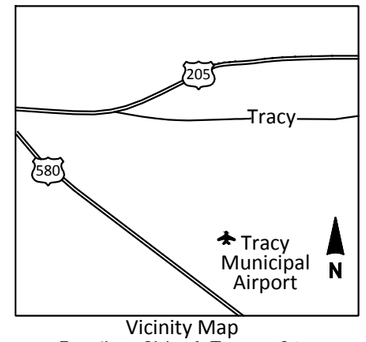
BRANCH NAME	BRANCH ID	SECTION ID	2003 PCI	2011 PCI	COMMENTS
TAXIWAY B	T5	A	91	69	No known maintenance since 2003
TAXIWAY F	T6	A	94	75	No known maintenance since 2003
TAXIWAY F	T6	B	86	69	No known maintenance since 2003
TAXIWAY F	T7	A	92	68	No known maintenance since 2003
TAXIWAY C	T8	A	96	85	No known maintenance since 2003
CROSS-TAXIWAY 9	T9	A	83	66	No known maintenance since 2003
TAXIWAY 10	T10	A	92	76	No known maintenance since 2003
TAXIWAY 11	T11	A	90	75	No known maintenance since 2003
TAXIWAY 12	T12	A	70	60	No known maintenance since 2003
TAXIWAY 13	T13	A	89	77	No known maintenance since 2003
TAXIWAY 14	T14	A	83	73	No known maintenance since 2003
TAXIWAY 15	T15	A	92	69	No known maintenance since 2003
TAXIWAY G	T16	A	90	65	No known maintenance since 2003
TAXIWAY D	T17	A	96	84	No known maintenance since 2003
TAXIWAY D	T18	A	100	87	No known maintenance since 2003



LEGEND

PCI RATING

100	GOOD
85	SATISFACTORY
70	FAIR
55	POOR
40	VERY POOR
25	SERIOUS
10	FAILED
0	



Vicinity Map
3 miles SW of Tracy, CA

Notes:

1. Map intended for schematic representation of pavement condition. Do not scale.
2. Private taxilanes and aprons as well as other non–publicly funded improvements are not shown.

NO.	REVISION	DATE

TRACY MUNICIPAL AIRPORT
SAN JOAQUIN COUNTY, CALIFORNIA
FAA Site Number 02359.*A
Site Code TCY

PCI RATING

California Division of Aeronautics Project No. 63A0061

Hill International

Mead & Hunt

DATE: 10/31/11

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6.0 - MAINTENANCE POLICY

From the first day of completion of a new pavement, its condition begins to deteriorate. In addition to the action of traffic, environmental factors such as exposure to oxygen, UV rays, freeze-thaw and wet-dry cycles act to weaken both flexible and rigid pavement systems. These effects over time reduce the performance characteristics of a pavement. These characteristics can be improved and the pavement life extended by well-timed maintenance activities. The key to maximizing the pavement life is to apply the right maintenance activity when the deterioration is in its developing form and before widespread failure occurs. This Airport Pavement Management System report is intended to give the airport owner and operator the tools to plan and budget for future maintenance activities on a pro-active basis. To highlight the value that APMS brings to you, we draw your attention to the idealized life cycle of a pavement as presented on the plate located at the end of this section.

For the first three-quarters of a pavement's life, a pavement is in fair to good condition. This corresponds to a reduction of about 40% in terms of relative performance to a new pavement. At this point in the pavement life, the owner has two basic choices.

The first is to perform a well-focused maintenance program to restore the pavement to a near new quality. The second choice is to do nothing and allow normal deterioration of the pavement to occur. Research shows that pavement deterioration does not occur in a straight line but accelerates with time. In relative terms, the owner can spend about $1 when the PCI is 60 or greater (fair condition) to restore to near new condition. If the owner waits until the PCI drops to 20 or less (serious to failed condition), restoration to near new condition is much more intensive. This intensive process, in relative terms, can cost from $4 to $14, as compared to the early maintenance intervention.

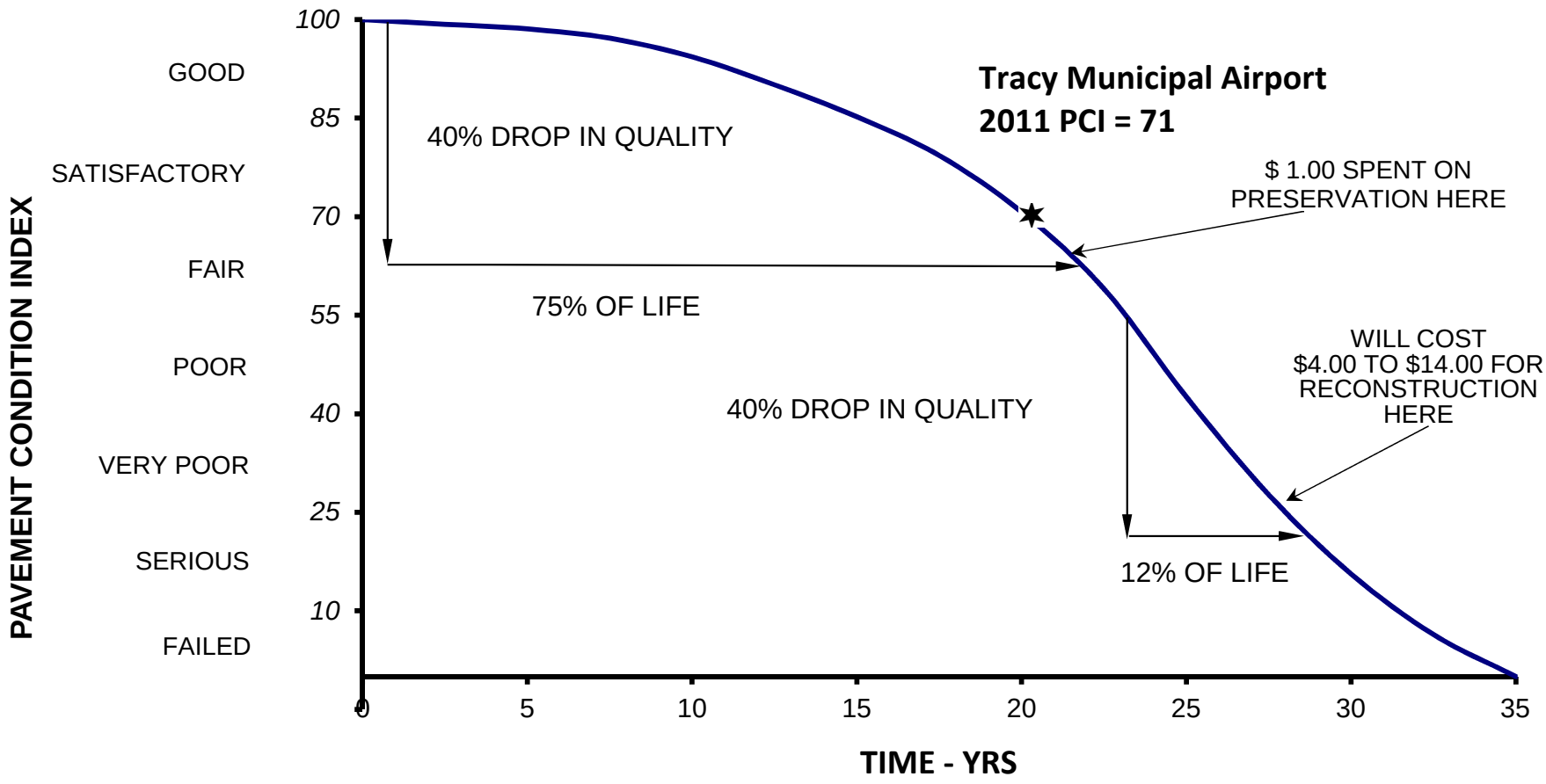
This comparison is even more striking when you compare the differences in pavement life between the maintained versus the unmaintained scenario. A well maintained pavement can continue to perform even at the end of a nominal 20 year design life. When you compare a well maintained pavement asset that requires reconstruction after 40 years versus an unmaintained pavement that is rebuilt twice in the same period, research shows that the owner will spend up to $14 in reconstruction costs for every $1 used for regular maintenance. In summary, relatively low cost maintenance expenditures in the early stages of a pavement's life are much more cost-effective than allowing a pavement to deteriorate too far prior to applying some type of maintenance procedure. This APMS report is intended to give you as the owner and operator of the airport the information and tools to plan and execute a well-timed maintenance program.

APMS uses a Maintenance Policy to serve as the basis for developing capital and maintenance programs. No Maintenance Policy can predict with precision what maintenance and restoration strategies are best for your airport. We have worked with Caltrans Division of Aeronautics to create a global policy which is used to look at the general aviation airport system as a whole. The Maintenance Policy was used to develop unit construction costs for maintenance activities. The Maintenance Policy adopted by Caltrans is presented in more detail in Appendix C.

In general, there are two types of maintenance policies, local and global. A local maintenance policy is defined as a maintenance procedure for addressing “local” distress conditions. An example of this would be the repair of a small section of alligator cracking or the repair of a spalled concrete slab corner.

A global maintenance policy is adopted to address “global” pavement deficiencies. An example of this type of maintenance policy would be the application of a seal coat to a weathered asphalt pavement or the re-sealing of the joints of a concrete pavement.

The recommendations for Tracy Municipal Airport presented in the following section of this report are based on these maintenance policies and unit costs presented in Appendix C. Note that the unit costs presented in the appendix are state-wide averages and may vary based on local contractor experience and capabilities. Also, costs related to project planning, engineering, and construction monitoring are not included in the unit costs.



PAVEMENT LIFE CYCLE

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Hill International
QES
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San Diego, CA 92127

Project No.: 63A0061

Date: February 2012

7.0 – RECOMMENDATIONS

Presented in Section 7.1 of this report are the recommendations for pavement maintenance procedures and associated costs based on current PCI conditions. Where no procedure is recommended, the PCI rating is currently at or above a level deemed acceptable under the adopted maintenance policy. Section 7.2 of this report presents future maintenance recommendations and costs for: 1) pavements currently at or above an acceptable PCI rating or 2) pavements requiring maintenance now but current budgets are inadequate for the current maintenance procedures, resulting in the deferral of maintenance.

Also presented is an estimate of the year when future maintenance procedures are anticipated.

7.1 CURRENT MAINTENANCE NEEDS

Based on the PCI values for each branch at the time the field survey was conducted (Table 2), the 2011 PCI was projected. Based on this projected PCI value, the current maintenance needs for Tracy Municipal Airport are presented in Table 3 on the following page.

TABLE 3
CURRENT MAINTENANCE NEEDS

BRANCH ID	SECTION ID	PCI	MAINTENANCE POLICY	ESTIMATED COST
A1	A	57	OL-AF - Thick (3") Overlay	$ 212,500
A1	B	70	ST-SS - Slurry Seal	$ 42,600
A1	C	74	ST-SS - Slurry Seal	$ 49,000
A1	D	84	ST-SS - Slurry Seal	$ 10,300
A2	A	67	OL-AF - Thick (3") Overlay	$ 522,750
A3	A	82	ST-SS - Slurry Seal	$ 6,650
R1	A	70	ST-SS - Slurry Seal	$ 80,400
R2	A	73	ST-SS - Slurry Seal	$ 81,410
T1	A	74	ST-SS - Slurry Seal	$ 5,400
T1	B	72	ST-SS - Slurry Seal	$ 33,500
T2	A	79	ST-SS - Slurry Seal	$ 10,480
T2	B	79	ST-SS - Slurry Seal	$ 1,480
T2	C	88	Do Nothing	$ -
T4	A	79	ST-SS - Slurry Seal	$ 1,200
T5	A	69	OL-AF - Thick (3") Overlay	$ 8,840
T6	A	75	ST-SS - Slurry Seal	$ 1,200
T6	B	69	OL-AF - Thick (3") Overlay	$ 14,144
T7	A	68	OL-AF - Thick (3") Overlay	$ 5,950
T8	A	85	ST-SS - Slurry Seal	$ 1,200
T9	A	66	OL-AF - Thick (3") Overlay	$ 29,750
T10	A	76	ST-SS - Slurry Seal	$ 2,800
T11	A	75	ST-SS - Slurry Seal	$ 1,800
T12	A	60	OL-AF - Thick (3") Overlay	$ 15,300
T13	A	77	ST-SS - Slurry Seal	$ 1,800
T14	A	73	ST-SS - Slurry Seal	$ 1,800
T15	A	69	OL-AF - Thick (3") Overlay	$ 11,781
T16	A	65	OL-AF - Thick (3") Overlay	$ 10,200
T17	A	84	ST-SS - Slurry Seal	$ 8,415
T18	A	87	Do Nothing	$ -
			Total 2011 Maintenance Costs:	$ 1,172,650

Note that these estimated costs are based on the unit costs presented in Appendix C and are state-wide averages. Actual costs may vary based on local conditions.

7.2 FUTURE MAINTENANCE NEEDS

If the current maintenance needs presented in Section 7.1 of this report are either minimal or are deferred, the costs listed in Table 3 are no longer valid. We have developed both short-term and long-term maintenance deferral scenarios to highlight the future financial impact. Table 4 presents the projected future maintenance needs and associated costs if maintenance is deferred for up to 5 years.

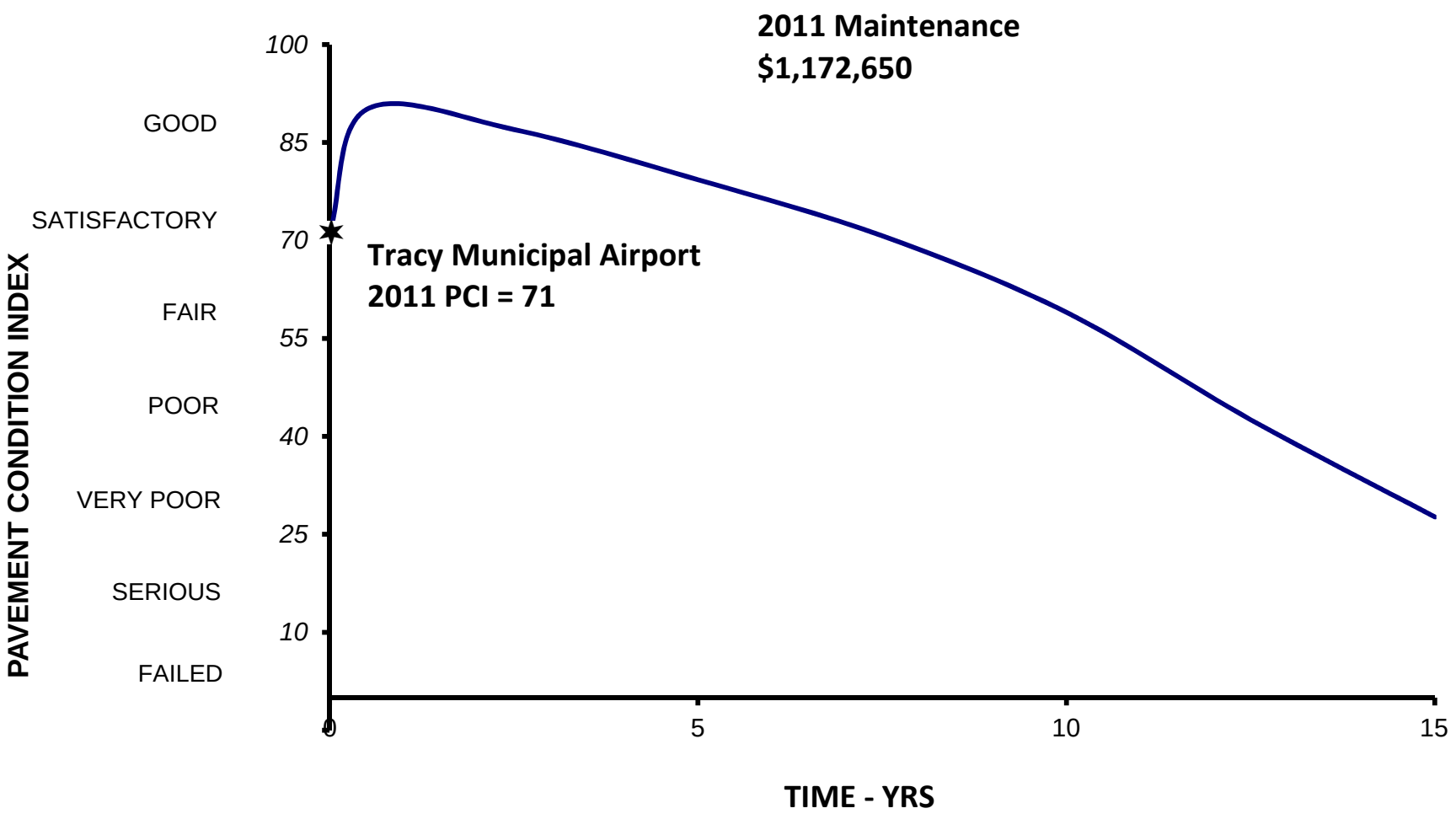
These needs and costs are based on the projected PCI for the year 2016 (5 years). Table 5 presents the projected future maintenance needs and associated costs for the year 2021 assuming all maintenance is deferred for up to 10 years. Costs shown are in current 2011 dollars and are state-wide averages which may vary by geographical area and local contractor expertise. Performance curves based on 2011 scheduled maintenance and 5- and 10-year deferred maintenance are shown at the end of this section.

TABLE 4
FUTURE MAINTENANCE NEEDS (5 YEAR DEFFERAL)

BRANCH ID	SECTION ID	Projected PCI	MAINTENANCE POLICY	ESTIMATED COST
A1	A	31	OL-AF - Thick (3") Overlay	$ 212,500
A1	B	48	OL-AF - Thick (3") Overlay	$ 362,100
A1	C	53	OL-AF - Thick (3") Overlay	$ 416,500
A1	D	66	OL-AF - Thick (3") Overlay	$ 87,550
A2	A	44	OL-AF - Thick (3") Overlay	$ 522,750
A3	A	64	OL-AF - Thick (3") Overlay	$ 56,525
R1	A	48	OL-AF - Thick (3") Overlay	$ 683,400
R2	A	52	OL-AF - Thick (3") Overlay	$ 691,985
T1	A	53	OL-AF - Thick (3") Overlay	$ 45,900
T1	B	50	OL-AF - Thick (3") Overlay	$ 284,750
T2	A	60	OL-AF - Thick (3") Overlay	$ 89,080
T2	B	60	OL-AF - Thick (3") Overlay	$ 12,580
T2	C	72	ST-SS - Slurry Seal	$ 18,080
T4	A	60	OL-AF - Thick (3") Overlay	$ 10,200
T5	A	47	OL-AF - Thick (3") Overlay	$ 8,840
T6	A	54	OL-AF - Thick (3") Overlay	$ 10,200
T6	B	47	OL-AF - Thick (3") Overlay	$ 14,144
T7	A	45	OL-AF - Thick (3") Overlay	$ 5,950
T8	A	68	OL-AF - Thick (3") Overlay	$ 10,200
T9	A	43	OL-AF - Thick (3") Overlay	$ 29,750
T10	A	56	OL-AF - Thick (3") Overlay	$ 23,800
T11	A	54	OL-AF - Thick (3") Overlay	$ 15,300
T12	A	35	OL-AF - Thick (3") Overlay	$ 15,300
T13	A	57	OL-AF - Thick (3") Overlay	$ 15,300
T14	A	52	OL-AF - Thick (3") Overlay	$ 15,300
T15	A	47	OL-AF - Thick (3") Overlay	$ 11,781
T16	A	41	OL-AF - Thick (3") Overlay	$ 10,200
T17	A	66	OL-AF - Thick (3") Overlay	$ 71,527
T18	A	71	ST-SS - Slurry Seal	$ 1,440
			Total 2016 Maintenance Costs:	**$ 3,752,932**

TABLE 5
FUTURE MAINTENANCE NEEDS (10 YEAR DEFERRAL)

BRANCH ID	SECTION ID	Projected PCI	MAINTENANCE POLICY	ESTIMATED COST
A1	A	4	CRAC2 - Reconstruct Pavement	$ 562,500
A1	B	23	CRAC2 - Reconstruct Pavement	$ 958,500
A1	C	30	OL-AT - Thin (1.5") Overlay	$ 220,500
A1	D	46	OL-AT - Thin (1.5") Overlay	$ 46,350
A2	A	19	CRAC2 - Reconstruct Pavement	$ 1,383,750
A3	A	43	OL-AT - Thin (1.5") Overlay	$ 29,925
R1	A	23	CRAC2 - Reconstruct Pavement	$ 1,809,000
R2	A	28	OL-AT - Thin (1.5") Overlay	$ 366,345
T1	A	30	OL-AT - Thin (1.5") Overlay	$ 24,300
T1	B	26	OL-AT - Thin (1.5") Overlay	$ 150,750
T2	A	38	OL-AT - Thin (1.5") Overlay	$ 47,160
T2	B	38	OL-AT - Thin (1.5") Overlay	$ 6,660
T2	C	53	OL-AT - Thin (1.5") Overlay	$ 81,360
T4	A	38	OL-AT - Thin (1.5") Overlay	$ 5,400
T5	A	22	CRAC2 - Reconstruct Pavement	$ 23,400
T6	A	31	OL-AT - Thin (1.5") Overlay	$ 5,400
T6	B	22	CRAC2 - Reconstruct Pavement	$ 37,440
T7	A	20	CRAC2 - Reconstruct Pavement	$ 15,750
T8	A	48	OL-AT - Thin (1.5") Overlay	$ 5,400
T9	A	17	CRAC2 - Reconstruct Pavement	$ 78,750
T10	A	33	OL-AT - Thin (1.5") Overlay	$ 12,600
T11	A	31	OL-AT - Thin (1.5") Overlay	$ 8,100
T12	A	8	CRAC2 - Reconstruct Pavement	$ 40,500
T13	A	34	OL-AT - Thin (1.5") Overlay	$ 8,100
T14	A	28	OL-AT - Thin (1.5") Overlay	$ 8,100
T15	A	22	CRAC2 - Reconstruct Pavement	$ 31,185
T16	A	16	CRAC2 - Reconstruct Pavement	$ 27,000
T17	A	46	OL-AT - Thin (1.5") Overlay	$ 37,867
T18	A	51	OL-AT - Thin (1.5") Overlay	$ 6,480
			Total 2021 Maintenance Costs:	**$ 6,038,572**

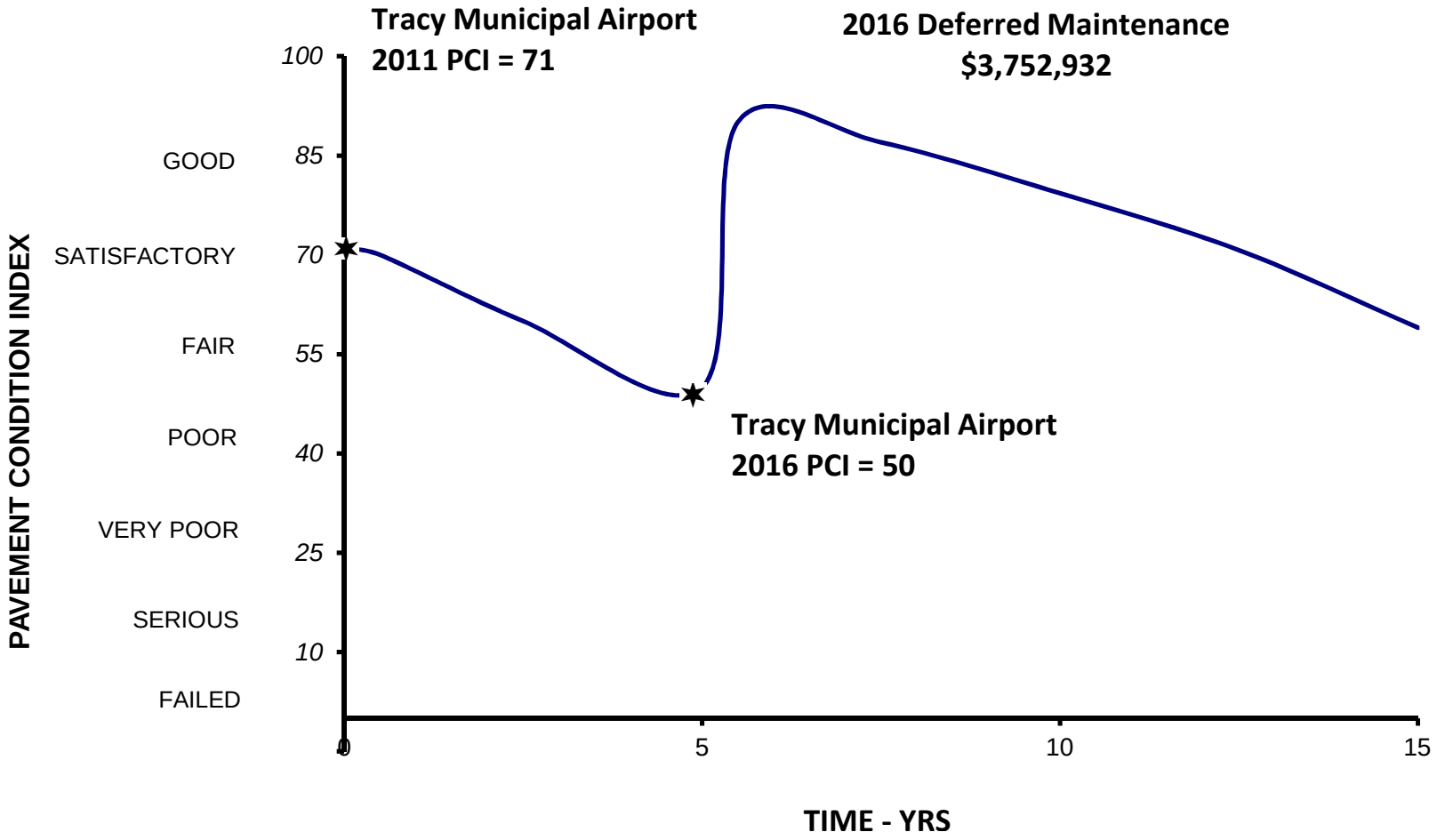


PAVEMENT LIFE CYCLE - 2011 MAINTENANCE

Mead&Hunt
Hill International
QES
11440 W. Bernardo Ct., Suite 375
San Diego, CA 92127

Project No.: 63A0061

Date: February 2012



PAVEMENT LIFE CYCLE: DEFERRED MAINTENANCE FOR 5 YEARS

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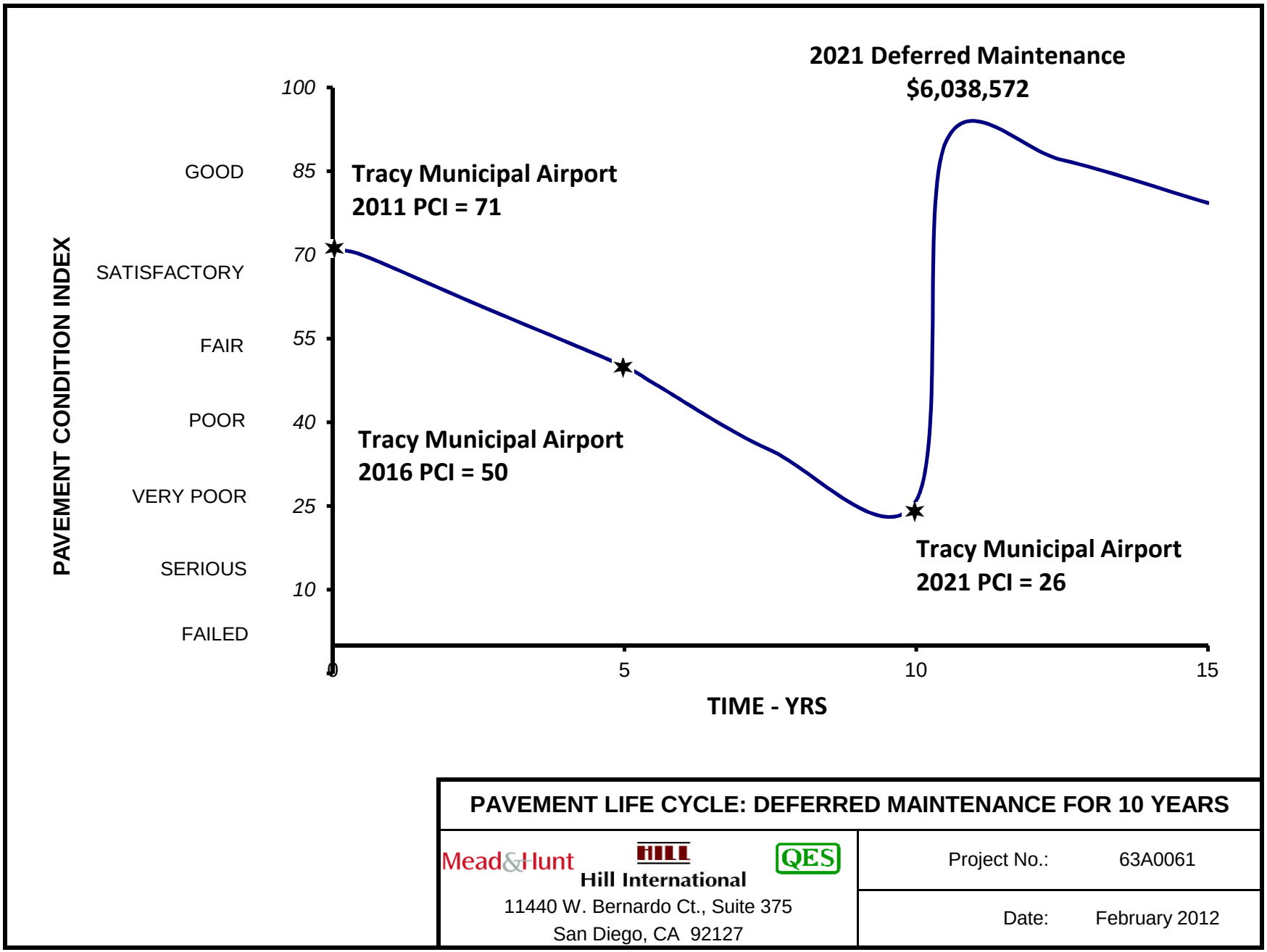
Hill International
QES
11440 W. Bernardo Ct., Suite 375
San Diego, CA 92127

Project No.: 63A0061

Date: February 2012



PAVEMENT LIFE CYCLE: DEFERRED MAINTENANCE FOR 10 YEARS

Mead & Hunt
HILL Hill International
QES
11440 W. Bernardo Ct., Suite 375
San Diego, CA 92127

Project No.: 63A0061

Date: February 2012

APPENDIX A

Section Inventory Report
Airport GPS Data

Section Inventory Report
Tracy Municipal Airport

Report Network Name	Network ID	Branch Name	Branch ID	Branch Use	Section ID	From	To	Length (ft)	Width (ft)	True Area (sf)	Surface Type	Last Construction Date
Tracy Municipal Airport, San Joaquin County	ALL	APRON 1	A1	APRON	A	ON MAP	SEE MAP	0	0	125,000	AC	7/1/1977
Tracy Municipal Airport, San Joaquin County	ALL	APRON 1	A1	APRON	B	ON MAP	SEE MAP	710	300	213,000	AC	7/1/1986
Tracy Municipal Airport, San Joaquin County	ALL	APRON 1	A1	APRON	C	ON MAP	SEE MAP	700	350	245,000	AC	7/1/1983
Tracy Municipal Airport, San Joaquin County	ALL	APRON 1	A1	APRON	D	SEE MAP	SEE MAP	170	200	51,500	AAC	6/1/2001
Tracy Municipal Airport, San Joaquin County	ALL	APRON 2	A2	APRON	A	SEE MAP	SEE MAP	1,500	300	307,500	AC	1/26/1994
Tracy Municipal Airport, San Joaquin County	ALL	APRON 3	A3	APRON	A	SEE MAP	SEE MAP	1,330	25	33,250	AAC	1/1/1990
Tracy Municipal Airport, San Joaquin County	ALL	RUNWAY 12/30	R1	RUNWAY	A	STATION 0+00	STATION 40+20	4,020	100	402,000	AAC	7/1/1980
Tracy Municipal Airport, San Joaquin County	ALL	RUNWAY 8/26	R2	RUNWAY	A	STATION 0+00	STATION 40+10	4,010	105	407,050	AAC	7/1/1977
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY C	T1	TAXIWAY	A	STATION 0+00 AT T16	STATION 5+40 AT RWY 8/26	540	50	27,000	AAC	7/1/1980
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY C	T1	TAXIWAY	B	STATION 0+00 AT RWY 8/26	STATION 33+50	3,350	50	167,500	AAC	7/1/1980
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY A	T2	TAXIWAY	A	STATION 0+00 AT TAXIWAY 5	STATION 13+10 AT RWY 12/30	1,310	40	52,400	AAC	7/1/1977
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY A	T2	TAXIWAY	B	RUNWAY 12/30	PARALLEL TAXIWAY 1	185	40	7,400	AAC	7/1/1977
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY A	T2	TAXIWAY	C	PARALLEL TAXIWAY 1	CROSS-TAXIWAY 4	2,260	40	90,400	AAC	7/1/1977
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY E	T4	TAXIWAY	A	RUNWAY 8/26	PARALLEL TAXIWAY 2	150	40	6,000	AAC	7/1/1977
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY B	T5	TAXIWAY	A	RUNWAY 8/26	PARALLEL TAXIWAY 2	130	40	5,200	AAC	7/1/1977
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY F	T6	TAXIWAY	A	RUNWAY 12/30	PARALLEL TAXIWAY 1	150	40	6,000	AAC	7/1/1980
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY F	T6	TAXIWAY	B	SEE MAP	SEE MAP	160	52	8,320	AC	1/26/1994
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY F	T7	TAXIWAY	A	PARALLEL TAXIWAY 1	APRON 1, SECTION C	70	50	3,500	AAC	7/1/1980
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY C	T8	TAXIWAY	A	RUNWAY 12/30	PARALLEL TAXIWAY 1	150	40	6,000	AAC	7/1/1980
Tracy Municipal Airport, San Joaquin County	ALL	CROSS-TAXIWAY 9	T9	TAXIWAY	A	PARALLEL TAXIWAY 1	APRON 1, SECTION C	500	35	17,500	AC	7/1/1986
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY 10	T10	TAXIWAY	A	TAXIWAY 14	TAXIWAY 11	400	35	14,000	AC	7/1/1986
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY 11	T11	TAXIWAY	A	TAXIWAY 9	TAXIWAY 10	360	25	9,000	AC	7/1/1986
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY 12	T12	TAXIWAY	A	TAXIWAY 9	TAXIWAY 10	360	25	9,000	AC	7/1/1986
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY 13	T13	TAXIWAY	A	TAXIWAY 9	TAXIWAY 10	360	25	9,000	AC	7/1/1986
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY 14	T14	TAXIWAY	A	TAXIWAY 9	TAXIWAY 10	360	25	9,000	AC	7/1/1986
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY 15	T15	TAXIWAY	A	APRON 1, SECTION B	SEE MAP	198	35	6,930	AC	7/1/1986
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY G	T16	TAXIWAY	A	RUNWAY 12/30	PARALLEL TAXIWAY 1	150	40	6,000	AAC	7/1/1980
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY D	T17	TAXIWAY	A	SEE MAP	SEE MAP	1275	33	42,075	AC	7/1/1990
Tracy Municipal Airport, San Joaquin County	ALL	TAXIWAY D	T18	TAXIWAY	A	SEE MAP	SEE MAP	180	40	7,200	AC	7/1/1990

Tracy Municipal Airport - GPS Data

Network Name	Branch ID	Section ID	Sample Unit	Latitude	Longitude
Tracy Municipal Airport, San Joaquin County	A1	A	2	37-41-19.07 N	121-26-16.42 W
Tracy Municipal Airport, San Joaquin County	A1	A	17	37-41-16.87 N	121-26-17.8 W
Tracy Municipal Airport, San Joaquin County	A1	A	22	37-41-23.44 N	121-26-10.67 W
Tracy Municipal Airport, San Joaquin County	A1	B	2	37-41-15.31 N	121-26-19.13 W
Tracy Municipal Airport, San Joaquin County	A1	B	19	37-41-16.42 N	121-26-16.54 W
Tracy Municipal Airport, San Joaquin County	A1	B	22	37-41-16.54 N	121-26-12.65 W
Tracy Municipal Airport, San Joaquin County	A1	B	35	37-41-16.75 N	121-26-13.88 W
Tracy Municipal Airport, San Joaquin County	A1	C	12	37-41-14.01 N	121-26-12.97 W
Tracy Municipal Airport, San Joaquin County	A1	C	15	37-41-13.78 N	121-26-16.59 W
Tracy Municipal Airport, San Joaquin County	A1	C	28	37-41-13.84 N	121-26-13.68 W
Tracy Municipal Airport, San Joaquin County	A1	C	43	37-41-11.99 N	121-26-11.49 W
Tracy Municipal Airport, San Joaquin County	A1	D	19	37-41-19.83 N	121-26-13.73 W
Tracy Municipal Airport, San Joaquin County	A2	A	4	37-41-9.63 N	121-26-25.17 W
Tracy Municipal Airport, San Joaquin County	A2	A	12	37-41-7.87 N	121-26-24.38 W
Tracy Municipal Airport, San Joaquin County	A2	A	23	37-41-7.29 N	121-26-28.81 W
Tracy Municipal Airport, San Joaquin County	A2	A	29	37-41-3.22 N	121-26-29.14 W
Tracy Municipal Airport, San Joaquin County	A2	A	48	37-41-0.17 N	121-26-29.52 W
Tracy Municipal Airport, San Joaquin County	A2	A	57	37-41-1.35 N	121-26-33.86 W
Tracy Municipal Airport, San Joaquin County	A3	A	1	37 41 01.7 N	121 26 36.0 W
Tracy Municipal Airport, San Joaquin County	A3	A	7	37 41 07.8 N	121 26 29.7 W
Tracy Municipal Airport, San Joaquin County	R1	A	7	37-41-3.99 N	121-26-11.71 W
Tracy Municipal Airport, San Joaquin County	R1	A	17	37-41-7.43 N	121-26-16.41 W
Tracy Municipal Airport, San Joaquin County	R1	A	27	37-41-10.77 N	121-26-21.62 W
Tracy Municipal Airport, San Joaquin County	R1	A	37	37-41-13.94 N	121-26-25.71 W
Tracy Municipal Airport, San Joaquin County	R1	A	47	37-41-16.99 N	121-26-30.38 W
Tracy Municipal Airport, San Joaquin County	R1	A	57	37-41-20.28 N	121-26-34.83 W
Tracy Municipal Airport, San Joaquin County	R1	A	67	37-41-24.02 N	121-26-39.75 W
Tracy Municipal Airport, San Joaquin County	R1	A	77	37-41-27.04 N	121-26-44.29 W
Tracy Municipal Airport, San Joaquin County	R1-12	A	Corner	37 41 27.8 N	121 26 46.4 W
Tracy Municipal Airport, San Joaquin County	R1-12	A	Corner	37 41 28.6 N	121 26 45.6 W
Tracy Municipal Airport, San Joaquin County	R1-30	A	Corner	37 41 01.7 N	121 26 09.1 W
Tracy Municipal Airport, San Joaquin County	R1-30	A	Corner	37 41 02.5 N	121 26 08.3 W
Tracy Municipal Airport, San Joaquin County	R2	A	5	37-41-25.43 N	121-26-54.44 W
Tracy Municipal Airport, San Joaquin County	R2	A	15	37-41-25.65 N	121-26-48.2 W
Tracy Municipal Airport, San Joaquin County	R2	A	25	37-41-25.84 N	121-26-40.17 W
Tracy Municipal Airport, San Joaquin County	R2	A	35	37-41-25.59 N	121-26-33.64 W
Tracy Municipal Airport, San Joaquin County	R2	A	45	37-41-26.07 N	121-26-28 W
Tracy Municipal Airport, San Joaquin County	R2	A	55	37-41-26.2 N	121-26-21.51 W
Tracy Municipal Airport, San Joaquin County	R2	A	65	37-41-25.92 N	121-26-15.06 W
Tracy Municipal Airport, San Joaquin County	R2	A	75	37-41-26.17 N	121-26-9.08 W
Tracy Municipal Airport, San Joaquin County	R2-08	A	Corner	37 41 26.2 N	121 26 57.3 W
Tracy Municipal Airport, San Joaquin County	R2-08	A	Corner	37 41 25.3 N	121 26 57.3 W
Tracy Municipal Airport, San Joaquin County	R2-25	A	Corner	37 41 25.6 N	121 26 07.3 W
Tracy Municipal Airport, San Joaquin County	R2-25	A	Corner	37 41 26.5 N	121 26 07.3 W
Tracy Municipal Airport, San Joaquin County	T1	A	3	37-41-30.43 N	121-26-43.41 W
Tracy Municipal Airport, San Joaquin County	T1	B	4	37-41-23.15 N	121-26-34.57 W
Tracy Municipal Airport, San Joaquin County	T1	B	10	37-41-19.13 N	121-26-29.27 W
Tracy Municipal Airport, San Joaquin County	T1	B	18	37-41-13.96 N	121-26-21.68 W
Tracy Municipal Airport, San Joaquin County	T1	B	27	37-41-8.1 N	121-26-13.24 W
Tracy Municipal Airport, San Joaquin County	T2	A	4	37-41-23.64 N	121-26-45.25 W

Tracy Municipal Airport - GPS Data

Network Name	Branch ID	Section ID	Sample Unit	Latitude	Longitude
Tracy Municipal Airport, San Joaquin County	T2	A	10	37-41-23.5 N	121-26-52.61 W
Tracy Municipal Airport, San Joaquin County	T2	B	1	37-41-23.98 N	121-26-36.85 W
Tracy Municipal Airport, San Joaquin County	T2	C	7	37-41-23.83 N	121-26-15.06 W
Tracy Municipal Airport, San Joaquin County	T2	C	12	37-41-23.63 N	121-26-21.51 W
Tracy Municipal Airport, San Joaquin County	T2	C	19	37-41-23.78 N	121-26-30.58 W
Tracy Municipal Airport, San Joaquin County	T4	A	1	37-41-25.13 N	121-26-7.65 W
Tracy Municipal Airport, San Joaquin County	T5	A	1	37-41-24.49 N	121-26-56.91 W
Tracy Municipal Airport, San Joaquin County	T6	A	1	37-41-12.68 N	121-26-20.64 W
Tracy Municipal Airport, San Joaquin County	T6	A	2	37-41-12.04 N	121-26-22.52 W
Tracy Municipal Airport, San Joaquin County	T7	A	1	37-41-13.47 N	121-26-19.78 W
Tracy Municipal Airport, San Joaquin County	T8	A	1	37-41-3.26 N	121-26-7.48 W
Tracy Municipal Airport, San Joaquin County	T9	A	3	37-41-8.78 N	121-26-10.31 W
Tracy Municipal Airport, San Joaquin County	T10	A	3	37-41-8.76 N	121-26-5.53 W
Tracy Municipal Airport, San Joaquin County	T11	A	2	37-41-11.21 N	121-26-6.79 W
Tracy Municipal Airport, San Joaquin County	T12	A	1	37-41-9.74 N	121-26-9.05 W
Tracy Municipal Airport, San Joaquin County	T13	A	2	37-41-8.76 N	121-26-6.74 W
Tracy Municipal Airport, San Joaquin County	T14	A	1	37-41-7.53 N	121-26-8.75 W
Tracy Municipal Airport, San Joaquin County	T15	A	1	37-41-15.55 N	121-26-9.58 W
Tracy Municipal Airport, San Joaquin County	T16	A	1	37-41-28.78 N	121-26-44.62 W
Tracy Municipal Airport, San Joaquin County	T17	A	3	37-41-0.33 N	121-26-13.91 W
Tracy Municipal Airport, San Joaquin County	T17	A	7	37-41-4.58 N	121-26-16.92 W
Tracy Municipal Airport, San Joaquin County	T18	A	2	37-41-0.89 N	121-26-10.75 W

APPENDIX B

Section Condition Report and PCI Frequency Reports

Section Condition Report

Pavement Database: tracy NetworkID: ALL

Branch ID	Section ID	Last Const. Date	Surface	Use	Rank	Lanes	True Area (SqFt)	Last Inspection Date	Age At Inspection	PCI
A1 (APRON 1)	A	07/01/1977	AC	APRON	P	0	125,000.00	06/14/2011	34	57.00
A1 (APRON 1)	B	07/01/1986	AC	APRON	P	0	213,000.00	06/14/2011	25	70.00
A1 (APRON 1)	C	07/01/1983	AC	APRON	P	0	245,000.00	06/14/2011	28	74.00
A1 (APRON 1)	D	06/01/2001	AAC	APRON	P	0	51,500.00	06/14/2011	10	84.00
A2 (APRON 2)	A	01/26/1994	AC	APRON	P	0	307,500.00	06/14/2011	17	67.00
A3 (APRON 3)	A	01/01/1990	AAC	APRON	P	0	33,250.00	06/14/2011	21	82.00
R1 (RUNWAY 12/30)	A	07/01/1980	AAC	RUNWAY	P	0	402,000.00	06/14/2011	31	70.00
R2 (RUNWAY 8/26)	A	07/01/1977	AAC	RUNWAY	S	0	407,050.00	06/14/2011	34	73.00
T1 (TAXIWAY C)	A	07/01/1980	AAC	TAXIWAY	P	0	27,000.00	06/14/2011	31	74.00
T1 (TAXIWAY C)	B	07/01/1980	AAC	TAXIWAY	P	0	167,500.00	06/14/2011	31	72.00
T10 (TAXIWAY 10)	A	07/01/1986	AC	TAXIWAY	T	0	14,000.00	06/14/2011	25	76.00
T11 (TAXIWAY 11)	A	07/01/1986	AC	TAXIWAY	T	0	9,000.00	06/14/2011	25	75.00
T12 (TAXIWAY 12)	A	07/01/1986	AC	TAXIWAY	T	0	9,000.00	06/14/2011	25	60.00
T13 (TAXIWAY 13)	A	07/01/1986	AC	TAXIWAY	T	0	9,000.00	06/14/2011	25	77.00
T14 (TAXIWAY 14)	A	07/01/1986	AC	TAXIWAY	T	0	9,000.00	06/14/2011	25	73.00
T15 (TAXIWAY 15)	A	07/01/1986	AC	TAXIWAY	T	0	6,930.00	06/14/2011	25	69.00
T16 (TAXIWAY G)	A	07/01/1980	AAC	TAXIWAY	S	0	6,000.00	06/14/2011	31	65.00
T17 (TAXIWAY D)	A	07/01/1990	AC	TAXIWAY	S	0	42,075.00	06/14/2011	21	84.00
T18 (TAXIWAY D)	A	07/01/1990	AC	TAXIWAY	S	0	7,200.00	06/14/2011	21	87.00
T2 (TAXIWAY A)	A	07/01/1977	AAC	TAXIWAY	S	0	52,400.00	06/14/2011	34	79.00
T2 (TAXIWAY A)	B	07/01/1977	AAC	TAXIWAY	S	0	7,400.00	06/14/2011	34	79.00
T2 (TAXIWAY A)	C	07/01/1977	AAC	TAXIWAY	S	0	90,400.00	06/14/2011	34	88.00
T4 (TAXIWAY E)	A	07/01/1977	AAC	TAXIWAY	S	0	6,000.00	06/14/2011	34	79.00
T5 (TAXIWAY B)	A	07/01/1977	AAC	TAXIWAY	S	0	5,200.00	06/14/2011	34	69.00
T6 (TAXIWAY F)	A	07/01/1980	AAC	TAXIWAY	T	0	6,000.00	06/14/2011	31	75.00

Section Condition Report

Pavement Database: tracy NetworkID: ALL

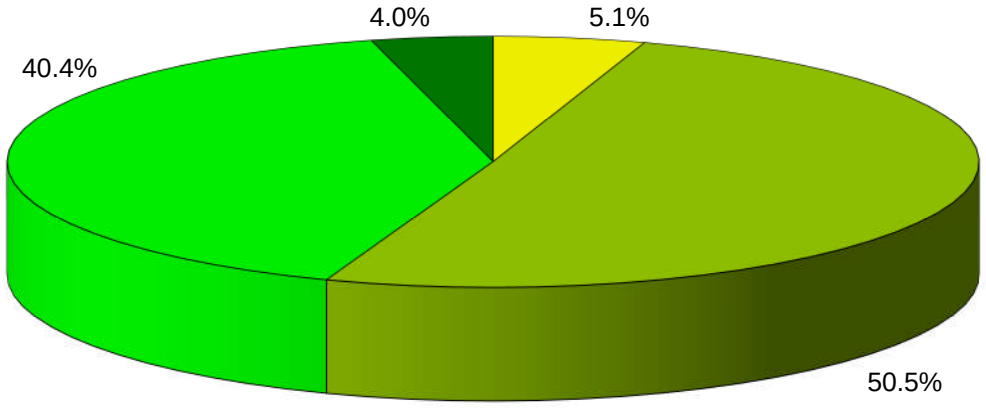
Branch ID	Section ID	Last Const. Date	Surface	Use	Rank	Lanes	True Area (SqFt)	Last Inspection Date	Age At Inspection	PCI
T6 (TAXIWAY F)	B	01/26/1994	AC	TAXIWAY	T	0	8,320.00	06/14/2011	17	69.00
T7 (TAXIWAY F)	A	07/01/1980	AAC	TAXIWAY	T	0	3,500.00	06/14/2011	31	68.00
T8 (TAXIWAY C)	A	07/01/1980	AAC	TAXIWAY	S	0	6,000.00	06/14/2011	31	85.00
T9 (CROSS-TAXIWAY 9)	A	07/01/1986	AC	TAXIWAY	T	0	17,500.00	06/14/2011	25	66.00

Section Condition Report

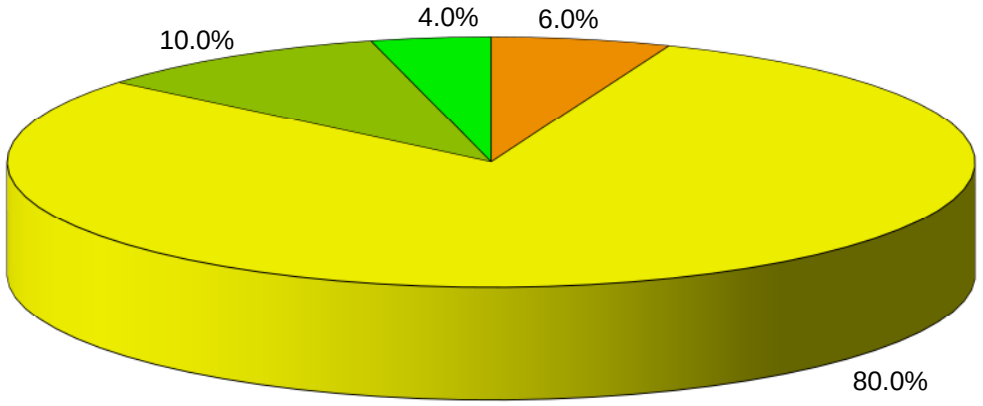
Pavement Database: tracy

Age Category	Average Age At Inspection	Total Area (SqFt)	Number of Sections	Arithmetic Average PCI	PCI Standard Deviation	Weighted Average PCI
06-10	**10.00**	**51,500.00**	**1**	**84.00**	**0.00**	**84.00**
16-20	**17.00**	**315,820.00**	**2**	**68.00**	**1.00**	**67.05**
21-25	**23.91**	**369,955.00**	**11**	**74.45**	**7.67**	**73.14**
26-30	**28.00**	**245,000.00**	**1**	**74.00**	**0.00**	**74.00**
31-35	**32.50**	**1,311,450.00**	**14**	**73.79**	**7.77**	**71.78**
All	**27.24**	**2,293,725.00**	**29**	**74.00**	**7.58**	**71.86**

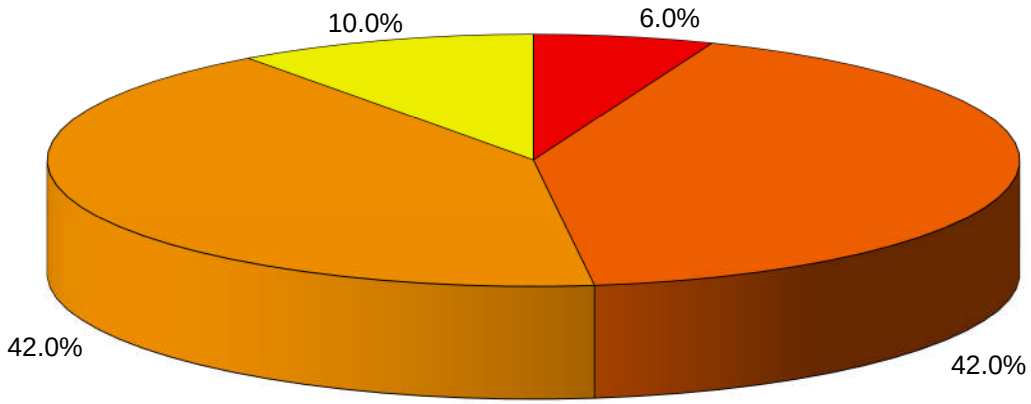
PCI Frequency Report – Tracy Municipal Airport



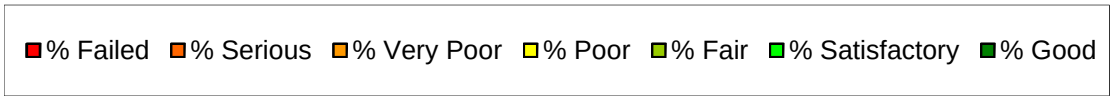
2011 PCI Condition Frequency



2016 PCI Condition Frequency



2021 PCI Condition Frequency



APPENDIX C
Maintenance Policy

MAINTENANCE POLICY

BACKGROUND: Each airport included in the APMS survey receives a field evaluation to identify pavement distresses defined in Advisory Circular (AC) 150/5380-6B, "Guidelines and Procedures for Maintenance of Airport Pavements." Field evaluations are input into the MicroPAVER program and are the basis for determining condition of all or portions of the airfield pavements.

This appendix describes local and global (entire section) maintenance and repair policies, work type codes, and unit costs input into the program for each type of distress. This data is needed to produce the Network Maintenance Report (estimated cost of routine repair to all or a portion of the pavement network), the Maintenance and Repair Report (estimated cost of global repairs and selected global repairs for specific pavement sections), and other reports that can be used to program airfield pavement maintenance.

Our approach considers the "network-level" analysis of the APMS survey. The network analysis is intended to provide a snap shot of the condition of the statewide general aviation airports as a system rather than on an individual basis. Therefore, we have developed maintenance and repair policies that represent a typical approach rather than a project specific approach.

Our approach to cost estimating uses a similar "network-level" analysis. We developed unit costs for reactive, one-time as well as programmed global/local maintenance and repairs policies using cost data compiled by Caltrans. The specific source is the Caltrans 2010 Contract Cost Data which is a compilation of construction costs statewide throughout all of 2010. This data was found on the Caltrans website at web location http://www.dot.ca.gov/hq/esc/oe/awards/2010CCDB/2010ccdb.pdf. Though the data is from highway construction projects, we judged the costs to be representative given many general aviation projects are constructed using Caltrans specifications rather than FAA specifications. The costs are averaged across the state and represent average values. The actual costs for each individual airport will vary depending on the vibrancy of local construction market, availability of suitable aggregates, labor conditions, etc. Again, we judge use of average statewide unit costs is appropriate for network-level analysis of the APMS process.

The policies, work methods, and unit costs used to develop the 2011 APMS are intended to reflect general maintenance and repair practices using conservative cost estimates. The exact method of maintenance and repair and accurate estimate of cost for each specific pavement project should be determined by further engineering investigation and site-specific design. The policies and unit costs were developed using the Caltrans 2010 Contract Cost Data, discussions with Caltrans Division of Aeronautics staff and accepted engineering practice.

LOCAL MAINTENANCE POLICY: Three local maintenance policies have been established as shown in Tables C-1, C-2 and C-3. Policy 01 is for flexible (asphalt) pavements used by aircraft with maximum gross weights of 30,000 pounds. Policy 02 is for flexible pavements used by aircraft with gross weights > 30,000 pounds. Policy 03 is for rigid (concrete) pavements for all aircraft gross weights. These policies apply to primary, secondary, and tertiary pavement features collectively.

GLOBAL MAINTENANCE POLICY: Global maintenance policies have been established as shown in Table C-4. These policies are applied to pavement sections based on types of pavement distresses and pavement condition index (PCI) determined by field evaluation.

WORK-TYPE TABLES: Work-type codes, descriptions, unit costs, and other data are shown in Table C-5. This information expands on work codes listed in local and global maintenance policies in Tables C-1 through C-4.

TABLE C-1

Local Maintenance Policy No. 01

Flexible Pavements

Aircraft with Maximum Gross Weight of ≤ 30,000 lbs.

Code	Distress	Sev	Work Type & Description	Unit Cost	Unit
41	Alligator Crack	L	PAAD1 Patch – 3" AC Deep	$ 3.20	SF
41	Alligator Crack	M	PAAD1 Patch – 3" AC Deep	$ 3.20	SF
41	Alligator Crack	H	PAAD1 Patch – 3" AC Deep	$ 3.20	SF
42	Bleeding	--	NOPOL No Lcl Maint Policy	0	SF
43	Block Crack	L	NOPOL No Lcl Maint Policy	0	SF
43	Block Crack	M	NOPOL No Lcl Maint Policy	0	SF
43	Block Crack	H	NOPOL No Lcl Maint Policy	0	SF
44	Corrugation	L	NOPOL No Lcl Maint Policy	0	SF
44	Corrugation	M	PAAD1 Patch – 3" AC Deep	$ 3.20	SF
44	Corrugation	H	PAAD1 Patch – 3" AC Deep	$ 3.20	SF
45	Depression	L	NOPOL No Lcl Maint Policy	0	SF
45	Depression	M	PAAD1 Patch – 3" AC Deep	$ 3.20	SF
45	Depression	H	PAAD1 Patch – 3" AC Deep	$ 3.20	SF
46	Jet Blast	--	NOPOL No Lcl Maint Policy	0	SF
47	Joint Refl Cr	L	NOPOL No Lcl Maint Policy	0	LF
47	Joint Refl Cr	M	NOPOL No Lcl Maint Policy	0	LF
47	Joint Refl Cr	H	CS-RC Crack Seal, Refl Cr	$0.30	LF
48	Long & Trans Cr	L	NOPOL No Lcl Maint Policy	0	LF
Code	Distress	Sev	Work Type & Description	Unit Cost	Unit

48	Long & Trans Cr	M	CS-RC Crack Seal, L & T Cr	$0.75	LF
48	Long & Trans Cr	H	CS-RC Crack Seal, L & T Cr	$0.75	LF
49	Oil Spillage	L	NOPOL No Lcl Maint Policy	0	SF
50	Patching	L	NOPOL No Lcl Maint Policy	0	SF
50	Patching	M	NOPOL No Lcl Maint Policy	0	SF
50	Patching	H	PAAD1 Patch – 3” AC Deep	$ 3.20	SF
51	Polished Aggreg	--	NOPOL No Lcl Maint Policy	0	SF
52	Raveling	L	NOPOL No Lcl Maint Policy	0	SF
52	Raveling	M	NOPOL No Lcl Maint Policy	0	SF
52	Raveling	H	NOPOL No Lcl Maint Policy	0	SF
53	Rutting	L	NOPOL No Lcl Maint Policy	0	SF
53	Rutting	M	PAAD1 Patch – 3” AC Deep	$ 3.20	SF
53	Rutting	H	PAAD1 Patch – 3” AC Deep	$ 3.20	SF
54	Shoving	L	NOPOL No Lcl Maint Policy	0	SF
54	Shoving	M	PAAD1 Patch – 3” AC Deep	$ 3.20	SF
54	Shoving	H	PAAD1 Patch – 3” AC Deep	$ 3.20	SF
55	Slippage Crack	--	NOPOL No Lcl Maint Policy	0	SF
56	Swelling	L	PAAD1 Patch – 3” AC Deep	$ 3.20	SF
56	Swelling	M	PAAD1 Patch – 3” AC Deep	$ 3.20	SF
56	Swelling	H	PAAD1 Patch – 3” AC Deep	$ 3.20	SF
57	Weathering	L	NOPOL No Lcl Maint Policy	0	SF
57	Weathering	M	NOPOL No Lcl Maint Policy	0	SF
57	Weathering	H	NOPOL No Lcl Maint Policy	0	SF

TABLE C-2

Local Maintenance Policy No. 02

Flexible Pavements

Aircraft with Maximum Gross Weight of > 30,000 lbs.

Code	Distress	Sev	Work Type & Description	Unit Cost	Unit
41	Alligator Crack	L	PAAD2 Patch – 4" AC Deep	$ 4.20	SF
41	Alligator Crack	M	PAAD2 Patch – 4" AC Deep	$ 4.20	SF
41	Alligator Crack	H	PAAD2 Patch – 4" AC Deep	$ 4.20	SF
42	Bleeding	--	NOPOL No Lcl Maint Policy	0	SF
43	Block Crack	L	NOPOL No Lcl Maint Policy	0	SF
43	Block Crack	M	CSLC Crack Sealing-AC L&T Cracks	$0.75	LF
43	Block Crack	H	CSLC Crack Sealing-AC L&T Cracks	$0.75	LF
44	Corrugation	L	NOPOL No Lcl Maint Policy	0	SF
44	Corrugation	M	PAAD2 Patch – 4" AC Deep	$ 4.20	SF
44	Corrugation	H	PAAD2 Patch – 4" AC Deep	$ 4.20	SF
45	Depression	L	NOPOL No Lcl Maint Policy	0	SF
45	Depression	M	PAAD2 Patch – 4" AC Deep	$ 4.20	SF
45	Depression	H	PAAD2 Patch – 4" AC Deep	$ 4.20	SF
46	Jet Blast	--	NOPOL No Lcl Maint Policy	0	SF
47	Joint Refl Cr	L	NOPOL No Lcl Maint Policy	0	LF
47	Joint Refl Cr	M	NOPOL No Lcl Maint Policy	0	LF
47	Joint Refl Cr	H	CS-RC Crack Seal, Refl Cr	$0.30	LF
48	Long & Trans Cr	L	NOPOL No Lcl Maint Policy	0	LF
48	Long & Trans Cr	M	CS-RC Crack Seal, L & T Cr	$0.75	LF

48	Long & Trans Cr	H	CS-RC Crack Seal, L & T Cr	$0.75	LF
Code	Distress	Sev	Work Type & Description	Unit Cost	Unit
49	Oil Spillage	L	NOPOL No Lcl Maint Policy	0	SF
50	Patching	L	NOPOL No Lcl Maint Policy	0	SF
50	Patching	M	NOPOL No Lcl Maint Policy	0	SF
50	Patching	H	PAAD2 Patch – 4” AC Deep	$ 4.20	SF
51	Polished Aggreg	--	NOPOL No Lcl Maint Policy	0	SF
52	Raveling	L	NOPOL No Lcl Maint Policy	0	SF
52	Raveling	M	NOPOL No Lcl Maint Policy	0	SF
52	Raveling	H	NOPOL No Lcl Maint Policy	0	SF
53	Rutting	L	NOPOL No Lcl Maint Policy	0	SF
53	Rutting	M	PAAD2 Patch – 4” AC Deep	$ 4.20	SF
53	Rutting	H	PAAD2 Patch – 4” AC Deep	$ 4.20	SF
54	Shoving	L	NOPOL No Lcl Maint Policy	0	SF
54	Shoving	M	PAAD2 Patch – 4” AC Deep	$ 4.20	SF
54	Shoving	H	PAAD2 Patch – 4” AC Deep	$ 4.20	SF
55	Slippage Crack	--	NOPOL No Lcl Maint Policy	0	SF
56	Swelling	L	PAAD2 Patch – 4” AC Deep	$ 4.20	SF
56	Swelling	M	PAAD2 Patch – 4” AC Deep	$ 4.20	SF
56	Swelling	H	PAAD2 Patch – 4” AC Deep	$ 4.20	SF
57	Weathering	L	NOPOL No Lcl Maint Policy	0	SF
57	Weathering	M	NOPOL No Lcl Maint Policy	0	SF
57	Weathering	H	NOPOL No Lcl Maint Policy	0	SF

TABLE C-3

Local Maintenance Policy No. 03

Portland Cement Concrete (PCC) Pavements

All Aircraft Gross Weights

Code	Distress	Sev	Work Type & Description	Unit Cost	Unit
61	Blowup	L	PA-PF Patch PCC Full Depth	$ 10.50	SF
61	Blowup	M	PA-PF Patch PCC Full Depth	$ 10.50	SF
61	Blowup	H	PA-PF Patch PCC Full Depth	$ 10.50	SF
62	Corner Break	L	NOPOL No Lcl Maint Policy	0	LF
62	Corner Break	M	NOPOL No Lcl Maint Policy	0	LF
62	Corner Break	H	PA-PF Patch PCC Full Depth	$ 10.50	SF
63	Linear Crack	L	NOPOL No Lcl Maint Policy	0	LF
63	Linear Crack	M	CR-PE Cr Repair Equiv Cost	$78.75	LF
63	Linear Crack	H	CR-PE Cr Repair Equiv Cost	$78.75	LF
64	Durability Cr	L	NOPOL No Lcl Maint Policy	0	SF
64	Durability Cr	M	PA-PP Patch PCC Partial Depth	$70.00	SF
64	Durability Cr	H	PA-PF Patch PCC Full Depth	$ 10.50	SF
65	Jt Seal Damage	L	NOPOL No Lcl Maint Policy	0	LF
65	Jt Seal Damage	M	NOPOL No Lcl Maint Policy	0	LF
65	Jt Seal Damage	H	JS-BT Jt Seal, Bituminous	$3.50	LF
66	Small Patch	L	NOPOL No Lcl Maint Policy	0	SF
66	Small Patch	M	NOPOL No Lcl Maint Policy	0	SF
66	Small Patch	H	PA-PP Patch PCC Partial Depth	$70.00	SF

67	Large Patch	L	NOPOL No Lcl Maint Policy	0	SF
Code	Distress	Sev	Work Type & Description	Unit Cost	Unit
67	Large Patch	M	PA-PP Patch PCC Partial Depth	$70.00	SF
67	Large Patch	H	PA-PF Patch PCC Full Depth	$ 10.50	SF
68	Popouts	--	NOPOL No Lcl Maint Policy	0	SF
69	Pumping	--	NOPOL No Lcl Maint Policy	0	SF
70	Scaling	L	NOPOL No Lcl Maint Policy	0	SF
70	Scaling	M	NOPOL No Lcl Maint Policy	0	SF
70	Scaling	H	PA-PP Patch PCC Partial Depth	$70.00	SF
71	Faulting	L	NOPOL No Lcl Maint Policy	0	LF
71	Faulting	M	NOPOL No Lcl Maint Policy	0	LF
71	Faulting	H	SL-PC Slab Replacement – PCC	$17.00	LF
72	Shattered Slab	L	NOPOL No Lcl Maint Policy	0	SF
72	Shattered Slab	M	SL-PC Slab Replacement – PCC	$17.00	SF
72	Shattered Slab	H	SL-PC Slab Replacement – PCC	$17.00	SF
73	Shrinkage Cr	--	NOPOL No Lcl Maint Policy	0	SF
74	Joint Spall	L	NOPOL No Lcl Maint Policy	0	SF
74	Joint Spall	M	PA-PP Patch PCC Partial Depth	$70.00	SF
74	Joint Spall	H	PA-PP Patch PCC Partial Depth	$70.00	SF
75	Corner Spall	L	NOPOL No Lcl Maint Policy	0	SF
75	Corner Spall	M	PA-PP Patch PCC Partial Depth	$70.00	SF
75	Corner Spall	H	PA-PF Patch PCC Full Depth	$10.50	SF
76	Akali Silica Reac	L	NOPOL No Lcl Maint Policy	0	SF
76	Akali Silica Reac	M	SL-PC Slab Replacement	$17.00	SF
76	Akali Silica Reac	H	SL-PC Slab Replacement	$17.00	SF

TABLE C-4

GLOBAL MAINTENANCE POLICY

PCI	FLEXIBLE (ASPHALT) PAVEMENTS		RIGID (CONCRETE) PAVEMENTS	
	< 30,000 lb Aircraft	> 30,000 lb Aircraft	< 30,000 lb Aircraft	> 30,000 lb Aircraft
100				
85 70	SLURRY SEAL (ST-SS) “L” Block Cracks “L” Weathering/Raveling	SLURRY SEAL (ST-SS) “L” Block Cracks “L” Weathering/Raveling		
55 40	THIN (1.5”) OVERLAY (OL-AT) “M” Weathering THICK (3”) OVERLAY (OL-AF) “M” Block Cracks “H” Weathering/Raveling	THICK (3”) OVERLAY (OL-AF) “M” Block Cracks “M” & “H” Weathering/Raveling		
25 10 0	RECONSTRUCT (CRAC1) “H” Block Cracks “H” Long & Trans Cracks Alligator Crack > 20% density Corrugation > 20% density Rutting > 20% density	RECONSTRUCT (CRAC2) “H” Block Cracks “H” Long & Trans Cracks Alligator Crack > 20% density Corrugation > 20% density Rutting > 20% density	RECONSTRUCT (CR-PA) All PCI < 10 conditions	RECONSTRUCT (CR-PC) All PCI < 10 conditions

Explanation and Use of Global Maintenance Policy Table:

1. Shaded areas indicate No Global Maintenance Policy.
2. Density of listed distresses for global repair > 50% except as indicated.

TABLE C-5

WORK TYPE TABLE

C = Construction, M = Maintenance, G = Global Treatment, L = Local Treatment

CODE	DESCRIPTION	WK UNIT	UNIT COST	C/M	G/L
CRAC1	**Compl Recon/Recycle (3" new AC)**	sq ft	$ 3.60	C	G
CRAC2	**Compl Recon/Recycle (5" new AC)**	sq ft	$ 4.50	C	G
	Description: Work items are for reconstruction of asphalt pavements that are in the failed or serious area of PCI rating (0 to 25). CRAC1 is for global reconstruction of asphalt concrete (AC) pavements accommodating aircraft gross weights ≤ 30,000 lbs. CRAC2 is for aircraft over 30,000 lbs.: 1) Remove existing pavement structure, grind and re-use as aggregate base. 2) Rework, replenish, and compact base course. 3) Place new AC course.				
CR-PC	**Compl Reconstruction – PCC**	sq ft	$ 11.20	C	G
	Description: Work item is for global reconstruction of 9" failed (PCI 0 to 10) concrete pavements accommodating aircraft over 30,000 lbs.: 1) Remove and dispose of old concrete pavement. 2) Rework subgrade and place 4" of new aggregate base. 3) Construct new concrete pavement.				
CR-PA	**Compl Reconstruction – PCC to AC**	sq ft	$ 4.80	C	G
	Description: Work item is for global reconstruction of 6" and less of failed (PCI 0 to 10) concrete pavements by replacing concrete with new AC pavement: 1) Remove and dispose of old concrete pavement. 2) Rework subgrade and reconstruct with 2" of AC over 8" of aggregate base.				
CS-RC	**Crack Sealing – AC Refl Cracks**	lin ft	$ 0.30	M	L
	Description: Work item is to repair H severity reflective cracks in AC overlay over concrete: 1) Clean cracks by air blasting and other methods necessary to free cracks of dirt, vegetation, debris, and loose sealant. 2) Seal cracks with AC compatible sealant to slightly below level of surrounding pavement.				

TABLE C-5 (continued)

C = Construction, M = Maintenance, G = Global Treatment, L = Local Treatment

CODE	DESCRIPTION	WK UNIT	UNIT COST	C/M	G/L
CS-LC	**Crack Sealing – AC L & T Cracks**	lin ft	$ 0.75	M	L
	Description: Work item is to repair longitudinal and transverse cracks in AC over 1½" wide in the M and H severity range: 1) Treat cracks with soil sterilant and clean by air blasting and other methods necessary to free cracks of dirt, vegetation, debris, and loose sealant. 2) For cracks ≤ 1 ½" wide, fill crack with clean sand to form a reservoir of 1.0 to 1.5 depth to width ratio and seal cracks with AC compatible sealant to 1/8" below level of surrounding pavement. 3) For cracks wider than 1 ½," tack coat side walls, fill cracks with ½" minus plant mix AC, and compact by tamping. If area is to receive an overlay, perform steps 1 and 3 for all width cracks.				
CR-PE	**Crack Repair – PCC Equiv Cost**	lin ft	$ 78.75	M	L
	Description: Work item is to repair M and H severity linear cracks which divide slab into two or three pieces and are considered major structural distresses. Method of repair is slab replacement. Linear cracks are measured by lin ft in MicroPAVER™ program. To accommodate PAVER program, listed repair cost in lin ft represents equivalent cost of slab replacement as described under work type SL-PC.				
JS-BT	**Joint Sealing – Bituminous**	sq ft	$ 1.75	M	L
	Description: Work item is for replacement of damaged bituminous joint sealant in PCC pavements: 1) Remove old joint sealant, re-face joints by sawing, and sandblast surfaces clean. 2) Install backer rod and PCC compatible joint sealant.				
OL-AF	**Overlay- 3" Thick**	sq ft	$ 1.70	C	G
	Description: Work item is for global repair of AC pavements accommodating aircrafts with gross weights ≤ 30,000 lbs which have widespread M severity block cracking or H severity weathering/raveling: 1) Patch existing failed areas (assume 10% of area) and seal larger L&T cracks, 2) Apply asphalt binder to pavement surface, and, 3) Construct a 3" surface course overlay.				

TABLE C-5 (continued)

C = Construction, M = Maintenance, G = Global Treatment, L = Local Treatment

CODE	DESCRIPTION	WK UNIT	UNIT COST	C/M	G/L
OL-AT	**Overlay – AC Thin**	sq ft	$ 0.90	C	G
	Description: Work item is for global repair of AC pavements with M severity weathering and raveling: 1) Patch existing pavement failures (assume 2% or area), seal larger L&T cracks. 2) Apply tack coat to pavement surface. 3) Construct a 1 ½" surface course AC overlay.				
PAAD1	**Patching – AC Deep, Type 1**	sq ft	$ 3.20	M	L
	Description: Work item is to repair most severities of alligator cracking, corrugations, depressions, patches, rutting, shoving, and swelling in AC pavements accommodating aircraft gross weights ≤ 30,000 lbs.: 1) Saw cut outside of defective areas, remove pavement section to firm material. 2) Replace and compact sub-base and base material as required. 3) Apply prime coat to base material and tack coat to vertical faces of existing AC pavement. 4) Place AC surface course and compact.				
PAAD2	**Patching – AC Deep, Type 2**	sq ft	$ 4.20	M	L
	Description: Same as PAAD1 except work item is for AC pavements accommodating aircraft gross weights over 30,000 lbs. Higher unit cost reflects additional work involved.				
PA-PF	**Patching – PCC Full Depth**	sq ft	$ 10.50	M	L
	Description: Work item is to repair all severity blowups and H severity corner breaks, durability cracks, M and H severity akali silica reactivity and large patches, and applies to pavements for all aircraft gross weights: 1) Saw cut outside of defective area, and break out and remove concrete from area to be patched. 2) Remove defective base material, and add and compact new material. 3) Clean face of remaining slab and coat with grout. 4) Maintain existing joint pattern using temporary inserts. 5) Place PCC concrete in patch area and finish to surrounding texture. 6) Prepare and seal joints.				

TABLE C-5 (continued)

C = Construction, M = Maintenance, G = Global Treatment, L = Local Treatment

CODE	DESCRIPTION	WK UNIT	UNIT COST	C/M	G/L
PA-PP	**Patching – PCC Partial Depth**	sq ft	$ 70.00	M	L
	Description: Work item is to repair various severities of durability cracks, patches, scaling, joint spalls and corner spalls, and applies to pavements for all aircraft gross weights: 1) Saw cut around defective area and break out unsound concrete with air hammers or pneumatic drills. 2) Maintain existing joints using temporary inserts. 3) Clean and prepare surfaces. 4) Place polymer concrete, tamp in place, and finish to surrounding texture. 5) Saw and seal joints.				
SL-PC	**Slab Replacement – PCC**	sq ft	$ 17.00	M	L
	Description: This work item is for replacement of concrete slabs with M or H severity shattered slabs or H severity faulted slabs: 1) Remove and dispose of old slab and unsuitable base. 2) Re-work subgrade and place 4” new aggregate base. 3) Construct new concrete slab.				
ST-SS	**Surface Treatment – Slurry Seal**	sq ft	$ 0.20	M	G
	Description: Work item is to seal small cracks and surface voids, retard raveling and loss of matrix, and improve skid resistance. Slurry seal is used only on pavements accommodating aircraft gross weights ≤ 30,000 lbs.: 1) Before application of slurry, thoroughly clean surfaces. 2) Apply a tack coat if pavement is dry or porous. 3) Apply a Type II polymer-modified slurry seal. 4) Roll 2 full coverage passes and vacuum sweep.				