Roswell International Air Center Airport (ROW)
Pavement Condition and Analysis

Submitted to:

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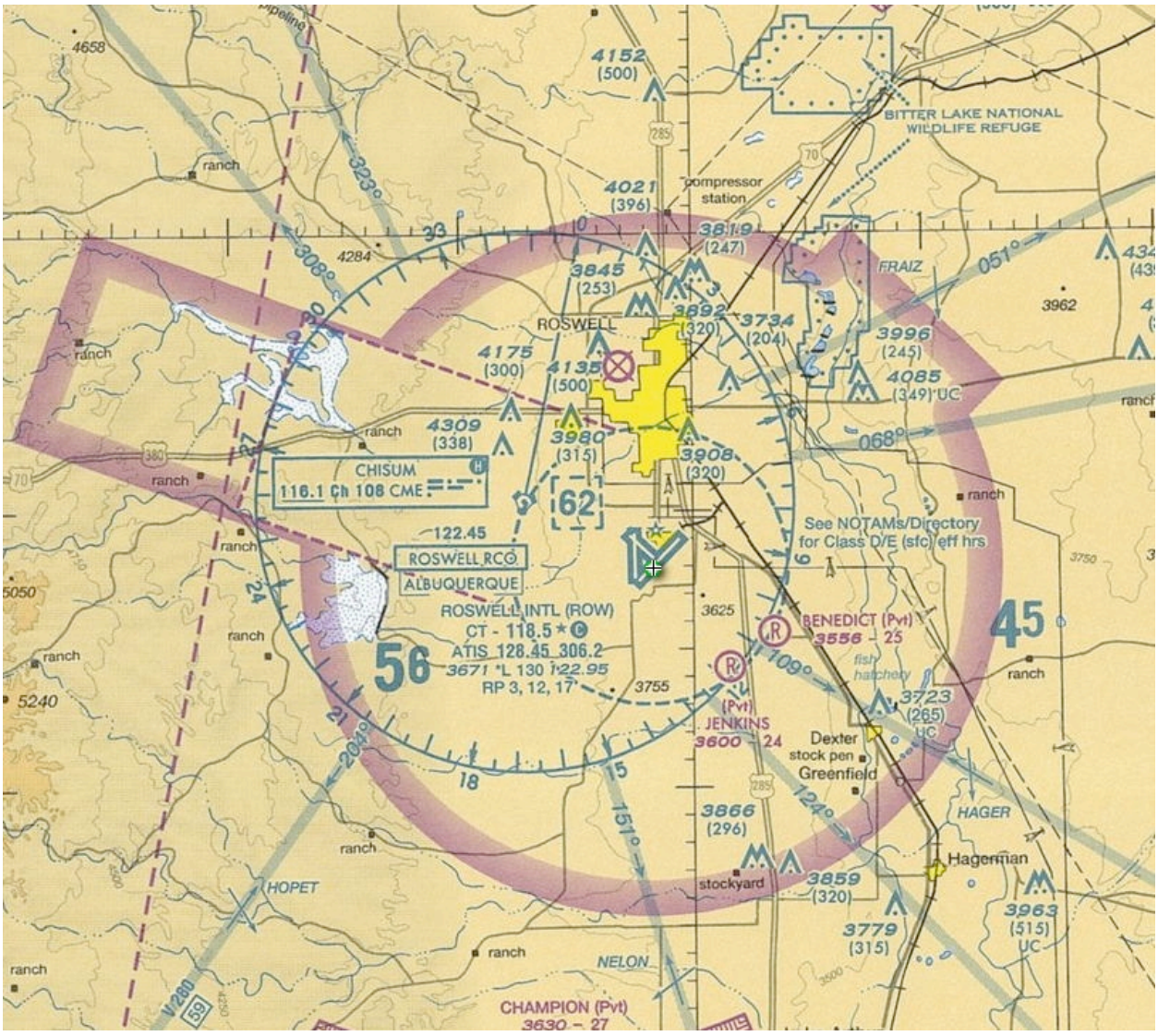
1. Conditions at Roswell International Air Center (ROW)

Roswell International Air Center (ROW) is located in Roswell, NM about 200 miles southeast of Albuquerque, NM (Figure 1).

Figure 1. Geographic Location of Roswell International Air Center (ROW)



Source: www.skyvector.com

Estimated aircraft traffic at the Roswell International Air Center (ROW), based on reported traffic data from 2008, is presented in Table 1, and the projected aircraft traffic is presented in Table 2. Air traffic is a mix of general aviation (single engine), air taxis, commercial (DC-8, Boeing 737, Boeing 747), military transports (C-130), and military helicopters.

Table 1. Roswell International Air Center (ROW) Aircraft Operations (2008)

Aircraft Category	Yearly Traffic [no.]	Average Daily Traffic [no.]	Annual Aircraft [%]	Estimated Annual Departures [no.]
General Aviation	19,691	53.9	36.9%	9,846
Air Taxi	7,026	19.2	13.2%	3,513
Air Carrier	303	0.8	0.6%	152
Military	11,655	31.9	21.9%	5,828
Military-Local	9,930	27.2	18.6%	4,965
Civilian-Local	4,715	12.9	8.8%	2,358
Total	**53320**	146	100.0%	
Estimated Departures	**26660**			

Source: Based on Roswell International Air Center (ROW) air traffic history (2008).

The pavement surfaces on the runway, taxiways, and aprons was last inspected by New Mexico Tech (NMT) during March, 2007. The paved surfaces are a mixture of asphalt concrete (AC) and Portland cement concrete (PCC) (Table 3). A recent airport diagram is presented in Figure 2. Maps showing the general condition of these areas along with labels for the inspected areas are presented in Figures 3 and 4. Table 3 presents the results of the March, 2007 pavement inspection, and the 2010 pavement condition index (PCI) estimates.

Table 2. Roswell International Air Center (ROW) Predicted Aircraft Operations 2007-2027

	2007	2012	2017	2027
General Aviation (Local)	24,726	25,280	25,850	27,040
General Aviation (Transient)	9,890	10,112	10,340	10,816
Air Taxi	8,560	7,680	7,920	8,410
Subtotal	43,176	43,072	44,110	46,266
Military	13,720	13,720	13,720	13,720
Commercial	230	300	300	300
Subtotal	13,950	14,020	14,020	14,020
Total Itinerant (Transient)	32,400	31,812	32,280	33,246
Total Local	24,726	25,280	25,850	27,040
Total Annual Operations	57,126	57,092	58,130	60,286
Itinerant Operations Percentage	57%	56%	56%	55%
Local Operations Percentage	43%	44%	44%	45%
Annual Operations Growth Rate (5 year periods, e.g. 2007-2012)		0.0%	0.4%	0.4%
Average Annual Operations Growth Rate (2007-2027)	0.3%			

Note: Projections based on *New Mexico Airport System Plan Update*, Wilbur Smith Associates, Inc. (2009).

Figure 2. Roswell International Air Center (ROW) Airport Diagram

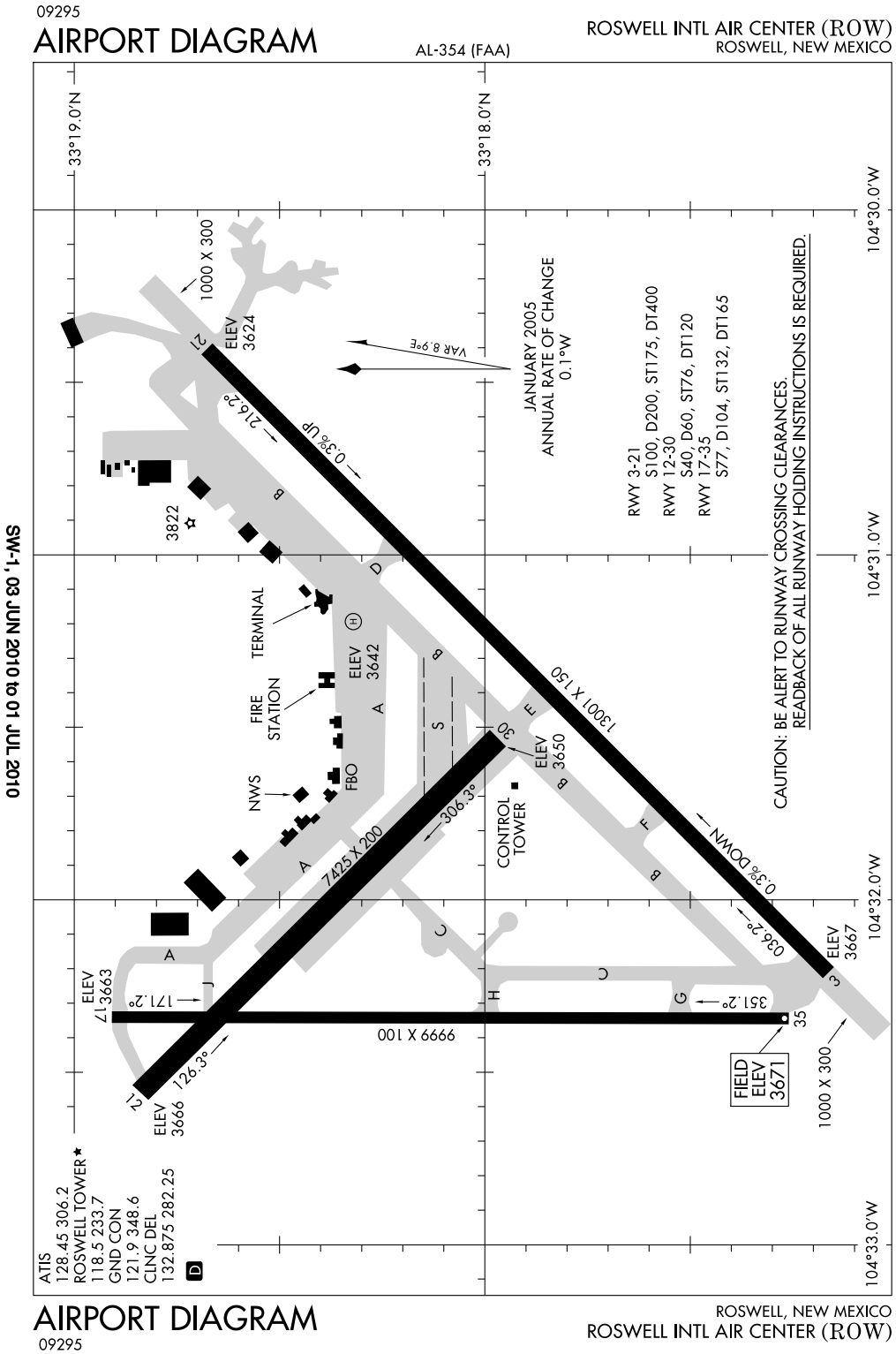
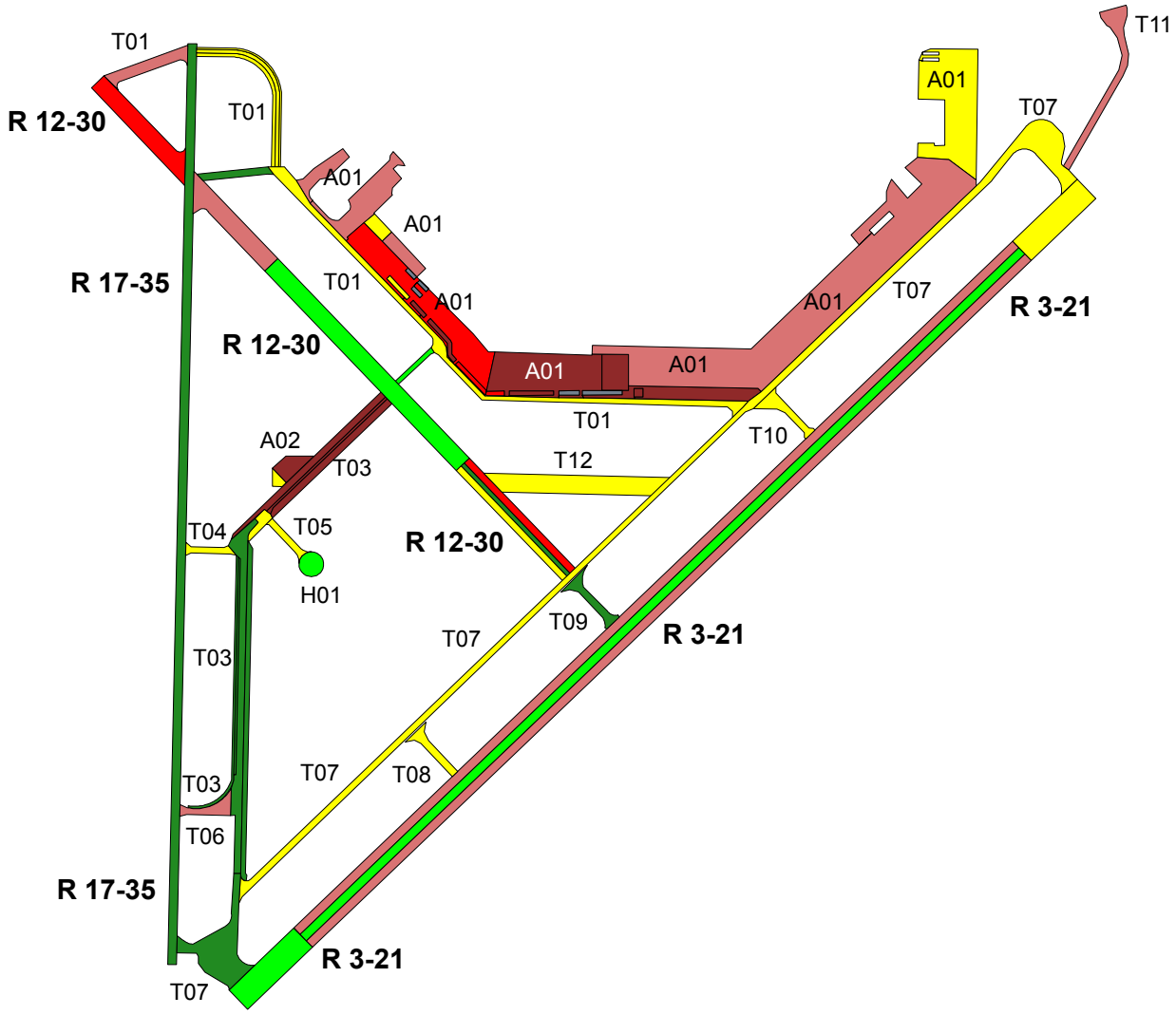
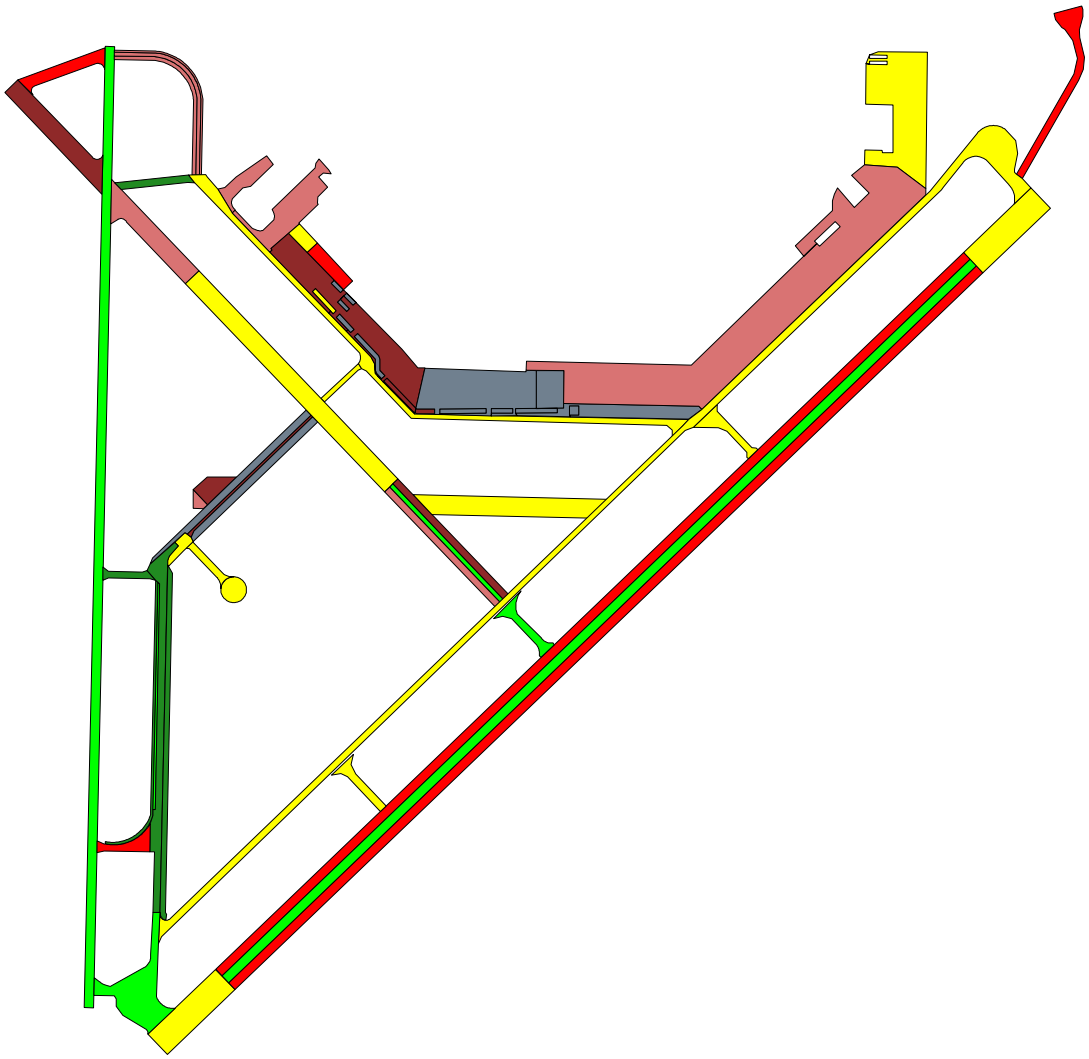


Figure 3. Roswell International Air Center (ROW) PCI Branch Map, March 14, 2007



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

Figure 4. Roswell Intl. Air Center (ROW) Predicted PCI Branch Map, March 14, 2010



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Serious	25-11	
Failed	10-0	

Table 3. Roswell Intl. Air Center (ROW) PCI Measurement for 2007 and 2010 Estimates

Branch ID	Section	Material	Area [ft^2]	PCI 2007	PCI 2010
ALL*			14,520,875	54	50
Apron 1	1	PCC	728,650	68	64
Apron 1	2	PCC	1,978,875	55	48
Apron 1	3	AC	120,000	25	8
Apron 1	4	AC	10,000	13	0
Apron 1	5	AC	16,250	70	59
Apron 1	6	AC	503,100	24	7
Apron 1	7	AC	22,250	10	0
Apron 1	8	AC	18,900	8	0
Apron 1	9	AC	51,300	36	20
Apron 1	10	PCC	280,000	48	41
Apron 1	11	AC	11,750	0	0
Apron 1	12	PCC	68,000	55	48
Apron 1	13	PCC	57,000	4	35
Apron 1	14	AC	45,000	69	58
Apron 1	15	AC	24,750	18	1
Apron 1	16	AC	32,750	37	22
Apron 1	17	AC	26,500	20	3
Apron 1	18	AC	11,250	12	0
Apron 2	1	PCC	78,750	25	18
Apron 2	2	AC	22,500	63	51
Helipad 1	1	PCC	45,000	76	67
Runway 12-30	1	PCC	250,000	29	22
Runway 12-30	2	AC	220,000	55	42

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

Branch ID	Section	Material	Area [ft^2]	PCI 2007	PCI 2010
Runway 12-30	3	PCC	610,000	80	69
Runway 12-30	4	AC	173,250	59	46
Runway 12-30	5	PCC	115,500	89	73
Runway 12-30	6	AC	173,250	36	20
Runway 17-35	1	AC	975,000	87	79
Runway 3-21	1	PCC	300,000	82	70
Runway 3-21	3	PCC	1,105,000	52	38
Runway 3-21	4	AC	1,105,000	85	71
Runway 3-21	5	PCC	1,105,000	53	39
Runway 3-21	7	PCC	300,000	63	60
Taxiway 1	1	PCC	108,000	42	35
Taxiway 1	3	PCC	38,200	58	50
Taxiway 1	4	AC	76,400	59	46
Taxiway 1	5	PCC	76,400	58	50
Taxiway 1	7	PCC	228,000	62	58
Taxiway 2	1	AC	35,750	95	89
Taxiway 3	2	PCC	11,250	82	70
Taxiway 3	4	AC	140,625	21	4
Taxiway 3	5	PCC	281,250	19	12
Taxiway 3	6	AC	140,625	17	0
Taxiway 3	7	AC	289,125	100	100
Taxiway 3	8	AC	75,625	100	100
Taxiway 3	9	AC	60,625	100	83
Taxiway 3	10	AC	203,500	100	100
Taxiway 4	1	AC	22,500	100	100

Condition	Scale	Color
Good	100-86	
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Fair	70-56	
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Very Poor	40-26	
Serious	25-11	
Failed	10-0	

Branch ID	Section	Material	Area [ft^2]	PCI 2007	PCI 2010
Taxiway 5	1	PCC	42,750	62	58
Taxiway 6	1	AC	36,000	42	27
Taxiway 7	1	PCC	1,156,875	64	70
Taxiway 7	2	PCC	300,000	98	62
Taxiway 8	2	PCC	44,250	70	65
Taxiway 9	2	PCC	44,250	96	77
Taxiway 10	2	PCC	44,250	70	65
Taxiway 11	1	AC	120,050	42	27
Taxiway 12	1	PCC	360,000	68	64

*weighted average PCI
AC = asphalt concrete, PCC = Portland cement concrete

Condition	Scale	Color
Good	100-86	
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Fair	70-56	
Poor	55-41	
Very Poor	40-26	
Serious	25-11	
Failed	10-0	

2. Soil and Aggregate Analysis

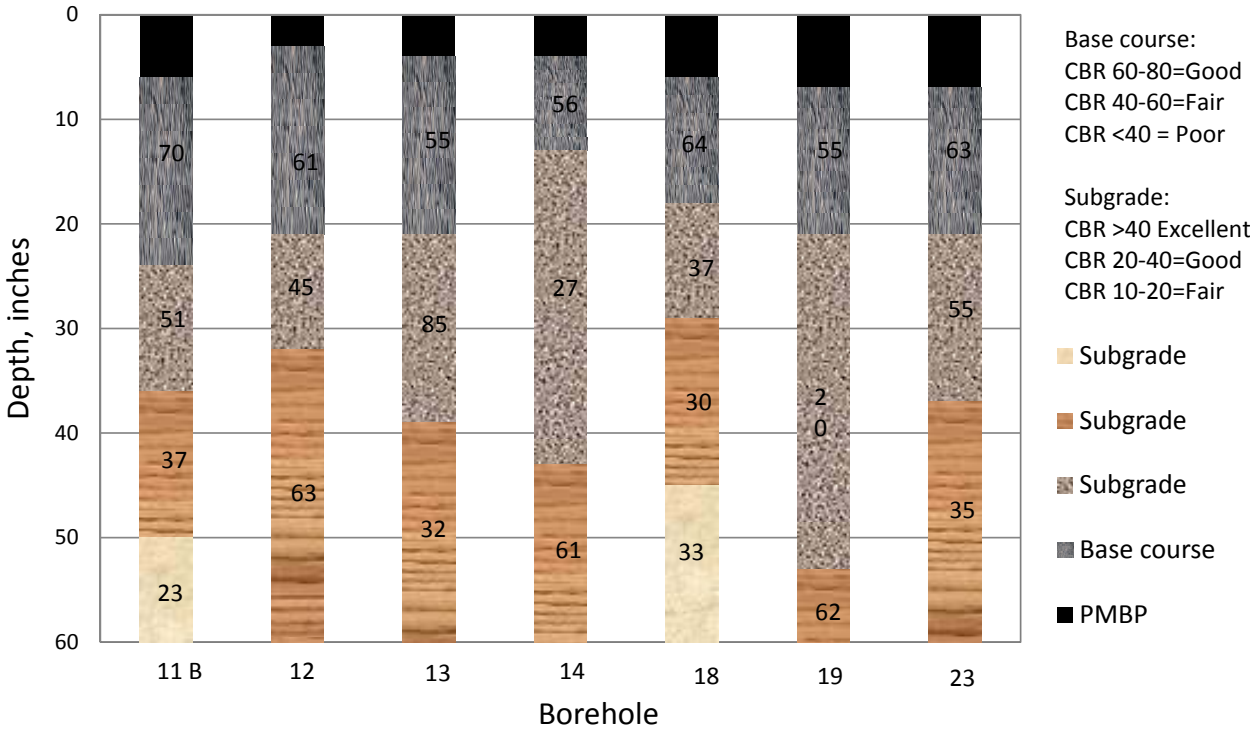
In September, 2009, the University of New Mexico (UNM) produced a report for the New Mexico Department of Transportation (NMDOT) – Aviation Division on the analysis of boreholes taken from the runways, taxiways and aprons at Roswell International Air Center (ROW). The data consisted of asphalt concrete, base and subgrade thicknesses, generalized material compositions and California Bearing Ratio (CBR) for the materials underlying the pavement. In their analysis, samples from 15 boreholes were taken (Figure 5).

Figure 5. Borehole Locations at Roswell International Air Center (ROW)

Runway 3-21

As part of the September, 2009 pavement and base analysis report, UNM examined Runway 3-21 (Figure 6).

Figure 6. Base and Subgrade Analysis for Runway 3-21



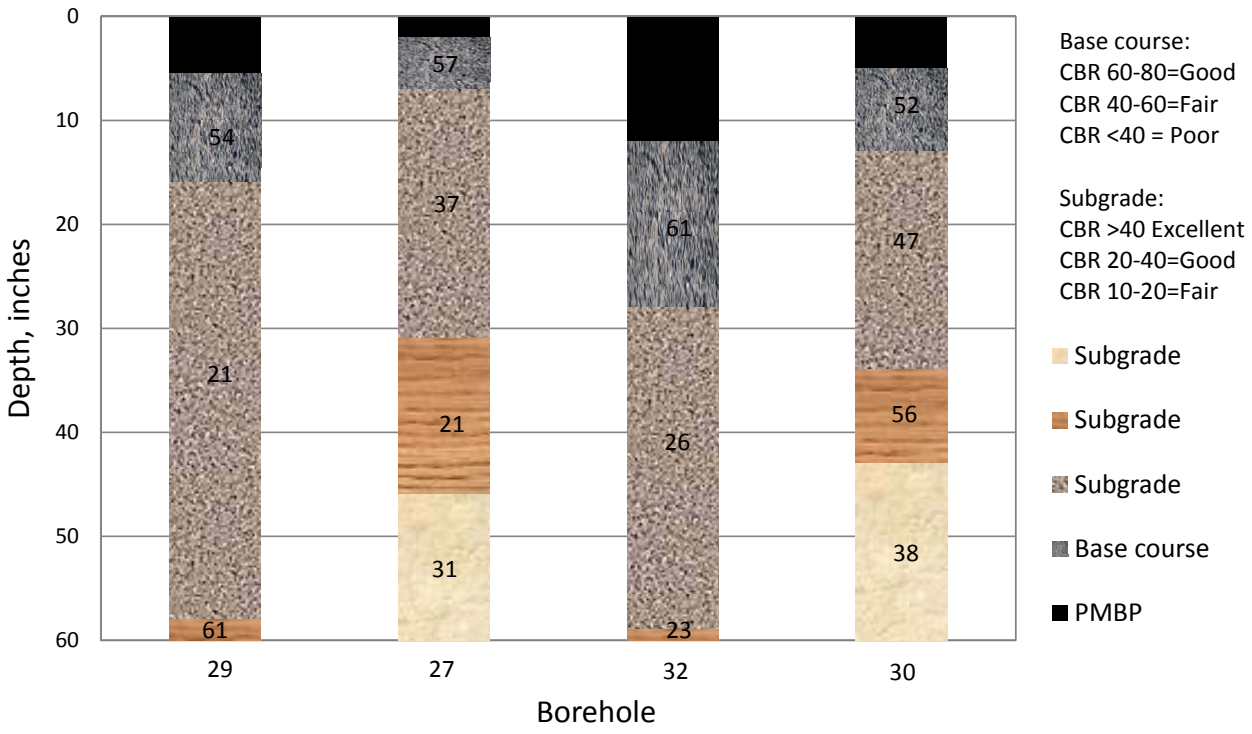
** Numbers Inside the Layers Indicate CBR Values

Seven borehole samples were taken on *Runway 3-21*. The average asphalt concrete depth was 5.3-inches, and the average base thickness was 14.6-inches. The material composition of the base was found to be either poorly-graded gravel or poorly-graded sand. The average CBR of the base was measured to be 61, with a range of values from 55 to 70. Overall the CBR of the base material is considered to be good. The subgrade material was composed of a mixture of gravel, sand and silt. The average CBR of the subgrade material was 44 (range of 20 to 85), which is excellent.

Taxiways and Apron A

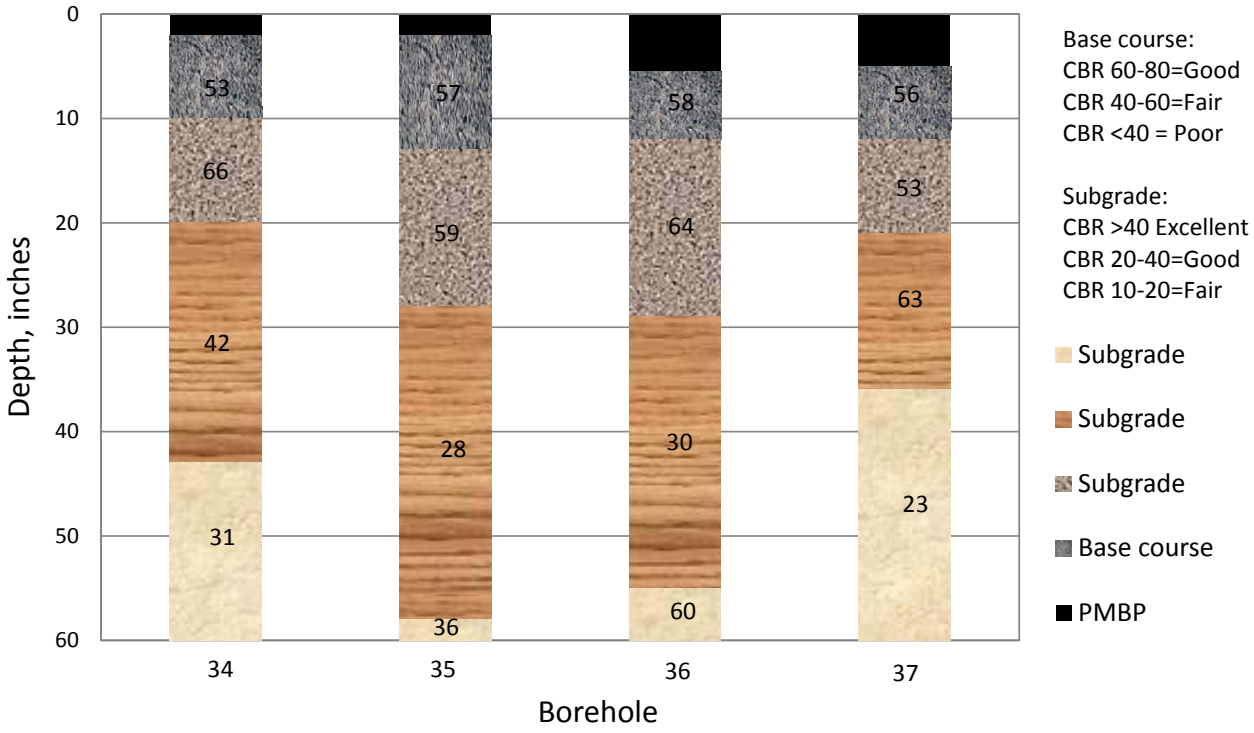
As part of the September, 2009 pavement and base analysis report, UNM examined Taxiways B, C, E, F and S and Apron A (Figures 7 and 8 and Table 4). Pavement construction of the taxiways varied greatly from 2 to 8.5 inches depth of asphalt concrete (Table 4).

Figure 7. Base and Subgrade Analysis for Taxiways B and C



** Numbers Inside the Layers Indicate CBR Values

Figure 8. Base and Subgrade Analysis for Taxiways E, F, S and Apron A



** Numbers Inside the Layers Indicate CBR Values

Table 4. Base and Subgrade Analysis for Taxiways and Apron A

Location	AC Depth [in]	Base Depth [in]	Base Material	Base CBR	Subgrade CBR	Recommended Aircraft
Taxiway B	3.8	7.8	well-graded or poorly graded gravel	56 (54 to 57)	34 (21 to 61)	< 30,000 lb
Taxiway C	8.5	12	well-graded gravel or sand	57 (52 to 61)	38 (23 to 56)	> 100,000 lb
Taxiway E	2.0	8.0	well-graded gravel	57	46 (31 to 66)	< 30,000 lb
Taxiway F	2.0	11	well-graded gravel	57	41 (28 to 59)	< 30,000 lb
Taxiway S	5.5	6.5	well-graded gravel	58	41 (30 to 64)	> 30,000 lb
Apron A	5.0	7.0	well-graded gravel	56	46 (23 to 63)	> 30,000 lb

Note: For a 20-year asphalt concrete (AC) lifespan, FAA designs recommend at least 4-in. of AC for aircraft loadings > 30,000 lb, and a stabilized base material for aircraft greater than 100,000 lbs.

FWD Analysis

In a September, 2009 report, the University of New Mexico (UNM) and the New Mexico Department of Transportation (NMDOT) presented data from the use of the falling weight deflectometer (*FWD*) method to analyze the structural capacity of the pavement wearing surface and the subgrade for Runways 3-21 and 17-35. As noted in the report, Runway 17-35 is in good condition and all of the layers of the pavement surface, base and subgrade have sufficient strength. FWD tests on Runway 3-21 showed little deflection also indicating that the runway was in good operating condition.

Skid Resistance

In the September, 2009 UNM report, the skid resistance of Runway 3-21 was tested at 99 points along its length on both sides of the runway. The skid resistance of asphalt concrete typically varies from a high of about 70, when the wearing surface is new to a low of about 30, which would be considered critically low. The average measured values obtained on Runway 3-21 varied from about 37 to 87.

The skid resistance of Runway 17-35 was tested at 45 points along its length on both sides of the runway. The average measured values obtained on Runway 17-35 varied from about 55 to 67.

3. Airport Maintenance Completed in December, 2009

In December, 2009, maintenance and reconstruction were completed on Taxiways C and H (Taxiways 3 and 4 in this report). Only the portion of Taxiway C from Taxiways B to H was reconstructed, and not the entire taxiway. Taxiway C received 3-inches of cold planning and a new asphalt concrete wearing course. Taxiway H received 2-inches of cold planning and a new asphalt concrete wearing course. Both areas are received an overlay fabric, and some areas were crack sealed. Since these areas underwent a major rehabilitation, their PCI values were adjusted to 100.

4. Predicted Pavement Conditions Assuming No Maintenance

MicroPAVER 6 was used to predict the PCI values of the various pavement sections present at Roswell International Air Center (ROW), assuming that no future maintenance occurs after 2010 (Tables 5 and 10 and Figures 9-11). The pavement prediction relies on initial construction dates, when known, and the March, 2007 on-site pavement inspection and construction that occurred during December, 2009. Additional inspection, construction or history data would increase the reliability of the predictive capabilities of the model.

Table 5. Predicted Pavement Conditions (PCI) Assuming no Maintenance After 2010

Branch ID	Section	Material	2007	2009	2010	2013	2018
ALL*			54	47	46	38	28
Apron 1	1	PCC	68	65	64	62	51
Apron 1	2	PCC	55	50	48	41	30
Apron 1	3	AC	25	14	8	0	0
Apron 1	4	AC	13	2	0	0	0
Apron 1	5	AC	70	63	59	46	21
Apron 1	6	AC	24	13	7	0	0
Apron 1	7	AC	10	0	0	0	0
Apron 1	8	AC	8	0	0	0	0
Apron 1	9	AC	36	26	20	4	0
Apron 1	10	PCC	48	44	41	35	23
Apron 1	11	AC	0	0	0	0	0
Apron 1	12	PCC	55	50	48	41	30
Apron 1	13	PCC	42	38	35	29	17
Apron 1	14	AC	69	62	58	45	19
Apron 1	15	AC	18	7	1	0	0
Apron 1	16	AC	37	27	22	5	0
Apron 1	17	AC	20	9	3	0	0
Apron 1	18	AC	12	1	0	0	0
Apron 2	1	PCC	25	21	18	12	0
Apron 2	2	AC	63	55	51	37	10
Helipad 1	1	PCC	76	69	67	64	58
Runway 12-30	1	PCC	29	25	22	16	4
Runway 12-30	2	AC	55	46	42	27	0

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

Branch ID	Section	Material	2007	2009	2010	2013	2018
Runway 12-30	3	PCC	80	72	69	64	60
Runway 12-30	4	AC	59	51	46	32	5
Runway 12-30	5	PCC	89	77	73	66	61
Runway 12-30	6	AC	36	26	20	4	0
Runway 17-35	1	AC	87	82	79	69	50
Runway 3-21	1	PCC	82	73	70	65	60
Runway 3-21	3	PCC	52	43	38	23	0
Runway 3-21	4	AC	85	75	71	65	61
Runway 3-21	5	PCC	53	44	39	24	0
Runway 3-21	7	PCC	63	61	60	53	42
Taxiway 1	1	PCC	42	38	35	29	17
Taxiway 1	3	PCC	58	53	50	44	32
Taxiway 1	4	AC	59	51	46	32	5
Taxiway 1	5	PCC	58	53	50	44	32
Taxiway 1	7	PCC	62	60	58	50	39
Taxiway 2	1	AC	95	91	89	82	66
Taxiway 3	2	PCC	82	73	70	65	60
Taxiway 3	4	AC	21	10	4	0	0
Taxiway 3	5	PCC	19	15	12	6	0
Taxiway 3	6	AC	17	6	0	0	0
Taxiway 3	7	AC	90	86	100	96	86
Taxiway 3	8	AC	90	86	100	96	86
Taxiway 3	9	AC	90	86	83	74	56
Taxiway 3	10	AC	90	86	100	96	86
Taxiway 4	1	AC	59	51	100	96	86

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

Branch ID	Section	Material	2007	2009	2010	2013	2018
Taxiway 5	1	PCC	62	60	58	50	39
Taxiway 6	1	AC	42	32	27	11	0
Taxiway 7	1	PCC	81	73	70	62	54
Taxiway 7	2	PCC	64	63	62	57	45
Taxiway 8	2	PCC	70	66	65	62	53
Taxiway 9	2	PCC	96	82	77	67	62
Taxiway 10	2	PCC	70	66	65	62	53
Taxiway 11	1	AC	42	32	27	11	0
Taxiway 12	1	PCC	68	65	64	62	51

Condition	Scale	Color
Good	100-86	
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Fair	70-56	
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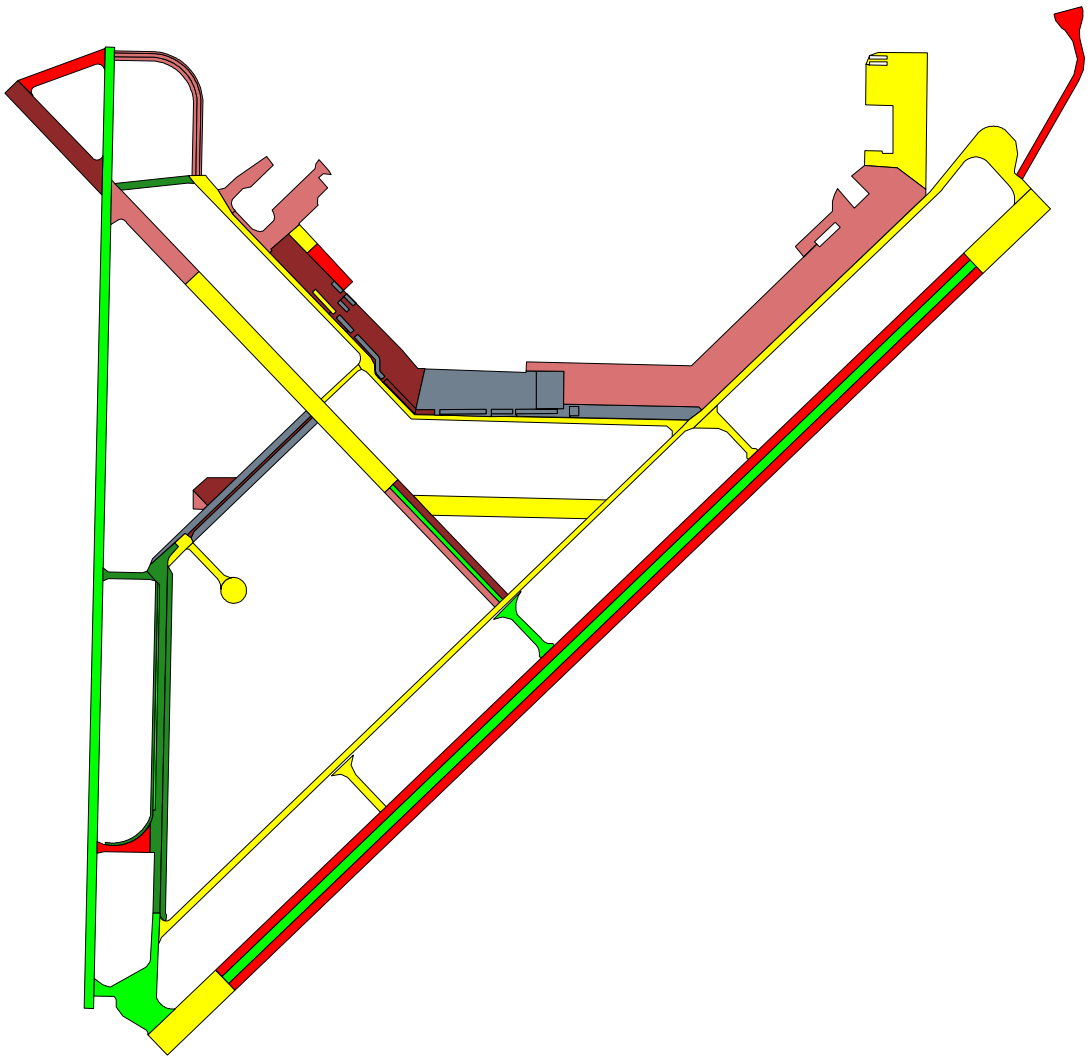
Very Poor	40-26	
Serious	25-11	
Failed	10-0	

*weighted average PCI
AC = asphalt concrete, PCC = Portland cement concrete

Figure 9. Roswell Intl. Air Center (ROW) Predicted PCI Branch Map for 2010



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Fair	70-56	
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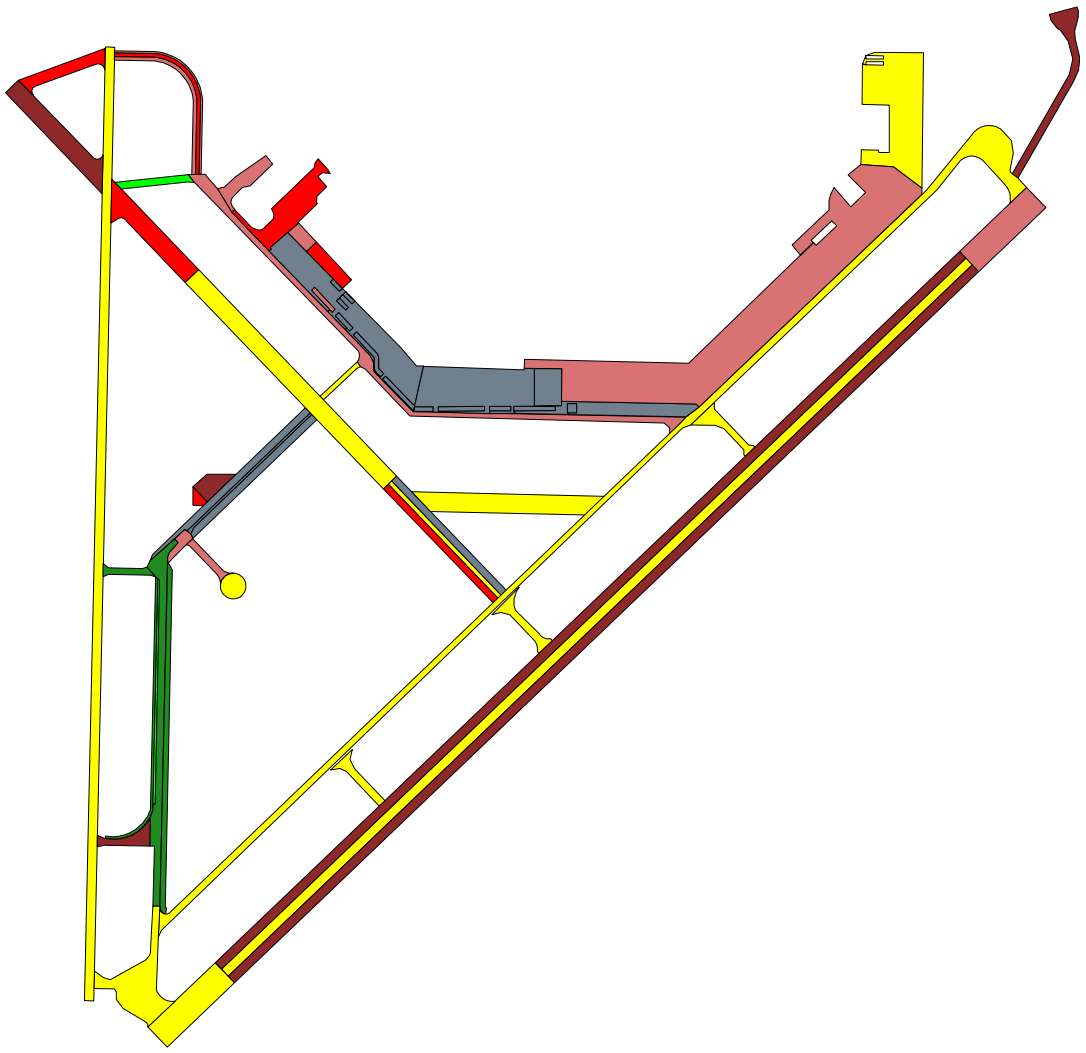
Very Poor	40-26	
Serious	25-11	
Failed	10-0	

Figure 10. Roswell Intl. Air Center (ROW) Predicted PCI Branch Map for 2013



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Good	100-86	
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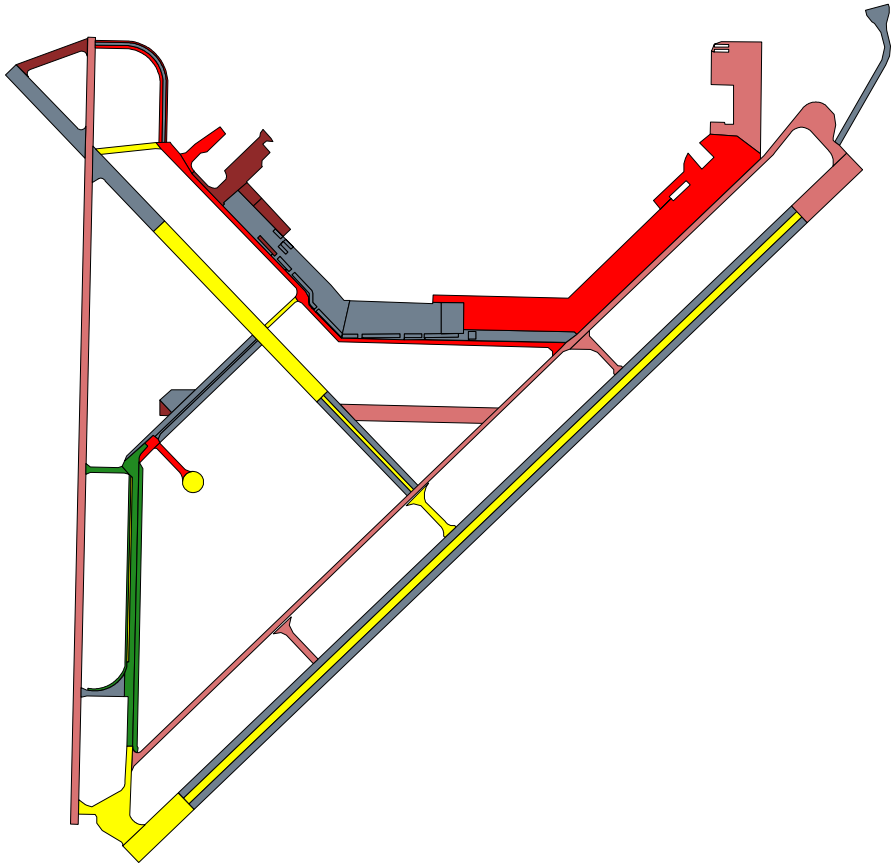
Fair	70-56	
Poor	55-41	
Very Poor	40-26	
Serious	25-11	
Failed	10-0	

Figure 11. Roswell Intl. Air Center (ROW) Predicted PCI Branch Map for 2018



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Good	100-86	
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Fair	70-56	
Poor	55-41	
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5. Recommend Pavement Design

The recommend asphalt concrete (AC) and Portland cement concrete (PCC) pavement construction was determined using FAA design procedures for the design aircraft detailed in Table 6. Standard and non-standard FAA designs were completed using the *FAARFIELD version 1.302* airfield pavement design software. The FAA recommends the use of a stabilized base course with asphalt concrete surfaces serving aircraft with gross weights exceeding 100,000 lbs. Therefore, the use of only a crushed aggregate base (P-209) with aircraft over this recommended weight limit is considered a non-standard design. The CBR of the subgrade was modeled at a value of 20, which is a slightly lower value than the lowest subgrade CBR measured at Roswell International Air Center (ROW).

Since Portland cement concrete (PCC) surfaces are also present at ROW, a recommended design for PCC paved surfaces is presented in Table 9. PCC pavements usually consist of the PCC wearing surface and a treated base material. An additional aggregate layer may also be presented, but the design in Table 9 assumed that only a treated base material was present under the PCC.

A normal FAA design life of 20 years was assumed for the cases listed below. The design pavement and aggregate thicknesses were rounded up to the nearest 1/2-inch.

Table 6. Design Aircraft Used for Runway Pavement Design

Aircraft Category	Gross Weight [lb]	Estimated Annual Departures [number]	Annual Aircraft [%]	Annual Growth [%]
Cessna Skyhawk 172	2,558	12,500	47.3%	0.5%
Regional Jet-200	47,450	3,750	14.2%	0.5%
Boeing 737-300	140,000	125	0.5%	0.5%
C-130	155,000	10,000	37.8%	0.5%
DC8-43	318,000	25	0.1%	0.5%
Boeing 747-400ER	913,000	25	0.1%	0.5%
Total		26,425	100.0%	

Table 7. FAA Standard Pavement Design for Asphalt Concrete

Layer Material	Thickness [in]	Modulus [psi]
HMA Asphalt Concrete Surface (P-401/P-403)[1]	4	200,000
Stabilized HMA Base (P-401/P-403)[2]	7.0	400,000
Subgrade[3]	CBR = 20	30,000

1. The asphalt concrete modulus is assumed to have a constant value of 200,000 psi.
2. The stabilized HMA base modulus is assumed to have a constant value of 400,000 psi.
3. The subgrade modulus (*E*) is estimated from the *CBR*-value, where $E = 1500 \times CBR$ [psi].

Table 8. FAA Non-Standard Pavement Design for Asphalt Concrete

Layer Material	Thickness [in]	Modulus [psi]
HMA Asphalt Concrete Surface (P-401/P-403)[1]	4	200,000
Crushed Aggregate (P-209)[2]	12.5	70,000
Subgrade[3]	CBR = 20	30,000

1. The asphalt concrete modulus is assumed to have a constant value of 200,000 psi.
2. The crushed aggregate modulus depends upon thickness, and it is estimated by the *FAARFIELD* program.
3. The subgrade modulus (*E*) is estimated from the *CBR*-value, where $E = 1500 \times CBR$ [psi].

Table 9. Recommended Runway Portland Cement Concrete (PCC) Pavement Design

Layer Material	Thickness [in]	Modulus [psi]
Portland Cement Concrete Surface (P-501)[1]	12	4,000,000
Cement Treated Base (P-304)[2]	6.0	500,000
Subgrade[3]	CBR = 20	30,000

1. The Portland cement concrete modulus is assumed to have a constant value of 4,000,000 psi.
2. The cement treated base modulus is assumed to have a constant value of 500,000 psi.
3. The subgrade modulus (*E*) is estimated from *k-value*.

6. Current Pavement Design for Runway 3-21

Runway 3-21 is currently constructed as follows (Table 9):

Table 10. Actual Design Conditions for Runway 3-21 (2010)

Layer Material	Thickness [in]
Asphalt Concrete (AC)	5.3
Base Course	14.6
Subgrade (avg. CBR = 43)	≥ 38

Using the design aircraft traffic specified in Table 6, and the data obtained from borehole analysis of the runways, it is determined that Runway 3-21 is adequately-designed.

7. Maintenance and Rehabilitation (M&R) Schedule for Asphalt Concrete Surfaces

The FAA recommends a 20-year lifespan for asphalt concrete airport pavements. As shown in Figure 12, it is much more expensive to perform maintenance on pavements that have deteriorated below a Pavement Condition Index (PCI) of about 60. At this PCI, a major rehabilitation or reconstruction (mill and overlay) is required to substantially increase the PCI-value. This type of treatment would incur a much greater expense compared to rehabilitating pavements with PCI values greater than 60. Rehabilitation of pavements with PCI values below 60 can cost 4 to 5 times as much compared to the rehabilitation of pavements with PCI values greater than 60. It is generally accepted that the maintenance and rehabilitation of taxiways and aprons is of a lower priority than runways, so a lower PCI threshold of around 40 could be used. Therefore, funding priorities typically favor runways.

A combination of data from *MicroPAVER* 6 and engineering judgment was used to generate the data for the estimated M&R schedule presented in Table 11. PCI-values where recommended maintenance should be performed are listed in the table legend. The M&R schedule relies on the pavement inspection performed by NMT during March, 2007, and the December, 2009 reconstruction of Taxiways C and H. The March, 2007 inspection only represents a single set of pavement inspection data. Additional inspection data would increase the reliability of the predictive capabilities of the M&R model.

Figure 12. Typical Pavement Condition as a Function of Time

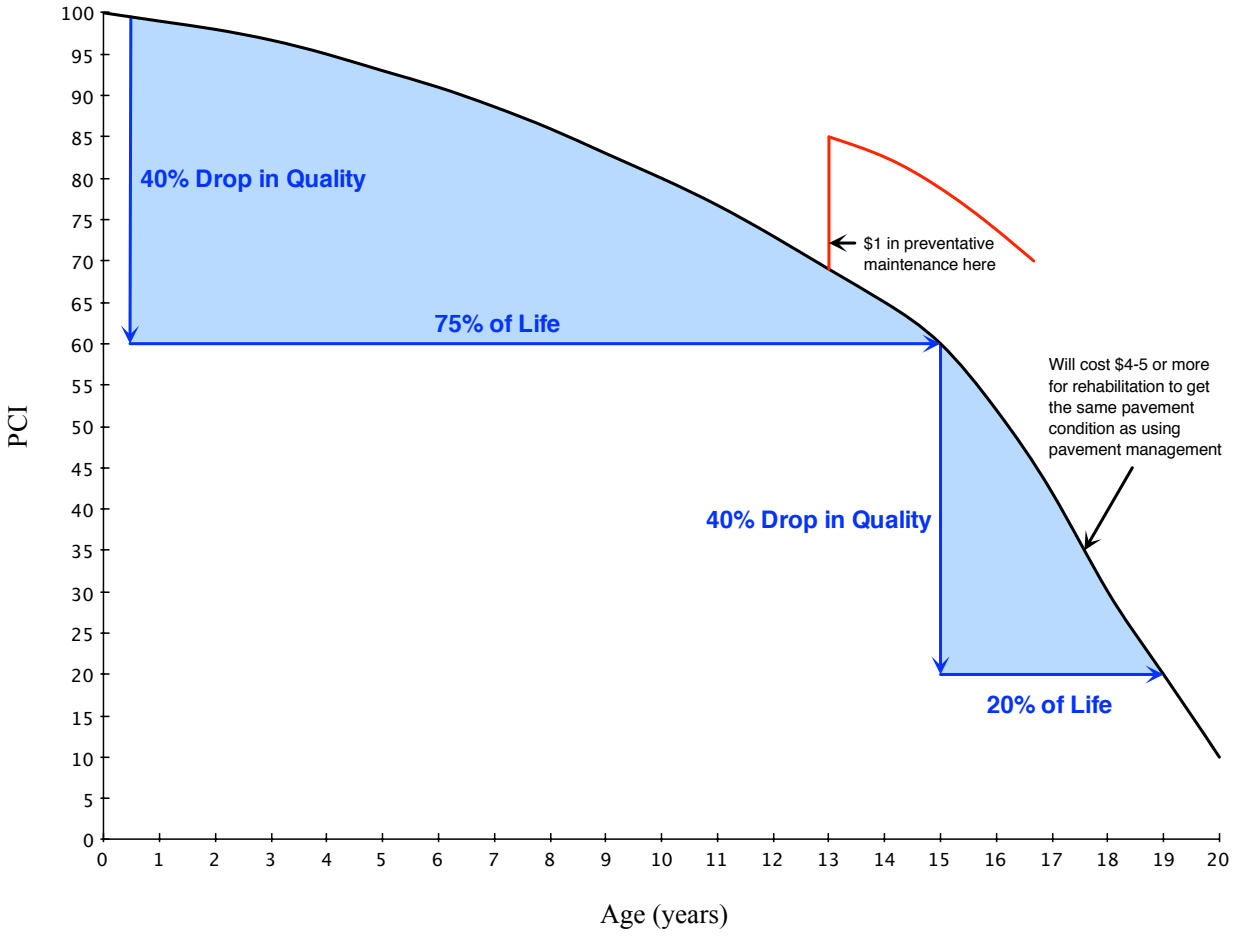

Table 11. Estimated Maintenance and Rehabilitation (M&R) Actions by Year for Asphalt Concrete Sections

Branch ID	Section	2010	2011	2012	2013	2014	2015	2016	2017	2018
Apron 1	3	8	3	0	0	0	0	0	0	0
Apron 1	4	0	0	0	0	0	0	0	0	0
Apron 1	5	59	55	50	46	41	37	32	26	21
Apron 1	6	7	2	0	0	0	0	0	0	0
Apron 1	7	0	0	0	0	0	0	0	0	0
Apron 1	8	0	0	0	0	0	0	0	0	0
Apron 1	9	20	15	9	4	0	0	0	0	0
Apron 1	11	0	0	0	0	0	0	0	0	0
Apron 1	14	58	54	49	45	40	35	30	25	19
Apron 1	15	1	0	0	0	0	0	0	0	0
Apron 1	16	22	16	10	5	0	0	0	0	0
Apron 1	17	3	0	0	0	0	0	0	0	0
Apron 1	18	0	0	0	0	0	0	0	0	0
Apron 2	2	51	46	42	37	32	27	21	16	10
Runway 12-30	2	42	37	32	27	21	16	10	5	0
Runway 12-30	4	46	42	37	32	27	21	16	10	5
Runway 12-30	6	20	15	9	4	0	0	0	0	0
Runway 17-35	1	79	76	73	69	66	62	58	54	50
Runway 3-21	3	71	68	67	65	64	63	63	62	61
Taxiway 1	4	46	42	37	32	27	21	16	10	5
Taxiway 11	1	27	22	16	11	5	0	0	0	0
Taxiway 2	1	89	87	84	82	79	76	73	69	66
Taxiway 3	4	4	0	0	0	0	0	0	0	0
Taxiway 3	6	0	0	0	0	0	0	0	0	0
Taxiway 3	7	100	99	97	96	94	92	90	88	86

Branch ID	Section	2010	2011	2012	2013	2014	2015	2016	2017	2018
Taxiway 3	8	100	99	97	96	94	92	90	88	86
Taxiway 3	9	83	80	77	74	71	67	64	60	56
Taxiway 3	10	100	99	97	96	94	92	90	88	86
Taxiway 4	1	100	99	97	96	94	92	90	88	86
Taxiway 6	1	27	22	16	11	5	0	0	0	0

Legend (maintenance required – general condition)		
None - Excellent		PCI ≥ 90 – maintenance is probably not necessary.
Light - Very Good		80 ≤ PCI ≤ 90 – light maintenance, such as crack sealing may be necessary.
Medium - Good		65 ≤ PCI ≤ 80 – medium maintenance, such as crack sealing and surface coating.
Medium to Major - Fair		40 ≤ PCI ≤ 65 – thin mill (half-depth) and overlay.
Major to complete - Poor or worse		PCI ≤ 40 – full-depth mill and overlay, or entire rebuild, if not structurally sound.

8. Maintenance and Rehabilitation (M&R) Options

NMDOT-Aviation Division currently uses the following pavement maintenance options:

- **Seal coat** – an asphalt seal placed on the top surface of the asphalt concrete pavement. It is used to seal small cracks, reduce pavement binder oxidation at the surface, and improve friction. Typical lifetime is 3-6 years.
- **Crack sealing** – typically, compressed air is used to clean cracks in the pavement, and then the cracks are filled with a sealant. This method reduces water infiltration, and it can prevent cracks from developing into more serious distresses, such as larger pavement pieces breaking loose. Typical lifetime is 3 years.
- **Crack filling (Mastic)** – this method is similar to crack sealing, but the preparation may vary, since more material has to be removed from the cracked area. This method is used for wide cracks. Typical lifetime is 2-3 years.
- **Thermoplastic coal tar emulsion slurry seal** – a proprietary thermoplastic compound derived from coal tar that is also resistant to surface fuel spillage. The thermoplastic coal tar emulsion slurry seal is mixed with aggregate material, and placed on the pavement wearing surface. It can be used for new pavement construction and also for rehabilitation. Typical lifetime is 5-7 years for rehabilitated pavements, and 15 years for new pavements.
- **Emulsified pavement sealer and rejuvenator** – an emulsified sealer and binder that is placed on the pavement wearing surface. The seal provides an anti-oxidative seal for the asphalt pavement surface. Typical lifetime is 3-5 years.
- **Fog seal** – a diluted emulsion, typically 1 part emulsion and 1 part dilutant (e.g. water), is added to the pavement surface. This treatment is used to delay raveling and oxidation. Typical lifetime is 1-2 years.
- **Slurry seal** – a mixture of fine aggregate, asphalt emulsion, water and mineral filler added to the pavement surface. This treatment is used, when excessive oxidation and hardening of the surface is a problem. Slurry seals retard surface raveling, seal small cracks, and improve surface friction. Typical lifetime is 3-5 years.

Estimated and relative costs for typical maintenance options for asphalt concrete are presented in Table 12. Table 13 contains the cost estimates for seal coating of the various asphalt concrete branches at Roswell International Air Center (apron, runway, taxiway), assuming that the entire surface is coated. Since crack treatments depend upon the number and severity of cracks, any cost estimate would have to be based upon visual inspection of the affected areas.

Table 12. Current NMDOT-Aviation Division Pavement Asphalt Concrete Maintenance Options

Crack Treatments	Estimated Cost (Applied) [linear ft]	Relative Cost	Estimated Additional Lifetime [years]
Crack sealing	$0.20	0.80	3
Crack filling	$0.25	1.00	2-3
Surface Treatments	[yd^2]		
Fog seal	$0.15	0.03	1-2
Coal tar sealer (seal coat)	$0.55	0.10	3-6
Emulsified pavement sealer and rejuvenator	$1.00	0.18	3-5
Slurry seal	$1.50	0.28	3-5
Thermoplastic coal tar emulsion slurry seal	$5.42	1.00	5-7

Note: relative cost is compared to the most expensive treatment. Estimated costs are based on 2008 average treatment cost.

Table 13. Estimated Costs of Seal Coatings at on the Asphalt Concrete Surfaces at Roswell International Air Center (ROW)

Branch ID	Section	Area [ft^2]	Fog Seal [$]	Seal Coat [$]	Emulsified Pavement Sealer [$]	Slurry Seal [$]	Thermoplastic Coal Tar Emulsion Slurry Seal [$]
Apron 1	3	120,000	$ 2,000	$ 7,333	$ 13,333	$ 20,000	$ 72,267
Apron 1	4	10,000	$ 167	$ 611	$ 1,111	$ 1,667	$ 6,022
Apron 1	5	16,250	$ 271	$ 993	$ 1,806	$ 2,708	$ 9,786
Apron 1	6	503,100	$ 8,385	$ 30,745	$ 55,900	$ 83,850	$ 302,978
Apron 1	7	22,250	$ 371	$ 1,360	$ 2,472	$ 3,708	$ 13,399
Apron 1	8	18,900	$ 315	$ 1,155	$ 2,100	$ 3,150	$ 11,382
Apron 1	9	51,300	$ 855	$ 3,135	$ 5,700	$ 8,550	$ 30,894
Apron 1	11	11,750	$ 196	$ 718	$ 1,306	$ 1,958	$ 7,076
Apron 1	14	45,000	$ 750	$ 2,750	$ 5,000	$ 7,500	$ 27,100
Apron 1	15	24,750	$ 413	$ 1,513	$ 2,750	$ 4,125	$ 14,905
Apron 1	16	32,750	$ 546	$ 2,001	$ 3,639	$ 5,458	$ 19,723
Apron 1	17	26,500	$ 442	$ 1,619	$ 2,944	$ 4,417	$ 15,959
Apron 1	18	11,250	$ 188	$ 688	$ 1,250	$ 1,875	$ 6,775
Apron 2	2	22,500	$ 375	$ 1,375	$ 2,500	$ 3,750	$ 13,550
Runway 12-30	2	220,000	$ 3,667	$ 13,444	$ 24,444	$ 36,667	$ 132,489
Runway 12-30	4	173,250	$ 2,888	$ 10,588	$ 19,250	$ 28,875	$ 104,335
Runway 12-30	6	173,250	$ 2,888	$ 10,588	$ 19,250	$ 28,875	$ 104,335
Runway 17-35	1	975,000	$ 16,250	$ 59,583	$ 108,333	$ 162,500	$ 587,167
Runway 3-21	4	1,105,00(	$ 18,417	$ 67,528	$ 122,778	$ 184,167	$ 665,456
Taxiway 1	4	76,400	$ 1,273	$ 4,669	$ 8,489	$ 12,733	$ 46,010
Taxiway 11	1	120,050	$ 2,001	$ 7,336	$ 13,339	$ 20,008	$ 72,297
Taxiway 2	1	35,750	$ 596	$ 2,185	$ 3,972	$ 5,958	$ 21,529

Branch ID	Section	Area [ft^2]	Fog Seal [$]	Seal Coat [$]	Emulsified Pavement Sealer [$]	Slurry Seal [$]	Thermoplastic Coal Tar Emulsion Slurry Seal [$]
Taxiway 3	4	140,625	$ 2,344	$ 8,594	$ 15,625	$ 23,438	$ 84,688
Taxiway 3	6	140,625	$ 2,344	$ 8,594	$ 15,625	$ 23,438	$ 84,688
Taxiway 3	7	289,125	$ 4,819	$ 17,669	$ 32,125	$ 48,188	$ 174,118
Taxiway 3	8	75,625	$ 1,260	$ 4,622	$ 8,403	$ 12,604	$ 45,543
Taxiway 3	9	60,625	$ 1,010	$ 3,705	$ 6,736	$ 10,104	$ 36,510
Taxiway 3	10	203,500	$ 3,392	$ 12,436	$ 22,611	$ 33,917	$ 122,552
Taxiway 4	1	22,500	$ 375	$ 1,375	$ 2,500	$ 3,750	$ 13,550
Taxiway 6	1	36,000	$ 600	$ 2,200	$ 4,000	$ 6,000	$ 21,680

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