ALASKA
Department of Transportation and Public Facilities

Southcoast Region Design & Engineering Services-
Materials Section

GEOTECHNICAL RECOMMENDATIONS REPORT

HNS AIRPORT RESURFACING

SFAPT00234 / -------

October 2020

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"Keep Alaska moving through service and infrastructure."

GEOTECHNICAL RECOMMENDATIONS REPORT

HNS AIRPORT RESURFACING

Project No. SFAPT00234/-------

October 2020

Report Prepared By:

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Regional Geotechnical Engineer

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Regional Materials Engineer

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State of Alaska
Department of Transportation and Public Facilities
Southcoast Region Materials Section

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APPENDICES

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1.0 INTRODUCTION

This report provides geotechnical recommendations for the proposed HNS Airport Resurfacing project in Haines, Alaska. The Alaska Department of Transportation And Public Facilities (ADOT&PF) will rehabilitate the existing pavement on Runway 08/26 and Taxiways A/B/C/D/E, replace runway and taxiway lighting, replace existing cross culverts, and install perimeter fencing as part of the subject project.

The following recommendations are based on the subsurface soil conditions reported in the *Haines Airport Resurfacing Geotechnical Data Report* (GDR) prepared by HDL Engineering Consultants, LLC in June, 2020 and the *Haines Airport Drainage Improvements & Pavement Rehabilitation GDR* prepared by the Southcoast Region Materials Section in February, 2016. The recommendations were developed in accordance with the Federal Aviation Administration (FAA) Advisory Circulars (AC) 150/5320-6F *Airport Pavement Design and Evaluation* and 150/5390-2C *Heliport Design*. Construction methods and material specifications referenced by item number or name are described in the ADOT&PF *Standard Specifications for Airport Construction, 2020 Edition* (SSAC) and FAA AC 150/5370-10H *Standard Specifications for Construction of Airports*.

2.0 EXISTING CONDITIONS

2.1 Site Description

The Haines Airport is located approximately three miles west of Haines, Alaska. The airport is bordered by Mount Ripinski to the north and the Chilkat River to the south. The original airport consisted of a 3000'x100' gravel runway constructed in 1952. The airport was modified to its current configuration in 1992. Operational surfaces at the airport include of a single 4000'x100' runway (Runway 08/26), a 4000'x100' parallel taxiway (Taxiway A), four connector taxiways (Taxiway B/C/D/E/) of various lengths, a General Aviation (GA) apron, a helipad, and a helipad taxilane.

The GA apron and sections of Taxiways A/B/C were resurfaced in 2018 as part of the *HNS Airport Drainage Improvements and Pavement Rehabilitation* project. Runway 08/26, Taxiway D, Taxiway E, the helipad, and the remaining portions of Taxiways A/B/C have not been resurfaced since 1992. The 2018 Pavement Inspection Report for the Haines Airport, provided in Appendix A, recommended corrective maintenance be performed on these operational surfaces. During a site visit in July, 2020 longitudinal, transverse, and alligator cracking was observed on the runway, taxiways, and helipad. Maintenance and Operations (M&O) personnel indicated the frequency and severity of the cracking has increased.

2.2 Subsurface Conditions

HDL Engineering Consultants, LLC completed a geotechnical subsurface investigation at the Haines Airport in July, 2020. This subsurface investigation included the twenty-one borings on Runway 08/26, fifteen borings on Taxiway A, one boring each on Taxiway D and E, and two borings on the helipad taxilane. The results of the 2020 investigation are summarized below. For additional information refer to the project's GDR.

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Table 1 – Summary of Runway 08/26 Subsurface Conditions

	Runway 08/26			
	Asphalt Thickness (inches)	**Base Course Thickness (inches)**	**Base Course Fines Content (percent) ***	**Average Modulus Value (ksi)^**
Minimum	2	6	6.9	7.7
Maximum	2	57.6	9.7	35.3
Average	2	20	8.3	22
Standard Deviation	0	11	0.9	8

Table 2 - Summary of Taxiway A/B/C/D/E Subsurface Conditions

	Taxiways A/B/C/D/E			
	Asphalt Thickness (inches)	**Base Thickness (inches)**	**Base Course Fines Content (percent) ***	**Average Modulus Value (ksi)^**
Minimum	2	3.6	5.1	12.3
Maximum	3.5	48	24.3	45.9
Average	2.6	13.5	13.9	22
Standard Deviation	0.4	11.2	5.9	9

Table 3 - Summary of Helipad Taxilane Subsurface Conditions

	Helipad Taxilane		
	Surface Course Thickness (inches)	**Surface Course Fines Content (percent) ***	**Average Modulus Value (ksi)^**
Minimum	7.2	4.4	12.3
Maximum	10.8	13.6	45.9
Average	9	9	22
Standard Deviation	2.5	6.5	16

***** Fines content represents the percentage of material passing the No. 200 sieve in the first sample reported for each boring location
^ Modulus values for unbound materials in the existing pavement structure were determined at each boring location using a lightweight deflectometer. The average modulus values determined using a 300mm load plate were used for design.

2.3 Frost Susceptibility

FAA categorizes soils into four frost groups (FG-1 through FG-4) for frost design purposes. Higher frost group numbers correspond with a higher frost susceptibility and higher potential for frost heave. The frost groups are determined by the soil's USCS classification and the percentage of material finer than 0.02mm ($P_{.02mm}$). Table 4 provides the frost group category for each operational surface based on the results of the 2020 geotechnical investigation. The $P_{.02mm}$ for the soils was estimated as half of the percentage of material passing the No. 200 sieve as recommended by the Alaska Flexible Pavement Design Manual.

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Table 4 - Operational Surface Frost Groups

Operational Surface	Design Frost Group (FG)
Runway 08/26	FG-2
Taxiway A	FG-2
Taxiway D & E	FG-2
Helipad and Heli-taxiway	FG-2

3.0 Fleet Mix

The fleet mix used for pavement design, provided in Table 5, represents aircraft that regularly use the airport or have a significant impact on the pavement structure. The fleet mix was develop based on the project's *Scoping Summary Report* provided by HDL Engineering Consultants, LLC. The FAA defines regular using aircraft as any aircraft with at least 250 annual departures (500 operations) from an airport. The Pilatus PC-12 and Beechcraft King Air B-200 have less than 500 annual operations but were included in the design fleet mix since they are the heaviest aircraft in the overall fleet and could impact pavement performance.

The Truck Axle Dual-Tandem and Truck Axle Tandem vehicles were included in the fleet mix to represent snow removal operations. The airport is plowed approximately 30 times per year using a plow truck with a sand spreader, and a grader.

Table 5 - Fleet Mix Used for Pavement Design

Aircraft/Vehicle	Gross Weight (lbs.)	Annual Operations
Cessna 205/206/207 Stationair	3,612	634
de Havilland DCH-2 Beaver	5,100	1,000
Piper PA-31 Navajo	6,536	1,255
Cessna Grand Caravan CE-208B	8,750	2,810
Pilatus PC-12	9,921	172
Beechcraft King Air B-200	12,590	432
Truck Axle Dual–Tandem	74,960	30
Truck Axle Tandem	37,480	30

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4.0 Design Criteria

The design criteria applicable to the pavement design are provided in Table 6.

Table 6 - HNS Airport Pavement Design Criteria

Criteria	Requirement	Reference
Design Life	20 years	AC 150/5320-6F Section 3.11.1
Minimum HMA Thickness	3 inches (MAGW* < 12,500 lbs.)	AC 150/5320-6F Table 3-3
	4 inches (MAGW* < 100,000 lbs.)	AC 150/5320-6F Table 3-3
Minimum Crushed Aggregate Base Thickness	3 inches (MAGW* < 12,500 lbs.)	AC 150/5320-6F Table 3-3
	6 inches (MAGW* < 100,000 lbs.)	AC 150/5320-6F Table 3-3

*Maximum Airplane Gross Weight Operating on Pavement

The FAA specifies minimum pavement layer thicknesses based on maximum airplane gross weight (MAGW). All regular using aircraft MAGW are less than 12,500 pounds, however since the King Air B-200 MAGW exceeds 12,500 pounds the proposed pavement recommendations were evaluated using the minimum layer thicknesses for both aircraft weight classes.

5.0 Pavement Recommendations

The following section provides pavement structural section recommendations for each operational surface. Recommendations were evaluated using the FAA's mechanistic-empirical pavement design software, FAARFIELD v1.42. The results of the pavement analysis are provided in Appendix B.

A value of one standard deviation below the mean modulus value for each operation surface was used to model the subgrade strength in accordance with AC 150/5320-6F Section 2.1.3.2. Modulus values were converted to California Bearing Ratio (CBR) values using the correlation provide in AC 150/5320-6F Section 2.5.3. The Reduced Subgrade Strength (RSS) method was used to address the effects of seasonal frost. The RSS method addresses the effects of thaw weakening but does not address frost heave. Subgrade CBR values for the RSS method were selected based on the Frost Group designation for each operational surface. The soil thawing period was conservatively assumed to last three months.

5.1 Runway 08/26 & Taxiway A/B/C/D/E

The existing hot mix asphalt (HMA) surface on Runway 08/26 and Taxiways A/B/C/D/E has reached the end of its service life and should be replaced. Three inches of P-401 HMA, Type II, Class B with PG58-34E binder is recommended for the new pavement surface. The results of the pavement analysis indicated that the Beechcraft King Air B-200 does not significantly impact the pavement structure and that three inches of HMA will provide a 20 year service life.

The existing base course has a high fines content and is susceptible to frost action and thaw weakening. Two approaches are recommended to address the base course: Remove and Replace, or Full Depth Reclamation. One approach should be selected and applied to all operational surface, including the shoulders. The first approach, shown in Figure 1, is to remove six inches of existing

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base course and replace it with six inches of new Crushed Aggregate Base Course (CABC) meeting the requirements of P-209 before placing the new pavement surface.

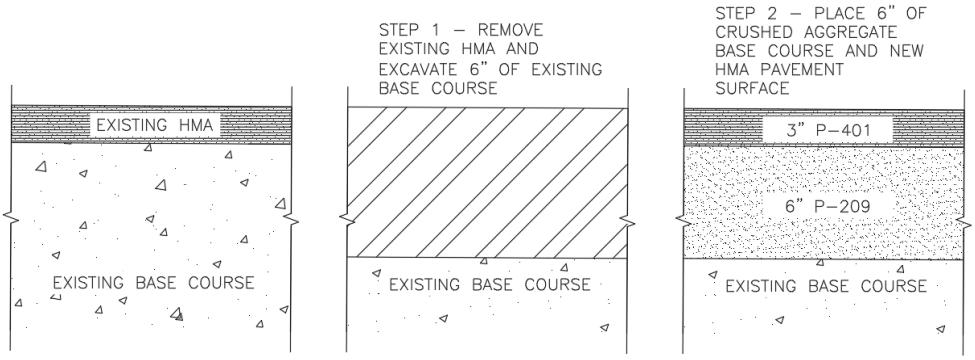

Figure 1 - Runway 08/26 and Taxiway A/B/C/D/E Pavement Structural Section Option 1 - Remove and Replace

The second approach, P-207 Full Depth Reclamation (FDR), is a pavement rehabilitation technique that recycles the existing HMA and base course. The FDR process, shown in Figure 2, consists of pulverizing the existing HMA surface and blending it with the underlying base course. Stabilizing agents are added to improve the performance of the recycled material as needed. The recycled material is then shaped and compacted to the required lines and grade before a new HMA surface is placed.

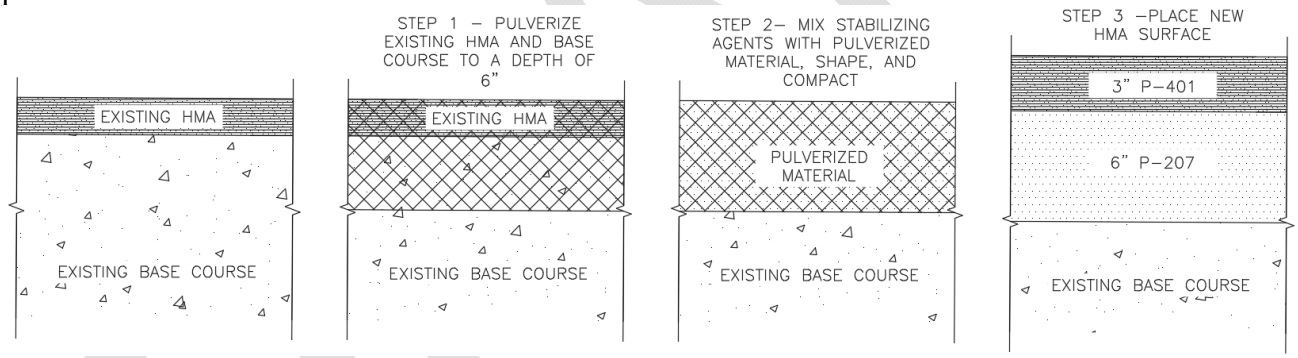

Figure 2 - Runway 8/26 and Taxiway A/B/C/D/E Pavement Structural Section Option 2 – Full Depth Reclamation

The FDR course should extend to six inches below the existing pavement surface. FDR material typically swells 5% to 10% of its original thickness. The additional FDR material may be removed or left in place. The following stabilizing agents are recommended for the FDR course:

Table 7 - Stabilizing Agents for P-207 Full Depth Reclamation

Stabilizing Agent	Application Rate
CSS-1 Emulsified Asphalt	2.5 gallons per square yard
Portland Cement	6.8 pounds per square yard

5.2 Helipad, Helipad Taxiway, and Helipad Access Road

A new pavement structural section consisting of eight inches of P-154 Subbase, three inches of P-209 CABC, and three inches of P-401 HMA Type II, Class B with PG58-34E asphalt binder is recommended for the helipad, helipad taxiway, and helipad access road (see Figure 3).

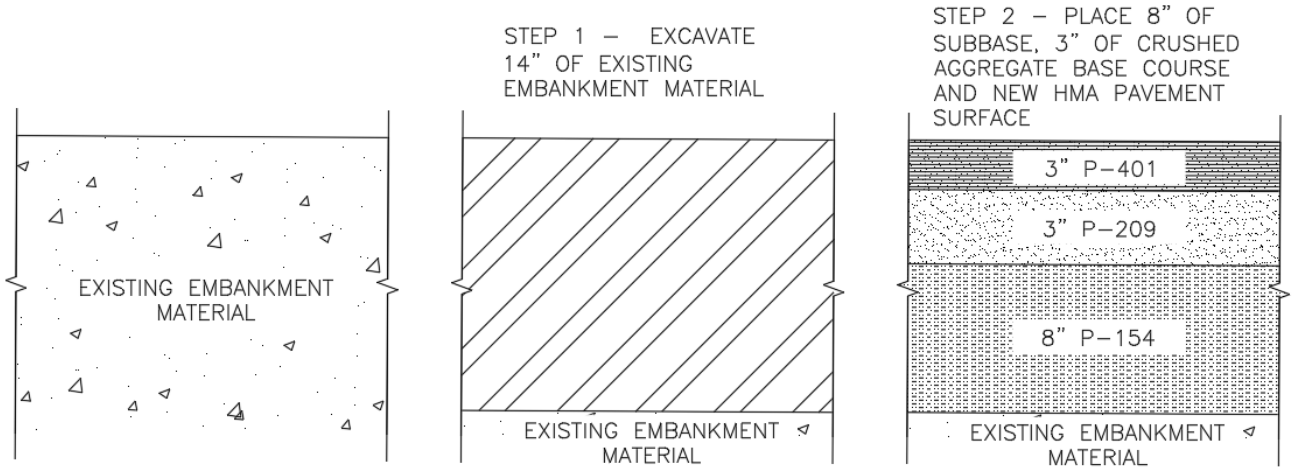

Figure 3 - Helipad and Helipad Taxiway Pavement Structural Section

Based on the performance of the existing helipad, the low traffic volume, and low aircraft loads asphalt pavement is recommended for the helipad surface. AC 150/5390-2C recommends using Portland Cement Concrete (PCC) pavement for helipads if feasible, however asphalt pavement will provide an equivalent level of service to PCC and is more cost effective for this helipad.

6.0 Embankment Recommendations

Where additional fill is required below the recommended pavement structures P-154 Subbase should be used to a maximum depth of eight inches below the base course. Suitable material meeting the requirements of P-152-2.3 should be used if additional fill is required below the subbase.

7.0 Closure

This Geotechnical Recommendation Report has been prepared for the exclusive use of DOT&PF Design and Engineering Services for the HNS Airport Resurfacing project. The Southcoast Region Geotechnical Engineer should be notified if there are significant changes in nature, design, or locations of the proposed activities so that we may review our conclusions and recommendations in light of the proposed changes and provide written modification or verifications of the changes.

If variations in the subsurface soils from those described in the Geology Data Report are noted during construction, notify the Southcoast Region Geotechnical Engineer so the recommendations in this report may be re-evaluated.

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REFERENCES

Alaska Department of Transportation and Public Facilities. *Haines Airport Drainage Improvements & Pavement Rehabilitation Geology Data Report,* February 2016.

Alaska Department of Transportation and Public Facilities. *Standard Specification for Airport Construction, 2020*.

Federal Aviation Administration. *Advisory Circular 150/5320-6F Airport Pavement Design and Evaluation*, November 2016.

Federal Aviation Administration. *Advisory Circular 150/5370-10H Standard Specifications for Construction of Airports*, December 2018

Federal Aviation Administration. *Advisory Circular 150/5390-2C Heliport Design*, April 2012.

Federal Aviation Administration. *FAARFIELD version 1.42.0003*, 2017.

HDL Engineering Consultants, LLC. *Haines Airport Resurfacing Geotechnical Data Report,* September 2020.

HDL Engineering Consultants, LLC. *Haines Airport Resurfacing Project Scoping Summary Report*, June 2020.

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Appendix A – 2018 Pavement Inspection Report

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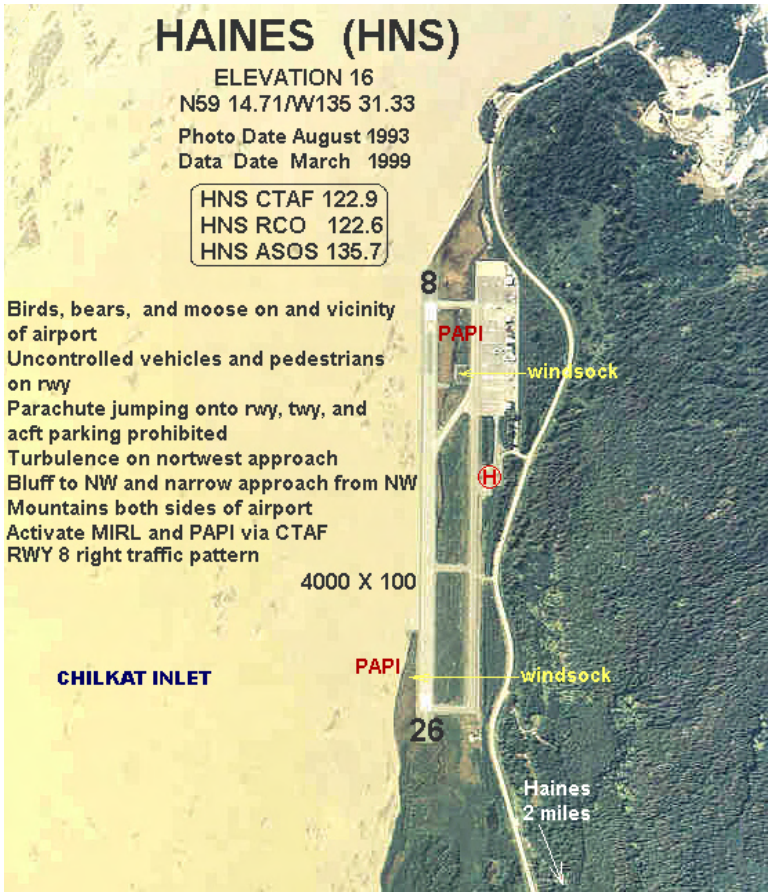

HAINES AIRPORT

Alaska Airport Pavement Inspection Report

Published October 2018

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Date: 10 /22/2018

Branch Condition Report

Pavement Database: PAVERDB_ALL NetworkID: Haines

Branch ID	Number of Sections	Sum Section Length (Ft)	Avg Section Width (Ft)	True Area (SqFt)	Use	Average PCI	PCI Standard Deviation	Weighted Average PCI
0100 (Taxiway A)	3	4,000.00	48.33	194,750.00	TAXIWAY	89.00	15.56	79.71
0200 (Taxiway B)	2	380.00	40.00	15,580.00	TAXIWAY	85.00	14.00	94.47
0300 (Taxiway C)	2	720.00	40.00	37,920.00	TAXIWAY	85.00	15.00	82.66
0400 (Taxiway D)	1	380.00	40.00	17,050.00	TAXIWAY	63.00	0.00	63.00
0500 (Taxiway E)	1	380.00	40.00	16,500.00	TAXIWAY	66.00	0.00	66.00
4100 (Main Apron)	2	2,268.00	175.00	378,240.00	APRON	100.00	0.00	100.00
4200 (Helipad)	1	150.00	140.00	21,000.00	HELIPAD	58.00	0.00	58.00
6100 (08/26)	2	4,000.00	100.00	400,000.00	RUNWAY	65.50	1.50	64.30

Branch Condition Report

Pavement Database: PAVERDB_ALL

Use Category	Number of Sections	Total Area (SqFt)	Arithmetic Average PCI	Average PCI STD.	Weighted Average PCI
APRON	2	378,240.00	100.00	0.00	100.00
HELIPAD	1	21,000.00	58.00	0.00	58.00
RUNWAY	2	400,000.00	65.50	1.50	64.30
TAXIWAY	9	281,800.00	81.78	16.22	79.11
All	14	1,081,040.00	80.36	17.12	80.53

Date: 10 /22/2018

Section Condition Report

Pavement Database: PAVERDB_ALL NetworkID: Haines

Branch ID	Section ID	Last Const. Date	Surface	Use	Rank	Lanes	True Area (SqFt)	Last Inspection Date	Age At Inspection	PCI
0100 (Taxiway A)	0100-01	07/20/2018	AAC	TAXIWAY	P	0	66,000.00	08/20/2018	0	100.00
0100 (Taxiway A)	0100-02	07/20/2018	AAC	TAXIWAY	P	0	9,000.00	08/20/2018	0	100.00
0100 (Taxiway A)	0100-03	09/01/1992	AC	TAXIWAY	P	0	119,750.00	08/20/2018	26	67.00
0200 (Taxiway B)	0200-01	09/01/1992	AC	TAXIWAY	P	0	13,060.00	08/20/2018	26	99.00
0200 (Taxiway B)	0200-02	07/20/2018	AAC	TAXIWAY	P	0	2,520.00	08/20/2018	0	71.00
0300 (Taxiway C)	0300-01	09/01/1992	AC	TAXIWAY	P	0	21,920.00	08/20/2018	26	70.00
0300 (Taxiway C)	0300-02	07/20/2018	AAC	TAXIWAY	P	0	16,000.00	08/20/2018	0	100.00
0400 (Taxiway D)	0400-01	09/01/1992	AC	TAXIWAY	P	0	17,050.00	08/20/2018	26	63.00
0500 (Taxiway E)	0500-01	09/01/1992	AC	TAXIWAY	P	0	16,500.00	08/20/2018	26	66.00
4100 (Main Apron)	4100-01	07/20/2018	AAC	APRON	P	0	333,240.00	08/20/2018	0	100.00
4100 (Main Apron)	4100-02	07/20/2018	AAC	APRON	P	0	45,000.00	08/20/2018	0	100.00
4200 (Helipad)	4200-01	09/01/1992	AC	HELIPAD	P	0	21,000.00	08/20/2018	26	58.00
6100 (08/26)	6100-01	09/01/1992	AC	RUNWAY	P	0	360,000.00	08/20/2018	26	64.00
6100 (08/26)	6100-02	09/01/1993	AC	RUNWAY	P	0	40,000.00	08/20/2018	25	67.00

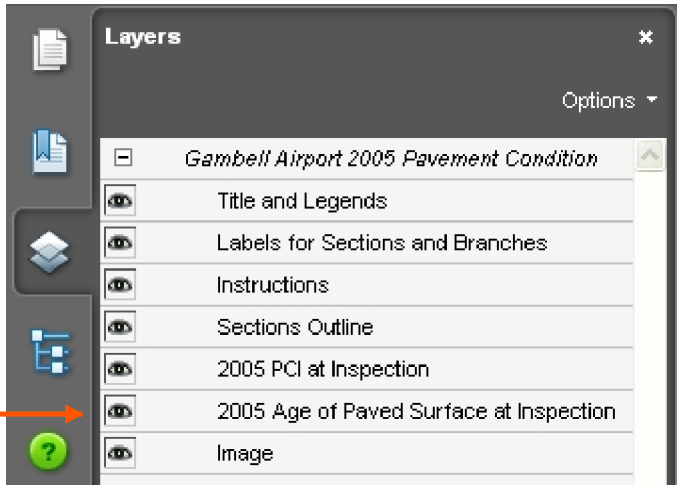
Section Condition Report

Pavement Database: PAVERDB_ALL

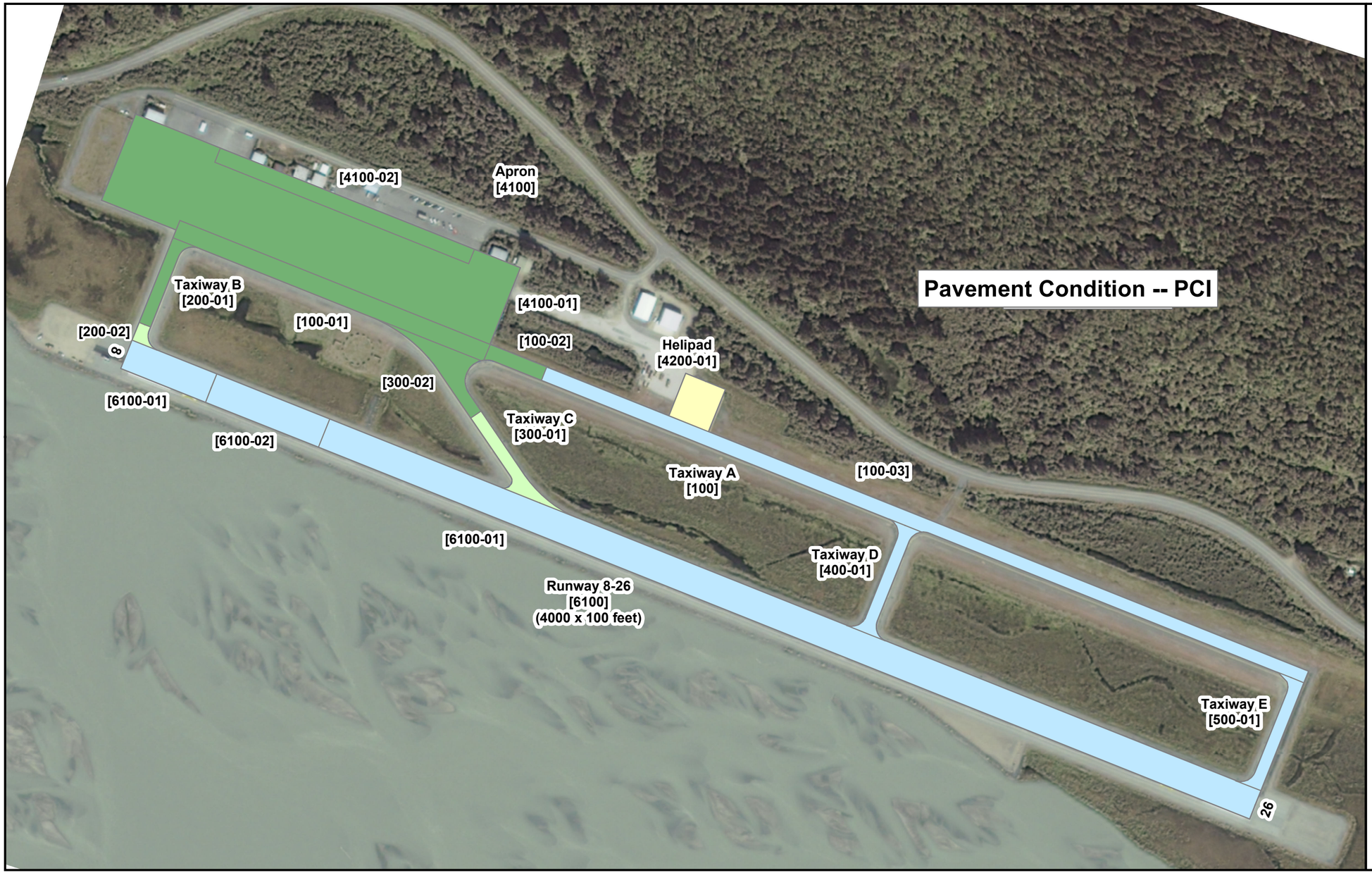
Age Category	Average Age At Inspection	Total Area (SqFt)	Number of Sections	Arithmetic Average PCI	PCI Standard Deviation	Weighted Average PCI
0-02	0.00	471,760.00	6	95.17	10.81	99.85
21-25	25.00	40,000.00	1	67.00	0.00	67.00
26-30	26.00	569,280.00	7	69.57	12.50	65.47
All	14.79	1,081,040.00	14	80.36	17.12	80.53

Instructions for Viewing Map Layers

- The map contains layers, and must be opened with Adobe Reader version 8 or later.



- Click on Adobe's Layer Tab to View Layer Controls
- Click in a layer's box to turn it on/off
- The "eye" symbol shows that the layer is visible.
- These layers draw from the bottom up, which means that a layer higher in the list might block out the information on a lower layer. Turn off the higher layer to see the information on a visible lower layer.



Haines Airport

Airport Code: HNS
Site Number: 50296.*A

2018 Pavement Inspection Results

Map Compiled by Central Region Materials, AK DOT&PF

Pavement Condition Index (PCI)

Target PCI Range for Runways: 70 to 100
Target PCI Range for Taxiways and Aprons: 60 to 100

PCI Values	General Pavement Recommendations
85 - 100	Do Nothing or Preventative Maintenance
70 - 84	Preventative Maintenance
60 - 69	Corrective Maintenance
55 - 59	Rehabilitate
40 - 54	Rehabilitate
25 - 39	Reconstruct
10 - 24	Reconstruct
0 - 9	Reconstruct

Pavement Surface Age

- 0 - 4 years
- 5 - 9 years
- 10 - 14 years
- 15 - 19 years
- 20 - 24 years
- 25 - 29 years
- >30 years

[ ] Branch-Section Identifier

Aerial Image: 2005 USDA via UAF GINA BDL WMS

N
S

0 250 500 1,000
Feet

Appendix B – FAARFIELD Results

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FAARFIELD

FAARFIELD v 1.42 - Airport Pavement Design

Section RW_8-26 in Job HNS_AP.

Working directory is C:\Users\tweckhoff\Documents\FAARFIELD\

The structure is New Flexible. Asphalt CDF was not computed.

Design Life = 20 years.

A design for this section was completed on 09/30/20 at 12:51:59.

Minimum layer thicknesses were reached.

Pavement Structure Information by Layer, Top First

No.	Type	Thickness in	Modulus psi	Poisson's Ratio	Strength R,psi
1	User Defined	3.00	200,000	0.35	0
2	P-209 Cr Ag	6.00	40,303	0.35	0
3	Subgrade	0.00	15,000	0.35	0

Total thickness to the top of the subgrade = 9.00 in

Airplane Information

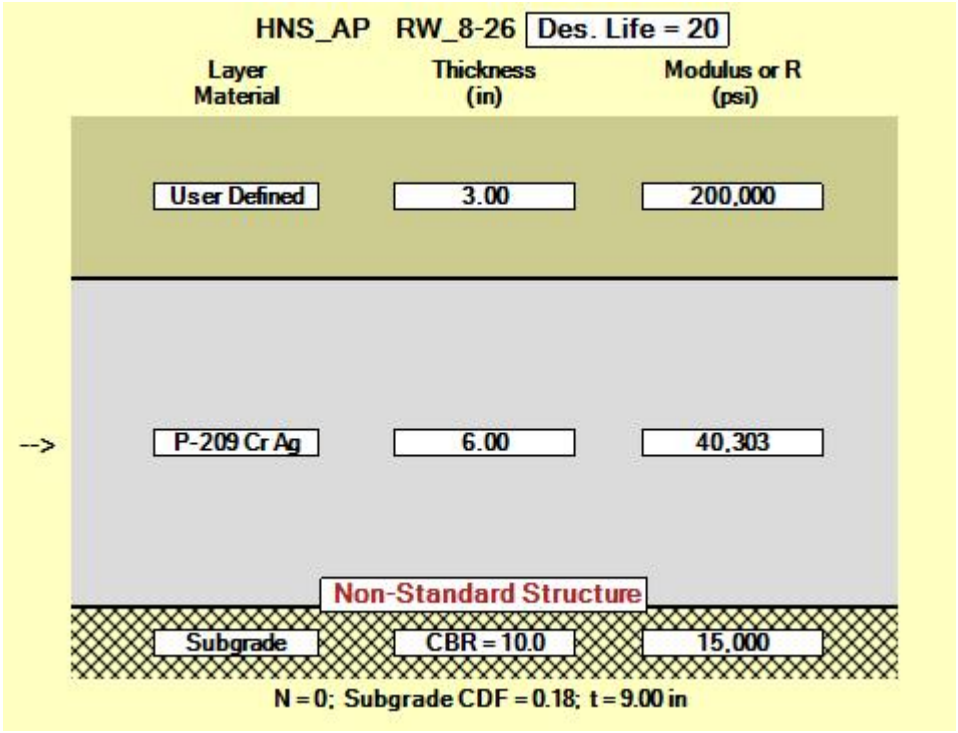
No.	Name	Gross Wt. lbs	Annual Departures	% Annual Growth
1	SuperKingAir-B200	12,590	216	2.50
2	GrnCaravan-CE-208B	8,750	1,405	2.50
3	Stationair-206	3,612	317	2.50
4	DHC-2 Beaver	5,100	500	2.50
5	Pilatus PC12	9,921	86	2.50
6	Navajo-C	6,536	628	2.50
7	Truck Axle Dual-Tandem	74,960	30	0.00
8	Truck Axle Tandem	37,480	30	0.00

Additional Airplane Information

Subgrade CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	SuperKingAir-B200	0.00	0.00	3.09
2	GrnCaravan-CE-208B	0.00	0.00	4.94
3	Stationair-206	0.00	0.00	5.42
4	DHC-2 Beaver	0.00	0.00	4.70
5	Pilatus PC12	0.00	0.00	4.57
6	Navajo-C	0.00	0.00	5.11
7	Truck Axle Dual-Tandem	0.15	0.15	2.30
8	Truck Axle Tandem	0.03	0.03	4.31

User is responsible for checking frost protection requirements.



FAARFIELD

FAARFIELD v 1.42 - Airport Pavement Design

Section RW_8-26_FDR in Job HNS_AP.

Working directory is C:\Users\tweckhoff\Documents\FAARFIELD\

The structure is New Flexible. Asphalt CDF was not computed.

Design Life = 20 years.

A design for this section was completed on 09/30/20 at 15:56:53.

Pavement Structure Information by Layer, Top First

No.	Type	Thickness in	Modulus psi	Poisson's Ratio	Strength R,psi
1	User Defined	3.00	200,000	0.35	0
2	User Defined	5.04	25,000	0.35	0
3	Subgrade	0.00	15,000	0.35	0

Total thickness to the top of the subgrade = 8.04 in

Airplane Information

No.	Name	Gross Wt. lbs	Annual Departures	% Annual Growth
1	SuperKingAir-B200	12,590	216	2.50
2	GrnCaravan-CE-208B	8,750	1,405	2.50
3	Stationair-206	3,612	317	2.50
4	DHC-2 Beaver	5,100	500	2.50
5	Pilatus PC12	9,921	86	2.50
6	Navajo-C	6,536	628	2.50
7	Truck Axle Dual-Tandem	74,960	30	0.00
8	Truck Axle Tandem	37,480	30	0.00

Additional Airplane Information

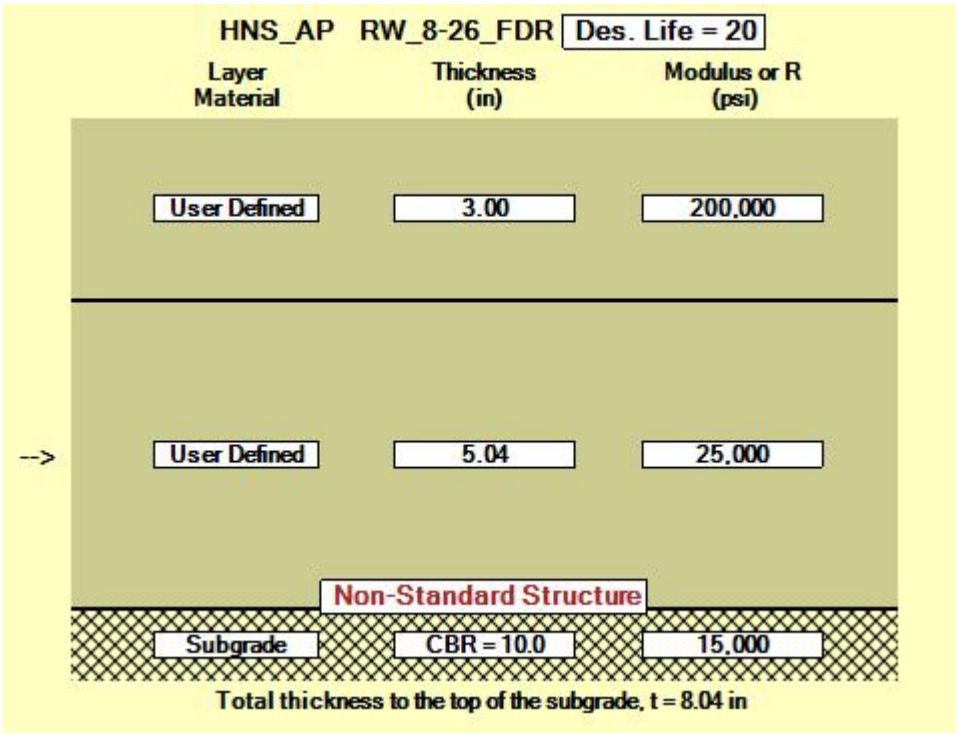
Subgrade CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	SuperKingAir-B200	0.00	0.00	3.21
2	GrnCaravan-CE-208B	0.00	0.00	5.26
3	Stationair-206	0.00	0.00	5.81
4	DHC-2 Beaver	0.00	0.00	4.99
5	Pilatus PC12	0.00	0.00	4.84
6	Navajo-C	0.00	0.00	5.45
7	Truck Axle Dual-Tandem	0.74	0.74	2.36
8	Truck Axle Tandem	0.26	0.26	4.55

HMA CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	SuperKingAir-B200	0.00	0.01	4.94
2	GrnCaravan-CE-208B	0.01	0.01	7.96
3	Stationair-206	0.00	0.00	9.37
4	DHC-2 Beaver	0.00	0.00	7.36
5	Pilatus PC12	0.00	0.00	7.04
6	Navajo-C	0.00	0.00	8.43
7	Truck Axle Dual-Tandem	0.00	0.01	1.65
8	Truck Axle Tandem	0.00	0.00	3.22

User is responsible for checking frost protection requirements.



FAARFIELD

FAARFIELD v 1.42 - Airport Pavement Design

Section RW_8-26_RSS in Job HNS_AP.

Working directory is C:\Users\tweckhoff\Documents\FAARFIELD\

The structure is New Flexible. Asphalt CDF = 0.0000.

Design Life = 20 years.

A design for this section was completed on 09/30/20 at 16:36:52.

Minimum layer thicknesses were reached.

Pavement Structure Information by Layer, Top First

No.	Type	Thickness in	Modulus psi	Poisson's Ratio	Strength R,psi
1	User Defined	3.00	200,000	0.35	0
2	P-209 Cr Ag	6.00	30,744	0.35	0
3	Subgrade	0.00	10,500	0.35	0

Total thickness to the top of the subgrade = 9.00 in

Airplane Information

No.	Name	Gross Wt. lbs	Annual Departures	% Annual Growth
1	SuperKingAir-B200	12,590	54	2.50
2	GrnCaravan-CE-208B	8,750	352	2.50
3	Stationair-206	3,612	80	2.50
4	DHC-2 Beaver	5,100	125	2.50
5	Pilatus PC12	9,921	22	2.50
6	Navajo-C	6,536	157	2.50
7	Truck Axle Dual-Tandem	74,960	8	0.00
8	Truck Axle Tandem	37,480	8	0.00

Additional Airplane Information

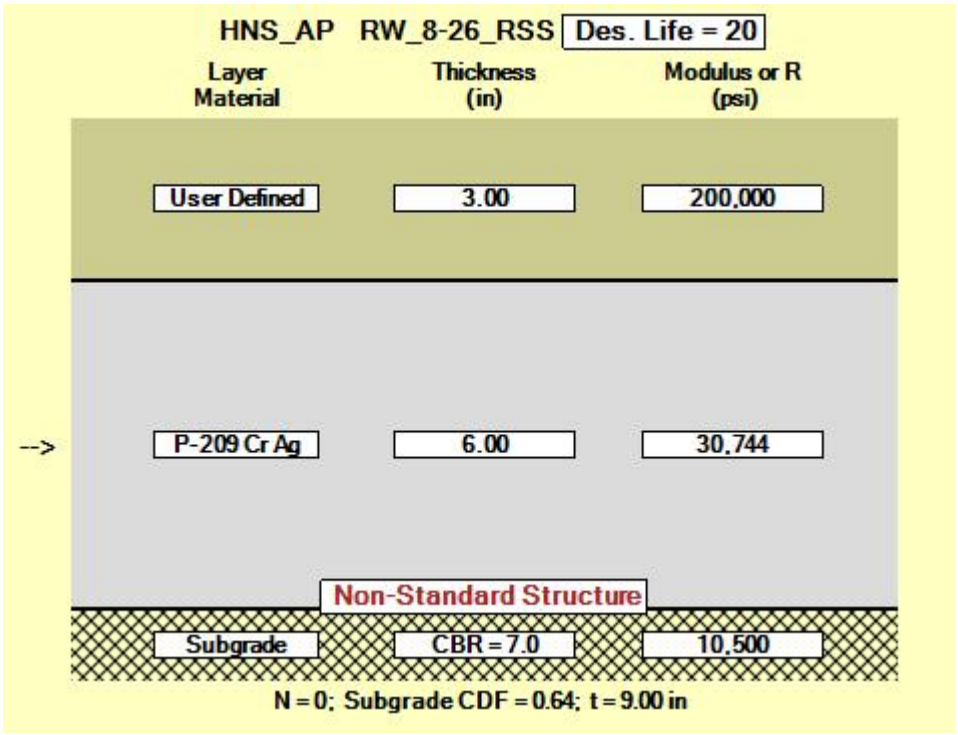
Subgrade CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	SuperKingAir-B200	0.00	0.00	3.09
2	GrnCaravan-CE-208B	0.00	0.00	4.94
3	Stationair-206	0.00	0.00	5.42
4	DHC-2 Beaver	0.00	0.00	4.70
5	Pilatus PC12	0.00	0.00	4.57
6	Navajo-C	0.00	0.00	5.11
7	Truck Axle Dual-Tandem	0.52	0.52	2.30
8	Truck Axle Tandem	0.12	0.12	4.31

HMA CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	SuperKingAir-B200	0.00	0.00	3.09
2	GrnCaravan-CE-208B	0.00	0.00	4.94
3	Stationair-206	0.00	0.00	5.42
4	DHC-2 Beaver	0.00	0.00	4.70
5	Pilatus PC12	0.00	0.00	4.57
6	Navajo-C	0.00	0.00	5.11
7	Truck Axle Dual-Tandem	0.52	0.52	2.30
8	Truck Axle Tandem	0.12	0.12	4.31

User is responsible for checking frost protection requirements.



FAARFIELD

FAARFIELD v 1.42 - Airport Pavement Design

Section RW_8-26_RSSF in Job HNS_AP.

Working directory is C:\Users\tweckhoff\Documents\FAARFIELD\

The structure is New Flexible. Asphalt CDF = 0.0069.

Design Life = 20 years.

A design for this section was completed on 09/30/20 at 16:37:03.

Pavement Structure Information by Layer, Top First

No.	Type	Thickness in	Modulus psi	Poisson's Ratio	Strength R,psi
1	User Defined	3.00	200,000	0.35	0
2	User Defined	5.83	25,000	0.35	0
3	Subgrade	0.00	10,500	0.35	0

Total thickness to the top of the subgrade = 8.83 in

Airplane Information

No.	Name	Gross Wt. lbs	Annual Departures	% Annual Growth
1	SuperKingAir-B200	12,590	54	2.50
2	GrnCaravan-CE-208B	8,750	352	2.50
3	Stationair-206	3,612	80	2.50
4	DHC-2 Beaver	5,100	125	2.50
5	Pilatus PC12	9,921	22	2.50
6	Navajo-C	6,536	157	2.50
7	Truck Axle Dual-Tandem	74,960	8	0.00
8	Truck Axle Tandem	37,480	8	0.00

Additional Airplane Information

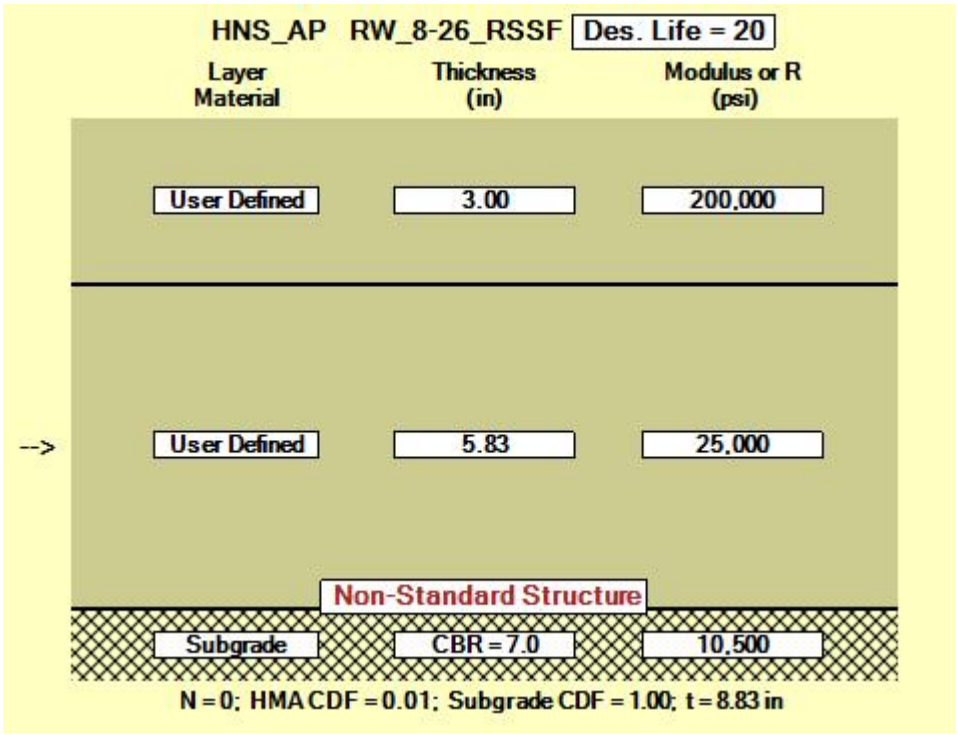
Subgrade CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	SuperKingAir-B200	0.00	0.00	3.11
2	GrnCaravan-CE-208B	0.00	0.00	4.99
3	Stationair-206	0.00	0.00	5.49
4	DHC-2 Beaver	0.00	0.00	4.75
5	Pilatus PC12	0.00	0.00	4.62
6	Navajo-C	0.00	0.00	5.17
7	Truck Axle Dual-Tandem	0.80	0.80	2.31
8	Truck Axle Tandem	0.20	0.21	4.35

HMA CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	SuperKingAir-B200	0.00	0.00	4.94
2	GrnCaravan-CE-208B	0.00	0.00	7.96
3	Stationair-206	0.00	0.00	9.37
4	DHC-2 Beaver	0.00	0.00	7.36
5	Pilatus PC12	0.00	0.00	7.04
6	Navajo-C	0.00	0.00	8.43
7	Truck Axle Dual-Tandem	0.00	0.00	1.65
8	Truck Axle Tandem	0.00	0.00	3.22

User is responsible for checking frost protection requirements.



FAARFIELD

FAARFIELD v 1.42 - Airport Pavement Design

Section TWs in Job HNS_AP.

Working directory is C:\Users\tweckhoff\Documents\FAARFIELD\

The structure is New Flexible. Asphalt CDF = 0.0000.

Design Life = 20 years.

A design for this section was completed on 09/30/20 at 16:37:10.

Minimum layer thicknesses were reached.

Pavement Structure Information by Layer, Top First

No.	Type	Thickness in	Modulus psi	Poisson's Ratio	Strength R,psi
1	User Defined	3.00	200,000	0.35	0
2	P-209 Cr Ag	6.00	37,234	0.35	0
3	Subgrade	0.00	13,500	0.35	0

Total thickness to the top of the subgrade = 9.00 in

Airplane Information

No.	Name	Gross Wt. lbs	Annual Departures	% Annual Growth
1	SuperKingAir-B200	12,590	216	2.50
2	GrnCaravan-CE-208B	8,750	1,405	2.50
3	Stationair-206	3,612	317	2.50
4	DHC-2 Beaver	5,100	500	2.50
5	Pilatus PC12	9,921	86	2.50
6	Navajo-C	6,536	628	2.50
7	Truck Axle Dual-Tandem	74,960	30	0.00
8	Truck Axle Tandem	37,480	30	0.00

Additional Airplane Information

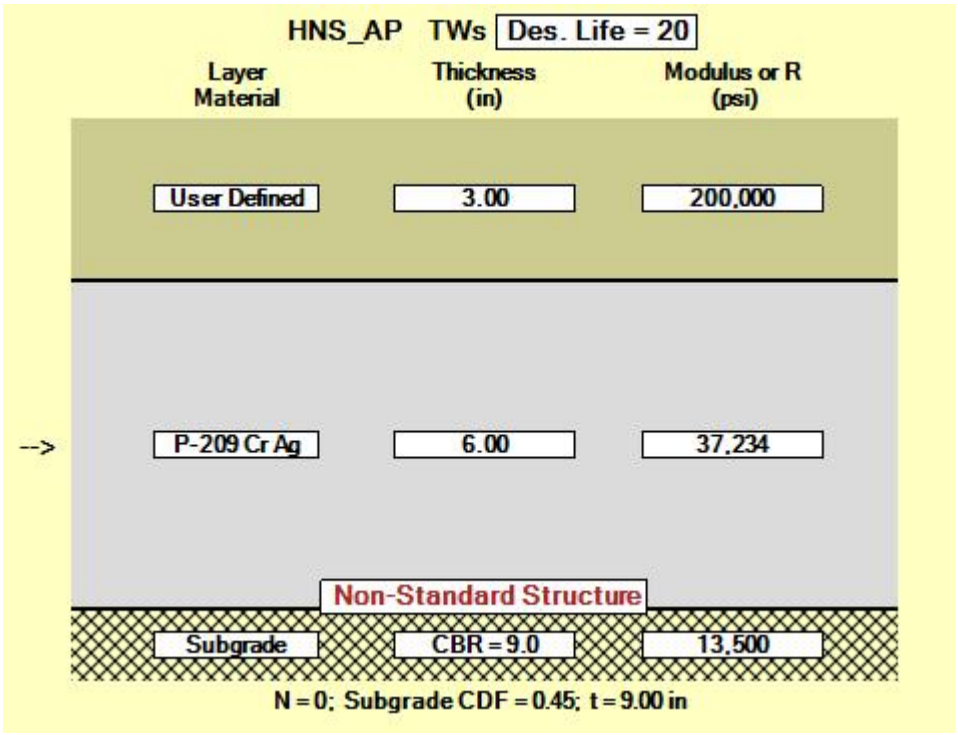
Subgrade CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	SuperKingAir-B200	0.00	0.00	3.09
2	GrnCaravan-CE-208B	0.00	0.00	4.94
3	Stationair-206	0.00	0.00	5.42
4	DHC-2 Beaver	0.00	0.00	4.70
5	Pilatus PC12	0.00	0.00	4.57
6	Navajo-C	0.00	0.00	5.11
7	Truck Axle Dual-Tandem	0.37	0.37	2.30
8	Truck Axle Tandem	0.08	0.08	4.31

HMA CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	SuperKingAir-B200	0.00	0.00	3.09
2	GrnCaravan-CE-208B	0.00	0.00	4.94
3	Stationair-206	0.00	0.00	5.42
4	DHC-2 Beaver	0.00	0.00	4.70
5	Pilatus PC12	0.00	0.00	4.57
6	Navajo-C	0.00	0.00	5.11
7	Truck Axle Dual-Tandem	0.37	0.37	2.30
8	Truck Axle Tandem	0.08	0.08	4.31

User is responsible for checking frost protection requirements.



FAARFIELD

FAARFIELD v 1.42 - Airport Pavement Design

Section TWs_FDR in Job HNS_AP.

Working directory is C:\Users\tweckhoff\Documents\FAARFIELD\

The structure is New Flexible. Asphalt CDF = 0.0247.

Design Life = 20 years.

A design for this section was completed on 09/30/20 at 16:37:15.

Pavement Structure Information by Layer, Top First

No.	Type	Thickness in	Modulus psi	Poisson's Ratio	Strength R,psi
1	User Defined	3.00	200,000	0.35	0
2	User Defined	5.75	25,000	0.35	0
3	Subgrade	0.00	13,500	0.35	0

Total thickness to the top of the subgrade = 8.75 in

Airplane Information

No.	Name	Gross Wt. lbs	Annual Departures	% Annual Growth
1	SuperKingAir-B200	12,590	216	2.50
2	GrnCaravan-CE-208B	8,750	1,405	2.50
3	Stationair-206	3,612	317	2.50
4	DHC-2 Beaver	5,100	500	2.50
5	Pilatus PC12	9,921	86	2.50
6	Navajo-C	6,536	628	2.50
7	Truck Axle Dual-Tandem	74,960	30	0.00
8	Truck Axle Tandem	37,480	30	0.00

Additional Airplane Information

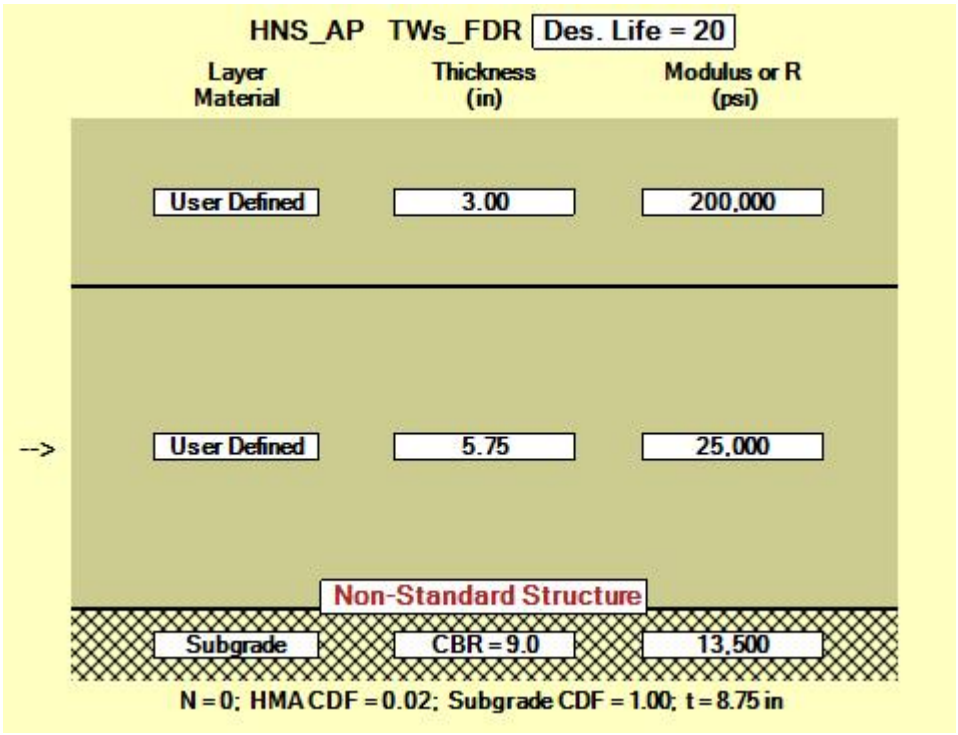
Subgrade CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	SuperKingAir-B200	0.00	0.00	3.12
2	GrnCaravan-CE-208B	0.00	0.00	5.02
3	Stationair-206	0.00	0.00	5.52
4	DHC-2 Beaver	0.00	0.00	4.77
5	Pilatus PC12	0.00	0.00	4.64
6	Navajo-C	0.00	0.00	5.20
7	Truck Axle Dual-Tandem	0.77	0.77	2.32
8	Truck Axle Tandem	0.23	0.23	4.37

HMA CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	SuperKingAir-B200	0.00	0.01	4.94
2	GrnCaravan-CE-208B	0.01	0.01	7.96
3	Stationair-206	0.00	0.00	9.37
4	DHC-2 Beaver	0.00	0.00	7.36
5	Pilatus PC12	0.00	0.00	7.04
6	Navajo-C	0.00	0.00	8.43
7	Truck Axle Dual-Tandem	0.00	0.01	1.65
8	Truck Axle Tandem	0.00	0.00	3.22

User is responsible for checking frost protection requirements.



FAARFIELD

FAARFIELD v 1.42 - Airport Pavement Design

Section TWs_RSS in Job HNS_AP.

Working directory is C:\Users\tweckhoff\Documents\FAARFIELD\

The structure is New Flexible. Asphalt CDF = 0.0000.

Design Life = 20 years.

A design for this section was completed on 09/30/20 at 16:37:23.

Minimum layer thicknesses were reached.

Pavement Structure Information by Layer, Top First

No.	Type	Thickness in	Modulus psi	Poisson's Ratio	Strength R,psi
1	User Defined	3.00	200,000	0.35	0
2	P-209 Cr Ag	6.00	30,744	0.35	0
3	Subgrade	0.00	10,500	0.35	0

Total thickness to the top of the subgrade = 9.00 in

Airplane Information

No.	Name	Gross Wt. lbs	Annual Departures	% Annual Growth
1	SuperKingAir-B200	12,590	54	2.50
2	GrnCaravan-CE-208B	8,750	352	2.50
3	Stationair-206	3,612	80	2.50
4	DHC-2 Beaver	5,100	125	2.50
5	Pilatus PC12	9,921	22	2.50
6	Navajo-C	6,536	157	2.50
7	Truck Axle Dual-Tandem	74,960	8	0.00
8	Truck Axle Tandem	37,480	8	0.00

Additional Airplane Information

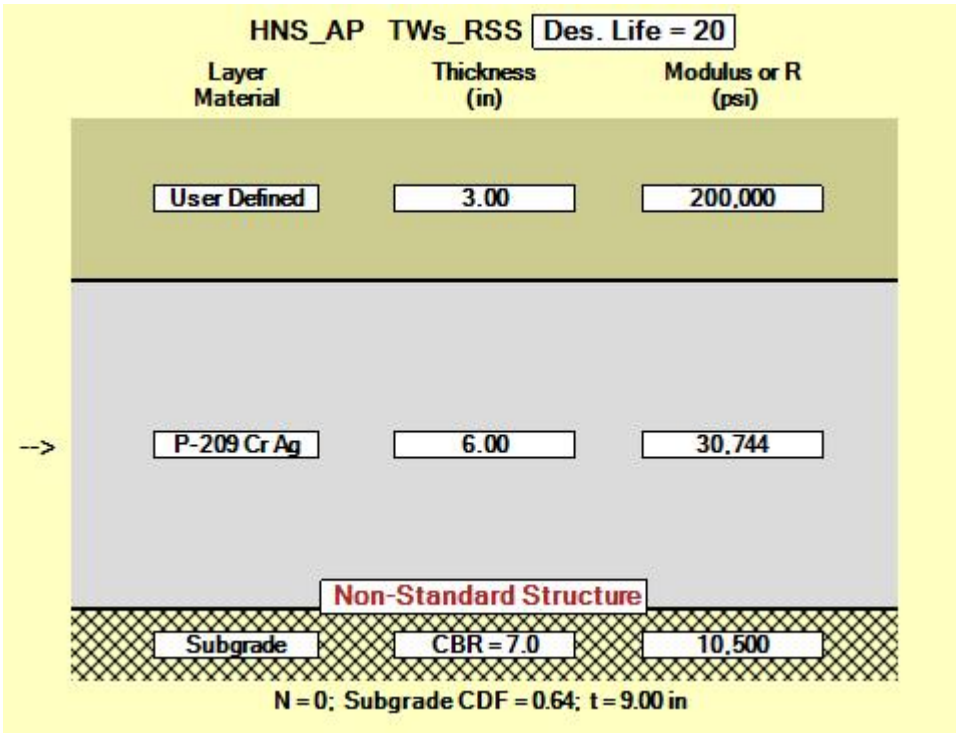
Subgrade CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	SuperKingAir-B200	0.00	0.00	3.09
2	GrnCaravan-CE-208B	0.00	0.00	4.94
3	Stationair-206	0.00	0.00	5.42
4	DHC-2 Beaver	0.00	0.00	4.70
5	Pilatus PC12	0.00	0.00	4.57
6	Navajo-C	0.00	0.00	5.11
7	Truck Axle Dual-Tandem	0.52	0.52	2.30
8	Truck Axle Tandem	0.12	0.12	4.31

HMA CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	SuperKingAir-B200	0.00	0.00	3.09
2	GrnCaravan-CE-208B	0.00	0.00	4.94
3	Stationair-206	0.00	0.00	5.42
4	DHC-2 Beaver	0.00	0.00	4.70
5	Pilatus PC12	0.00	0.00	4.57
6	Navajo-C	0.00	0.00	5.11
7	Truck Axle Dual-Tandem	0.52	0.52	2.30
8	Truck Axle Tandem	0.12	0.12	4.31

User is responsible for checking frost protection requirements.



FAARFIELD

FAARFIELD v 1.42 - Airport Pavement Design

Section TWs_RSS_FDR in Job HNS_AP.

Working directory is C:\Users\tweckhoff\Documents\FAARFIELD\

The structure is New Flexible. Asphalt CDF = 0.0069.

Design Life = 20 years.

A design for this section was completed on 09/30/20 at 16:37:28.

Pavement Structure Information by Layer, Top First

No.	Type	Thickness in	Modulus psi	Poisson's Ratio	Strength R,psi
1	User Defined	3.00	200,000	0.35	0
2	User Defined	5.83	25,000	0.35	0
3	Subgrade	0.00	10,500	0.35	0

Total thickness to the top of the subgrade = 8.83 in

Airplane Information

No.	Name	Gross Wt. lbs	Annual Departures	% Annual Growth
1	SuperKingAir-B200	12,590	54	2.50
2	GrnCaravan-CE-208B	8,750	352	2.50
3	Stationair-206	3,612	80	2.50
4	DHC-2 Beaver	5,100	125	2.50
5	Pilatus PC12	9,921	22	2.50
6	Navajo-C	6,536	157	2.50
7	Truck Axle Dual-Tandem	74,960	8	0.00
8	Truck Axle Tandem	37,480	8	0.00

Additional Airplane Information

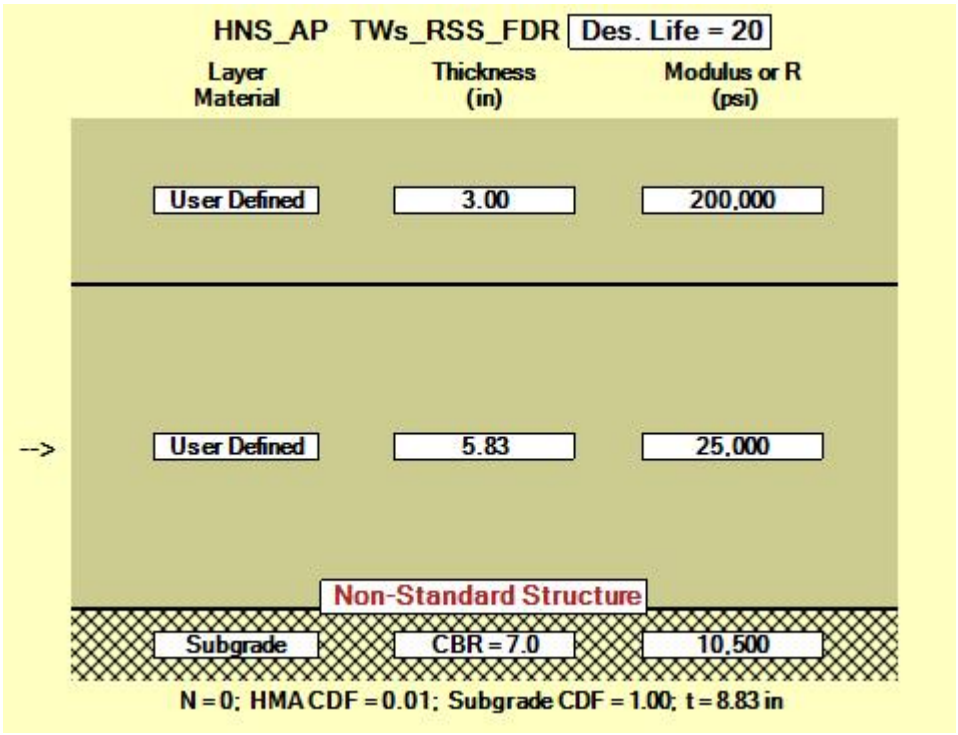
Subgrade CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	SuperKingAir-B200	0.00	0.00	3.11
2	GrnCaravan-CE-208B	0.00	0.00	4.99
3	Stationair-206	0.00	0.00	5.49
4	DHC-2 Beaver	0.00	0.00	4.75
5	Pilatus PC12	0.00	0.00	4.62
6	Navajo-C	0.00	0.00	5.17
7	Truck Axle Dual-Tandem	0.80	0.80	2.31
8	Truck Axle Tandem	0.20	0.21	4.35

HMA CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	SuperKingAir-B200	0.00	0.00	4.94
2	GrnCaravan-CE-208B	0.00	0.00	7.96
3	Stationair-206	0.00	0.00	9.37
4	DHC-2 Beaver	0.00	0.00	7.36
5	Pilatus PC12	0.00	0.00	7.04
6	Navajo-C	0.00	0.00	8.43
7	Truck Axle Dual-Tandem	0.00	0.00	1.65
8	Truck Axle Tandem	0.00	0.00	3.22

User is responsible for checking frost protection requirements.



FAARFIELD

FAARFIELD v 1.42 - Airport Pavement Design

Section Heli in Job HNS_AP.

Working directory is C:\Users\tweckhoff\Documents\FAARFIELD\

The structure is New Flexible. Asphalt CDF = 0.0108.

Design Life = 20 years.

A design for this section was completed on 09/30/20 at 16:35:55.

Pavement Structure Information by Layer, Top First

No.	Type	Thickness in	Modulus psi	Poisson's Ratio	Strength R,psi
1	P-401/ P-403 HMA Surface	3.00	200,000	0.35	0
2	P-209 Cr Ag	3.00	27,538	0.35	0
3	P-154 UnCr Ag	8.11	13,191	0.35	0
4	Subgrade	0.00	7,500	0.35	0

Total thickness to the top of the subgrade = 14.11 in

Airplane Information

No.	Name	Gross Wt. lbs	Annual Departures	% Annual Growth
1	Truck Axle Dual	37,480	30	0.00
2	Truck Axle Dual	37,480	30	0.00
3	DHC-2 Beaver	5,100	500	0.00

Additional Airplane Information

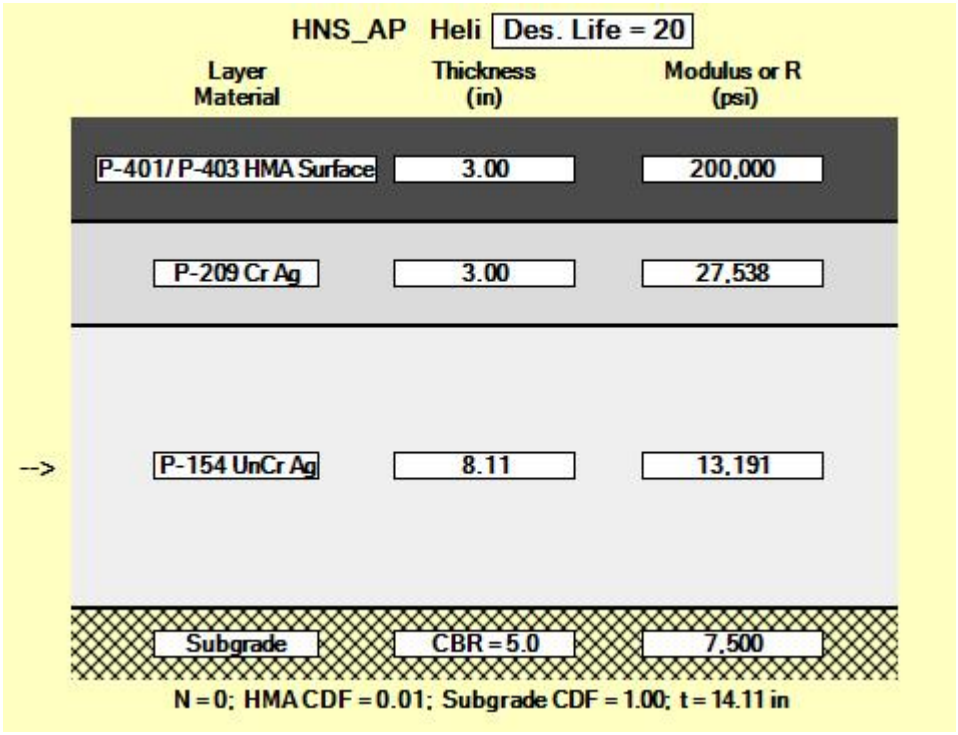
Subgrade CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	Truck Axle Dual	0.50	0.50	2.03
2	Truck Axle Dual	0.50	0.50	2.03
3	DHC-2 Beaver	0.00	0.00	3.62

HMA CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	Truck Axle Dual	0.01	0.01	3.30
2	Truck Axle Dual	0.01	0.01	3.30
3	DHC-2 Beaver	0.00	0.00	7.36

User is responsible for checking frost protection requirements.


HNS_AP Heli Des. Life = 20
Layer Material
Thickness (in)
Modulus or R (psi)
P-401/ P-403 HMA Surface
3.00
200,000
P-209 Cr Ag
3.00
27,538
-->
P-154 UnCr Ag
8.11
13,191
Subgrade
CBR = 5.0
7,500
N = 0; HMA CDF = 0.01; Subgrade CDF = 1.00; t = 14.11 in

FAARFIELD

FAARFIELD v 1.42 - Airport Pavement Design

Section Heli_RSS in Job HNS_AP.

Working directory is C:\Users\tweckhoff\Documents\FAARFIELD\

The structure is New Flexible. Asphalt CDF = 0.0040.

Design Life = 20 years.

A design for this section was completed on 09/30/20 at 16:36:03.

Pavement Structure Information by Layer, Top First

No.	Type	Thickness in	Modulus psi	Poisson's Ratio	Strength R,psi
1	P-401/ P-403 HMA Surface	3.00	200,000	0.35	0
2	P-209 Cr Ag	3.00	25,991	0.35	0
3	P-154 UnCr Ag	5.79	12,275	0.35	0
4	Subgrade	0.00	7,500	0.35	0

Total thickness to the top of the subgrade = 11.79 in

Airplane Information

No.	Name	Gross Wt. lbs	Annual Departures	% Annual Growth
1	Truck Axle Dual	37,480	8	0.00
2	Truck Axle Dual	37,480	8	0.00
3	DHC-2 Beaver	5,100	125	0.00

Additional Airplane Information

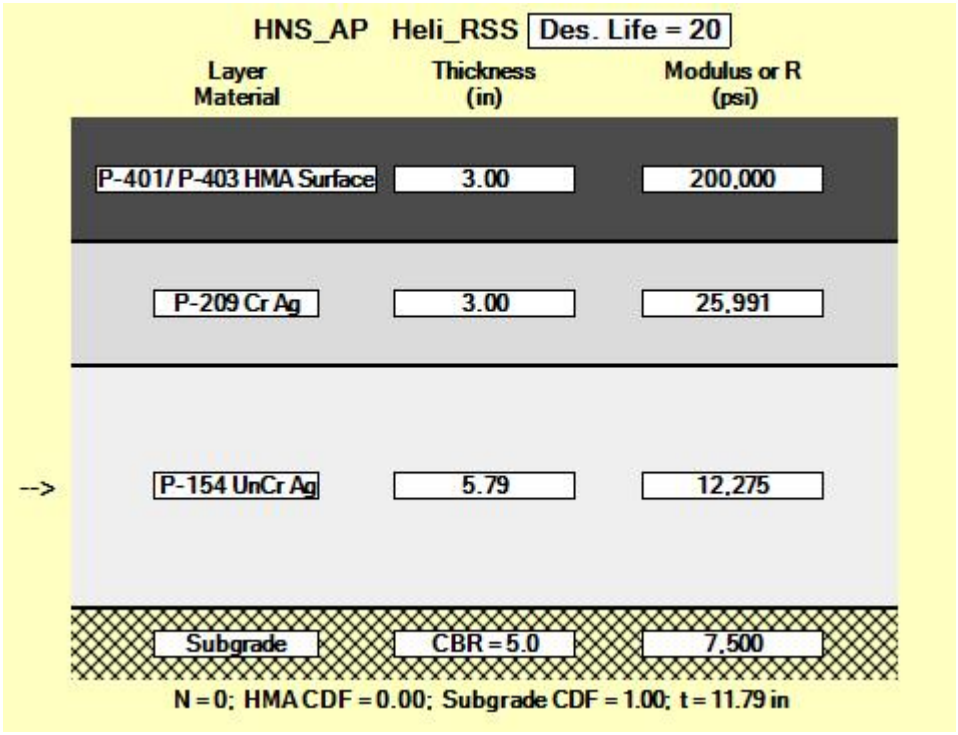
Subgrade CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	Truck Axle Dual	0.50	0.50	2.14
2	Truck Axle Dual	0.50	0.50	2.14
3	DHC-2 Beaver	0.00	0.00	4.04

HMA CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	Truck Axle Dual	0.00	0.00	3.30
2	Truck Axle Dual	0.00	0.00	3.30
3	DHC-2 Beaver	0.00	0.00	7.36

User is responsible for checking frost protection requirements.


HNS_AP Heli_RSS Des. Life = 20
Layer Material
Thickness (in)
Modulus or R (psi)
P-401/ P-403 HMA Surface
3.00
200,000
P-209 Cr Ag
3.00
25,991
-->
P-154 UnCr Ag
5.79
12,275
Subgrade
CBR = 5.0
7,500
N = 0; HMA CDF = 0.00; Subgrade CDF = 1.00; t = 11.79 in